Analysis of Co-Management Arrangements in Fisheries and related Coastal Resources:

A Research Framework

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1. INTRODUCTION

The Coastal Resources Co-management Research Project is a collaborative project between International Centre for Living Aquatic Resources Management (ICLARM), Institute of Fisheries Management and Coastal Community Development (IFM), Denmark and National Aquatic Resource Systems (NARS) partners in Asia and Africa. It is based on a mutual interest to gain practical experience in research on fisheries co-management. There are eight components to the research:

(1) Co-management case studies
(2) Hypothesis testing
(3) Studies of issues related to process and management systems
(4) Legal, policy and institutional analysis
(5) National policy development
(6) Technical assistance to co-management initiatives
(7) Synthesis of research results
(8) Networking/capacity building

This paper describes the research framework which has been developed by the project to carry out the above research. The aim is to provide a common analytical framework which will enable comparison between case studies, country research and co-management models. This will allow data to be analysed in a systematic way and allow generalisations to be made about conditions which facilitate successful co-management.

This paper is divided into two main sections. The first section (chapter 2) briefly describes the theoretical background to the research framework, exploring the concepts of common property resources, co-management, institutional analysis and rights and rules. For more detailed coverage of the theoretical background, readers are encouraged to consult the bibliography. The second section (chapter 3) describes the research framework itself.

2. THEORETICAL BACKGROUND

2.1 Common property resources

The Acommons@ include natural resources, such as wild fish stocks, wildlife, forests, irrigation waters and pasture lands, which by their physical nature are not owned by individuals but are shared by a community or group of users, such as fishers. The Acommons@ have come to connote inevitable resource degradation. Many have accepted that fishery resources which are held in common are subject to overexploitation and degradation. The main rationale for this was based on Hardin's theory on The Tragedy of the Commons (Hardin, 1968) which concluded that "freedom of the commons brings ruin to all". The assumption was that when resources are limited and publicly owned, it is rational for each individual to overexploit them, even though this behaviour ultimately results in tragedy for the group (Acheson, 1989). Hardin's solution was either to privatise the commons or keep them as public property, to which rights of entry and use could be allocated i.e. privatisation or government control. It has for a long time been a widespread perception that common property and

open access are synonymous. Today this perception of common property is recognised as having no basis in reality (Hanna 1990), as s**ocial scientists have observed that not all common property resources are subject to such a 'tragedy' and are not overexploited. This has led to considerable discourse on the subject and consequent rejection of the notion that it is the common property nature of the resource which is the problem. What is important is not the type of resource i.e. common property, but the property rights regime in combination with the resource it is subject to, namely open access, private property, communal property and state property. The following definitions are given by Feeny et al (1990) to describe these regimes**:

Open access: **the absence of well defined property rights. Access to the resource is unregulated and free and open to anyone.**

Private property: **the rights to exclude others from using the resource and to regulate the use of the resource are vested in an individual or group. The rights are usually recognised and enforced by the state and are usually exclusive and transferable.**

Communal property: **the resource is held by an identifiable community of interdependent users who may exclude outsiders while regulating use amongst members. The rights are unlikely to be exclusive or transferable and are often rights of equal access and use. Some inshore fisheries and shellfish beds are managed as communal property. The rights of the group may be legally recognised or** *de facto.*

State property: **rights to the resource are vested exclusively in the government which makes decisions concerning who should have access to the resource, the conditions and the level and nature of exploitation.**

This separation between the nature of the resource and the property regime it falls under shows that Hardin's theory was correct inasmuch as it predicted a situation of a common property resource under an open access regime. However, other property regimes can and have also led to overexploitation, indicating that the provision of property rights alone is not enough. New methods of management are being investigated, in an attempt to take on the best aspects of state, private and communal property. Largely from the management experiences gained in certain fisheries, and other common property resources such as forests and groundwater, it is recognised that what is needed is a more dynamic partnership where the capacities and interests of local resource users and communities, are complemented by the ability of the state to provide enabling policies and legislation as well as enforcement and other assistance. This type of partnership has been termed co-management.

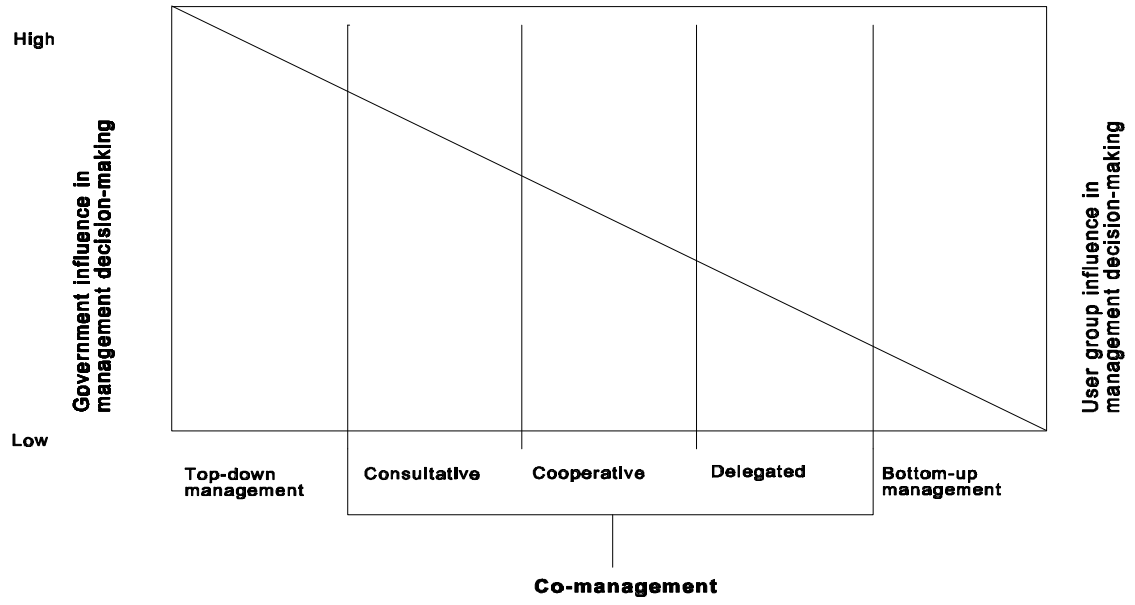
2.2 Coastal resources co-management

Co-management is defined as the sharing of responsibility and/or authority between the government and local resource users to manage a specified resource, e.g. fishery, coral reef. Lying between two management strategies - centralised control and self or community management - co-management covers a broad spectrum of management arrangements (Figure 1). The amount of responsibility and/or authority that the government and local resource users have, will differ and depend upon country and site-specific conditions. For this reason, co-management covers a number of arrangements ranging from government (agencies) instructing user groups to user groups informing government on management arrangements they have developed. Co-management should not be

viewed as a single strategy to solve all problems of coastal resource management. Instead, it should be seen as a set of alternative management strategies, appropriate for certain areas and situations (Pomeroy and Williams 1994).

Coastal resources in the present context comprises primarily the fauna and flora of coastal territories both seawards and landwards. It includes lakeshore and riverine areas as well as wetlands. Dependent on the site specific circumstances it may include other coastal resources susceptible to mining or farming.

Figure 1. Spectrum of co-management arrangements



Consultative **Institutional structures for government to consult with user-groups/fishing communities exist, but all decisions are taken by government.**

Cooperative **Government and user-groups/fishing communities cooperate together as equal partners in decision-making.**

Delegated **Management authority (mainly for setting operational rules) is delegated to user-groups/fishing communities and government is informed on decisions taken.**

2.3 Institutional analysis

In conducting research on coastal resources co-management we are essentially interested in understanding how rules affect the behaviour of the resource users and other stakeholders and the outcomes achieved . Institutional analysis provides the framework for the research. It focuses on the institutional arrangements by which is understood the set of rights and rules by which a group of resource users and government organises resource governance, management and use in collective action situations. The purpose of institutional analysis is to separate the underlying rules from the strategy of the players. Institutional analysis examines how institutional arrangements (rules and regulations) affect user behaviour and incentives to coordinate, cooperate and contribute in the formulation, implementation and enforcement of management regimes[1]. When carrying out institutional analysis, it is also important to examine some aspects of organisations because their strategies can influence, or lead to change, in institutions.

2.3.1 Institutions

Institutions constitute the central element in co-management analysis. Therefore, there is a need to explain what they are, and distinguish institutions from organisations, which very often is a major source of confusion.

Depending on the discipline of social science there are different definitions of institutions. Political scientists, influenced by rational choice and game theory traditions, view institutions as *Aframeworks of rules, procedures and arrangements@***, or** *Aprescriptions about which actions are required, prohibited, or permitted@* **(Powell and DiMaggio 1991). The new institutional economists, particularly economic historians contend that** *Ainstitutions are regularities in respective interactions, customs and rules that provide a set of incentives and disincentives for individuals@***. The economists of organization conceive institutions as** *Agovernance structures, social arrangements geared to minimise transaction costs@* **(***ibid., p 8***). In a sociological perspective institutions are:** *Aa system of norms that regulate the relations of individuals to each other, and define what the relations of individuals ought to be@* **(Scott, 1995).**

In this research framework institutions are: *A the rules of the game in a society; the humanly devised constraints that shape human interactions, and are affected by social, cultural, economic and political factors@***. By adding Acultural factors@ among the list of factors that affect the institutions this definition is a slightly modified version of North (1990).**

Berger and Berger (1972) have identified five basic characteristics of institutions: (i)E*xternality:* **that institutions are experienced as having external reality, that is, an institution is something outside the individual, something real in a way different from the reality of the individual=s thoughts, feelings or fantasies; (ii)** *Objectivity:* **that institutions are experienced as possessing objectivity; (iii)** *Coerciveness:* **that institutions have coercive power. The fundamental power of an institution over the individual is precisely that it is objectively there and that it can not be wished away; (iv)** *Moral authority:* **that**

[1] **It should be noted that not every detail of institutional analysis will be discussed in this paper. The reader is encouraged to make use of the publications in the reference list for more specific discussion of several aspects of institutional analysis.**

institutions have moral authority. Institutions do not simply maintain themselves by coercive power, they claim the right to legitimacy; and (v) *Historicity:* **that institutions have the quality of historicity. Institutions are not only facts but historical facts, they have a history.**

Institutions can either be formal or informal and may be created or evolve over time. Depending on the situation, the formal rules may be in written form and the informal ones may not. The nature of institutions can further be explained by the use of an iceberg analogy. The top visible part of the iceberg can be taken as the formal and written institutions, whereas, the lower part of the iceberg, which is not visible but exists, can be taken as the informal and unwritten institutions. Both formal and informal codes may be violated and therefore, punishments are enacted. The essential part of the functioning of institutions is then determined by whether they can be enforced, the cost of enforcement and the severity of the punishment.

2.3.2 Organisations

Organisations are groups of individuals bound by some common factors to achieve particular objectives. The origin of organisations and how they evolve is influenced by the institutional framework and in turn organisations influence how the institutional framework evolves. Organisations are created for specific objectives, and in the course of attempting to accomplish their objectives they initiate the process of institutional changes. Organisations can be political such as a local council, economic such as a cooperative, social such as a church, or educational such as a school.

North (1990) used the analogy of a football game to describe institutions and organizations. The rules of the game are institutions, some of which are formal and written, while others are in a form of unwritten codes of conduct, which underlie and supplement the formal rules. In this analogy, the football team is the organization. The main point to note here is that, in an organization, there exists both formal and informal institutions.

Culture constitutes the organizational environment and makes organizations possible and meaningful. In organisational theory, culture has for a long time been treated as an independent variable. Max Weber was one of the first to examine the emergence of rational legal rules, which he thought was essential to support the development of organisations (Scott, 1995). Thus, organization is a cultural phenomenon that varies according to a society=s path or stage of development. It is based on this that Sandersen (1996) warns that to regard organisations at the local level, as implied in the co-management model, as a universal panacea for improved fisheries management might be an ethno-centric ideological stand on part of the industrialised Western world. Both modernisation, development and formal organization are products of a specific western epistemological and institutional tradition.

2.3.3 Rights and Rules

The terms "rights" and "rules" are often used interchangeably in referring to the uses of natural resources. "Rights" refer to particular actions that are authorized (Ostrom 1990). Rights define the uses

which are legitimately viewed as exclusive and the penalties for violating those rights. The specification of a right does not define how the right is to be exercised. How rights are exercised are defined by Arules@. Rules define specifically what acts are required, permitted, and forbidden in exercising the authority provided by the right. For every right that an individual holds, rules exist that authorize particular actions in exercising the right. For example, a right provides the authority for a fisher to operate on a specific fishing ground. How the fisher exercises that right through the fishing activity is specified by rules which may dictate the type of fishing gear used or the time of year when the fishing gear can be used. Thus rules specify both rights and duties. The important aspect of rules in terms of institutional analysis is that they may create different incentives which affect cooperation among users. The more complete the set of rights, the less exposed the resource users are to the actions of others, and the less risk the users face in organising themselves in groups (Ostrom 1990).

Schlager and Ostrom (1993) distinguish between different types of rights:

a) Access right: the right to enter a defined physical property e.g. participate in the fishery.

2) Withdrawal right: the right to obtain the "products" of a resource; e.g., catch a certain amount of fish.

c) Management right: the right to devise operational-level rights of withdrawal.

d) Exclusion right: the right to devise operational-level rights of access.

e) Transfer right: the right to sell or lease all or part of the above collective-choice rights.

The sources of the rights of access, withdrawal, management, exclusion and transfer are varied. These rights may originate by government which explicitly grants rights to resource users. These *de jure rights* **are given formal and legal recognition. Rights may also originate from resource users. Such indigenous or** *de facto rights***, devised and enforced by the users, are not usually recognized by government. These two types of property rights may overlap, complement or conflict with each other. While de facto rights may eventually be given recognition by government, until they are formally legitimized, they are less secure than de jure rights (Schlager and Ostrom 1993). While most authorities tend to ignore de facto rights, many have proven to be efficient and equitable.**

Rules are defined by authority relationships that specify *who* **decides** *what* **in relation to** *whom***. Ostrom (1991) identifies three levels of rules which are all closely linked:**

*1. Operational rules***, govern and regulate resource use (e.g. fishing regulations). Operational rules directly affect the day-to-day decisions made by the users (e.g. fishers) concerning when, where and how to harvest (fish); who should monitor the actions of others and how; what information must be exchanged or withheld, and what rewards or sanctions will be assigned to different combinations of actions and outcomes. Operational rules can be formal (written, legitimized) or informal (unwritten, customary/ traditional). In both circumstances they are understood by those to whom they apply.**

2. Collective choice rules, **are rules about how the resources and their exploitation should be managed e.g. in a co-management institutional set-up. Such institutional arrangements are needed to adjudicate conflicts, enforce decisions, formulate and change operational rules, detect and sanction against rule**

violation, and hold officials accountable. In a broad sense, collective-choice rules include qualifications for participation in the management organisation and whether membership is compulsory. They may state what proportion of the group of resource users must agree before a rule may be adopted. Of critical importance are the arrangements for monitoring and enforcing compliance with the operational rules and for settling disputes.

There may be multiple levels of collective-choice entities depending upon the situation. In some situations only one entity, e.g. a national fisher's association, may be constituted to adopt and enforce their own collective-choice and operational rules. In another situation, multiple collective-choice entities, at national, regional and/or local levels, may subject resource users to multiple sets of operational rules. For example, national-level regulations may overlap with local-level regulations which may overlap with customary or traditional practices. Issues of coordination and control must be addressed when multiple levels of collective-choice entities are in place (Tang 1992).

3. Constitutional-choice rules **by determine who is eligible to participate in the system and establish the process by which collective-choice rules are created, enforced and modified. Constitutional-choice rules include, for example, the national legislation which establishes the national administrative and management structure and legitimize co-management arrangements.**

Operational or working rules are nested within collective choice rules which are in turn nested within constitutional rules. In other words, the rules affecting operational choice are made within a set of constitutional choice rules.

3. INSTITUTIONAL ANALYSIS FOR COASTAL RESOURCES CO-MANAGEMENT

3.1 Research framework

Based on the theoretical concepts described in Section 2, an analytical framework has been developed for use by project researchers on coastal resources co-management. The purpose of institutional analysis is to separate the underlying rules (institutions) from the strategy of the players (organisations). Institutional analysis examines how institutional arrangements affect user behaviour and incentives to coordinate, cooperate and contribute in the formulation, implementation and enforcement of management regimes. When carrying out institutional analysis, it also important to examine some aspects of organisations because their strategies can influence, or lead to change in, institutions.

Such an analysis can then be used to make generalisations about the type of co-management arrangements appropriate for different situations. In particular, the analysis would enable:

(1) The identification of the *existing property rights system* **in order to determine who defines rights to exploit the resource, who has access to the resource and whether any of these rights are transferable.**

(2) The *scale and level of user group involvement* **in order to determine the ways in which user groups do or can participate in co-management. Scale refers to the types of tasks which can**

be carried out by user groups, whilst level refers to the political level at which user groups are involved such as local, regional or national. Scale is related to level in the sense that different tasks can be carried out at different levels.

(3) **The** *nature of the representation of user groups* **in the decision-making process in order to determine the participants in the co-management arrangement, which user groups are legitimate participants in the decision-making process and who can claim rights to participate.**

(4) **The** *type of management organisation* **(existing or possible) in order to determine the type of co-management arrangement most appropriate for a particular resource or resource system.**

The research framework allows for the essential elements of the action situation to be identified and examined. The framework is used to collect and organise information on key contextual variables which characterize collective action situations at multiple levels. The same set of contextual variables are used to describe and analyze all situations. These contextual variables will take on different values in different situations. By utilising the same set of contextual variables, it is possible to conduct a systematic and comparative analysis of diverse situations and identify relationships among variables for evaluative, diagnostic and design purposes.

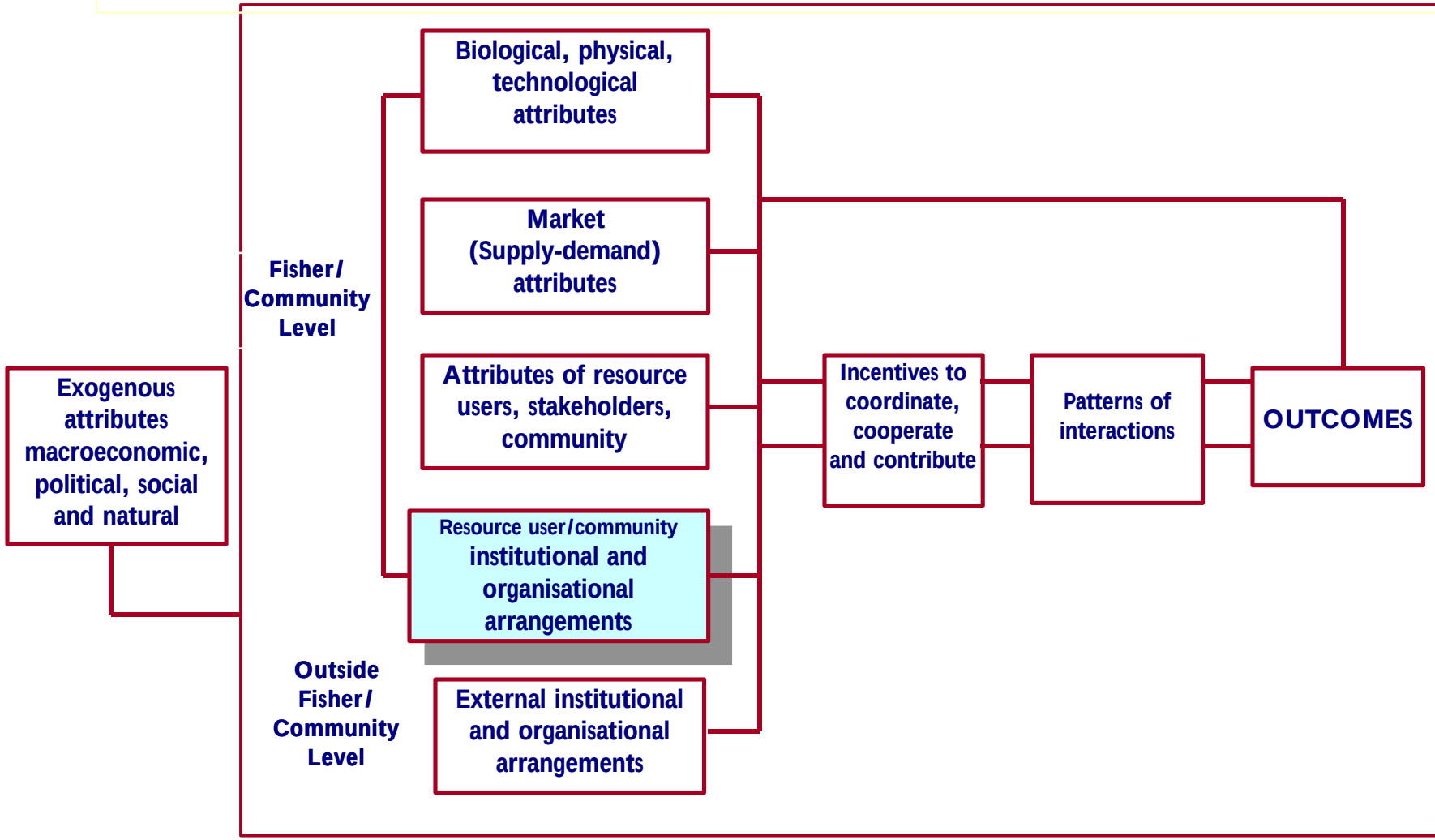
The research framework is adapted from theoretical and empirical work on the Institutional Analysis and Development (IAD) framework developed by researchers at the Workshop in Political Theory and Policy Analysis at Indiana University, USA.

The framework, of which a graphical representation is given in figure 2, enables the following analysis:

1. **<u>Institutional Arrangements Analysis</u>: This component links contextual variables characterizing key attributes of the resource (biological, physical) and the resource users (technology, market, social, cultural, economic, political) with the management institutional arrangements (rights and rules). The contextual variables are each composed of a number of attributes. A causal relationship exists among and between the contextual variables, the institutional arrangements (the focus of the analysis) and the resulting transactional (action) situations. The institutional arrangements and the contextual variables affect the actions of the resource users and authorities responsible for fisheries management by shaping the incentives and disincentives they have to coordinate and cooperate in resource governance, management and use; the incentives, in turn, shape the patterns of interaction and behaviour between the co-management partners, i.e. the types of co-management arrangement established and the way it functions.**

2. **<u>Co-management Performance Analysis</u>: The co-management arrangement results in outcomes. These outcomes will, in turn, affect contextual variables as well as behaviour of resource users, other stakeholders and public authorities (indicated by dotted line in figure 2). Time is a critical element. All the contextual variables can change through time. This may cause change in institutional arrangements which, in turn, affect incentives, patterns of interaction and outcomes. The outcomes of co-management institutional arrangements can be evaluated in terms of e.g. management efficiency, equity, and sustainability of resource utilisation.**

Figure 2. A Research Framework for Institutional Analysis



Adapted from Oakerson 1992 Fisheries Co-Management

3. Characteristics of Successful Co-management Institutional Arrangements: The most important aspect of this analysis is the specification of what conditions and processes bring about successful long-enduring, fisheries co-management arrangements. From the analysis we can identify a list of principles and propositions about conditions and processes.

The institutional analysis focuses on how rules combine with various contextual variables to structure the action situation and to generate particular types of outcomes. The analysis begins with an identification of variables affecting the action situation; the institutional, biophysical, technological, market, socio-cultural, economic, and political attributes and conditions of the resource users and the resource. These variables form the context within which resource users, other stakeholders and authorities coordinate and cooperate to establish institutions and organisations to govern, manage and use the resources.

In analysing institutional arrangements, the basic strategy is to separate and dissect the parts of the action situation - contextual variables, incentives, patterns of interactions and outcomes (Figure 2). The purpose of this is to examine relationships between and among the parts. Each part of the framework has a causal relationship with other parts, some stronger and some weaker depending upon the involvement of human choice in the relationship. Biophysical and technological attributes can have a direct affect on outcomes, for example, high levels of fishing effort can lead to overexploitation of resources, regardless of whether or not institutional arrangements are in place. Institutional arrangements, on the other hand, have an indirect affect on outcomes as they lead to changes in human behaviour and choice, which affect interactions and outcomes (Oakerson 1992). Different combinations of these parts can be examined depending upon the situation. These relationships can be analysed forward or backward depending upon if one is using the framework as an evaluative, diagnostic or design tool. Explicit and implicit assumptions about the relationships help structure and guide the analysis.

In a short-run analysis of an action situation, the contextual variables are assumed to be unchanging. Over a longer period, however, change will occur in them. Yields may increase, gear type may change or the day-to-day rules may be restructured. A dynamic element can be introduced into the framework. One approach treats institutional changes as exogenous; the aim is simply to understand how a series of changes in resource attributes or institutional arrangements affects patterns of interaction and outcomes. Another approach examines long-term relationships between attributes and institutional arrangements in an iterative and causal fashion. For example, outcomes can affect patterns of interactions resulting in a process of learning by the resource users; causing, in turn, individuals to modify their strategies. These relationships can be traced through the framework to identify factors which cause the strategies to change (Oakerson 1992).

3.2 Institutional arrangements analysis (applied to fisheries co-management)

3.2.1 Contextual variables

(a) Biological, physical and technological attributes

Problems and constraints over resource use most often originate in the biological and physical attributes of the resource and in the harvesting technology used. The nature of interactions among

fishers are commonly structured by the biophysical and technological environment of the fishery. The vulnerability of fishers to scarcity and uncertainty in supply and its effects impact upon their incentives to engage in collective action. Collective action situations have been shown to develop when a group of individuals are highly dependent on a resource and when availability of the resource is uncertain or limited. If the resource availability problem is repeatedly experienced, and if it exists within a single community of users, the users are likely to develop institutional arrangements to deal with the problem. To understand the actions fishers have taken and the institutions that they have developed requires an understanding of the fishing grounds, fish stocks, fishing activity, boundary conditions and fishing technology. Key questions to be considered are shown in Table 1.

Oakerson (1992) has identified three considerations for analyzing these attributes:

> **(1) The relative capacity of the fishery to support many fishers simultaneously without mutual interference and/or without diminishing the aggregate yield of the fishery for the group (subtractability). The harvesting activity of an individual fisher subtracts from the amount of fish available for other fishers to withdraw. The catch of one fisher affects the amount of fish that can be harvested by other fishers utilising the same fishing ground. Oakerson (1992) states, "The analysis should specify as precisely as possible the 'limiting conditions' that pertain to natural replenishment or maintenance of the resource. Physical limits established by nature or technology provide critical information for devising rules to maintain jointly beneficial use."**
>
> **(2) The degree to or relative ease with which access to the fishery is limited (exclusion). The physical nature of fishing grounds means that exclusion (or limiting access) of fishers is both difficult and costly. A single fisher would find it difficult to exclude other fishers, therefore, fishing grounds are subject to joint use. Oakerson (1992) states, "Two types of exclusion can be distinguished: (1) access may be fully regulated on an individual basis, or (2) it may be partially regulated and applied only to those outside the immediate community. This distinction is related to the potential exposure to increases in demand. Within a definite community of users, increases in aggregate demand derive mainly from expanded operations. If there is open access, however, increases in the number of users can also contribute to an increase in total demand on the resource." Thus, fishery is characterised by high levels of interdependence among fishers. The action of one fisher affects the actions and outcomes of other fishers. These interactions can lead to conflicts among fishers over space and amount of fish (Schlager 1990).**
>
> **(3) The spatial boundaries of the fishery, which determine the minimal scale on which effective coordinated resource management can occur (indivisibility). Physical boundaries having to do with divisibility of the fishery derive from nature, human design and technology. Fishing gear type, terrestrial and oceanographic features, customs, culture, government, organisations and scale all dictate the division or partitioning of the fishery into smaller units for management purposes (Oakerson 1992).**

The basic institutional forms for fisheries management are fundamentally shaped by these three characteristics of the resource. In addition to the above, two other concerns are important.

Technological problems **occur when fishers physically interfere with each other in the fishing activity. Gear conflicts may occur or the placement of gear may interfere with the flow of fish, often referred**

to as crowding. *Assignment problems* **occur when fishers, desiring to fish the most productive spots, fail to allocate themselves efficiently across spots, leading to conflicts (Schlager and Ostrom 1993).**

(b) Market (supply and demand) attributes

Resource problems are often market-based. Market attributes (price, structure, stability) can effect the incentives for resource use activities, effort levels and compliance with rules. Market attributes include those related to the operation and function of the market and those related to fisher and fish trader relationships. The first of these comprise market availability and orientation (local, regional, national, international), stability and transparency of supply and demand over time and competitive situation. The second includes such attitudes as credit linkages between fishers and fish traders, and rules on market behaviour.

Key questions to be considered are shown in Table 2.

(c) Socio-economic and socio-cultural attributes of fishing community

Community attributes include religious beliefs and practices, traditions and customs, sources of livelihood, the degree of social, cultural, economic and locational heterogeneity or homogeneity, asset ownership, level of community integration into the economy and polity, and others. Whether individual or in combination with others, each of these attributes potentially affects incentives to cooperate. General assumptions about fishers and stakeholders are related to how they behave both individually and in groups. Stakeholders, indirectly dependent upon the fishery for their livelihood, such as fish traders, processors and transporters, are also included since their relationship with fishers can provide incentives or disincentives for the fishers to cooperate (Table 3).

Some literature suggest two key attributes which lead to incentives to cooperate (Ostrom 1990, 1992, Runge 1992): (1) if a community of fishers exhibits a high degree of social, cultural and economic homogeneity in terms of kinship, ethnicity, religion, interests, beliefs, customs, livelihood strategies, etc.; and (2) if there is a high dependence or reliance of fishers on the fishery for their livelihood and the number of alternative livelihoods available in the community is low. If the fishers are highly dependent upon the fishery and if the availability of the resource is uncertain or limited, fishers are more likely to facilitate collective action to deal with the problem.

(d) Institutional and organisational arrangements at community level

Institutional arrangements concern the rights and rules which applies to and regulate the fisheries in which community members take part. The research focus is on power structures at the local level, decision making arrangements, participation of fishers and stakeholders, legitimacy, mechanisms for enforcement and compliance with rules.

Organisational arrangements concerns the characteristics of the fora in which decisions are made and collective action taken at the local level. Important issues are representation, decision-making procedures, implementation of decisions in the field, and interface with other related fora (dealing

with other resources than fish, e.g. tourism). The questions which are considered critical are given in Table 4.

Fisheries co-management arrangements often identify the community level as the most important level for partnership and sharing of management responsibility. Therefore institutional analysis at this level is of crucial importance to the understanding of co-management arrangements.

(e) External institutional and organisational arrangements

Institutional and organisational arrangements at higher levels than the community level most often affect the institutional and organisational arrangements at the community level. The relations can vary widely. Some community level institutional arrangements (e.g. the establishment of operational rules for fishing in waters adjacent to the local community) may have been subject to constitutional approval and may be supported by both enabling legislation and government enforcement. Other institutional arrangements at the community level may not have that legitimacy viz-a-viz fisheries and other authorities at municipal, district, regional or higher levels.

Organisational arrangements at the community level may have been developed and designed at a higher level to meet higher level needs and fit into a multiple layer, nested structure. They may for this reason have to follow rules and procedures that are more or less compatible with the local conditions. Institutional and organisational arrangements outside the fisheries sector may impact on community institutional and organisational arrangements. Key questions are given in Table 5.

(f) Exogenous (macroeconomic, social, political, natural) attributes

A variety of factors exogenous to the fishery resource, fisher and community have an impact on fisher or community institutional arrangements. These are factors which are beyond the control of the fishers and community, and at times also higher level entities. These are surprises or shocks to the community or management system, brought about by macroeconomic, social, political or natural occurrences or interventions which affect the survival of the institutional arrangements. They may include typhoons, war, civil unrest, change of political system, economic crisis, etc. Institutional analyses should always be viewed in a historical and dynamic perspective.

These factors can provide an indication of how well the institutional arrangements are functioning and surviving through their capacity or resiliency to accommodate sudden change. Critical issues are listed in table 6.

3.2.2 Incentives to cooperate and coordinate

The contextual variables and the institutional and organisational arrangements for decision making and implementation of decisions made give incentives and disincentives for individuals and groups to cooperate, engage in collective actions and coordinate activities to achieve desired outcomes. The focus of the research is on the relative importance of the various variables and arrangements in creating incentives for fishers and stakeholders to coordinate, cooperate and contribute as individuals

and as groups. The contextual situation and the institutional arrangements in place also give government authorities responsible for fisheries management incentives and disincentives to coordinate and cooperate with fishers and other stakeholder groups at various administrative levels. The dominant incentives for government agencies may to a large degree relate to the exogenous economic and political attributes and to institutional and organisational arrangements external to the local community. Table 7 list these questions.

3.2.3 Patterns of interactions between co-management partners

The incentives for groups of fishers and stakeholders and government agencies responsible for fisheries management to coordinate and cooperate will be reflected in the pattern of interaction between the parties. For research of co-management arrangements the analytical focus will be on the institutional and organisational arrangements established for the co-management partnership to materialize as well as the evolution process of the partnership. The analysis will enable typologization of the co-management arrangement in question (cf. Figure 1) but should also provide detailed information on how the practical aspects of fisheries co-management are dealt with in the action situation at various administrative levels. This includes e.g. the monitoring of fish stocks and fishing effort, the enforcement of fishing regulations, regulatory interference with fish markets, structural adjustments, etc.

It is the pattern of interaction between the co-management partners in the action situation which determine the dynamics of the co-management (evolution) process and ultimatively the outcome of co-management. How co-management arrangements evolve over time is of particular interest.

3.2.4 Outcomes

The co-management outcomes are produced as a result of the patterns of interaction between the co-management parties. The consequences affect both those involved directly in the action situation and those indirectly involved.

The outcomes of co-management institutional arrangements can be evaluated in terms of performance, that is, the meeting of management objectives and the impact on the resource and its users. It is expected that in certain situations co-management institutional arrangements will perform better than other types of fisheries management institutional arrangements, such as centralized management or self management.

The performance of co-management institutional arrangements can be evaluated at two levels. The first level of evaluation relates to overall institutional performance of co-management versus other types of management arrangements. These advantages include equity, more economical in terms of administration and enforcement, increased sense of ownership of the resource by users, higher degree of acceptability and rule compliance, improved information about the resource, improved social cohesion in the community, and more participation (Pomeroy and Williams 1994). A comparative assessment of the performance of different co-management institutional arrangements can be conducted at this level of evaluation.

The second level of evaluation relates to performance in meeting specific management objectives and impacts at the operational level. Each individual co-management case has objectives established by the participants, both resource users and government that are to be achieved. Performance evaluation is conducted to determine how well the objectives are achieved and what the impacts of the management activity are on both the human and biophysical environment.

The most common evaluative criteria are efficiency, equity and sustainability.

Efficiency

There are various measures of efficiency. The first aspect of efficiency is whether fishers have achieved an optimal rate of use of the fishery (Oakerson 1992). A less rigorous criterion is that fishers are not exceeding the sustainable yield of the fishery. A second measure of efficiency has to do with the flow of benefits resulting from the co-management institutional arrangements and the costs (such as transaction costs) of establishing and maintaining such arrangements. Ostrom, Schroeder and Wynne 1993) state, "Economic efficiency is determined by the magnitude of the change in the flow of net benefits with an allocation or reallocation of management resources." A minimal efficiency criterion is that the benefits of operating and maintaining co-management arrangements exceed the full set of direct and indirect costs. A comparative efficiency criterion is that the difference between the benefits and the costs of co-management institutional arrangements in one setting is the same as or greater than those of similar arrangements in a similar setting elsewhere (Ostrom 1992).

As management processes are established to achieve particular objectives, the cost-effectiveness of the process compared to others has to be evaluated. One of the purported advantages of co-management compared to centralised management is that it will reduce transaction costs - the costs of information-gathering and processing, coordination of decision-makers/user groups and regulation enforcement. Some of these costs remain fixed regardless of the management regime, such as information which is required by law. Other transaction costs vary with the quality of data and the process used to make decisions. Hanna (1994) points out that a centralised approach is often associated with low programme design costs but high implementation, monitoring and enforcement costs as the management regime may have little legitimacy with user groups. A co-management approach, on the other hand, is associated with high programme design costs as effective participation is time-consuming and therefore costly. However, co-management is likely to lead lower implementation, monitoring and enforcement costs as legitimacy of the regime is greater (Hanna 1995).

Equity

Equity (fair treatment for all people involved in managing, governing and using the resource) has four main components (Hanna 1995):

(a) *Representation:* **a more equitable management regime should represent the range of interests in the fishery and accommodate the full diversity of those interests.**

(b) *Process clarity:* **the management process should have a clear purpose and a transparent**

operation.

(c) *Homogenous expectations:* **the extent to which participants have similar expectations concerning the management process and its objectives.**

(d) *Distributive effects:* **the management process should address the distributional changes embedded in the options under consideration.**

Equity can be measured in several ways. First, is the distribution of an individual's return on contributions to the management and governance effort roughly similar to the benefits they receive? Oakerson (1992) states, "The presence of inequities may lead to the collapse of reciprocity, resulting in less efficient use. Equity problems are apt to be aggravated by asymmetries (unequal proportions) among users, which create opportunities for some to benefit at others' expense. This, in turn, can lead to costly conflict where all parties lose." Corruption and abuse of authority may contribute to inequities. A second measure is to determine if there are patterns of redistribution that fishers wish to achieve at this level of institutional arrangements.

Sustainability

Sustainability can be divided into stewardship, resilience and governance. *Stewardship***, the tendency for resource users to maintain productivity and ecological characteristics of the resource, is divided into three components: time horizons, monitoring and enforcement. To promote resources stewardship, the management process should expand time horizons beyond the short term. A sense of stewardship will be more likely if the effects of the management regime can be monitored and where necessary, enforcement measures taken.**

Resilience **is the ability of the management system to absorb and deal with changes and shocks. The three components of resilience are rule flexibility, structural adaptation and market adaptation. Rules should be flexible enough to respond quickly to changing conditions. The management regime should be able to adapt to both changes in the structure of the industry as well as changes in the market (Hanna 1995).**

Governance **includes the level of rule compliance as a major aspect. The willingness of fishers to regularly follow operational-level rules reflects the viability of the rules as coordinating devices. Other measures of governance may include overall reduction in conflict, existence of an effective conflict resolution mechanism, and existence of practical and implementable enforcement procedures.**

3.3 Characteristics of successful co-management institutional arrangements

The most important research task for an institutional analysis of fisheries co-management is to specify conditions and propositions for successful development of co-management institutions and which arrangements are most favorable for maintaining it. A number of questions need to be answered: Why are some co-management arrangements successful, while others fail? Why do some co-management arrangements endure for long periods of time? How can we improve the success rate for implementation of co-management arrangements?

The success of co-management institutional arrangements may be related to specific contextual variables or attributes, and these may affect the development and maintenance of the arrangements. The research framework provides a means to identify attributes which lead to successful co-management from those which lead to failure. For example, specific biophysical or fisher attributes, such as boundary definitions or fish stock characteristics or social homogeneity of the community, may be critical factors for success of co-management. They may be more critical than the institutional arrangements themselves. By identifying these attributes and then examining their relationship with patterns of interaction and outcomes, it is possible to specify conditions and propositions which can lead to successful development and maintenance of fisheries co-management institutional arrangements.

Over the last decade, research done at different locations around the world has documented many cases of co-management in fisheries and other natural resource systems. From the results, certain conditions are emerging which appear to be central to the chances of developing and sustaining successful co-management institutional arrangements. Ostrom (1990, 1992) and Pinkerton (1989) have made useful contributions to our existing knowledge about key conditions for successful fisheries co-management. These key conditions are discussed in Pomeroy and Williams (1994). These conditions should not be taken as complete as continued research is needed to reveal more about co-management arrangements and the factors leading to successful performance.

FISHERIES CO-MANAGEMENT RESEARCH FRAMEWORK

IMPORTANT INDICATORS OF CONTEXTUAL ATTRIBUTES, DECISION MAKING ARRANGEMENTS, PATTERNS OF INTERACTION AND CO-MANAGEMENT OUTCOME.

Table 1. Biological, physical and technical attributes

1. Type of ecosystem (marine coast, coral reef, estuary, lake, river, floodplain, other?)
2. Boundaries (physical, administrative, restrictions in access to fish resources)
3. Health status of fish habitats (spawning areas, nursing areas, fishing grounds)
4. Characteristics of target fish species and stocks (migratory or sedentary; status of stocks)
5. Characteristics of fisheries (industrial, artisanal, fishing technologies used, physical range of fishing operations, seasonal variations in fishing activities)
6. Post harvest utilization of catches (fresh, salted, dried, smoked, fermented, frozen, canned, etc.)

1 - 6 MUST INCLUDE MAJOR CHANGES IN RECENT YEARS

Table 2. Fish market attributes (including major changes in recent years)

1. Types of fisheries taking place (commercial, recreational, subsistence)
2. Market orientation of the fisheries (local, regional, national, international markets)
3. Value of fish products (high or low value market)
4. Market structure (many or few suppliers/ buyers, market dominance, power relations between suppliers and buyers, interdependencies)

1 - 4 MUST INCLUDE MAJOR CHANGES IN RECENT YEARS

Table 3. Socio-economic and socio-cultural attributes

1. Homogeneity /heterogeneity of fishers, fish traders, fish processors and other stakeholders (ethnicity, religion, fishing gear use, gender, ownership of boats and fishing gear)
2. Dependency on fisheries/fish trade/fish processing for livelihood; other sources of income/subsistence.

3. **Indigenous knowledge relevant to fisheries management (ecological and biological knowledge of resources and habitats, knowledge of catchability and fishing technologies)**

4. **Cultural factors affecting community or group attitude to fisheries/fish trade/fish processing and determining behaviour of individuals/groups**

Table 4 Institutional and organisational arrangements at community level

1. **Community power structures and leadership (role, functioning and importance of traditional leadership structures in decision making inside/outside the fisheries sector)**

2. **Organizations established/appointed to serve as co-management partner (legal basis, mandate, representation, decision-making system/procedures, mechanisms for implementation of management decisions/enforcement)**

3. **Local regulation of access to fish resources (principles for allocation of fishing rights or for exclusion of groups or individuals)**

4. **Operational rules in place concerning fish catch, fish trade and fish processing, including origin of rule**

5. **Legitimacy of institutional arrangements and organizational set-up involving fishers and other stakeholders. Attitudes towards co-management**

6. **Mechanisms for conflict resolution among resource users**

1 - 6.5 MUST INCLUDE MAJOR CHANGES/NEW DEVELOPMENTS IN RECENT YEARS

Table 5 External institutional and organisational arrangements

1. **Overall structure of national political and administrative system (relation between legislative and administrative system; centralization/decentralization)2.**

2. **Department of Fisheries and other relevant organisational structures involved with fisheries management (mandate and legal basis, structural organization, management function and tasks at national, provincial, district etc. levels)**

3. **Legal basis for co-management arrangements (enabling legislation, administrative decree, other)**

4. **Government agencies outside the fisheries sector whose mandate and activities interfere with or impact on fisheries.**

5. **Power structures outside the fishing communities which impact on local power structures and**

leadership (e.g. influence of political leaders, high ranking military or police chiefs)

6. Role of donor organizations in promoting/enabling co-management arrangement.

1 - 6 MUST INCLUDE MAJOR CHANGES/NEW DEVELOPMENTS IN RECENT YEARS

Table 6. Exogenous (macroeconomic, social, political, natural) attributes

1. Political and economic context of co-management arrangement (change in political system and overall economic development since colonial time; major events which impact on the survival of institutions (e.g. market liberalization)).

2. Disasters caused by war/civil unrest, typhoons, earthquake, flooding etc. which impact on the survival of institutions

Table 7. Patterns of interaction among co-management partners

1. Major incentives for groups of fishers and other stakeholders to engage in fisheries co-management

2. Major incentives for government agency to engage in co-management

3. Origin and development of co-management initiative; driving forces in the process

4. Characteristics of co-management arrangement in place (type of arrangement)

5. Ways and means of communication between the co-management partners

6. Mechanisms in place for conflict resolution between the co-management partners

Table 8. Efficiency of co-management arrangements

1. Stakeholders assessment of the return for the time and effort invested by them in the co-management arrangement (in terms of appropriateness of rules and regulations, enforcement of decisions made)

2. Government authorities assessment of the cost-effectiveness of co-management in comparison with previous management arrangements (government expenses for establishing and operating co-management arrangement assessed in relation to the compliance with rules and the need for monitoring and control.

Table 9. Equity effects of co-management arrangements

1. **Changes in the representation of the various stakeholders' interests in the decision making process**
2. **Changes in the transparency and clarity of the decision making process viz-a-viz the stakeholder groups (information systems and procedures established)**

3. **Convergence of expectations of stakeholders as regards the objectives of fisheries management and the management process**

4. **Changes in the distribution of the (access to) benefits from the fisheries among stakeholder groups and individuals**

Table 10. Sustainability effects of co-management arrangements

1. **Changes in attitudes of fishers/stakeholders towards maintaining productivity of fish resources and integrity of ecosystem (changes in time horizons, interest shown in monitoring of stocks and habitats, compliance with rules and regulations and participation in enforcement at the individual level).**

2 **Changes in governance (compliance at group/community level; changes in conflict resolution, existence of effective measures/procedures for rule enforcement)**

3. **Ability of co-management arrangement to handle major changes in contextual attributes (e.g. fluctuations in resource base, changes in market structures, new entrants in social system etc.)**