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The challenge of self-governance in complex, globalizing economies: Collection of revised papers of a PhD seminar

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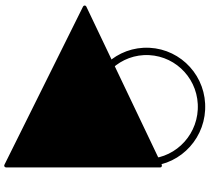

Universität Freiburg

Institut für Forstökonomie

Arbeitsbericht 47-2007

The Challenge of Self-Governance in Complex, Globalizing Economies

Elinor Ostrom; Achim Schlüter

Collection of revised papers of a PhD seminar;

17th to the 26th of April 2007 in Freiburg

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Foreword

This paper is one of several working papers that are a result from an interdisciplinary PhD Seminar we organised. The seminar took place from April 16th to 27th, 2007, in Freiburg, Germany. It was a joint project between the Institute of Forestry Economics, the Walter-Eucken Institute, and the Faculty of Economics and Behavioural Science of the Albert-Ludwigs University. The title of the seminar was "The Challenge of Self-Governance in Complex, Globalizing Economies". Following Walter Euckens' "Great Antinomy" – which was the starting point for us, and the philosophy of the Workshop in Political Theory and Policy Analysis (Elinor Ostrom's "home") – an emphasis was placed on the necessity of using a multiplicity of methods and disciplines in order to understand institutional diversity and the outcomes of different institutions in multiple settings. A truly interdisciplinary group of researchers, coming from all over Europe (and one from the US), applied a broad array of methods and worked together. The first week was comprised of lectures. The second week was organised as a mini-conference – a well-established technique at the Workshop, used to collectively discuss the participants' papers. The papers, which were presented and vigorously debated, have been reworked by the authors and are now published in this Working Paper series. Some of them are future chapters of PhD projects, while others are stand-alone papers, which will later be published elsewhere. We are proud of the output we are presenting here. We hope that the seminar not only led to the improvement of numerous working papers, but that our combined effort has also created a network of motivated scholars, who are researching in the same broad field, yet applying a huge diversity of disciplines and methods.

We wish you a pleasant and inspiring read!

Elinor Ostrom (Bloomington, USA) Achim Schlüter (Freiburg, Germany)

This Seminar was only feasible with the financial support of the Albert-Ludwigs-University Freiburg (Gastprofessorenprogramm) and the Stihl foundation. The financial help is gratefully acknowledged.

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A multi-scale analysis of institutions, interests and beliefs associated with forest policies. Insights from Northern Vietnam

Floriane Clement*

Newcastle University

Abstract

In Vietnam, official statistics report a substantial increase in forest cover for the last decade. However, many research studies denounce the poor quality of current forest and the limited contribution of forest policies to poverty reduction. Using previous findings from a local case study of reforestation in Northern Vietnam, I investigate why forestland allocation and reforestation policies have not reached their stated objectives of poverty alleviation and environmental protection. A multi-scale approach coupling institutional analysis and political ecology is adopted. The analysis is based on data collection at the local, provincial and national level, including semi-structured interviews with farmers, local authorities, government agencies, Non-Governmental Organizations (NGOs), donors, and researchers in northern Vietnam.

I argue that forest policies have led to unintended outcomes because: (i) national policy-makers have biased beliefs on the upland environment and upland people, (ii) the institutions designed at the central level are purposely blurred and over-general and (iii) theory is encapsulated under black boxes. Blurred rules and discourses have allowed the most powerful actors at the provincial level to shape and use policies according to their interest. As a result, few benefits are left for the final recipients of policies at the village level.

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1 Introduction

In a previous study (Clement et al., 2007), I explored the role of state-led forestland policies in the substantive reforestation that had occurred in three villages of Northern Vietnam. I argued that reforestation was indirectly the result of policies but not according to the way that was intended by policy-makers. Forestland allocation to households had not provided the incentives to reforest but instead disrupted collective land use systems, which ultimately led to the end of annual cropping. Tree plantations were not a well thought-out farmer strategy but had been chosen as the last resort, when cropping systems were no longer viable. I asserted that the outcomes of forestland policies were highly unpredictable and very locally-dependent and I advanced the assumption that this unpredictability was reinforced by the fact that policies had been based on simplistic or biased narratives on forest and on the land management systems of the ethnic minorities.

In the present paper, I examine the representativity of these findings in northern Vietnam and their underlying causes by contextualizing these into a wider institutional, political and economic context. My objectives are to analyze at the regional scale the role of policies and institutional change on reforestation and to identify the driving forces for institutional change at multiple governance levels.

In this aim, I adopted a multi-scale and interdisciplinary framework, based on institutional and policy process analyses, and integrating concepts from political ecology and political economy. Institutional analysis enabled us to track up the design and implementation of rules impacting forest and upland management from the local to the central level. Policy process analysis highlighted some of the driving forces for institutional change. Using a political ecology approach, I also paid attention to the beliefs and discourses that are linked to these institutions and policies at multiple decision-making levels. Lastly, I linked institutional and political decisions to a larger political and economic context.

I argue that centrally-defined forest policies have not resulted in the stated objectives because: (i) national policy-makers have biased beliefs on the upland environment and upland people, (ii) the institutions designed at the central level are purposely blurred and over-general and (iii) theory is encapsulated under black boxes. Blurred rules and discourses have allowed the most powerful actors at the provincial level to shape and use policies according to their interest. As a result, few benefits are left for the final policy recipients: the farmers.

I first give an account of the context for this study, with a brief synthesis of the legal and institutional characteristics of the forest arena[1] in Vietnam. In the next section, I present the framework and methodology for data collection and analysis. Then, I highlight some of the observed outcomes of forest policies, and link these with the institutions, discourses and politico-economic context at higher governance levels. Lastly, I conclude on the general lessons learnt from this case study applicable to other research works examining environmental policies.

[1] The forest arena refers here to the action arena in which actors participating to forest management interact with different action situations, at all decision-making levels.

2 Background context

The analysis will focus on the impact of two specific political directions: the decisions to allocate forestland use rights to households[2] and then to households and communities, and the national efforts towards reforestation, more particularly the currently running reforestation program called the Five Million Hectare Reforestation Program (5MHRP). The examined political decisions are only the visible partial manifestations of a much broader political system and on-going process. However, they are major "mobilization factors" in the policy process since they provide the official basis of rights and responsibility for provincial authorities, as well as a source of funding for provincial action.

2.1 The legal and institutional context

The forestry sector and forest protection have been subject to many political, economic and institutional changes in Vietnam over the last two decades. Forestland and forest resources management have been defined and revised in more than 100 laws and regulations (an exhaustive list is given on VietnamNet INCOM, 2007). I will not present here in detail the forest legal framework, but invite the reader to refer to previous studies (e.g. De Jong et al., 2006, Do Dinh Sam and Le Quang Trung, 2001).

The legal decisions that have particularly affected the forest arena include: (i) land classification and the rules for forest protection defined in the Law on Forest Protection and Development in 1991 and 2004 (National Assembly of Vietnam, 1991, National Assembly of Vietnam, 2004); (ii) the devolution of land use rights to private organizations and households notably through the decrees 02/CP in 1994 and 163/1999 in 1999; (iii) the recognition of communities as legal recipients for forestland use rights in 2004 (National Assembly of Vietnam, 2004); (iv) the reforestation programs (programs 327, 556 and 661) and; (v) the reform of State Forest Enterprises (SFEs) (Decision 187/QD-TTg).

Land allocated to households has primarily been allocated on an individual basis. Communities (e.g. groups of households and villages) were not recognized as legal recipients of land use rights until the recent revision of the Land Law in 2003 and the Law of Forest Protection and Development in 2004. Since then, land allocation to communities has been very limited, often restricted to pilot studies supported by donors and Non-Governmental Organizations (NGOs). Today, according to Sunderlin and Huynh Thu Ba (2005), although 61 percent of the land has been allocated, only 10 percent has been actually allocated to households and communities. The rest has been allocated to SFEs that are supposed to allocate it back to households.

Following the Law on Forest Protection and Development (1991), forest and forestland have been classified according to their intended use. Forest is classified into three categories:

1. special-use forest with an intended use for nature conservation (biodiversity preservation) and landscape protection (including historical and cultural heritage);
2. protection forest with an intended use for water sources and soil protection; and
3. production forest with an intended use for commercial activities: exploitation of timber or non-timber forest products (NTFPs).

[2] In reality, Forestland Allocation is not a single policy decision, it is a political will that has been legislated through several stages in different laws and decrees

To be defined as forestland does not necessarily mean there is a current forest cover. Production forestland can be covered by natural forest and protection forestland can be much degraded with a very poor forest cover. Forest and land classification has implications for land ownership (e.g. special-use forest is managed by the State but production forest can be allocated to private organizations and individuals), and determines the rights and responsibilities of all state and private land owners over land use.

National reforestation programs have started in Vietnam from the mid 1950s (De Jong *et al*., 2006). The reforestation effort has been particularly strengthened since the 1990s, with two major state initiatives, called "Greening the Barren Hills Program" (or Program 327) and the Five Million Hectare Reforestation Program (5MHRP). The 5MHRP (or Program 661 from the name of the Decision 661/QD-TTg) replaced Program 327 in 1998. It was divided into three stages, with the third stage running from 2006 until 2010. Although the 5MHRP includes social and economic goals, the first stated primary goal in the Decision 661 is environmental (Prime Minister of the Government of Vietnam, 1998) : "*to increase the forest cover to 43% of the national territory, protect the environment, decrease the severity of natural disasters, increase water availability (…), protect biodiversity*." The objectives are to protect existing forest and to plant 5 million hectares (ha) forest[3], including 2 million ha of protection and special-use forest. The state investment funds allocated to the 5MHRP are almost[4] exclusively directed to establishment and protection of protection and special-use forest (Prime Minister of the Government of Vietnam, 1999). Plantation of production forest is subsidized through a loan scheme, the Development Support Fund.

There have been substantial discrepancies among provinces in the way forest policies have been implemented. This is related to an essential characteristic of the rules designed at the constitutional level: the relative freedom that is – more or less officially – entitled to provinces to implement national policies within their administrative boundaries. This relative freedom is linked to a long Vietnamese historical tradition but has been reinforced by the recent decentralization process that accompanied the economic reforms initiated by the Đổi Mới (Economic Renovation Policy) from 1986. Globally, provinces have gained more autonomy in shaping the socio-economic development of their territory and have increased their budget. The devolution of power has been uneven. On the one hand, the decentralization process has been restricted to the devolution of administrative tasks and has not been accompanied by power devolution (Dupar and Badenoch, 2002, Zingerli, 2003), taking the form of deconcentration. On the other hand, Vietnam is often described as a "weak state" (Fforde, 1997 in McCarty, 2002). Central authorities have a limited ability to impose their will upon lower levels and there is great room at the provincial level for interpretation of central laws (Dupar and Badenoch, 2002, McCarty, 2002). For instance, there are large disparities in the progress of forestland allocation to households between provinces in Vietnam. The land policy area indeed accounts for the largest number of reported "fence-breaking" incidents in the daily newspapers from 1990-2000 (Malesky, 2004). Freedom in land allocation has ranged from deliberately slow implementation, light adaptations, amendments (e.g. Son La province amended the 1993 Land Law in 1996 to allocate land to communities) to non

[3] 2 million ha of production forest, 1 million ha of industrial and fruit trees, and 2 million ha of protection and special-use forest

[4] The only state investment funds that concern production forest are for the establishment of "forest with rare and precious tree species with a production cycle of 30 years or more" Prime Minister of the Government of Vietnam. (1999) 'Circular on Management of State Funds for the National Five Million Hectares Reforestation Programme', in *Decision 28/199/TT-BTC*National Political Publishing House: Hanoi.

implementation (e.g. Hoa Binh province has not implemented Decree 163/1999). The Party closes its eyes as long as it does not clash with its strategic orientations, but some provinces have been sanctioned. Yet, some provincial initiatives that were first criticized were then taken as a model and led to a law revision (Malesky, 2004).

2.2 The actors

The institutional or governance levels considered in this paper are (i) the operational level where decisions taken directly affect resources management; (ii) the collective-choice level where decisions taken affect the rules-in-use at the operational level and (iii) the constitutional level where decisions taken affect who decides and how decisions are taken at the collective-choice level. They can be located in multiple and sometimes overlapping administrative or geographical units and engage a wide range of stakeholders. Decision-makers can simultaneously be involved in several administrative and institutional levels. A cadre from the Provincial People's Committee (PPC) might also be a member of the Central Communist Party. He acts both at the collective-choice and constitutional level in his province and at the national level. Table 1 clarifies which actors intervene at which institutional level[5].

Actors	Institutional level			Geographic area
	Operational	Collective-choice	Constitutional	
The central Communist Party of Vietnam (CPV)[1]		*De jure*: Defines strategic directions for national policies in the resolutions of the Party National Congress. *De facto*: In addition, final approval of laws	*De jure*: Defines who is allowed to take part in the definition of legal documents *De facto*: In addition, final approval of laws	National
The National Assembly		*De jure* : Determines policies *De facto* : Approves laws designed by the ministries with little legislative input	*De jure* : Supervises the activities of the central Government *De facto* : Has little coercive power *vis-à-vis* the central government	National
The central Government (Prime minister, ministries and other state agencies)		*De jure* : Designs implementing decrees, resolutions, decisions, directives, circulars *De facto*: Also designs laws.	*De facto*: Decides on who implements and how are implemented legal decisions at the lower level	National
Provincial People's Council/ Provincial People's Committee (PPC)[2]		*De jure:* Defines provincial resolutions / defines provincial decisions and directives	Decides on who implements and how are implemented policies at the lower administrative level	Province

[5] This table is an attempt to clarify responsibilities and should be considered as an approximate mapping of the political system; the latter is in reality still quite opaque, especially when coming to the role of the Party.

Actors	Institutional level			Geographic area
	Operational	Collective-choice	Constitutional	
Provincial professional Departments		*De facto*: Supervises the implementation of provincial guidelines		Province
District People's Committee and professional departments		*De facto*: Implements the provincial guidelines with relative freedom		District
Commune People's Committee		*De facto*: Implements the provincial guidelines with relative freedom		Commune
State Forest Enterprises (SFEs)	Ownership and/ or management of forest resources			Owned area
Communities/ Households/ Individuals	Ownership and / or management of forest resources	Define community rules	Might define who designs and how are designed community rules	

Notes: 1 The PPC is not formally part of the State's institutional system but has a central role in the political and legal life of Vietnam. For instance, the Đổi Mới stems from a resolution of the Party National Congress.

2 The People's Council and People's Committee are officially the legislative and executive bodies at the local administrative levels (province, district, commune). However as underlined in Shanks, E., Luttrell, C., Conway, T., Vu Manh Loi and Ladinsky, J. (2004) Understanding the pro-poor political change: the policy process. Vietnam. London: Overseas Development Institute, the power is unevenly balanced between these two organizations at the benefit of the People's Committee which holds both budgetary and administrative power.

Table 1: Legal actors involved in rules crafting and implementation of at the three institutional levels

Stakeholders in forest policies design

Within the government, forest and forestland responsibilities are divided into two ministries: the Ministry of Agriculture and Rural Development (MARD) for forest management, and the Ministry of Natural Resources and Environment (MONRE) for forestland management, including forestland allocation. Within the MARD, two professional departments are responsible for forest issues: the Forest Protection Department (FPD) and the Forestry Department (FD).

Stakeholders in forest policies implementation

While policy design is still concentrated within a restricted policy arena, power over policy making is highly decentralized at the provincial level. The Party at the provincial level and the Provincial People's Committee (PPC) issue provincial guidelines defining the implementation of national decisions in their province. The provincial professional Departments are the executing arms of the PPC. They also have a role of advisor and knowledge base to the latter; lastly, they delegate the tasks to and coordinate the actions of the district authorities on the field.

The provincial Department of Agriculture and Rural Development (DARD) is more particularly in charge of forest planning. At the provincial level, the FD is a sub-department of the DARD responsible for the 5MHRP implementation, coordinating local 661 project committees at the district level and controlling the state organizations responsible for operational forest management. Although the FPD is a sub-department of the MARD at the national level, it is not always a DARD sub-department at the provincial level. As it was the case in the four visited provinces, it often has a position equivalent to the DARD, located directly under the authority of the PPC. The FPD activities are dedicated to forest protection but some are also related to forest management. In addition, the FPD has recently been entitled the task of forest monitoring and evaluation.

The provincial professional Departments are *de jure* accountable both to the PPC and to the Ministry. *De facto* they are much more accountable to the PPC as the latter decides on budget, staff, or individual promotion.

Stakeholders in forest operational management

I will mainly focus on the role of State Forest Enterprises (SFEs) and individual households, which are respectively the first and second larger forest recipients for land use rights in Vietnam (Nguyen Quang Tan, 2006b). Other recipients include: State Management Boards for Special-Use Forest and State Management Boards for Protection Forest, army units and mass organizations. A detailed description of these forestland users and their responsibilities is provided by Nguyen Quang Tan (2006b). State and private forest users are allowed to manage forest under different arrangements: state, private or common property, joint management under contracting.

SFEs are key actors in the forest arena. In 2005, according to the MARD database, 362 SFEs still controlled 40 percent of forestland in Vietnam (Rural Development & Natural Resources East Asia & Pacific Region (EASRD), 2005). A distinction shall be made between small SFEs, which only manage forest plantations, and large ones, which still depend on the state central company VINAFOR, and might include wood processing companies (that encompass private companies and commercial sub-units of one single central state-owned company: VINAPIMEX). SFEs currently act as implementing units of the 5MHRP by contracting with households for forest protection, regeneration and plantation.

The role of these logging companies that were established by the socialist State has dramatically changed over the last ten years. In 1991, their management has been decentralized from the central government to provincial and district authorities. Then, from 1994, their economic activities have been seriously affected by the logging ban of natural forest; and more recently, since 1997, the SFE reform initiated their transformation into commercially viable and autonomous business units. Because of the slow pace of the reform process, privatization was further reaffirmed in 2004 (Decree 200/2004/ND-CP) and non-viable SFEs should either be dissolved or transformed into a State Management Board for Protection forest.

2.3 Case study area

The focus of my work is limited to the northern uplands of Vietnam. Data have been collected through semi-structured interviews with civil servants at the provincial and central level, NGOs, donors, and researchers in Hanoi and in northern provinces (Figure 1).

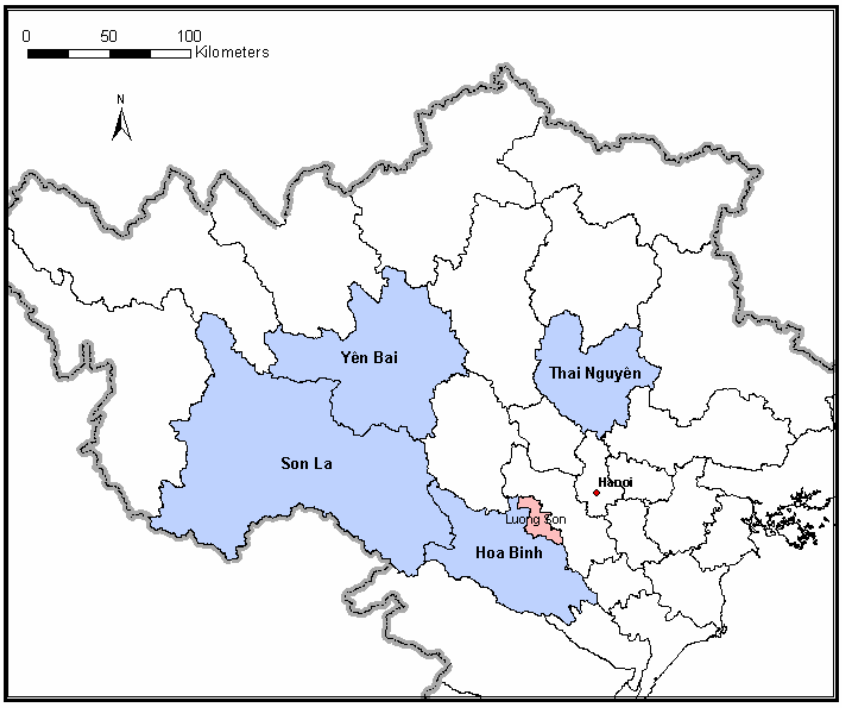

Figure 1: Location of fieldwork in North Vietnam

Data collection at the provincial level was carried out in four provinces of Northern Vietnam: Hoa Binh, Son La, Thai Nguyen and Yen Bai. The provinces were selected in order to get a representative sample of the northern region regarding socio-economic variables (distance to Hanoi, population density, importance of the forestry sector), environmental variables (area of land classified as forestland), and political variables (progress in forestland allocation implementation). These characteristics are presented in Table 2 for each province investigated.

Provinces	**Hoa Binh**	**Son La**	**Thai Nguyen**	**Yen Bai**
Total area[1] (ha)	466 253	1 405 500	354 350	688 777
Population density[2] (person/km^2)	174	70	313	106
Distance from the provincial capital to Hanoi (km)	76	308	80	183
Forest cover[1] (%)	40.4	40.3	41.4	48.2
Percentage of land classified as forestland[1] (%)	70.1	65.0	60.0	81.3
Output value of forestry at constant 1994 prices[2] (billion Vietnam Dongs (VND))	193.6	231.1	67.5	332.7

Sources:

1. Forest Protection Department website, (only available in Vietnamese) http://www.kiemlam.org.vn/dbr/ Nam2005/DBR 2005.htm, last accessed in Feb 2007
2. General Statistics Office (GSO) of Vietnam website, http://www.gso.gov.vn, last accessed in Feb 2007

Table 2: Characteristics of the visited provinces (2005 figures)

Visits in the provinces consisted of two-hour semi-structured interviews with high officials from the Department of Agriculture and Rural Development (DARD) and/or Forestry Department (FD), the Forest Protection Department (FPD) in the four provinces, with the Department of Natural Resources and Environment (DONRE) in two provinces and the Forest Science Institute of Vietnam in Son La. In total, 12 organizations and 21 persons were interviewed (Annex 1). SFEs, donors and NGOs may have non negligible impact on policy implementation at the provincial level. However, because of time constraints, I chose to restrict interviews to state agencies as the latter are the sole implementing bodies of policies. When possible, external views from researchers and NGOs working in the provinces were also gathered. The issues tackled during the interviews included the evolution of land degradation and reforestation, land use change, the importance of the forestry sector in the province, the implementation process of FLA and the 5MHRP (actors involved, budget, tasks and responsibilities) and the impact of these programs on land use. Data on the areas of forestland, forest cover and allocated forestland, and provincial evaluation reports on FLA and the 5MHRP were also collected.

At the national level, 36 semi-structured interviews of one hour were conducted with foreigner and national researchers, donors, international and national NGOs, consultants and civil servants (Annex 1). The interviews focused on the organization's activities, networks and links with other actors (particularly policy-makers), on the driving forces for recent policy changes, and explored the beliefs related to forest and land degradation.

3 Institutions, beliefs and interests: a framework

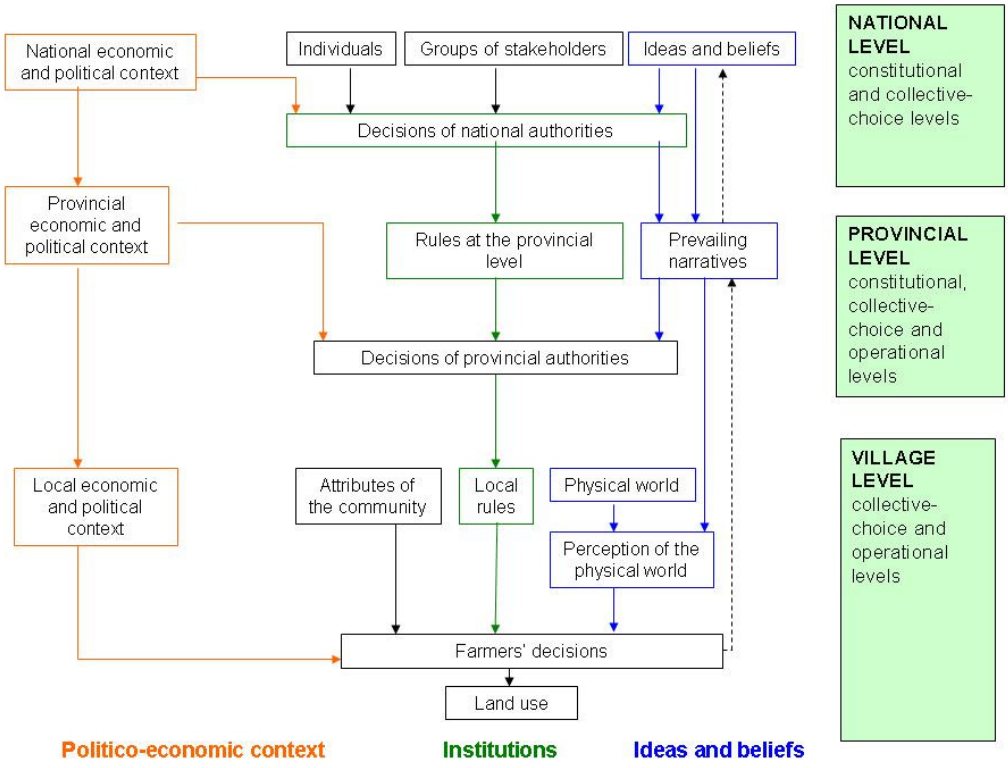

Figure 2: Framework used for this analysis, adapted from the IAD framework (Ostrom, 1999)

The framework (Figure 2) is organized into three administrative sub-systems: national, provincial and local levels, and into three theoretical sub-systems of analysis: institutions, beliefs and interests.

3.1 Institutions

Institutions are "the prescriptions that humans use to organize all forms of repetitive and structured interactions" (Ostrom, 2005). They thus refer to the "rules of the games" (North, 1990, p. 3) and are distinguished from organizations, which are compared to the "players" of the game who will use the rules in a way to win the game (ibid). Institutional analysis focuses on the role of rules in influencing human behavior in different spheres, e.g. polity units, markets systems or social arrangements. The framework designed for this research is based on the Institutional Analysis and Development (IAD) framework developed by Elinor Ostrom and her colleagues (Kiser and Ostrom, 1982). The latter has been applied in a wide range of settings including the provision of urban public services and the study of common-pool resources management (for references see Ostrom (2005, p.9)).

Institutional analysis was selected because the recent changes in the forest arena in Vietnam have significantly impacted the set of actors and rules governing land access and land use. Results from the local level (Clement *et al.*, 2007) indicated that the changes in the local rules resulting from national policies had been an important driver in the land use decisions of farmers. FLA has directly impacted on institutions by fixing new rules of land ownership, access and use. The 5MHRP does not include any explicit institutional component, in the sense that it does not modify existing rules or create new rules regarding private forest management. However, its execution relies on the establishment or enforcement of existing rules on land classification, land ownership and land use. Institutions are represented as an exogenous variable that provides actors incentives or constraints for decision-making at multiple governance levels. Two exogenous variables were added to the IAD framework: beliefs and interests. These two variables are seen as drivers for human desire to act, with the institutions acting as a frame that provides incentives and restrictions to pursue these desires.

3.2 Beliefs

It is important in this paper to consider beliefs for two reasons. First, because ideology and beliefs can act as powerful driving forces for policy change (Sabatier and Weible, 2006, Sabatier and Jenkins-Smith, 1999, Sewell, 1985). It is especially relevant under the Vietnamese context as an ideological struggle still opposes the conservatives, who believe in the socialist model, and the reformists, who envision an economic development based on capitalism. The most significant economic and political shift, the Đổi Mới, was the result of bottom forces (Kerkvliet, 1995) but, ultimately, it reflected a move in the ideology of Vietnamese policy-makers (McCarty, 2002). Ideology is also an important component of actor behavior at the operational level because of the particular characteristics of the forestry sector (Schluter, 2007).

Yet, ideology and beliefs do not only influence, more or less consciously, decision-making. The categorizations of the world that they convey through discourses also apply a specific structure of knowledge and power on society (Foucault, 1980). It implies prescribing what is right and wrong, normal and abnormal, legal and criminal. It implies deciding on the inclusion and exclusion, legitimacy and illegitimacy of social categories of actors. Discourses and

appealing narratives are thus also an instrument of power as they can be used by powerful actors to shape others' values, norms and preferences, and to justify political decisions that are driven by reprehensible motives. Indeed, forest management practices have often been justified by technical arguments linked with ecological values (e.g. 'scientific forestry' in colonial Asia, cf. Bryant, 1998). However, decisions related to forest management are not politically neutral (Forsyth, 2003, Springate-Baginski and Blaikie, 2007). Forest management has to deal with power, rights and entitlements issues because it deals with the ownership, access, control and use of land and forest products (Springate-Baginski and Blaikie, 2007), and with the process of territorialisation.

Drawing from a Foucauldian line of enquiry and using concepts developed in political ecology, I examine political decisions within the historical context of the evolution and discontinuities of discourses.

3.3 Political and economic interests

Institutions are intrinsically linked with power as decisions taken at one level affect the distribution of power at the lower level (Agrawal and Ostrom, 2001). However as argued by Ribot (2006), the IAD framework does not bring power issues to the fore. Power relationships are framed by and to some extent encapsulated within institutions. When examining decision-making at the collective choice and constitutional level, it is worth giving a greater role to how a particular political and economic context shapes the interests of policy-makers (e.g. Ribot *et al.*, 2006). Highlighting the underlying motives of policy-makers behind institutional change helps providing relevant recommendations to improve policy outcomes. In this aim, I propose to link institutional change and discourses with the political and economic context and interests that drive actor motives.

3.4 Using the framework

The mental model that is assigned to the actors in the framework is particularly important as it determines how they weight different options. The IAD framework has usually assumed actors to follow a bounded rationality model of behavior but the latter has some shortcomings when applied to the forestry sector (Schluter, 2007). In Vietnam, norms are particularly strong as the whole society is thought of as a family. Professional and intellectual arguments come after norms and values such as kinship ties. Furthermore, consensus prevails over evidence within the policy-making process in Vietnam (Shanks et al., 2004, McCarty, 2001). Decisions are not necessarily the most rational ones but rather the ones that gather agreement from all actors. For these reasons, I chose a model of actor behavior that is boundedly rational but that considers that the payoffs actors calculate for each option are heavily influenced by norms. For instance, the payoff attributed to a choice considered normatively correct will get an added positive value.

The resulting framework has to be used as a way of structuring analysis and providing a menu of questions that should be considered when performing the analysis.

4 Linking outcomes with institutional change

4.1 The economic context for reforestation

Before examining the impact of institutions on reforestation, it is worth laying out the economic context of forestry in Vietnam. The forestry sector was of critical importance during the war. Today, the forestry sector does not formally contribute today a significant amount to the national economy[6] with a share of around one percent of the Gross Domestic Product (Ministry of Agriculture and Rural Development, 2005). However, there is an increasing national and international demand for timber and the wood processing industry in Vietnam is undergoing a dynamic expansion. Despite of this favorable macro-economic context, interviews and previous studies (Roda and Rathi, 2005, Fortech, 1998) highlighted the difficulty to make tree plantations a strong economic constituent and a financially viable option for farmers under the current context[7]. Most provincial cadres acknowledged during the interviews that current market conditions were not sufficiently attractive to ensure valuable incomes to households; that such a long-term investment was not appealing and; that more generally "*There is no mechanism to enable people to live from forestry*." Even in the Bai Bang paper mill supply area, Ohlsson et al. (2005) report that farmers' agricultural needs were stronger than incentives provided by the mill demand for timber. As observed in the author's case study area (Clement *et al.*, 2007), tree plantations are often for farmers the least bad option. As mentioned by high officials from the DARD in one visited province: "*When someone wants to invest, he has to calculate the return of the forestry option and it is less good than other options*."

Few incentives have been provided by the 5MHRP to make forestry a more attractive option for farmers. The poor capacity of the 5MHRP to foster smallholder plantations and improve livelihoods has been openly recognized by the authorities of one visited province, who have decided to develop their own reforestation scheme, specifically directed to households, in parallel to the 5MHRP. The 5MHRP investment funds have indeed been almost exclusively directed to protection forest which establishment and exploitation have to follow strict state planning schemes. Contracts for the plantation and regeneration of forest protection can be lucrative, however they are offered to a very limited part of the population (Sowerwine, 2004). Loans for production forest are *de facto* accessible for a small part of the population (Ministry of Agriculture and Rural Development - International Cooperation Department and 5MHRP Partnership Secretariat, 2001) and the interest rate provided for loans in forestry is still too high and does not provide a sufficient incentive (DARD Thai Nguyen, 2006). A significant part of the increase in forest cover in the northern uplands was identified as a natural regeneration due to agricultural intensification in the lowlands (Sikor, 2001, Meyfroidt and Lambin, Submitted).

[6] Its economic importance might nonetheless be substantial in some provinces, for instance in Central Vietnam where large SFEs are engaged in timber trade with Laos.

[7] Difficulties mentioned are the low productivity of plantations and the high transportation costs due to a scattering and low accessibility of tree plantations.

4.2 Forestland classification

During a previous fieldwork stage in 2005 carried out in Hoa Binh province, an officer of the Forest Protection district unit of Luong Son reported that "*in 2004, the government decided to extend some of the forest protection land to protect water sources*." Interviews at the provincial level suggested that the increase in land classified as protection forestland was a general trend. It was confirmed by national figures (Table 3) and discourses (Deputy Prime Minister of the Government of Vietnam, 2005). The area of protection forestland reported by local authorities reached over 9 million ha in 2005, far beyond the 6 million ha that had been planned by the government in the National Forestry Development Strategy 2001-2010.

Areas in million hectares (ha)	1999[a]	2005[b]
Special-use forestland	0.9	2.4
Protection forestland	5.7	9.5
Production forestland	12.4	7.1
Total forestland	19.0	19.0

Sources:

a. (Nguyen Xuan Nguyen et al., 1999)

b. FPD, 2007 on www.kiemlam.org.vn

Table 3. Evolution of the land area classified under the three categories of forestland

The increase of protection forestland has several important social and economic implications. On the one hand, it decreases the production land area officially suitable for crop cultivation, grazing or, if forested, timber exploitation (Dinh Duc Tuan, 2005). On the other hand, it increases the area under state control. Means for control and enforcement have thus increasingly become inadequate. This is not an issue of concern for the DARD and the FD, which implement the 5MHRP and receive state funds, since forest protection is under the responsibility of the FPD. The implementation of the 5HMRP – which concerns mainly protection forest – and the task of forest protection are led by two different departments that have no incentive to collaborate towards a common goal.

The conjunction of both factors (decreased land area available for economic production and inadequate means of control) has encouraged illegal logging, illegal wood marketing and corruption (To Xuan Phuc and Sikor, 2006, McElwee, 2004). Illegal activities are characterized by environments where the rules of the most powerful dominate. Villagers involved in illegal activities do not make high profits, as compared to middlemen or corrupted provincial officials involved in large-scale logging (McElwee, 2004). In the illegal timber commodity chain, the highest risks and the lowest incomes are borne by the less powerful actors of the chain, i.e. small-scale illegal loggers (To Xuan Phuc and Sikor, 2006).

4.2 Forestland allocation to individual households

The specific impacts of forestland allocation on land use are unclear as other influential drivers for land use change appeared simultaneously, e.g. agricultural intensification in the lowlands (Sikor, 2001) and new market opportunities (Kim Chi Vu, 2007) induced by the general shift to a free market economy. The effect of forestland allocation on land use and on poverty was thus markedly recognized as dependent on other local or macro-scale variables (Sikor, 2001, Nguyen Quang Tan, 2006a, Gomiero et al., 2000). Furthermore, power conflicts

at the local level have also resulted in gaps between theory and practice and have led to unintended outcomes (Sikor and Thanh, 2007). It is not my intention to draw a comprehensive assessment of forestland allocation in Vietnam in this paper. Instead, I will focus on the institutional aspects of forestland allocation and more particularly on its impacts on common land.

Before forestland allocation, shifting cultivation was one of the most widespread land management systems in the northern uplands of Vietnam. As intended by policy-makers, forestland allocation, combined with settlement policies, has significantly hindered shifting cultivation, because once land was allocated it was not possible to open up new fields and the size of individual plots did not usually permit crop fallowing. Yet, the shift to fixed cultivation also resulted in unintended consequences. Crop rotation on commonly managed land was well adapted to the biophysical conditions of mountainous regions. The move from shifting to fixed cultivation has accelerated nutrients depletion in some areas (Castella et al., 2006, Nguyen Thanh Lam et al., 2004). In addition, when appropriate rules have been developed, some natural resources such as NTFPs or grazing land are often more efficiently managed under collective arrangements than under individual property. In a previous paper (Clement *et al.*, 2007), I explain how fixed cultivation and land allocation led to the collapse of the collective rules that had been developed for the cohabitation of grazing and cultivation activities. A few scholars (Gomiero et al., 2000, Hager, 2006) reported conflicts over NTFPs and grazing land resulting from or exacerbated by the lack of common land.

In addition, there was a significant consensus among interviewees in the provinces to acknowledge – more or less openly – that FLA had not reached its intended objective of encouraging reforestation: *"Allocation didn't have an impact on land use. Land use depends on soil quality and household objectives (…). With a high demand for agricultural products, instead of planting protection forest, they will cultivate agricultural crops"; "Allocation has had an impact on land use, but we can't precise, changes are not very big."* Its impacts on both poverty alleviation and on reforestation have indeed been challenged by many studies[8] (Dinh Duc Tuan, 2005, Sikor, 2001, Sunderlin and Huynh Thu Ba, 2005).

I do not imply here that institutions should not be changed. Yet, the new set of institutions imposed by land allocation does neither fit with the local biophysical conditions of some regions of Vietnamese uplands (Do Dinh Sam, 1994, Castella et al., 2002, Dupar and Badenoch, 2002), nor with the culture of many ethnic minority groups. As acknowledged by one young officer from a DONRE: "*Ethnic minorities live in a disparate way; it is difficult to allocate land to one household or to another*."

4.3 Forestland allocation to communities

Some provinces have allocated forestland to communities before the Land Law of 2003 and the Law on Forest Protection and Development of 2004, which officially recognized communities as legal recipients of land use rights. That was the case in Son La province,

[8] Contrarily to this assertion, the socio-economic assessment report of Bai Bang paper mill, commanded by the Swedish International Development cooperation Agency (SIDA), argues that FLA has provided strong incentives to farmers of neighbouring areas to engage in forestry. It recognises however that reforestation would probably not have sustained without the unique commercial opportunities offered by the proximity of the mill (Blower, N., Ngo Minh Hang, Jamieson, A., McCarty, A., Pearce, D., Pham Quang Hoan, Quirke, D., Nguyen Quoc, Mandy, T., Do Thi Binh, Hoang Van Hoa, Warner, B. and Vincent, D. (1999) *Paper, Prices and Politics. An evaluation of the Swedish support to the Bai Bang project in Vietnam.* Gothenburg: SIDA)

further to the amendment of the Land Law of 1993 by the Provincial People's Comittee in 1996. However, what is actually meant by community has often meant the Commune People's Committee. Later during the interview, this cadre précised: "*We allocated land to "communities" because we didn't have time to create a management committee to allocate to groups of households, but it will change*."

In Yen Bai province, some forestland has been allocated to villages, but this is land that is located in remote areas and has been allocated to communities because no household was willing to receive it. Thus, this decision does not reflect the belief that community management holds advantage over individual management, but was fostered by administrative incentives: progress in land allocation. Other studies have reported similar bureaucratic interests around forestland allocation to communities.

5 Driving forces for institutional change

Using policy process analysis and discourse analysis, I provide here some insights on the driving forces that have led to the crafting of institutions as described in the previous section.

5.1 Increasing protection forestland: an ecological concern?

Protection forestland: for whom?

Beyond the environmentally-orientated discourse that justifies the increase in protection forestland lies a range of political and economic interests. A MARD cadre acknowledged that during the program 327: "*provinces increased protection forest to benefit from state budget*." According to interviewed donors and NGOs, the same reason prevailed under the 5MHRP: provinces have increased the protection forestland area to receive more state funds (see also Ministry of Agriculture and Rural Development - International Cooperation Department and 5MHRP Partnership Secretariat, 2001, De Jong et al., 2006). It was officially acknowledged by the Deputy Prime Minister in a recent discourse at a review workshop on the 5MHRP (2005).

Part of the 5MHRP state funding goes to SFEs to cover the program administration costs. Many SFEs, which are supposed to run as independent businesses, lack capital (Rural Development & Natural Resources East Asia & Pacific Region (EASRD), 2005) and rely on the 5MHRP funds to survive. It is in the interest of provincial authorities to encourage this process as SFEs are an important employer and hold significant areas of forestland. In addition, there is a tight relationship between the forestry sector and the policy arena at the provincial and national level. The forestry sector is said to have been an important source of income for the Communist Party structure in Southern and Central provinces of Vietnam (Bangkok Post 1993 in McElwee, 2004). Furthermore, many high-level provincial and national cadres come from the forestry sector.

Centrally-designed rules have also allowed provincial stakeholders to pursue their interests. At first, because the rules on land classification lack clarity and consistency. The classification under the three categories remains controversial (2000, Ministry of Agriculture and Rural Development - International Cooperation Department and 5MHRP Partnership Secretariat, 2001), and the criteria for land classification and the boundaries between protection and production forest are unclear. This lack of clarity was reinforced by the fact that definitions have greatly changed over the past ten years.

Secondly, one can wonder why the 5MHRP state funds are exclusively allocated to protection forest whilst defined objectives for new plantations entails 60 percent for production/industrial forest. The fact that one MARD official recognized that under the program 327 provinces had increased protection forest area to receive state funds suggests that the government was already aware of this bias by the time the 5MHRP was designed. However, by allocating all funds to protection forest, the government encouraged the same process under the 5MHRP[9]. Besides, SFEs are supposed to become autonomous business units but they have been nonetheless entitled (Decree 200/2004/ND-CP) to keep up to 5000 ha protection forest, which induces the possibility to mix protection (i.e. public service) and business activities. Thirdly, a lack of monitoring by the central level has allowed biases in forest classification and state funds diversion. The recent state audit on the 5MHRP reported a diversion of 135 billion Dong[10] (VND) from the program investment funds by civil servants or state organizations (Công An Nhân Dân, 2007). Because of the influence of foresters in the political arena, the central government has also economic and political interests in allocating funds to protection forestland. Under the cover of the SFE reform that was required by the Asian Development Bank, the state tries to help SFEs to survive. At the same time, the central government also keeps control of forestry activities and forestland.

Protection forestland: for what?

The underlying interests and motives of provincial and national decision-makers are also visible in their discourses, which, I argue have further eased the implementation of blurred rules. It appears quite clearly that the focus on protection forest does not stem from environmental motives. Although the first stated goal of the 5MHRP is environmental, there is some fuzziness around what is the major focus. A study recently published by the MARD says: "*compared with the previous 327 program which mainly focused on protection forest, the 661 project considered timber production from plantations as the major strategy of the reforestation*"(Dinh Duc Tuan, 2005). At the provincial level, although the 661 investment funds are for protection forest, the deputy director of a Forestry Department explained that the tree species planted under the 5MHRP scheme have been selected according to their productive use. Indigenous species have been replaced by exotic ones. "*Before 2003, we were planting Chukrasia tabularis and teak (Tectona grandis). Since 2004, we have replaced them by acacia, pine and eucalyptus for economic reasons. For Chukrasia tabularis, we need to wait for 30-50 years to exploit, for pine it is only 15 years. After the 15th year, pine trees give resin and wood for paper paste*".

Mixing with subtlety environmental and economic goals in discourses has helped to pursue economic and political objectives under the cover of environmental rationales. Forest is vaunted among national policy-makers and national researchers in Vietnam as an environmental panacea. Testifying the name of the Program 327: "Greening the barren hills". The rationale of re-greening what is called barren hills – but which in fact might be biodiversity rich ecosystems (Sowerwine, 2004) – still prevails. As stated by the director of one research institute on upland agriculture: "*The quality of forest is poor but it is very green*". When the Deputy Prime Minister (Deputy Prime Minister of the Government of Vietnam,

[9] Recently, the Government of Vietnam has asked provinces to convert back protection forestland to production forestland. This shift was reflected in the National Forestry Strategy 2006-2020 (Prime Minister of the Government of Vietnam. (2007) *Viet Nam Forestry Development Strategy 2006-2020*. pp: 57.) The less critical sub-category of the protection forestland will be converted into production forestland (it concerns around 3 million ha).

[10] This is equivalent to 6.6 million Euros / 8.7 million USD.

2005) reminded the objectives of the 5MHRP, he started with "*speed up forest plantation; re-green bare land*". During an interview, a cadre from the MARD stated that: "*It is important to cover barren hills to increase protection forest*". When asked why there was a shift from protection to production forest, the latter replied: "*Production forest is also protection forest. All forests can play this role*".

At the provincial level, the perception that forest is inherently good also prevails. For interviewed officers, forest is equivalent to good soil quality, reduced soil erosion and increased water supply. In most visited provinces, there is however very little sound scientific evidence on the environmental benefits of exotic tree plantations. Although large areas have been classified as protection forestland around the Hoa Binh dam, the provincial authorities in Hoa Binh and Son La provinces are not aware of any study showing the link between dam sedimentation and tree plantations in the surrounding areas. A recent report on forest and soil degradation from Yen Bai DARD is based on the following: "*According to research studies (…), if land with a slope greater than 20-25% is not covered by trees and plants, 140-245 t/ha of soil are eroded each year (…). It means that within 30 years we won't have productive land anymore. On the contrary, with 2-year-old acacias, erosion rate will decrease by 40% (…)"(Forest Protection Department - Yen Bai Province, 2006)*. These scientific findings are from the research works of two renowned Vietnamese academic, What is contestable is that these results are quoted in the report as if they were universal truths equally valid in whole Vietnam. Doubts can be raised about the generability of such findings. Yet, what matters is that they help justifying the – less politically correct – underlying objectives: subsidy SFEs and please international funding organizations with high figures of forest cover. As advanced by the vice-director of a visited Forestry Department when justifying the selection of exotic species: "*from 2004, we have planted acacias and eucalyptus saplings; with these, it is very easy to cover the land*".

One recurrent criticism of the 5MHRP is the poor quality of the newly established forest (Ministry of Agriculture and Rural Development - International Cooperation Department and 5MHRP Partnership Secretariat, 2001, Deputy Prime Minister of the Government of Vietnam, 2005). It is not very surprising if only "covering or re-greening the land" matters.

Figure 3 synthesises my argumentation by linking outcomes at the local level with institutions, the political and economic context and discourses located at the provincial and national level.

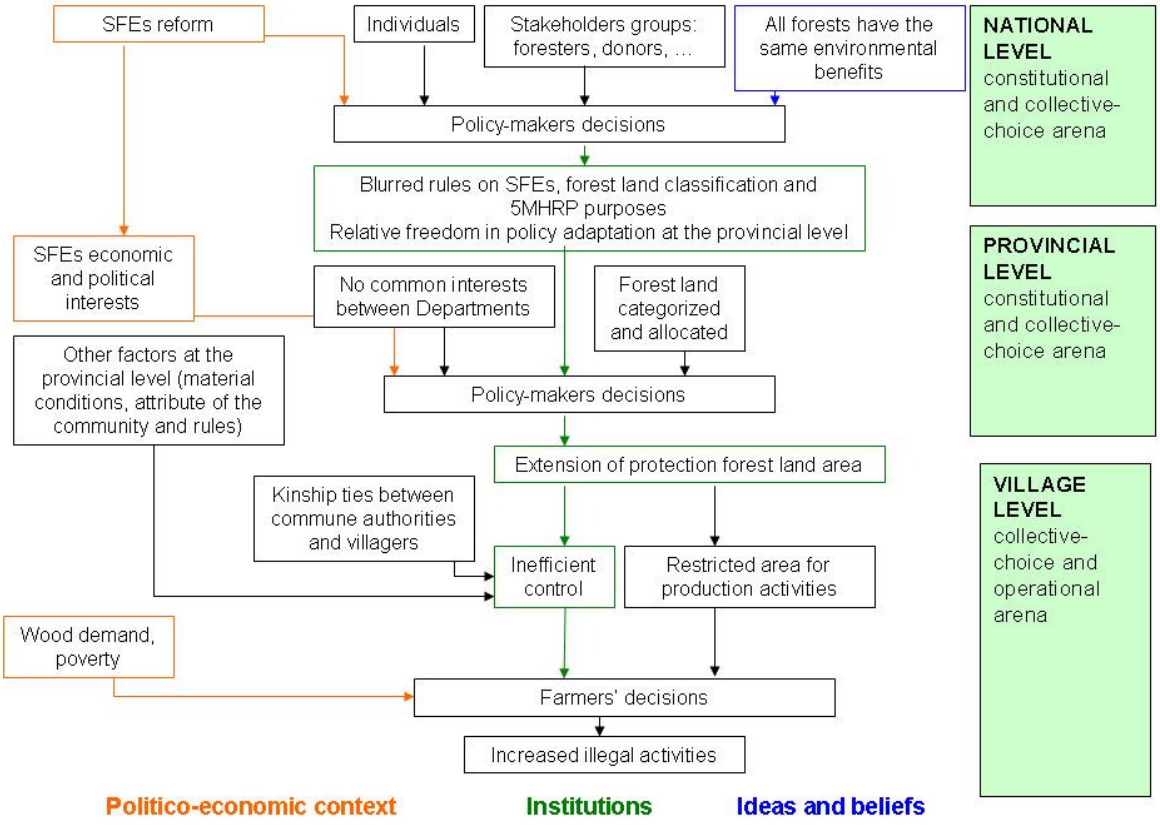

Figure 3: A multi-level analysis of some of the national policies impacts

5.2 Which rationale for forestland allocation?

First stage: forestland allocation to households

The rationale for forestland allocation at the national level lies on several arguments. Firstly, there was an economic crisis in the forestry sector in the end of the 1980s, and SFEs were running at a loss. Forestland allocation was a response to this crisis. It arose from the idea to replicate the model of land allocation, which had successfully responded to the economic failure of the cooperative system in the lowlands, to the uplands. It was based on the belief that farmers would have more incentives and abilities to invest and manage efficiently the land if they had individually received long-term land use rights. Agricultural yields would thus increase, resulting in economic growth and, through a trickle-down effect, would enhance poverty alleviation in the uplands. Because these policies were based on the model of the land management systems in the lowlands, they encompassed a set of biased beliefs (Zingerli, 2003, Sowerwine, 2004). In a period of economic reform marking the end of collectivization, individually-based production systems were better valued than community-based ones.

Another influential and linked rationale for forestland allocation was the eradication of shifting cultivation. Shifting cultivation has in Vietnam and other Southeast Asian countries been labeled as inherently “bad”, “bad” meaning: backward and responsible for deforestation. It also relies on the belief that collective land use systems are economically inefficient

compared to individual ones. This narrative is still largely and deeply anchored in the national collective imagination. As an example, a recent report on land degradation from the FPD of one visited province stated that: "*There still remain backward practices such as slash-and-burn, nomadic cultivation, (…).*" Interestingly, although the statement "shifting cultivation is responsible for deforestation" is considered as common knowledge, the people responsible are not mentioned. It is not politically correct anymore to say that: "ethnic minority groups are responsible for deforestation". But entrenched beliefs remain. Referring to the phenomenon is an elegant metaphor for saying who is responsible without directly pointing out at specific social actors.

Other motives encompass political and strategic interests: forestland allocation linked with settlement policies was also a way to control land and people and secure strategic borders (Sowerwine, 2004). Lastly, FLA was part of the reforestation effort, on the basis that households would take care of the forest if they received forestland use rights.

Testing new models?

As emphasized previously, serious discrepancies have been observed between provinces in their implementation of forestland allocation. Scholars researching on decentralization and provincial autonomy mentioned historical reasons and the existence of central-local networks as important factors for provincial differentiation in policy implementation (for a systematic study, see Malesky, 2004). The interviews highlighted the importance of (i) individuals; (ii) groups of stakeholders (e.g. donors and SFEs) and; (iii) wealth[11] and economic autonomy of the province. I explore here more particularly the decision of allocating forestland to communities.

The reason for Son La authorities to amend the Land Law in 1996 and allocate forestry land to "communities" (or communes) was explained by the FPD deputy director as the following: "*before, the protection forest was owned by the People's Committee. They defined the rules of the game and played at the same time: they were the owner and the manager. It is not rational. That is why we decided to allocate land to communities*." According to him, land allocated was preferably to communities for protection purposes: "*if we devolve land use rights to the community, its awareness is raised. Forest is a public good so an individual does not damage it. Furthermore, villages have rules to protect the forest."* Behind these justifications also lie bureaucratic and economic reasons: it is quicker and cheaper to allocate land to communities than to allocate it to each household: "*it is easier to allocate land to communities. We only discuss with the head of the village, no need to discuss with all villagers*".

The drivers for policy change at the national level are unclear. There is no agreement among the respondents on the reasons for this shift, each actor (donors, NGOs, central government, provinces) claiming a share of contribution in the decision. The concept of community management has been very much pushed forward by international organisations and received particular attention of the government. It was the focus of a dedicated working group composed mostly of Vietnamese experts at the national level. Dominated by conservative thinkers, the forestry sector has not been very receptive to CBFM "*There is some resistance from the foresters who think that households can't manage forests, which arises from beliefs about the ability of local people to manage forests*." (FSSP Chief Technical Advisor, 2006). The law revision might represent an ideological victory of the reformists, which include Cao Duc Phat, the acting Minister of Agriculture and Rural

[11] The cadastral survey for land mapping and allocation has relied exclusively on the provincial budget since 1998.

Development, over the foresters and conservatives. Besides, there are some economic interests at stake. The process of land mapping, classification and allocation is a costly and overwhelming task. Land allocation to communities could easily speed up the process. In addition, forest protection is less costly for the state if let to communities as explained by a Vietnamese officer managing a donor-funded CBFM project: "*Before, the government spent a lot of money for forest (…). With community forestry, people can manage forest with their own fund".*

Once again, blurred rules and discourses are likely to help actors to pursue underlying economic interests. First, the conditions for forestland allocation to community are not clearly defined. Second, the trendy and popular concept of Community Based Forest Management (CBFM) appears to be loose for many people professionally involved in the forest arena at the national and provincial level. CBFM is inherently "good", "good" meaning "fostering or enabling forest protection". Yet, respondents never précised why or under which conditions community forestry might be suitable. There is in the discourses a general confusion between open-access and common-property regimes and contradictions often emerged during the interviews when asserting what type of institutional arrangement conduces to forest protection. A few minutes after saying that community forestry was "good", a forestry expert working for a cooperation agency stated: "*Before land allocation, forest was owned by many people at the same time, and was destroyed*." Similarly, some respondents defended CBFM and later on during the interview referred to the traditional Vietnamese axiom that preceded Hardin: "cha chung không ai khóc", literally "common father, nobody cries" (i.e. nobody takes care of common-pool goods). Behind the black box of Community Based Forest Management, entrenched Hardinian beliefs remain.

6 Conclusion

For the last decade, there has been a trend of similar reforestation policies and devolution of natural resources management towards households and communities in Asian countries, including China, Thailand and Indonesia. Championed and supported by international funding agencies, these policies have been considered as a positive move towards more environmentally, equitable and participatory approaches. However a wide gap has often been observed between stated policy intentions and outcomes.

Inspired by recent studies on decentralization (Ribot et al., 2006), forest policies (Blaikie and Muldavin, 2004) and community based forest management (Springate-Baginski and Blaikie, 2007), I defend the need to examine the politics hidden behind laws and discourses. I propose the adoption of a multi-scale, historically sensitive and simultaneous examination of (i) institutions, (ii) the political and economic context and interests, and (iii) beliefs and discourses in order to link outcomes with the driving motives behind state policies.

In Vietnam, unintended outcomes have emerged for two reasons. First, because some policies were blueprint models based on biased narratives and beliefs that did not match the reality. Second, because the intended benefits of policies have been hijacked and captured at the provincial level by powerful stakeholders driven by vested interests. In this case, little benefit is left for the final policy recipients located at the village level. I argue that provincial actors could take profit of the rules because of their lack of clarity, which was further reinforced by blurred discourses. Unclear rules are partly intentional, as they suit the political and economic interests of some actors located at the national level. They might also unintentionally stem from the consensus-based style of policy design in Vietnam and the

desire to please a wide range of stakeholders with different interests. Indeed, international actors interacting with policy-makers also participate in maintaining blurred discourses by promoting panacea concepts encapsulated within black boxes.

There is a role for the research community to deconstruct the black boxes that shape current beliefs on land management systems and forest environmental benefits. As argued by Forsyth (2003), providing scientific evidence, if important, is not sufficient. It also requires acknowledging and clarifying the co-construction of scientific knowledge and policies.

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ANNEX 1 – List of respondents

Provincial level: Hoa Binh, Yen Bai, Son La and Thai Nguyen provinces

Province	Organisation	Position of the interviewee
Hoa Binh	DARD	Deputy Director
Hoa Binh	DARD	Head of the planning and investment section
Hoa Binh	FD	Director
Hoa Binh	FPD	Head of the forest protection and management section
Yen Bai	DARD	Head of the policy section
Yen Bai	FD	Deputy Director
Yen Bai	DONRE	Deputy Director Land titling section
Yen Bai	DONRE	Director of the Land planning Section
Yen Bai	FPD	Director of the Forest Management Section
Yen Bai	FPD	Deputy Director of the Forest Management Section
Son La	FD	Deputy Director
Son La	DARD	Head of the technical section
Son La	FPD	Deputy Director
Son La	FSIV	Director
Son La	FSIV	Deputy Director
Thai Nguyen	DARD	Deputy Director
Thai Nguyen	DARD	Head of the soils section
Thai Nguyen	DONRE	Director of the land titling section
Thai Nguyen	DONRE	Technical staff from the land titling section
Thai Nguyen	DONRE	Deputy Head of the land management section
Thai Nguyen	FPD	Deputy Head of the forest management section

National level

Organisation	Position
Forestry Department - MARD	Chief of Planning Division
Vietnamese Academy of Agricultural Sciences (VAAS)	President
Forest Inventory and Planning Institute (FIPI) - MARD	Deputy-director of the Forest Resources and Environment Centre
Forest Sector Support Programme and Partnership (FSSP) Coordination Office	Chief Technical Advisor
Hanoi Agricultural University - Centre for Agricultural Research and Ecological Studies (CARES)	Director
Hanoi Agricultural University - Centre for Agricultural Research and Ecological Studies (CARES)	Senior Researcher
Vietnam National University - Centre for natural Resources and Environmental Studies (CRES)	Senior Researcher - Head of the upland working group
Northern Mountains Agricultural and Forestry Science Institute (NOMAFSI) - MARD	Director General
Ex Northern Mountains Agricultural Research Centre (NOMARC)	Vice Director
Centre for International Forestry Research (CIFOR) and World	Representative in Vietnam

Agroforestry Centre (ICRAF)	
Institute for Soils and Fertilizers (ISF) - VAAS	Vice Director
Institute for Soils and Fertilizers (ISF) - VAAS	Principal Scientist
Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD) - MARD	Technical advisor
Groupe de Recherche et d'Echanges Technologiques (GRET)	Representative in Vietnam
Helvetas	Technical Advisor – Extension Training Support Project
Japan International Volunteer Centre (JVC)	Representative in Vietnam
SNV Netherlands Development Organisation	Project Officer
Flora and Fauna International (FFI)	Asia Pacific Regional Director
Sustainable Rural Development (SRD)	Director
The World Conservation Union (IUCN)	Forests Programme Officer
Northern Mountains Poverty Reduction Project	Chief Technical Advisor
GFA Consulting group	Chief Technical Advisor for the Afforestation Project kfw4
Agrifood Consulting	Research Fellow
University of Sidney	PhD student / consultant
European Union (EU) delegation	Programme Officer, Rural Development and Environment Co-operation Section
United Nations Development Programme (UNDP)	Programme Coordinator
UK Department For International Development (DFID)	Poverty and policy adviser
UK Department For International Development (DFID)	Social development adviser
Swedish International Development Cooperation Agency (SIDA)	Programme officer Forestry
World Bank (WB)	Senior Specialist – Rural Development and Natural Resources Management
World Bank (WB)	Operations Officer – Rural Development
Asian Development Bank (ADB) – Vietnam Resident mission	Head of the Agriculture, Rural Development and Natural Resources
Finland Embassy	Programme Officer
Finland Embassy	Counsellor
German Technical Cooperation (GTZ)	Forestry Engineer, Chief Technical Advisor
Japanese International Cooperation Agency (JICA)	Forestry expert
Swiss Agency for Development and Cooperation (SDC)	First Secretary - Development and Cooperation, Assistant Country Director
Agence Française de Développement (AFD)	Head of Agriculture and Rural Development section

Collective choice on different spatial levels and over time: a framework to analyze adaptation and sustainability of common pool resource management in German recreational fisheries (GRF)*

Katrin Daedlow♣, Robert Arlinghaus♦, Volker Beckmann♠

Abstract

There is some concern that the management of German recreational fisheries (GRF) might impair ecosystem services generated by fish and facilitate social conflicts among resource users. Furthermore, it might be characterized by inefficient resource management.

This paper aims to develop a framework to analyze these potential problems growing out of multiple interactions within and between anglers and fish resources. Both are placed in a complex social and ecological system (SES). Besides the angler's activities, the major components of the social system are the institutional environment on one hand and the agents of the governance structure who decide about resource management on the other. The fish stocks as part of the ecological system are embedded in resource systems such as waters and in the broader biophysical world. Their specific characteristics as renewable common pool resources need particular awareness in resource management. All components are connected by multiple relations, which are explained by using insights from Institutional and Ecological Economics Theories.

Based on the work of Elinor Ostrom (2005, 2007) we develop a framework which is explained from the perspective of the governance structure. Its agents, in charge for a collective choice of a particular management approach, are the key for solving potential problems in resource use. To balance possible ecological, social, and economic problems which arise from the complexity, uncertainty and changes in all components of the SES, we argue that an adaptation of management instruments is needed to achieve a sustainable resource management over time. A specific feature of GRF is the resource management on different spatial levels in East and West Germany. These two distinct governance structures provide a compelling frame to study different efforts to manage for sustainability.

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1 Introduction

In most industrialized countries recreational fishers[1] are currently the dominant users of fish resources in inland waters. These fish resources provide numerous social, ecological, and economic benefits to society such as fishing experience, fish consumption, relaxation in nature, enjoyment of the angling community, ecological education, environmental monitoring, fishing tackle expenditure etc. (Arlinghaus et al. 2002; Arlinghaus 2004a, b). However, there is a growing concern that intensive recreational fishing activities can have undesirable effects from the perspective of sustainability[2] (Post et al. 2002; Cooke & Cowx 2004, 2006; Lewin et al. 2006), and German recreational fisheries (GRF) are likely no exception. It has been suggested that recreational angling can have ecologically undesirable effects such as overexploitation of targeted fish species, genetic contamination of fish populations though stocking of non-native fish (i.e. non-native to specific catchments), or social conflicts regarding fish stock use (Cooke & Cowx 2004; Arlinghaus 2005; Arlinghaus & Cooke 2005). Freshwater ecosystems provide several services for human use like fish harvesting or recreational activities (Costanza et al. 1997) and issues such as those mentioned above are indicative of a disorder[3] between social and ecological subsystems of GRF, which can compromise the maintenance and future use of the ecosystem services generated by fish[4]

[1] There are many definitions for recreational fisheries, however, there is no universally agreed upon definition (Aas 2002: 254). In Germany, recreational fisheries can be understood as a non-commercial fishing activity conducted during leisure (i.e. non-working) time. This activity is highly restricted with regards to technical equipment (e.g. fishing nets are forbidden) and typically done by rod and line fishing (angling). In addition, getting appropriate angling licenses and permits requires a lot of effort on the part of anglers when compared with other European countries.

[2] Sustainability means that the needs of the present generation do not compromise the needs of future generations; a concept that integrates social, economic and environmental dimensions (WCED 1987). This implies that social, economic and ecological goods and services generated through ecosystems or components of ecosystems such as fish populations must be maintained.

[3] What disorder means exactly highly depends on norms, attitudes and most importantly on the perceptions of the different stakeholders.

[4] Ecosystem services represent the benefits (e.g. food supply) humans derive, directly or indirectly, from the ecosystem (Costanza et al. 1997: 253). Holmlund & Hammer (1999: 255) differentiate four major fundamental and demand-derived ecosystem services generated by freshwater fish populations. These are firstly regulating services such as the regulation of food web dynamics, recycling of nutrients or maintenance of genetic, species, ecosystem biodiversity, secondly linking services such as the linkage within aquatic ecosystems, between aquatic and terrestrial ecosystems or for transport of energy, thirdly cultural services such as the production of food and medicine, reduction of waste, supply of aesthetic values or recreational activities, and fourthly information services such as the assessment of scientific and educational information, assessment of ecosystem stress or revealing evolutionary tracks. The loss of such services due to human activities has negative social, economic and ecological consequences and management approaches have to take this into account.

for humans (Holmlund & Hammer 1999; Low et al. 1999). Moreover, one of the most important objectives of GRF management is to provide satisfactory fishing experiences for the angling public, and mismanagement might comprise this social goal.

Human use of ecosystem services provided by fish populations is regulated by a complex system of institutions (with formal and informal rules for fisheries management), governance structures such as fisheries authorities, angling associations, other fishery stakeholders, and contracts implementing or governing specific fisheries management measures (Williamson 1996). These groups define the approaches and tools used to manage the use of ecosystem services and try to regulate disorder occurring in those systems. These management measures, defined as transactions to organise and implement human activities in recreational fisheries, have several costs such as search and information costs, bargaining and decision costs, and monitoring and implementation costs (Richter & Furubotn 1999: 35). These costs are highly dependent on the arrangement of the institutional environment and governance structures.

GRF can be characterized as a co-management system. Fishery authorities regulate the allocation of fishing rights in inland waters, and monitor the compliance to fishery regulations. However, the holder of the fishing rights has the responsibility by law to manage the resource in a sustainable manner. For recreational fisheries, angler organisations usually own or lease the fishing rights of waters. Angler organisations are angling clubs at the local level which together form angling associations at the regional or states[5] level. However, there is a major difference between East and West Germany with regards to the holding of fishing rights. In East Germany anglers associations usually lease or own the fishing rights whereas in West Germany angling clubs lease or own the fishing rights. As a result, the responsibility for managing the fish stock resources rests with groups organized at different spatial levels. Hence, the distinct governance structures in East and West Germany provide a unique opportunity to study how different groups deal with the challenges of GRF management and the different efforts they employ to maintain long-term sustainability.

A crucial factor in fish resource management is the individual resource system's characteristics which must be considered by all management groups. These characteristics are expected to exert a strong influence on the implementation and enforcement of specific management measures by the different governance structures (Berkes 2006, Carpenter & Brock 2004). Germany's geographical structure is mainly separated into the North German Lowlands with large and often connected lakes and canal/river systems with abundant fish populations whereas the Central German Uplands are featured by fast running, mostly small rivers, and very small ponds or larger dams which are widely scattered over the countryside. Thus, the objective of this study is to determine how the different institutions and governance structures in GRF respond to challenges of social-ecological disorder or potential disorder (i.e., those not yet realised by the majority of stakeholders) in systems that have discrete resource characteristics, and how they generate sustainable and adaptive management systems to provide further utilizable ecosystem services.

Fundamental and comprehensive studies on the institutional environment, the governance structure and management systems in GRF have not been extensive (Arlinghaus et al. 2002; Steffens & Winkel 2002; Arlinghaus 2006: 46), nor has the role of actors' behaviour in GRF

[5] "States" are the so called German "Laender", of which there are sixteen. These federal states are: Mecklenburg-Western Pommerania, Brandenburg, Saxony-Anhalt, Thuringia, Saxony (all Eastern Germany), Schleswig-Holstein, Hamburg, Lower Saxony, Bremen, North Rhine Westphalia, Rhineland-Palatine, Saarland, Hesse, Baden-Wuerttemberg, Bavaria (all Western Germany), and the capital Berlin.

governance systems been thoroughly examined. Furthermore, it is unclear whether the governance structures facilitate adaptive management systems in GRF, a system that is thought to be oriented towards sustainability. Carpenter & Folke (2006: 313) point out the key role of governance in ecosystem management: "Its success or failure (of adaptive environmental management, added by author) appears to depend on the institutional and political processes that govern the project." Examining governance here means "to study the structures and processes by which humans make decisions and share power in the process of managing ecosystem services" (Carpenter & Folke 2006: 313). This study aims to investigate this research objective for GRF and thereby partly fill the existing research gaps.

2 Human-nature-interaction → the research problem in GRF

A recreational angler catching fish appears to be a simple transaction at the first glance, but there exists a web of more complicated relationships of human-nature interactions within the social-ecological system (SES). The impact of angling activities on fish stock resources can produce major disturbances in the functioning of freshwater ecosystems and might cause undesirable outcomes. However, the characteristics of fish stock resources themselves and the fact that they are embedded in larger resource systems challenge the way fish stock populations are used by humans. Fish stock populations as renewable natural resources can be framed as so called common-pool resources[6] and are characterized by a high rivalry for utilisation of the resource and problems in the exclusion of other (non-authorized) users. High rivalry derives from the fact that the use by one fisherman precludes the use by another (both cannot utilise the same fish). This can cause the so called "tragedy of the commons" as depicted by Hardin (1968). The "tragedy of the commons" arises in the following case. Without any regulation (= open access), there is a free run on the common-pool resource. Every angler tries to catch as many fish as possible and every fish not caught is free to be harvested by another fisherman. Problems arise if growing numbers of anglers, improved angling technical equipment, and/or increasing demand for fish cause an overuse of the resource and disturb both the ability of the fish stock to reproduce and its provision of ecosystem services. As a consequence, the regulation of resource use among competing users to hinder these undesirable effects is needed.

The second major feature of common pool resources is the difficulty of excluding non-authorized users. Fish stock populations are nested in water systems. Water bodies are scattered over wide spatial scales which may be interconnected over large distances by things such as long rivers or connected lake systems. Furthermore, their importance for social and economic use makes it difficult to exclude potential users of fish stocks or water resources. For instance many rivers and lakes are used as waterways for commercial or private shipping traffic. Another example is the construction of local water power facilities which build in fish ways (Uhlitzsch 2003). Additionally, many leisure activities such as hiking, swimming, canoeing, or camping utilize water resources. Hence, excluding non-authorized users (e.g. building a fence), from water and fish stock resources to avert things such as fish stock overuse is a difficult task to undertake.

The difficulties arising from these intrinsic resource characteristics are called first order dilemma in the literature. The difficulties of common pool managers to deal with these are

[6] See Perman et al. (2003: 126) for a detailed description of public, private, club, and common-pool resources (goods).

called second order dilemma (or social dilemma) because many of the hitherto used management approaches failed and did not work out economic inefficiencies[7], social conflicts, or destruction of natural resources finally. To overcome these obstacles new management approaches such as the adaptive management approach need to be developed and implemented. The key to achieving this goal lies with the governance structure as the entity that decides how a certain resource management plan is carried out.

To avoid or mitigate the problems that result from typical common pool resource characteristics in GRF several management tools have already been established by the governance structure. Measures such as access regulations (e.g. fishing rights or permits), use regulations (e.g. seasonal closures), or fish stocking activities try to reduce the risk of resource overuse and the loss of ecosystem services. Furthermore these regulations attempt to regulate or avoid social conflicts between different resource users regarding their individual benefits from catching fish. Another issue is to manage the resource use as efficiently as possible to balance the costs and benefits of resource management. It still needs to be investigated whether these management objectives are applied and reached by angling clubs and associations.

However, there is some concern that these attempts to manage and regulate GRF are not entirely successful and that governance structures are challenged by several problems in fish resource use. The challenges in fish resource management are highlighted by the following three major problems: access and use regulations, fish stocking measures and problems that result from multiple stakeholder interest in inland water resources.

2.1 Access and use regulations

Property rights are typically established to regulate access to and the use of fish stock resources by humans. The aim is to share the scarcity of the resources among different users while maintaining a suitable stock structure for the future use of ecosystem services. There are a multitude of management measures regarding access and use in recreational fisheries to reach these policy goals (Young 1999; Hoel & Kvalvik 2006). However, many of these management regulations fail for several reasons (Begossi 1998; Kearney 2001; Wang 2001). For instance unclear specifications and information about how resources may be used and protected may incur transaction costs (Edwards 2003), or management regulations are not ecologically consistent with the resource they are supposed to manage (Almlöv & Hammer 2006).

In GRF, all people or organisations that own or lease the fishing rights on waters, and people who buy angling permits from them have access to the fish stock resources. In East German recreational fisheries, angling associations usually lease or hold the fishing rights on waters over larger spatial scales and try to sell the angling permits as cheaply as possible to provide easy access for many anglers. Between the angling associations in different East German states there are fishing permits contracts which allow anglers from one state to go fishing in another state at low prices. On the contrary, in West Germany angling clubs on a local level usually lease or own a limited number of lakes or parts of rivers and strongly restrict the access of users other than the angling club members. For recreational fishers this often requires a lot of effort to bargain for access and high costs to obtain a permit. These different access and use rules might cause conflicts between East and West German angling

[7] Efficiency is defined shortly as follows: under a designed set of institutions, governance structures, and resource characteristics there is no management improvement possible (Pareto-efficiency).

associations and clubs regarding the use of fish resources. While it is very easy for West German anglers to participate in East German recreational fisheries, it is comparably difficult for East German anglers to participate in West German recreational fisheries.

The fishery laws and regulations in the particular states define access and use restrictions. In addition to the property rights regulations that restrict access to the resource, other regulations may also restrict fish stock use, such as protected species, closed fishing seasons, or the protection of undersized, immature fish which has to release to the water. The owners or lease holders of fishing rights also have the option to make these regulations more stringent, but not to make them less stringent.

Managers must also deal with issues regarding various illegal activities associated with access and utilization regulations. One issue is illegal angling which means harvesting fish without the permission of the owner (free-rider problem: getting the benefit from a good without paying for it, typical for common-pool-resources or public goods). A greater problem concerns non-compliance with the use regulations such as restrictions on bag or fish size, fish species, angling areas and technical limits of angling (e.g. anglers catch eel under limit and take it home or commercial fishing tackles are used like gillnets). There are many reasons for anglers to carry out illegal angling or to ignore use regulations (Sumaila et al. 2006). However, both the complexity of resource systems and the diverse organizational structure of recreational fisheries make it problematic to provide effective enforcement (Pereira & Hansen 2003).

The resource characteristics in the North German Lowlands might further reduce the efficiency of enforcement. The large water resource systems in this region could complicate monitoring and the implementation of access and use regulations and this is thought to be a major contributing factor to illegal activity. Angling associations organized on a larger scale (i.e., East Germany) might be better able to bear the higher financial and personal costs of enforcement because of their large number of members and their strong position (because of their long-range water resource ownership on a regional level) in higher policy-decisions which decide about access and use regulations. Their mandate to provide easily obtainable and cheaper use permits to all anglers and to abandon the fishery licence might hinder illegal angling activities in their water areas.

On the other hand, limited water bodies can be controlled more effectively and strong restrictions on membership, such as in the low-level organized governance structures in West Germany (special-limited water resource ownership), support easier and cheaper control measures for access and use restrictions. Small-scale management may support more control by club members and save financial and personnel resources that otherwise may have been required for enforcement. Furthermore, it is probably easier to monitor the fish resources and gather information about the amount and state of the fish stock population. This knowledge might make it easier to estimate correct restrictions on access and use. However, it is also assumed that in complex resource systems the management by angling clubs is less efficient because of less influence and management capabilities in larger water ecosystems based on their limited ownership and membership.

2.2 Fish stocking measures

Fish stocking is the most widespread and abused management tool used in freshwater fisheries (Cooke & Cowx 2006) and it is a typical human reaction to fish stock decline which may be caused by many different reasons (Feunteun 2002). Generally, it has been carried out to meet the following objectives: a) compensation to mitigate a disturbance to the

environment caused by human activities; b) maintenance to compensate for recruitment overfishing; c) enhancement to increase and maintain the fisheries productivity of a water-body at a higher level, and d) conservation to retain stocks of a species threatened with extinction (Welcomme 2001: 241). Thus, reasons for fish stocking measures can have two aims, firstly to gain similar or more catch satisfaction (considering human use of the ecosystems service fish supply) or to maintain ecosystem services like biodiversity or food chain dynamics in fish stock resources (Hansson et al. 1997). However, some case studies point out that to reach such ecosystem services, better monitoring and information systems have to be established in fisheries management in order to only stock when the situation is appropriate (Welcomme & Bartley 1998; Holmlund & Hammer 2004) and to avoid stocking as a tradition (Klein 1996).

The main problem of using fish stocking as a management measure is that they are carried out without complete information about the actual or potential success of the exercise (Cowx & van Zyll de Jong 2004) or without any definition of the objectives (Cowx 1994). Information about the amount of fishes in the lake/river, about the number and quality of the stocked fish species and of the catch amount by anglers is often lacking. This lack of information arises from non-existing, failed or biased monitoring measures of angler catch amount, lack of research and support by scientist, and lack of monitoring of the status of the resource base. Gathering this information is also made more difficult by very complex resource characteristics. In large-scale water bodies fish migrate and fish populations differ from one water body to another. Additionally, fish stocks are part of a broader food web and birds or mammals could have a strong influence on the quantity and quality of fish stocks. The problem of free-riding can appear as well. Especially in complex resource systems where several property rights on one water body could exist, it is assumed that the benefits of fish stocking measures, carried out by one adjacent owner, can be taken along by the others without own management effort.

In Germany, there are few lakes or rivers which are not stocked with fish and these management instruments are generally uncritically applied and carried out to increase fish yield for recreational anglers (Klein 1996). Recently, concern has been raised that traditional stocking practices are often single-species oriented and do not take into account the complex structures of fisheries food webs (Arlinghaus et al. 2002). This in addition to the other concerns related to stocking suggest that clarification is needed on the objectives that angling associations or angling clubs hope to achieve by fish stocking. Is the objective only to assure selfish angler catch satisfaction or is it to care for ecosystem requirements, which means that stocking is conducted in an adaptive management framework and that stocking is followed by an evaluation of success and future stocking changed accordingly?

2.3 Multiple stakeholder management

The problem that is addressed by this research is that regulating fisheries management on different spatial levels attaches different values to ecosystem services (Hein et al. 2006). There are different interests regarding the use of fish and water resources which cause diverse conflicts in this sector (Arlinghaus 2005). For instance in GRF, interests other than fish catch exist such as scientific interests to investigate fish species or fish behaviour in specific habitat structures. Thus, angling in a system where research is being carried out would disturb the scientific investigation. Other interests in the resource systems (directly and indirectly influencing fish stocks) are the provision of long water traffic ways including river training works. These measures are usually planned and implemented at a regional and

states' level and are carried out over many water basins. As a result, it is difficult for angling clubs at the local level to influence such decisions. Based on former research evidence that small-scale community-based management deals better with ecosystem requirements (Ostrom 1990), proceedings that exist from this point on consider the influence of multiple resource user groups (Wilson et al. 1999; Berkes 2006) on different scales of the resource systems. Many conflicts can be identified regarding different resource use interests (Bennett et al. 2001) and small-scale management measures are not able to react on those challenges (Lester et al. 2003), because other resource users are acting on the regional or states' level. However, regulations that are too stringent at higher scales can in turn also cause management failure (Carpenter & Brock 2004). Thus, management approaches should consider local fish resource requirements organized by anglers clubs and associations and should consider interactions between flexible and multiple resource user demands on higher scales. This approach is widely discussed in this paper under the term "multiple stakeholder management."

German recreational fisheries are often confronted with a high level of complexity (many different interests in fish resource and water resource services covering different spatial scales) in their resource systems. Hence, recreational fisheries management depends strongly on the non-fishery players (Arlinghaus et al. 2002). Fish stocks are mainly used by recreational anglers, but also have to be shared with commercial fishermen. The use of these resource systems is much more differentiated. Other pressures arise from the fact that many rivers, canals and lakes are used as waterways for shipping traffic. To facilitate these activities, most waterways have recently been renovated or are still under reconstruction. Both factors have a great influence on the natural habitat for fishes. The input from industrial or agricultural facilities may also influence fish populations. For instance, the entry of farm animal waste can change water quality from oligotrophic to eutrophic, which affects the fish species whose preferred habitat is one or the other (e.g. pikeperch like highly eutrophic water basins). The construction of local hydroelectric facilities often alters or restricts fish movement (Uhlitzsch 2003) and affects fish habitat. Furthermore, there are many leisure and sport activities that utilize water. These activities usually do not consider the existence of the fish stocks and their habitat requirements and might disturb angling activities at the water. Additionally, trade-offs between different interests can emerge and questions arise about how to deal with such social situations.

In Germany the debate about fish welfare issues is highly controversial. Animal welfare and nature conservation issues are of very high societal concern and are represented by nature conservation interest groups. These concerns have been implemented in several international, European, and national laws (Stoll-Kleemann 2001), and affect many regulations of recreational fisheries management (Cooke & Cowx 2006: 101). The influence of these issues in GRF is twofold. Animal welfare interest groups aim to protect every single fish, and to hinder killing and pain caused by anglers' activities. Nature conservation groups try to establish protected areas to preserve whole habitats including fish populations and to reduce or forbid anglers activities in those areas.

Summing up this chapter, there is a high influence on GRF social-ecological system from various external and internal factors and the users of the resource system have great cross-scale effects on the fish stocks and thus on angling activities (Arlinghaus et al. 2002). Regarding the governance structure in GRF, it is assumed that there is no well connected interaction between different stakeholders (Arlinghaus 2006) and anglers interests are marginalized in some resource system contexts. To consider the interests of anglers in other resource use structures on higher levels (Okey 2003) it is necessary to develop further co-

management systems over different resource use scales (Begossi 2006). The institutional challenge for the governance structures in GRF is to implement their interests in the decision-making process on the states and regional levels and to cooperate with other stakeholder groups, for instance to get the right of hearing regarding decisions on reconstruction of waterways or to demonstrate their own conservation interests to animal welfare stakeholder groups. The high-level governance structure of recreational fisheries in East Germany might be better included in policy-decision processes on water management decisions whereas the low-level organized angling clubs in West Germany might be disregarded because of their local-level activities. It is assumed that the incorporation of stakeholders in the decision-making process causes lower transaction costs and makes it possible to establish suitable management measures (Sutinen & Johnston 2003; Cowx & Gerdeaux 2004). A crucial point here is that the stakeholders are willing to cooperate, which often occurs after an initial phase of behaviour following selfish interests (Stoll-Kleemann 2001; Pereira & Hansen 2003).

Due to the different resource characteristics in the North German Lowlands and the Central German Uplands it is important to consider that (except nature conservation and animal welfare issues) in complex water systems there are many stakeholder groups with different interests regarding the water resources (hydroelectric companies, the tourist industry, commercial fishermen, water sports etc.). Therefore, high-level recreational fisheries organizations might be more successful and efficient in those settings, whereas if the water resource is less complex such as in the Central German Uplands local organized management might be sufficient.

2.4 Research questions

Hence, the research questions of this study are:

1) Which governance structure is more successful in the maintenance of ecosystem services, solving social conflicts, and avoiding economic inefficiency in GRF?

2) Which governance structure is more adaptive in GRF management considering varying resource characteristics?

3 Insights from Institutional and Ecological Economics

Economists study the system of consumption, production and distribution of goods, and the management of these in the human society. Ecological economics considers the importance of natural resources for this exchange process and stresses the limits of economic growth resulting from scarce natural resources (Perman et al. 2003). Furthermore, this branch of economics has moved away from the paradigm of traditional economic theory that natural resources are completely substitutable through human and financial capital and that individuals always maximize their utility (Vatn 2005). Ecologists stress the interdependency of human-ecological interactions (e.g. angler-fish stock interactions) and focus on the outcomes of these interactions. The central idea here is that the function of ecosystems eventually can be destroyed through human activities, and the crucial question is how we can organize the utilization of natural resources and at the same time maintain ecosystem functions, while providing further resource use by humans. That maintenance can be named as resilience, defined as the ecosystem's ability to return back to its organizational structure

intact after a perturbation (e.g. human activity such as overfishing) has taken place (Carpenter & Folke 2006). Securing the resilience of an ecosystem depends on adaptive resource management, which considers the economic, cultural, political, and regulatory dimensions of the system.

In this study, insights from Institutional Economics are chosen because "they regulate relationships among individuals and between the social and ecological systems, i.e. rights and duties as well as costs and benefits of actions. Therefore institutions link social and ecological systems." (Gatzweiler & Hagedorn 2003: 3) This theory considers market and non-market explanations such as regulatory, cultural, or behavioural factors for the success or failure of natural resource management.

Following Vatn (2005) the core question of Institutional Economics is which choices people make within different types of contexts, both physically and socially. For example, which choices are made by angling associations or clubs when implementing management measures in one way versus another and why do they do so. These choices follow institutions. Institutions are defined as "the humanly devised constraints that shape human interaction. In consequence they structure incentives in human exchange, whether political, social, or economic." (North 1990: 3) They consist of informal (sanctions, taboos, customs, traditions, and codes of conduct) and formal rules (constitutions, laws, property rights) (North 1991: 97). In the context of this study, this means traditions, rules, regulations etc. related to fisheries management, the constraints on the interaction between angling associations or angling clubs and freshwater ecosystems (use of the fish stock resources) and the choices of certain kinds of management measures. Thus, the institutional environment defines the choice domain within which the members of society operate (Bromley 1989: 741). These members (individuals or groups of people) are called agents (or governance agency), which are organized in different alternatives (governance structure) and defined by institutions. However, the members also have the ability to define institutions. Thus, governance structures are the key for changing traditions, rules, and common customs. They consist of institutions incorporated by humans in discrete structural governance alternatives; classical market, hybrid contracting and hierarchy (Williamson 1996). For the GRF governance structures, these alternatives are private ownership of fish stocks like commercial fishermen (classical market), common ownership like anglers associations or clubs in East and West Germany (hybrid), or governmental ownership (hierarchy). These governance alternatives mediate between individual formal or informal transactions (management measures) to align incentives that organize the allocation of (fish) resources.

The theory of Institutional Economics follows the assumption that the detailed arrangements of institutions matter and that their failure (or success) has a direct influence on a particular outcome of resource use (Vatn 2005). Those institutional arrangements are highlighted by different theories such as property rights theory, transaction cost theory, social capital theory, and the theory of institutional change, which are explained in detail on the following pages.

3.1 Property rights theory

Property rights are an institutional form (these can be also called rules) which regulate the access to and use of resources by humans. Those rights are enforced by the state as the "unit of coercion" (Bromley 1992: 3), which both defines the boundaries of property rights and observes holders of the property rights in their use of the natural resource. Therefore, Bromley defines property rights as "a benefit stream that is only as secure as the duty of all others to respect the conditions that protect the stream." (1992: 10). Protecting the stream

means for example that natural resources are not squandered in anarchy and that the holders of the property rights invest in the resource to maintain future use. A functioning property rights system depends on well-defined and well-established property rights rules, which give the holders the security that their rights are recognized by potential competitors in the present and the future (Ostrom & Schlager 1996). This security ensures the development of long-term management plans.

To investigate the functioning of property rights, two parameters have to be considered; the attributes of the resource and the attributes of the resource user (Paavola & Adger 2005: 356). Fish stock resources are common pool resources and are characterized by high rivalry and difficult exclusion of users. The difficulties of exclusion depend of the characteristics of the resource, for example whether it exists in approachable and lake-rich landscapes and provides the possibility of free riding, such as resource use in situations without fishery rights and the correspondently costs of its provision. This might imply consequences for the different approaches of recreational fisheries management in East and West Germany. Furthermore, the property rights' holders are also challenged by the attributes of the resource user, i.e. the number, heterogeneity, and the social capital of anglers. For instance, a small number of anglers can be better observed by angling club managers in West Germany, than a high number of users can be monitored by angling associations in East Germany. However, it is still unclear which governance structure is more efficient in the different resource characteristics in Germany.

3.2 Transaction cost theory

The failure or success of management measures in GRF also depends on the amount of transaction costs incurred to achieve a particular outcome, for example management measures such as fish stocking or access restrictions. Transactions of management measures can be defined as "developing initial contracts between parties responsible for the production of the ecosystem services necessary for recreational fisheries" (Rudd et al. 2002: 47). Those contracts are e.g. capture limits or size limits and should be in line with both actors' preferences, goals and motivations and the maintenance of fish resources. However, the carrying out of such management measures has costs. In addition to the production and personnel costs there are so called transactions costs, which are broadly defined as the "costs of running the economic system" (Arrow 1969: 48). These costs are e.g. search and information costs, bargaining and decision costs, and monitoring and implementation costs (Richter & Furubotn 1999: 35). They are all assumed to have an influence on the arrangement of management measures by the governance structure. For instance if regulations at the state or regional level do not fully conform to the attitudes of local resource users (top-down approach), the costs of monitoring and enforcement rise (Costanza et al. 1998). Therefore, the amount of transaction costs incurred might also have a strong influence on the resource managers' choice of which kind of management measure to carry out.

The amount of transaction costs incurred varies greatly among the different forms of the institutional arrangement (e.g. governance structures (Williamson 1991)), resource characteristics, anglers' attributes, and the degree of the resource use complexity (Paavola & Adger 2005). In different situations the transaction costs can be higher or lower. Because of the distinct governance structure in GRF, the structure of the costs differs between East and West Germany. In the West, the small-scale organized angling clubs at the local level might have low monitoring and enforcement costs (regarding access and use restrictions) because

of their proximity to the resource. Nevertheless, the information costs between different angling clubs might be much higher, and the effort required to influence the policy-decision process at higher spatial levels (regional or mostly states' level) about fishery laws might also be high. Therefore, angling clubs at the local level might have higher bargaining and decision costs to enforce their interests relative to the interests of other fish resource interest groups (e.g. nature conservation groups) or water system user (representatives of hydroelectric facilities or water traffic companies). In East Germany, where anglers' organizations are at the regional and states' level, there might have more access to and influence on the policy-decision process because they decide for a wide community of anglers and participate with "one vote." However, information costs about the resource, monitoring and enforcement costs associated with access and use restrictions might be much higher.

Resource characteristics also have a strong influence on transaction costs. In complex water bodies (which are typical for the North German Lowlands) more search and information costs are incurred to obtain information on the status and change in fish stock populations. The monitoring and enforcement of access and use restrictions might also have much higher costs in these systems than in limited and easily observable water bodies such as in the Central German Uplands.

Another parameter to consider in the governance structures are the attributes of the angler community (Arlinghaus et al. 2002, Arlinghaus 2004a, 2005, 2006). Their expectations about resources might influence decisions about management measures by angling associations and clubs managers more than e.g. ecological requirements of the resource system. In addition, the number and attitudes of anglers might have a strong influence on the effective implementation of management measures (Arlinghaus & Mehner 2005). For instance, consideration of varying attitudes, beliefs, and catch orientation of anglers might increase the bargaining costs in governance structure management decisions. However, it could also be the case that the inclusion of anglers' interests in management decisions reduces enforcement and monitoring cost because of the anglers' participation in management decisions.

3.3 Social capital theory

The often described problem in using common-pool resources is the so called social dilemma. This means that the decisions about and the use of fish stock resources highly depend on trust, reciprocity, and equity between the resource users and arise from the characteristics of common-pool resources (Ostrom 2005b). The success or failure of management systems to prevent rivalry in resource use and to enforce restrictions on access depends highly on these values. Additionally, norms and traditions influence anglers' activities and management decisions. Furthermore, the lack of information and knowledge about the complexity in resource systems complicates the management of fish stock resources. The ability of different resource users to communicate about problems arising from resource use also becomes a crucial consideration. All these behavioural and cognitive traits of the resource users are difficult to consider in management decisions and are not easy to incorporate. It is also assumed that strategic behaviour (utility maximization) with complete information does not work in common-pool resource management (rational choice theory). On the contrary the bounded rationality of humans in using ecosystems services (fish stock resources) is obvious (Jager et al. 2000).

However, one way to solve these difficulties is the collective action approach. This approach departs from rational choice theory and points out the importance of sharing norms between

different resource users. Similar to this approach is the concept of social capital (Paavola & Adger 2005: 363), which is defined as the "capacity of social groups to act in their collective interest" and this "depends on the quality of the formal institutions under which they reside." This is also seen as a central strategy for a resource user's adaptation to environmental problems. With respect to the resource use in GRF, this means that resource managers have to build up common preferences in fish resource use, consider all requirements for the different expectations of varying resource users and maintain the ecological system of fish stock populations. To achieve this societal endeavour they have to overcome challenges like communication barriers and the lack of resource knowledge and they have to deliberate the further use of traditional management measures (Arlinghaus 2006).

Regarding the different governance structures in GRF it might be the case that local angling clubs are more successful in building up these strong relationships and communication skills within a well known and homogeneous angler community. However, these issues are also important for high-level angling associations, representing many heterogeneous anglers, and their interactions with other stakeholder or interest groups. It might be easier to trust and work together in small communities. However, to achieve sustainable fish resource management, e.g. in complex resource systems, it is also important to invest in human capabilities at higher levels (Berkes 2006).

3.4 Theory of institutional change

Theories of institutional change are important for the research question of this study: how potential management failure and deficiency of both existing governance structures in GRF in varying resource characteristics can be overcome and move towards an adaptive management approach. Within institutional economics there are many explanations regarding institutional change. For instance transaction costs are often claimed to be essential for change or stability in institutions, because high transaction costs may prevent institutional change (North 1990). Inefficient property rights, technological changes or market changes may also cause institutional change. However, this study focuses on co-evolutionary and collective action approaches to explain institutional change (Paavola & Adger 2005). Economic co-evolution is defined as "mutual adjustment and development of ecological and economic systems" and "social systems in turn reflect the peculiarities and constraints imposed by the resource on which they depend" (Paavola & Adger 2005: 361). This approach allows consideration of a broader range of reasons for institutional change. The central point is the assumption that human decisions follow bounded and imperfect rationality. The choice of resource management is understood as a learning process of trial and error and emphasizes the volitional decisions made by resource managers.

Central in this approach are feedback mechanisms between the user, the resource and the learning processes of resource managers about human resource use (van den Berg & Stagl 2003). Feedback mechanisms of the SES and learning processes influence the decision about management regulations and provide the basis for adaptive management systems. Adaptive governance structures can be defined as follows: "institutional and political frameworks designed to adapt to changing relationships between society and ecosystems in ways that sustain ecosystem services." (Carpenter & Folke 2006: 309)

At this feedback mechanisms are a precondition for institutional innovation, i.e. a change in laws, rules or the behaviour of stakeholders, in order to provide new management approaches that are able to adapt to the changing requirements of social-ecological systems. Furthermore, it is central that the results of feedback information are considered in the

decision-making process and that the stakeholders are able to draw conclusions from them, i.e. to change currently failing management approaches to adapt to the requirements of the social-ecological system. Therefore, the knowledge, attitudes, and resources of fish stock managers (representatives of angling associations and angling clubs) have a high influence on change in the institutional environment, in management systems and in human behaviour and norms regarding fish resource use.

4 A framework to analyze GRF management

This framework shown in figure one, draws heavily on the work of Elinor Ostrom (1990, 2005, 2007). It regards to both the “Framework for Institutional Analysis and Development” (IAD) and further enlargements towards a social-ecological system analysis (2007). The here proposed framework considers the influence of the institutional environment, rules, traits of actors and resource characteristics underlying a particular arrangement of management measures on resource use such as those mentioned in theoretical explanations described in part three of this paper. Furthermore, it takes into account intra-sectoral relationships of ecological systems between resource units and resource systems within the biophysical world, which feed signals back to the social world.

The two parts in the framework, the social and ecological system, do not imply contradicting positions. On the contrary both are strongly connected by everyday human-nature interactions, specifically through multiple interplays between numerous components of the system. Both adapt activities on each other and give feedback to the other part. This view on human-nature interaction is based on the integrated concept of “human in nature” perspective of social-ecological systems by Berkes & Folke (1998). The implication of this concept on resource management is that a sustainable use of natural resources needs the consideration of all three branches of sustainability: economic efficiency and success, social conflict resolution (both on the social part of the SES), *and* ecological resilience (the ecological part of the SES). These management objectives (which are the objectives of this research as well) are the evaluation criteria in the adaptive management cycle. Disturbances in one of these parts might have strong influences on the other parts and might cause social-ecological disorder and hence may hamper sustainable resource use altogether.

As described in chapter two, problems in resource use arise with the daily human-nature interaction. This interaction consists mainly of human activity regarding natural resource use and the outcome fed through the ecological system as a result of this activity. A simple example would be the following: too many anglers have access to a limited area of water. They cause a comparable high angling pressure with a high capture rate. The outcome would be a reduction of the abundance of the fish stocks, changes in fish population structure or in the fish community structure in all. This again has an influence on resource use. The anglers might gain lower catch amounts and might start to argue about the use of reduced fish stock populations (social conflict).

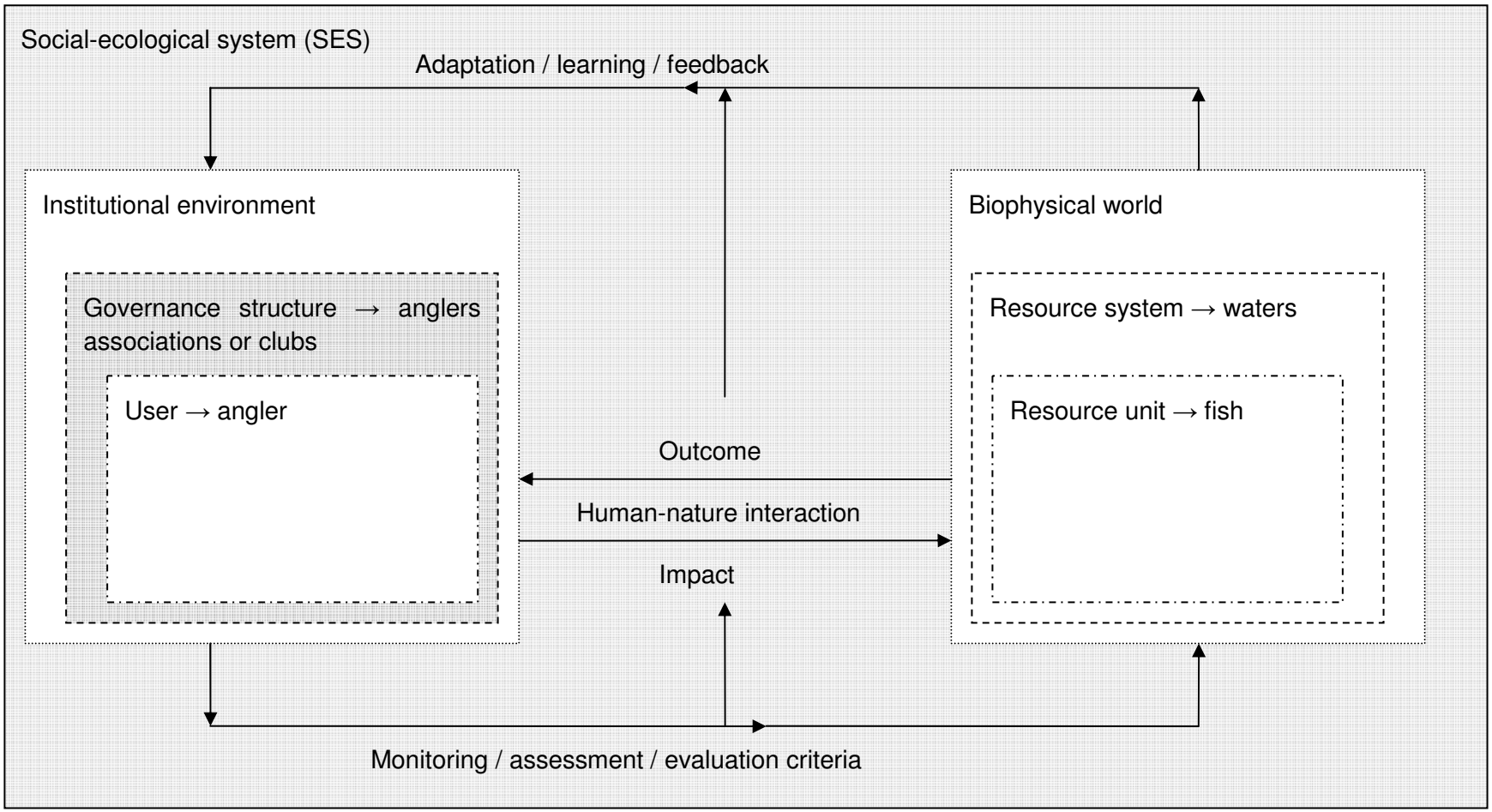


Figure 1: Adaptive management cycle in the recreational fishery social-ecological system (based on Ostrom 2005, 2007)

This framework takes the perspective of the governance structure of GRF, defined as the key part of the SES. It has the choice of how natural resource uses should be organized and the right to set the rules of resource management and use. Only the agents of the governance structure are able to carry out adaptive management. This is due to its (potential) ability to recognize management problems and undesirable effects on the resource and its power to change existing rules on resource use. The permanent interactions and changes between resource users and resource units are nested in the resource system and the biophysical world. Sustainable resource use then requires an adaptive management system consisting of monitoring and assessment tools, and socially defined evaluation criteria to observe what is going on in the ecosystem. However, to complete the adaptive cycle it is necessary to make use of feedback (and its information content). That means to learn what activities have an undesirable outcome with respect to the evaluation criteria and which rules and management instruments do not work accordingly. The adaptation is fulfilled when the managers are able to change those rules and resource use behaviour to reach the listed but not yet achieved evaluation objective. The consideration of the process of adaptation in resource management in the analysis of SES enables the investigation of the (potential) development of rules and norms over time.

Another key issue in GRF is the spatial level at which the governance agency decides on and carries out resource management. The spatial distance to the resource unit and the resource system on the one hand and the organisational distance to anglers and the institutional environment on the other hand are supposed to have a high influence on the success or failure in sustainable resource management.

With the help of this framework the actors, the rules, the resource characteristics and the performance of GRF management regarding the described management problems will be investigated. On the following pages the parts of analysis are explained in detail. Chapter five considers the major components of the SES exemplified by GRF management and fish stock resources. Chapter six focuses on the adaptive cycle between the social and ecological systems of GRF.

5 Major components of the social-ecological system in GRF

5.1 The institutional environment[12] / the constitutional level

Institutions are the rules of the game (North 1990). These rules, or also called norms, customs or traditions regulate human behaviour, such as fish stock resource use. The objectives of institutions are manifold. They protect the interests of different stakeholders, distribute costs and benefits, coordinate human behaviour, and enforce laws (Vatn 2005).

A major distinction in Institutional Economics is the separation of rules into the formal and informal. Informal institutions are, for example, sanctions, taboos, customs, traditions, and codes of conduct arising from the cultural and/or religious background of a society. Formal

[12] Institutions of GRF management do not exist in an isolated environment. Social, economic, and political settings influence rules of GRF management such as economic development (joblessness), demographic trends, political stability, government settlement policies or market availability (Ostrom 2007).

rules are, for example, constitutions, laws[13], and property rights, which are seen as more legally defined with sanctioning conditions (North 1991: 97; Vatn 2005: 65). Williamson (2000) classifies the informal rules in a level of institutional embeddedness which influence all other levels of social analysis: the institutional environment (formal rules), the governance structure (players and decision makers), and resource allocation. This analytical approach is comparable with the Ostrom's multiple levels of analysis (2005: 58), which consists of the meta-constitutional level, the constitutional level (rules in use), the collective choice level (governance structure), and the operational level (resource use). However, Ostrom does not follow the distinction between formal and informal rules because, she argues that so called informal rules can be sanctioned and clearly defined as well. Alternatively, Crawford & Ostrom provide the approach of "a grammar of institutions" to analyze the rules which can be used to understand GRF management, described in detail on page 27 in the subchapter about the analysis of rules in use.

In GRF, multiple fishery laws, regulations on the state-level and special regulations for water bodies by angling organisations exist in written form, which can be comparable easily collected and analyzed. However, an assumption is made that there are additional non-written rules, norms, or strategies on local and regional level as well. These rules need to be determined through face-to-face in-depth interviews with managers of angling clubs or associations and members of fishing authorities as well.

On the following pages, the framework focuses on the property rights system as providing the rules that define which individuals or groups of people have access to and use rights of the resources. This system is used to determine who is in charge of resource management as well as the analysis of rules in use.

[13]The different governance structures and their activities in recreational fisheries are regulated by laws and regulations (institutional environment) on states' level. This implies that there are sixteen discrete fishery laws ("Fischereigesetz") on property rights, fishery management, fish stocking, and species protection in Germany. In addition, detailed regulations on specific fishery issues exist such as fishery license examination, placing of fishery licenses and permits, the implementation of management measures etc. also differ. Although there are sixteen different fishery laws with correspondently regulations in the single states, these laws and regulations are generally similar[1]. Some fishery laws resemble each other more than others based on the fact that after the reunification in 1990 old West German states helped to build up the fishery laws in the newly-formed German states in the Eastern part. Furthermore, the states' fisheries regulations are not completely independent because they have to incorporate German national state or the European Union regulations regarding e.g. animal welfare, nature conservation (Federal Nature Conservation Act, EU Flora-Fauna-Habitat-Directive), and water protection issues (EU Water Framework Directive) into their laws. These regulations aim to implement sustainability in different parts of society therefore influencing GRF management. For example, decisions about catch limits for endangered fish species, nature protection areas with very limited access for anglers, potential restrictions on fish stocking measures and also measures to maintain recreational fishing areas would be influenced by these regulations. However, these European and German state laws provide a framework upon which the particular states are able to build up their own laws considering regional and local characteristics. The fishery law liable the fishing rights holders to conservation, advancement, and upkeeping of native fish stocks correspondent to the size, conditions, and natural biodiversity of the waters as a precondition for resource use. Furthermore, the fishery laws points out that recreational fishery should be encouraged in general.

3.3.1 Property rights systems in GRF

As opposed to a no property rights regime (open access)[14] according to Ostrom et al. (1999), there are three possibilities for property rights regimes to limit the access: individual-, group-, and government property.

Property rights on waters, the fishing rights and the disposal are similarly organized throughout Germany. It is open for people or organizations, who own a fishery licence to buy or lease water bodies inclusive the fishing rights. The states' fishery authorities distinguish property rights on inland waters between those accruing to private persons, groups of people and keeping it under its own head. In the latter case it depends on the importance of the lakes, dams, or rivers for common societal interests such as water traffic, or public water supply. Thus, following the distinction by Ostrom et al. (1999) there are all three forms of property rights existent in Germany as can be seen in table two. However, it is prevalent that angling clubs or angling associations purchase the property rights (group/common property rights regime) or lease the fishing rights from the owner of lakes (Steffens & Winkel 2002). In Germany, anglers are the dominant users of freshwater resources. Angling associations or angling clubs own or lease the fishing rights in the majority of inland waters (Hilge 1998, Arlinghaus 2004).

The rights of ownership or lease holding of fish resources incur the duty of managing the resource in a sustainable manner with regard to its ecosystem functions. This entails the obligation to mitigate the effects of environmental degradation ("Hegepflicht" – liability to care for natural resources) and satisfying the recreational fishing community. To fulfil both objectives, management measures like access and use restriction (e.g. bag and fish size limits), fish stocking coupled with habitat maintenance or rehabilitation, or providing catch possibilities are carried out (Welcomme 2001: 15).

The arrangement of property rights in GRF regarding particular actions in resource management is shown in detail in table one. By design the owners of water bodies have the full bundles of property rights connected with the ownership: access to and the withdrawal of the fish stock resources, the duty to manage the fish resource for further use, the right to exclude potential but not authorized users from the resource and the right of alienation. A fishing right owner has the same rights and duties except for the alienation right of the waters because he or she only acquires rights on the fish resources and not on the water body. Both the owners of water bodies and the owners of fishing rights can sell fishing (or angling) permits to individual persons such as anglers. However, owners of fishing permits are only allowed to obtain access to the resource and to withdraw fish resources. This is also the case for landownership bordering lakes and rivers.

	Operational level		Collective choice level		
Water ownership	Access	Withdrawal	Management	Exclusion	Alienation
Fishing rights	Access	Withdrawel	Management	Exclusion	
Fishing permits	Access	Withdrawel			
Landownership at lakes and rivers	Access	Withdrawel			

Table 1: Bundles of rights in GRF (based on Ostrom & Schlager 1996)

[14] Vatn (2005: 296) denominate these property rights regimes as follows: private-, common-, and state property rights.

The distinction of rights between operational and collective choice level is important. Rights on operational level just allow exercising these rights. Rights on collective choice level in turn allow the owners of these rights to participate in the definition of all rights (Ostrom & Schlager 1996: 131). Owners of water bodies and fishing rights are therefore automatically defined as the governance structure of freshwater fisheries. In recreational fisheries these are mainly angling clubs or organisations.

As described above, allocation of fishing property rights in Germany is being regulated by fisheries authorities. The ownership of water bodies and of fishing rights is subject to such authorization by fishery authorities. Also the restrictions on e.g. catch amount, closed fishing seasons, or the protection of undersized, immature fish are regulated through administrative order. Fishery stakeholders and others have the possibility to participate in this fishery policy decision process. Fishing property rights in GRF are leased or purchased by angling associations or angling clubs. The angling clubs in turn organize the purchase of angling permits ("Angelerlaubnisschein") for their members, which are usually valid for one year. Furthermore, there are arrangements where property rights can be linked. This means that a single water body may have several owners or lease holders ("Koppelfischereirecht") that exist side by side.

GOVERNMENT PROPERTY	Water ownership			
	Fishery authorities		Collective choice	
	Fishing rights are being leased out to angling organizations or commercial fishermen or private persons or other corporations			
COMMON/GROUP PROPERTY	Water ownership or fishing rights			
	Angling associa-tions	*East Germany*	Collective choice on states or regional level	
	Angling clubs	*West Germany*	Collective choice on local level	
	Fishing permits are sold to angler			
INDIVIDUAL PROP-ERTY	Water ownership or fishing rights			
	e.g. Fishermen		Private choice	
	Fishing permits can be sold to angler			

Table 2: Specification of property rights regimes in German inland fisheries

German recreational fishery management is characterized by two distinct ways of organizing the allocation of property rights. As shown in table two the purchase or lease of fishing property rights are undertaken either by angling clubs on local level (low-level) or angling associations on regional or states level (high-level). The former is typical for West-Germany while the latter is typical for East-Germany. However, there is also co-existence to a minor degree. This general pattern of different allocation of fishing property rights in Germany is defined as common property rights regimes and will be described in detail in the following.

In East Germany angling associations are owners or leaseholders of the resource and hence they are in charge for its sustainable management. That means both angling clubs and so called "free" anglers (no membership in clubs) are relatively free of obligation in resource management because representatives at the states level take most of the responsibility for

local management. Activities by single angling clubs are mainly voluntary and support the anglers associations on the regional and states level. Punishment for neglected activities is usually not possible. However, the angling associations try to include angling clubs in water and fish resource management. They established a “System der betreuenden Vereine“(water steward-ship by angling clubs), in which angling clubs are supposed to monitor, protect or clean the lakeside of water bodies in the local area. However, the clubs do not have the possibility to restrict access or use of the nested fish stock or carry out fish stocking measures.

In contrast to the East German anglers associations, the associations in West Germany have mainly representative character without management duties. The individual angling clubs on local level own or lease fishing rights and thus they are in charge for fish resource management. The local club members decide on access and use restrictions and are responsible for managing their water and fish resources by themselves. Their management is often characterized by high levels of exclusion implemented by high costs of club membership and angling permits.

Nonetheless, basic traits of property rights regimes can be violated or misarranged which causes additional costs (Wang 2001). The basic features of property rights regimes should be completely specified, exclusive, transferable, and effectively enforced (Caddy & Seijo 2005: 69-70) for sustainable resource use. In GRF a property rights systems is well established (Arlinghaus 2005, 2006) and every individual, organisation or the government have the possibility to purchase or to let utilization rights or water bodies as long as it is guaranteed that the owner has a fishery licence. However, it would be a fallacy to assume that there are perfectly functioning systems operating. For example, the enforcement of exclusion of un-authorized people is often suspected to be ineffective (free-rider problem/illegal angling; in the case of commercial marine fisheries, cp. Sumaila et al. 2006). Another reason for inappropriate regulations could be the high density of anglers or outside resource system/unit users, the diversity or availability of water basins, and the mobility of technology (Begossi 1998). Again, concerning GRF there is no scientific evidence of successes or failures in property rights regimes.

Analyzing rules in use

Rules in use are the structure of institutions that shape the interactions of actors in the policy (i.e. management-decision process). “Rules can be thought of as the set of instructions for creating an action situation in a particular environment.” (Ostrom 2005: 17) One way of analyzing rules is to investigate them according to linguistic terms. Crawford & Ostrom (1995) provide such an approach to analyse institutions in collective choice situations, which can be applied to observed regularities in GRF management. Under the notion of *institutional statements* which relates to a “shared linguistic constraints or opportunities that prescribes, permits, or advises actions or outcomes for actors” (Crawford & Ostrom 1995: 583), they distinguish three concepts of institutions: rules, norms, and strategies.

“By rules, I mean shared prescriptions (must, must not, or many) that are mutually understood and enforced in particular situations in a predictable way by agents responsible for monitoring conduct and for imposing sanctions … By norms, I mean shared prescriptions known and accepted by most of the participants themselves involving intrinsic costs and benefits rather than material sanctions or inducements. By strategies, I mean the regularized plans that individuals make within the structure of incentives produced by rules, norms, and expectations of the likely behaviour of others in a situation affected by relevant physical and material conditions.” (Ostrom 2005b: 825)

Regarding this definition the linguistic syntax of rules, norms, and strategies is defined as follows (Crawford & Ostrom 1995: 584):

		Rules	Norms	Strategies
A	ATTRIBUTES Is holder for any value of a participant-level variable that distinguishes to whom the institutional statement applies	X	X	X
D	DEONTIC Is a holder for the three modal verbs using deontic logic: may (permitted), must (obliged); and must not (forbidden)	X	X	
I	AIM Is a holder that describes particular actions or out-comes to which the deontic is assigned	X	X	X
C	CONDITION Is a holder for those variables which define when, where, how, and to what extent an AIM is permitted, obligatory, or forbidden	X	X	X
O	OR ELSE Is a holder for those variables which define the sanctions to be imposed for not following a rule	X		

Table 3: The ADICO format of rules, norms, and strategies[15]

This distinction makes it possible to compare different strategies, norms, and rules of GRF management. For instance, it can be used to determine which institutions regarding the GRF management are formulated as strategies, norms, or rules. The latter includes the sanction mechanism that can be identified as the tool to put through (e.g. fish catch limits more efficient because anglers want to avoid the punishment costs). However, norms (without sanctions) or strategies (without sanctions and permission, obligation, prohibition) can also be efficient, as long knowledge about the usefulness of rules and trust between the anglers exist. This approach is useful to summarize the content of institutions, and to distinguish between the different forms and their impact of human behaviour (Ostrom 2005: 139). Nevertheless, as described in the analytical framework, other components of the SES have to be considered, (e.g. characteristics of the resource unit, system, and the biophysical world), to explain human angling behaviour sufficiently.

Another way to examine rules in use in GRF management is through the comparison of the eight design principles by Ostrom (1990, 2005). These design principles were developed from hundreds of case studies (Ostrom 1990) and several scholars have found empirical evidence to support these principles.

[15]Crawford and Ostrom (1995: 583) point out three restrictions regarding institutional statements: they are not always easily and fully articulated or recognized by participants; they are not supposed to be always meaningful; and they are not sufficient for the analysis of human behaviour.

1.	Clearly defined boundaries	The boundaries of the resource system and the individuals or households with rights to harvest resource units are clearly defined.
2.	Proportional equivalence between benefits and costs	Rules specifying the amount of resource products that a user is allocated are related to local conditions and to rules requiring labor, materials, and/or money inputs.
3.	Collective-choice arrangements	Many of the individuals affected by harvesting and protection rules are included in the group who can modify these rules.
4.	Monitoring	Monitors, who actively audit biophysical conditions and user behaviour, are at least partially accountable to the users and/or are the users themselves.
5.	Graduated sanctions	Users who violate rules-in-use are likely to receive graduated sanctions (depending on the seriousness and context of the offense) from other users, from officials accountable to these users, or from both.
6.	Conflict-resolution mechanism	Users and their officials have rapid access to low-cost, local arenas to resolve conflict among users or between users and officials.
7.	Minimal recognition of rights to organize	The rights of users to devise their own institutions are not challenged by external governmental authorities, and users have long-term tenure rights to the resource.
8.	Nestled enterprises	Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Table 4: Design principles by Ostrom (1990, 2005: 259)

However, the methodology cannot be used to completely design robust social-ecological systems. On the contrary, Ostrom points out that using the design principles "is a beginning point for conducting a broad search for appropriate means of solving problems" (2005: 271). Thus, there might be further designs of rules which are successful in sustainable resource use as well. However, part of the analysis will be the investigation into whether the identified formal and informal rules of GRF management comply with the eight design principles by Ostrom. This analysis will be used to compare which of the identified rules might support or hamper long-enduring management systems. Furthermore, it is assumed that the different management systems in East and West Germany caused by the governance structure on different spatial levels might show differences in these design principles – in particular in collective-choice arrangements (number three in table four).

Additionally, the focus of this analysis will also be on the enforcement mechanisms because of their assumed influence on the success of GRF management (cp. Paavola 2007). The key question is: on which spatial level are enforcement mechanism organised and who participates in this process? Furthermore, awareness of the varying and detailed access and use regulations in GRF management (often existing for single waters), will help determine whether anglers are overtaxed by these rules and what influence this potential overregulation has on resource use customs on operational level.

5.2 Governance structure/ collective choice on different spatial levels

The agents of the governance structure in GRF who are responsible for resource management are mainly managers of angling clubs and angling associations. As introduced on the previous pages, there are two structural alternatives in managing fish stock resources: in East Germany the managers of angling associations on regional or states level and in West Germany the managers of angling clubs on local level. It is assumed that this difference in the organisational structure has influence on the transaction of resource management. For instance, what it will be important to identify the costs for the angling association to collect information about aspects such as anglers behaviour on local level, or how long it takes until problems of resource use are reach the managers on states level.

The collective choice of both structural alternatives about a particular management approach can be analyzed by the "Institutional Analysis and Develop-ment Framework" (IAD) by Ostrom (1990, 2005). With this framework it is possible to model the choice of angling clubs and association managers in their particular setting of institutions and resource conditions. This management decision process is symbolized by the action arena, which includes the actors/agents/participants and the particular action situation. This situation is influenced by the institutional environment (rules in use, Chapter 5.1), the attributes of the angling community considering the anglers view on resource use (Chapter 5.3), and the attributes of the biophysical world (Chapter 5.4).

A typical arrangement of this action arena causes certain patterns of interaction. GRF managers make decisions about detailed regulations of (e.g. fish size limits or seasonal closures). Their decisions then cause a certain kind of interaction in fish sock use, such as resulting angling activities (e.g. seasonal closures). This interaction leads to a specific outcome. Outcomes of access and use regulations could be angler dissatisfaction in catch requirements caused by high restrictions, or the destruction of fish habitat or stocks resulting from high angling intensity caused by too low restrictions.

Important in this framework are as well evaluative criteria to monitor success or failure of management measures. They are a precondition for changes in the action arena and for change in the influencing factors such as rules and angler behaviour, but also in resource characteristics. Crucial at this point is to determine the evaluative criteria (e.g. anglers catch satisfaction or support of fish habitats) and are the actors willing and able to adapt to the existing use regulations on undesirable outcomes. This important issue in resource management is explained in detail in chapter 6.1. The following subchapter gives attention to the analysis of the action arena to understand how GRF managers come to a decision on regulations of fish stock use.

Analyzing choice in the action arena

Collective choice in GRF management is related to multiple aspects of management including: who makes decisions about resource use, what the position is of the participants, what the participants can actually do, what kind of information is available to them, what they can control, and what the expected costs and benefits of the potential outcome of their decisions are (Ostrom 2005: 33). Participants of the action arena can change existing rules in reaction to anticipated problems in resource use. Whether this happens depends highly on the single components in the action arena.

"Participants in an action situation are decision-making entities assigned to a position and capable of selecting actions from a set of alternatives…" (Ostrom 2005: 38). In GRF the managers of angling clubs or angling associations are the participants in the action situation.

They are elected by the members of the clubs and associations and represent the angler's community. The number of participants can vary, because of the individual structure of the organisations. However, they all have a so called team status because their decision about resource management measures depends highly on the expectations of the anglers and the chance to be re-elected in future. Furthermore, the attributes of participants are supposed to influence the decision as well. This includes their knowledge about the resource, their negotiation skills, their experience in resource management, their leadership abilities, and the level of trust towards the other participants or to the angler's community. A crucial point here is the perception of the managers about the resource (Edwards-Jones et al. 2000). What do they think about fish habitat structures in lakes or rivers? Are fish species compensable or not? For instance, regarding fish stocking measures: do they think it is important to stock local endemic fish species or are fish species from elsewhere useful to stock as long as the price is acceptable?

The participants in an action arena are assigned to positions. This position, such as members of chair, managers, members etc. defines the standing of the participant in that situation: "the standing of a position is the set of authorized actions and limits on actions that the holder of the position can take at particular choice set in the situations." (Ostrom 2005: 41) For instance, a manager in an angling association might have less influence on the decision-making process than a president of the angling associations by definition of their position. Managers are recruited to supervise the association and the particular resource management. Presidents and other members of chair are elected to assert the interests of anglers and have the right to define the particular management approach. Thus, it can be assumed that the decision for a certain kind of management measure will be more influenced by the president of this association.

The choice of the participants for one alternative as opposed to others in resource management can be named as undertaking an action in the decision process. This choice of a participant for a particular management approach depends on the information about the decision process, on the opportunity to control the action situation, and on the expected costs and benefits of the potential outcome of the management choice (Ostrom 2005: 33). The balance of costs and benefits of a particular management decision is presumed as a major point. An example could be the weight up of how much fish should be stocked in waters and rivers to increase (e.g. catch opportunities for anglers). The participants of the action arena could choose between two alternatives: on the one hand they could stock endemic fish species which are usually more expensive (because of costly production) or on the other hand they could stock other species which are cheaper in production and purchase. Given a fixed financial basis the decision for the former case means they can buy less fish or, in the latter case, more fish. However, if they consider anglers preferences for increasing their catch amount they might decide to purchase less expensive but more fish for stocking. But if they consider the possibility that the given habitat can bear only a limited amount of fish stocking (surplus stocked fish will die) and endemic species would fit better into the existing fish community, they could decide to purchase more expensive but less endemic fish species for stocking. The unequal distribution of information and power of control over the decision process by participants (e.g. to oppress other participants of the action arena) could to influence the outcome as well. For instance, if the information about fish stocking success of endemic species is known and accepted only by one participant of the action arena, the person can be easily voted down by others. Furthermore, power relations between the participants can be crucial as well. Continuing the example, this could mean that this single participant, convinced about the stocking benefits of less but endemic fish species in natural

waters, has a high extent of control over the other participant. A reason for that could be that this person is the president of an angling association or club for many years and his knowledge is highly appreciated by other participants. Moreover, even private motives in the participants' relationship could play a role.

An action arena does not take place isolated or not always only at one point (Ostrom 2005: 53-64). On the contrary, quite often it needs more than one action situations to come to a decision in resource management. Moreover, the decision about different management instruments needs different action situations. In addition, the management outcomes need to be re-negotiated in future decision processes. If the decision processes are repeated games, participants start to use cooperative strategies because of former built trust or to increase future trust between them. They also might include the "Tit for Tat"-strategy (if one participant take a step back in one action situation, the other participant will take a step back in the next action situation). This strategy can save both the participant's own advantages and reduce the risk of loosing advantages. The future action situation controls the current action situation. Furthermore, an action situation is embedded in other action situations. In GRF, the action arena takes place at different levels and organisational structures. In East Germany managers and representatives of angling associations usually decide about management measures which are applied on regional or states level. In West Germany managers and representatives of angling clubs usually decide about management measure on local level.

Choice on different spatial levels

A major feature of GRF is that the collective choice of resource management rests on different spatial levels as graphed by figure two. The decisions on how to regulate access and use restrictions, and fish stocking measures are taken by angling associations at regional or states level in East Germany and by angling clubs at local level in West Germany. Angling associations, both in East German and in West German states, participate in the policy decision process with other stakeholders. However, it is assumed that the degree of influence might be dependent of if the managers of angling associations are directly responsible for the resource management such as in East Germany or not such as in West Germany. Considering this major distinction in the GRF governance structure, collective choice in the action arena takes place on different spatial levels symbolized by the ellipses in figure two.

Angling associations at state or regional level in East Germany (defined here as **high-level governance structure**) are characterized by a low level of exclusion. They try to increase the number of members and usually set low prices on angling permits (access). A guideline for East German angling associations is the so-called "liberality of angling": anybody who wants to fish should be able to and easily (DAV 2004). Furthermore, because of the ownership of fishing rights on wider spatial scales the angling associations provide an easy access to the waters. For instance, an angler who purchases the angling permit of the angling association in the German state "Brandenburg" is allowed to go fishing in about 30,000 ha water area.

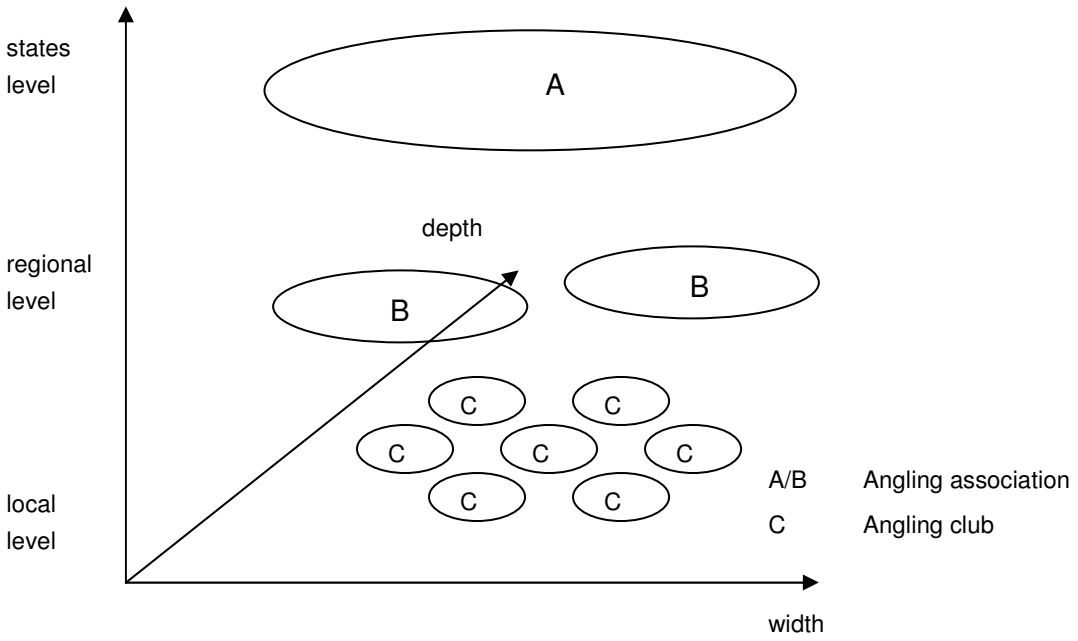


Figure 2: GRF governance structure on different spatial levels

The following table five shows the sixteen German states separated their differences regarding GRF common property rights regimes.

	Common property rights regimes on …		
	States level	Regional level	Local level
West German states			
Schleswig-Holstein			Yes
Hamburg			Yes
Lower Saxony		Yes	Yes
Bremen			Yes
North Rhine-Westphalia			Yes
Hesse			Yes
Rhineland-Palatinate			Yes
Baden-Wuerttemberg			Yes
Bavaria			Yes
Saarland			Yes
East German states			
Brandenburg	Yes		
Mecklbg.-Western Pom.	Yes		
Saxony		Yes	
Saxony-Anhalt		Yes	Yes
Thuringia		Yes	Yes
Berlin	Yes (East Berlin)		Yes (West Berlin)

Table 5: Common property rights regimes on different levels in the German states

In contrast to the East German anglers associations, the local angling club in West Germany own and lease out the fishing rights only for a limited number of waters and strongly restrict other users (defined here as **low-level governance structure**). Often this involves high levels of exclusion implemented by high costs of club membership and angling permits. This, however, varies between angling clubs. In West Germany, it is not easy to change angling water bodies or negotiate the use of water bodies (permits) of other anglers clubs. The restricted organization on the local level might lead to the movement of recreational fishers to other lakes or rivers for angling. Often this involves long distance travel. However, for recreational fishers it often requires a lot of effort to bargain for access rights and high costs to obtain a permit.

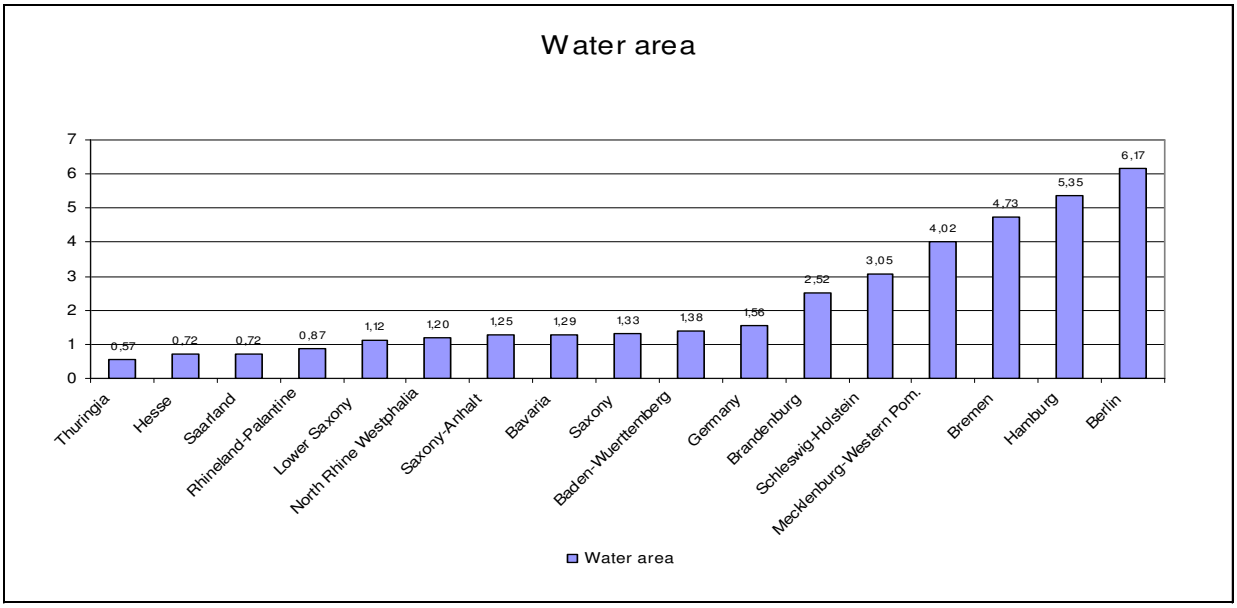
5.3 Resource user/ the operational level

The characteristics and attitudes of the angler community is a further decisive point in GRF management (Arlinghaus et al. 2002, Arlinghaus 2004a, 2005, 2006). Basically anglers are supposed to follow the regulations crafted by the agents of the governance structure on collective choice level. However, the compliance or non-compliance with the regulations on operational level (where the resource use and allocation actually takes place) depends highly on the characteristics and recognition of anglers. This should be taken into account by managers of angling associations in their decision about management instruments. Table six shows major second-tier variables to analyze anglers that should be considered in the management decision process. Apart from point five all other issues might be important for the success or failure of GRF management which is explained in the following paragraphs.

1.	Number of users
2.	Socioeconomic attributes of users
3.	History of use
4.	Location
5.	Leadership/entrepreneurship
6.	Norms/social capital
7.	Knowledge of SES/mental models
8.	Dependence on resource
9.	Technology

Table 6: Second-tier variables analyzing users in a SES (Ostrom 2007)

The **number of anglers** is important for the allocation management of fish stock resources. For instance a limited abundance of fish populations needs access and bag regulations when too many anglers want to catch fish. The figure three shows the number of fishing licences per ha water area in the German states. It points out that despite of the higher participation of the human population in angling activities in the North German Lowlands, the lake-rich landscape provides still various water resources for fishing. In contrast, the number of fishing licences in South German states per ha water area is clearly higher. Thus, we could assume that there exists a higher angling pressure on fish stock resources.



Source: Bundesamt für Kartographie und Geodäsie, DLM 250

Figure 3: Number of fishing licences per ha water area

A further point is the **socioeconomic status** of anglers. The GRF management needs to consider two points: the costs of fishing licenses and angling permits, and the objectives of anglers to catch fish. The socioeconomic status can vary highly. For instance unemployed anglers vote for cheaper angling licenses and angling permits. Their objective for angling is often to support their own food supply and aim to catch fish as much as possible. For other anglers fishing has a higher social status represented by using e.g. expensive angling equipment. Their **dependence** on fish resources might be less for food supply but more for recreational relaxation and the amount of the fish caught is less important than the trophy status of the fish.

Furthermore the **history of use** might play an important role in GRF management as well. The two distinct angling organisations in East and West Germany refer to different angling traditions. The former sees its roots in workers angling clubs established at the beginning of the last century to provide favourable access to fish resource for people of lower classes. The latter draws on the traditions of prior civic angling clubs which were more elitist oriented. This historical background might have influence on the self-conception of anglers and might cause a certain demand on managers of angling organisations to arrange e.g. access regulations.

The **location** of anglers and resources might play an important role in fish stock management insofar that anglers might have preferences to cover a short distance to closer located lakes or rivers. Additionally, certain kind of waters could be more popular than others. Thus, particular waters are more frequented than others and the consequently higher fishing intensity should be considered into the management decision process.

The **norms** of anglers and the degree of trust and communication within the anglers community is another crucial issue for GRF management. If managers of angling clubs or associations try to implement a particular management regulation, which is in contradiction to norms on local level, it might cause non-compliance within the angler's community. This could be even reinforced when anglers on local level have built a "sworn confraternity" where they carry out angling activities following their own rules. This situation might be intensified

when the **knowledge** about fish resources of anglers are not considered in resource management decisions. There is scientific evidence that the inclusion of local or indigenous knowledge support sustainable resource management (Berkes & Folke 1998).

The **technology** used by anglers is a subject of GRF management institutions as well. The limitations on angling tackles aim to reduce the fishing intensity. For instance, fishing nets are forbidden for anglers. They are only allowed to use a limited number of rods or lines. Technological progress is another important point. For instance the use of more effective angling tackles might have exhausting impacts on fish stock resources. In this case the management should monitor the altered impact on the resource and if problems arise such as resource overuse they should adapt rules on this new situation to reach their management objectives.

5.4 Fish resources as a part of a complex and changing biophysical world

Institutional analyses can not afford an investigation of resource systems functioning or resource unit's interactions within the biophysical world. This is a task for biologists, ecologists or other natural scientists. However, important for an analysis of institutions and governance structures in GRF is to look whether the components of and changes in the biophysical world are considered in fish resource management, and how the social system react on changes in the ecological system.

This chapter is subdivided regarding the three major components of the ecological system. The biophysical world means here the biological, material, and climatic attributes of the ecological system on wider spatial scale wherein water systems (resource system) and fish stocks (resource unit) are embedded.

The biophysical world

The influence of the biophysical world on water systems and fish stocks can be manifold. Ostrom (2007) identifies three major second-tier variables within the environment of related ecosystems: climate patterns, pollution patterns, and flows into and out of the focal SES (defined here as the water resource system with fish stocks). Climatic conditions could have strong impacts on GRF. For instance long dry periods or hot temperatures can reduce the water level and might put fish stocks under pressure and might cause fish diseases or mortality. Similar impacts might be caused by agricultural or industrial production situated close to waters which introduce pesticides or chemical ingredients in the ecological system (pollution patterns). Furthermore, predators such as sea ravens or other animals might have a high fish consumption in particular water spots and might cause a decrease in fish stock abundance (flow out of the resource system). These are only some examples. GRF management should consider interactions like these within the biophysical world to be able to regulate or avoid social-economic problems caused by these interactions.

Resource systems in North and South Germany

A further crucial factor in fish resource management are the characteristics of the resource system which are expected to exert high influence on the implementation of specific management measures by the different governance structures (Berkes 2006, Carpenter & Brock 2004). Resource management has to consider the characteristics of waters such as lakes or rivers etc. Lakes are standing waters and bodies of water enclosed by land. They can be classified by size, origin, and/or nutrient richness status (oligotrophic, mesotrophic, eutrophic, dystrophic). Rivers are linear features of the landscape that transfer the water from

mountain springs (South German Uplands) or runoff from precipitation on the land, to the sea (North German Lowlands). Rivers are open systems and have a hierarchical structure from small tributary streams to large rivers, with a highly seasonal natural state, alternating between periods of high and low flow (between rising and falling water). However, many rivers in Germany are now controlled to the point where normal flooding of the lateral plains no longer occurs (Welcomme 2001: 17-28).

Germany's geographical structure is mainly separated in the North German Lowlands and the South and Central German Uplands. These show significant differences in lake and river characteristics and corresponding nested fish populations. Those different characteristics are suggested to have a high influence on the transaction costs of fish stock management, e.g. the control of access to fish resources and the use of fish resource regulations, for the different property rights regimes in East and West Germany.

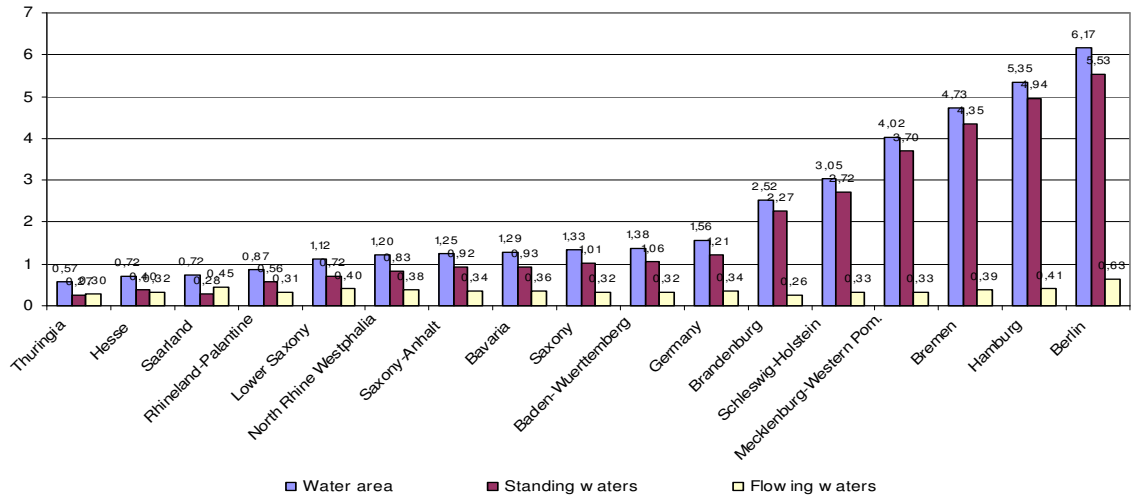
The North German Lowlands are mainly characterized by slow large rivers, canal systems, and large, often connected lakes including primarily bream and sometimes barbel populations (pilot fish zones, cp. Feld et al. 2005). Usually these water bodies contain rich fish stock resources due to a high nutrient status of the waters. Such featured water bodies are defined as **complex resource systems** here.

The Central German Uplands are featured by fast running, mostly small rivers and a limited number of often very small lakes or larger dams. The fish population structure is characterized by trout or grayling (Feld et al. 2005). The lakes are widely scattered over the countryside. The nutrient status of the rivers and lakes is usually low and fish stocks are not as high as in the North German Lowlands. Such water bodies are defined as **simple resource systems**.

	Complex resource systems	Simple resources systems
	North German Lowlands	Central German Uplands
West German states		
	Schleswig-Holstein	Hesse
	Hamburg	Rhineland-Palatinate
	Lower Saxony	Baden-Wuerttemberg
	Bremen	Bavaria
	North Rhine-Westphalia	Saarland
East German states		
	Brandenburg	Saxony
	Mecklenburg-Western Pom.	Thuringia
	Saxony-Anhalt	
	Berlin	

Table 7: German states divided by features of resource characteristics

In the following figure the surface water area in the German federal states is depicted in percent of land area. Most of the North German states have a higher share of waters on land area mainly caused by the amount of wide-ranging standing waters. Bremen, Hamburg, and Berlin are city states in the North German Lowlands. They show the highest share of waters on land area because they are located nearby large rivers and waters, but are limited in land area.



Source: Bundesamt für Kartographie und Geodäsie, DLM 250

Figure 4: Water area in German states in percent of land area

Resource unit

Such as the influence of the biophysical world the particular characteristics of fish stocks should be considered in GRF resource management. Non-consideration of these characteristics (shown in table eight) might cause inefficient resource management, social conflicts and destruction of fish habitats in GRF. However, the complex interactions can be only roughly described at this point.

1.	Resource unit mobility
2.	Growth or replacement rate
3.	Interaction among resource unit
4.	Economic value
5.	Size
6.	Distinctive markings
7.	Spatial & temporal distribution

Table 8: Second-tier variables for analyzing resource units in a SES (Ostrom 2007)

The varying resource system characteristics in North and South Germany enclose different nested fish populations. They are separated in so called pilot fish zones which vary from upstream (fast waters) to downstream (calm waters). These pilot fish zones (listed from South to North: trout zone, grayling zone, barbel zone, bream zone) are dependent upon different water quality, ecological environment and habitat structure. The **mobility** of fish species can highly vary. Beside stationary species which are very faithful to their habitat, there are also species which extensively or locally migrate along rivers and connected lake systems. Some of them such as eel or trout are diadromous species that use both marine and freshwater habitats during their life cycle. This varying mobility of fish species has consequences for e.g. fish stocking management. Migrating fish stocks might flow to water areas where other stakeholders own the fishing rights. In this case GRF managers should

make sure that their fish stocking measure benefit the own waters and anglers and not other fishing rights owner in the resource system. Furthermore, the construction of local hydroelectric facilities might restrict fish movement and might impair the abundance of fish stocks for angling activities.

Fish stocks are renewable natural resources and are reproducible. That means their reproduction rate is directly related to the size of the stock (Perman et al. 2003). Thus, the fish stock **growth rate** is exponentially increasing until limiting factors stops this development. Those influencing factors could be habitat competition, biotic or physiological reasons, or over harvesting by humans. However, renewable resources are exhaustible when the use rate is higher than their natural capacity of reproduction. When fish stocks are exploited to a certain level, the water habitat often provides enough food for the remaining fish. Their growth rate increase and anglers might have the opportunity to catch bigger fish. Fish with slower growth rate can be a sign of fish stock overpopulation. The fish compete for limited food and this impair their growth rate and anglers could catch much smaller fish. GRF management should take this in account considering the fact, that many anglers would like catch bigger fish. Too high stocking rates in a limited water habitat would include the risk to waste investment for unpreferred small fish.

Interaction among the resource units, here mainly the interaction between predatory fish and prey fish, are influenced by angling activities and resource management as well. In GRF there is a catch preference of anglers for predatory fish such as pikeperch, pike, perch, or eel. Furthermore, fish stocking measure try to increase the abundance of these species in waters. In any case, too many or too less predatory fish in the water habitat will cause changes in the whole food chain.

The **economic value** of fish in GRF for anglers is not “economic” in the proper sense because they are forbidden to sell caught fish. Their benefit lies in the angling activity, the consumption of caught fish, or in the play with the fish. However, anglers are supposed to count up their angling permit costs with their actually caught fish and sometimes blame GRF managers to neglect appropriate fish stocking measures. The economic value of fish for GRF managers plays an important role in those fish stocking measure. As previously mentioned they have to calculate the costs of stocked fish under a given amount of money, under a certain expectation of the angler community, and under the limits requirements of water habitats.

In GRF management the **size** of fish plays an important role as well because many use regulations are often connected to a limited size of the fish. Caught fish under a certain limit must be released. The reasons for this size restriction lies in the management approach that every fish should have the change to reproduce itself at least one time. On the contrary catch and release of fish above this limit is forbidden. That means bigger and faster growing fish is disadvantaged in the reproduction of the fish stock. This effect might be reinforced by angler’s preferences on catching large fishes. Scientific studies show some evidence that this might cause stunted fish stocks and evolutionary changes in the fish stock structure (Birkeland & Dayton 2005, Munch et al. 2005), or indirectly on entire aquatic ecosystems (Post et al. 2002, Pauly et al. 2002).

For some renewable resources such as cattle herds **distinctive markings** are very useful to mark ownership rights on the single animal. However, this tool to identify resource ownership and to facilitate the implementation and in consequence the enforcement of ownership rights is not applicable for fish stock resources. On the contrary, their existence hidden in waters makes it more arduous to identify which fish stock resources are owned by a particular stakeholder. Additionally, this trait makes it complicated to assess the abundance and quality

of fish resources for appropriate management measures. Furthermore, this “invisibility” causes a low perception of fish stocks in the public and makes it difficult for GRF managers to assert their interests in the society.

Caused by the varying mobility and the growth rate of different fish species the **spatial and temporal distribution** of fish stocks alter as well. A consideration of these characteristics needs a careful long-term monitoring in resource management. Local knowledge of anglers and/or angling club members might support the efficiency of the resource management as well. For instance, for some well-monitored lakes water maps with indicated spatial distribution of fish species are available. Such as other characteristics the varying spatial and temporal distribution of fish stocks makes it difficult to allocate property rights on particular fish as well. Before the fish are caught, anglers own fishing rights (angling permits) only on particular water. This provides an equal allocation within authorized users and the catch success depends on ability and fortune of the angler. After the fish is caught the angler gets the right on this individual fish.

6 The capacity to solve social-ecological problems

Both social systems and ecological systems are characterized by complexity, change, and uncertainty (Berkes & Folke 1998, Wilson 2002). Complexity arises from uncountable single components which generate a SES. Change originates from the manifold interactions between these components influencing each other. Uncertainty comes from the limited ability of humans to understand or even recognize these manifold components and interactions[16]. So an adaptive management approach aims to be aware of essential components and react on these transformation processes in a SES. For instance, a change in the technical equipment of anglers might increase their catch yield of certain fish species. This might endanger the abundance of fish stocks and requires a reaction by GRF managers to change used regulations, such as a higher limitation of the allowed number of fish caught. However, bearing in mind that the various other influencing mechanisms, such as the food web structures, the nutrient status of waters, and angler’s attitudes may compensate the opportunity of higher catch amount and make stronger regulations redundant.

The capacity to solve social-ecological problems lies in the ability of humans to adapt their actions on changes in the environment. The precondition of institutional and behavioural adaptation is to get information about the impact and outcome of human-nature interactions. Knowledge about and understanding of what is going on in the ecological system, what is the amount and abundance of the fish stock, what kind of problems are caused by human impact guided by resource use rules, what is caused by other influences within the ecological system is crucial to be able (and willing) to alter the rules and human activities to eliminate inappropriate resource management and use outcomes.

The core issue in investigating GRF management is to find out whether there is an adaptive cycle. Are there monitoring tools and an assessment of management measures and resource traits? Which evaluative criteria are in use? Will the governance structure take in the feedback? Are the agents of the governance structure able and willing to learn from changes in the ecological system and from resource use problems, and are they able to adapt their management system on new situations? Or do they just what they always do in the resource management and do they keep the status quo?

[16]Considering these conditions, the framework delineated here can only be restricted as well.

6.1 Starting the adaptive cycle

The initial point of adaptive management is on the one hand the monitoring and the assessment of processes in SES and on the other hand the definition of evaluative criteria for the findings of the information gathering process. These criteria can be named as management objectives as well – following the previously defined social, economic or ecological goals.

The need for gathering information about complex SES is obvious and managers of natural resources require support by social and nature scientists. However, "scientific knowledge of the conditions and trends of ecosystems is far from complete," (Carpenter & Folke 2006: 311). Therefore, a long-term monitoring process which includes systematic data gathering and supervision of the processes in SES should be established. This is furthermore the basis for appropriate assessment of SES which can be defined as follows: "a structured process for synthesizing technical information in a way that is useful for policy." (Carpenter & Folke 2006: 309)

The results of the monitoring and assessment process need to be comparable with previously defined **evaluative criteria**. This makes it possible to judge whether the outcomes of the resource management and use comply or do not comply with these criteria (Ostrom 2005, Imperial/Yandle 2005). There can be manifold criteria (or management objectives). However, GRF management is bound in law to manage and use fish stock in a sustainable manner. Therefore, this study concentrates on the evaluative criteria of economic efficiency, social agreement, and maintenance of ecosystem services as the three major components of sustainability.

Efficiency is notionally defined as follows: under a designated set of governance structures, rules, and resource characteristics there is no management improvement possible (Pareto efficiency). The goal is to achieve the highest amount of benefit with the lowest possible amount of costs to gain common societal goals such as averting the exploitation of fish resources or satisfying anglers catch requirements.

However, being aware that fish stock resource themselves and the management of them are characterized by high biological and social complexity, we have to admit our imperfections of measuring all costs and benefits of these social-ecological system arising of use interactions. Thus, it is unlikely to achieve full Pareto-optimality. Also economically feasible management options are highly constraint by limited knowledge and uncontrollable resource variations (Wilson 1982: 417).[17]

Nevertheless, the investigation of **economic efficiency** is possible as so far as to compare incomes and expenditures of the distinct governance structures in East and West Germany carried out in different resource systems. For instance, this includes incomes such as angling permits, membership fees, or other financial sources on one hand and expenditures on the purchase of fishing rights, fish stocking measures, or other management instruments on the other hand. The monetary measure is often quite difficult. Thus, spending time hours or number of engaged people in resource management are important parameters as well. A further crucial point is the evaluation of transaction costs. For instance, it is to figure out how far information costs differ regarding the distinct governance structure, how high enforcement costs differ to monitor the compliance of rules in varying resource characteristics, or how

[17] Therefore, Wilson suggest to understand efficiency "in this kind of environment … much more closely related to the adaptive, learning behaviour of individual economic actors than to the traditional notion of input cost minimization." (Wilson 1982: 417)

high bargaining and decision costs of self-regulated GRF management differ on different organisational levels. Issues like these can only be measured by interviewing and surveying the perceptions of GRF managers on those issues.

The balance of income and expenditure and the appropriateness of transaction costs support the functioning of GRF management and can be seen as a precondition to achieve the other management objectives. It is assumed that, when management fails in economic issues, then the chances to solve social conflicts and maintain ecosystem services are comparative low.

Another evaluative criterion is the **social agreement** about the allocation of fish stock resources. This is to find out whether the distribution follows the maxim of equity (everybody has the same opportunity to use the resource), is there a redistribution process to support poorer people of the society, or is the goal to restrict the number of potential users in general. Furthermore, it is important to clarify whether the management is organized in a way that those who benefit from the resource use should bear the costs as well (and vice versa). For instance, this is crucial in the policy-decision process with other stakeholders of the resource. How do they deal with arising positive or negative externalities of the use of resource systems or units? It is important to achieve a social agreement between the resource users to support the maintenance of the resource. Otherwise, in extreme cases, social conflicts might cause oppositional reactions by anglers and non-compliance with management regulations to save from environmental degradation and economic inefficiency.

The criterion **maintenance of ecosystem** services means that managers should take into account that certain kind of human impact might destroy fish stocks or freshwater habitats which provide services within the ecological system and for the human use as well. This holistic view should be considered in resource management to maintain further functioning and use of ecosystem services.

The challenge for the governance structure is to find optimal solutions in trade-off situations such as on the one hand between the different evaluative criteria, e.g. the calculation of costs for fish stocking measures and the consideration of habitat requirements or on the other hand the opposed objectives of different interest groups regarding inland waters and fish resource use, e.g. water power plants block fish routes and hamper catch possibilities for anglers. The choice between different management alternatives can be facilitated by calculation of opportunity costs. If a GRF manager decides to stock non-endemic species because of limited financial resources and a high demand for fish stocking by anglers, he faces the risk that in the long run these non-endemic species will derogate the ecosystem in general and will cause lower angling satisfaction.

6.2 Getting the cycle closed

Crucial to get the adaptive cycle of natural resource management closed is to take in the **feedback** loops of the SES. Feedbacks refer to “the result of any behaviour which may reinforce (positive feedback) or modify (negative feedback) subsequent behaviour” (Berkes & Folke 1998: 6). That means managers and users of natural resources should develop the “ability to observe and interpret essential processes and variables in ecosystem dynamics to develop the social capacity to respond to environmental feedback and change” (Folke et al. 2005: 445). Different authors have identified several feedback mechanism and principles of adaptive management to balance the social-ecological system in a sustainable manner (Folke et al. 2005; Almlöv & Hammer 2006; Lebel et al. 2006). These feedback mechanisms consist of monitoring tools, management evaluation, data collection on the status of fish

stocks, knowledge building, learning processes, consideration of anglers' responses to management measures, utilisation of cost-benefit analyses as management tools etc. This social capacity consists of the following major matters: **learning**, meaning, knowledge, and experience of ecosystem dynamics. Considering the complexity and dynamics of SES agents of the governance structures need to realize that not single-species models or managing for control and stability help to sustain ecosystem services but knowledge and understanding of the whole system. This understanding should "be continuously updated and adjusted, and each management action viewed as an opportunity to further learn how to adapt to changing circumstances" (Folke et al. 2005: 447, Carpenter & Gunderson 2001). A rewarding step to attain comprehensive information about changes in SES is to combine local and scientific knowledge. And other research found out that besides gradual changes particularly rapid crises seem to activate learning and knowledge generation (Folke et al. 2005: 446, Olsson & Folke 2001).

Based on these learning processes and knowledge building the next step is the **adaptation** of resource management on the dynamics in SES. Adaptive management means that agents of the governance structure continually adjust rules in use on the unwanted outcome of previously implemented resource management measures. This might include the alignment of property rights or the cross-scale integration of institutions (Carpenter & Folke 2006: 311). Folke et al. (2005: 463-464) characterize this process as follows: "The sharing of management power and responsibility may involve multiple and often polycentric institutional and organizational linkages among user groups or communities, government agencies, and nongovernmental organizations… Adaptive comanagement relies on the collaboration of a diverse set of stakeholders, operating at different levels through social networks. This aspect emphasizes the role of multilevel social networks to generate and transfer knowledge and develop social capital as well as legal, political, and financial support to ecosystem management initiatives." This definition makes it possible to investigate GRF management regarding the major traits of adaptive governance (see page 18).

7 Connecting theory and framework – the research hypotheses

The framework considers various features of the components in a SES. However, for the analysis of GRF management it is unlikely that all of them play a major role in the explanation of successful or not successful sustainable resource use. Therefore, the guiding hypothesis of this study is focused on the potential key exogenous variable "resource characteristics" influencing the capacity of the "two distinct governance structures" in East and West Germany to manage for sustainability (figure five).

Capability here means the ability of the governance structure to manage for sustainability. It is assumed that the distinct governance structures in East and West Germany have different success in achieving economic efficiency, different potential to solve social conflicts and to maintain ecosystem services considering the different resource system characteristics in the North German Lowlands and the South German Uplands. On the following pages two hypotheses are explained exemplified by the three major potential problems in GRF management and resource use which are access and use regulations, fish stocking measures and multiple stakeholder management.

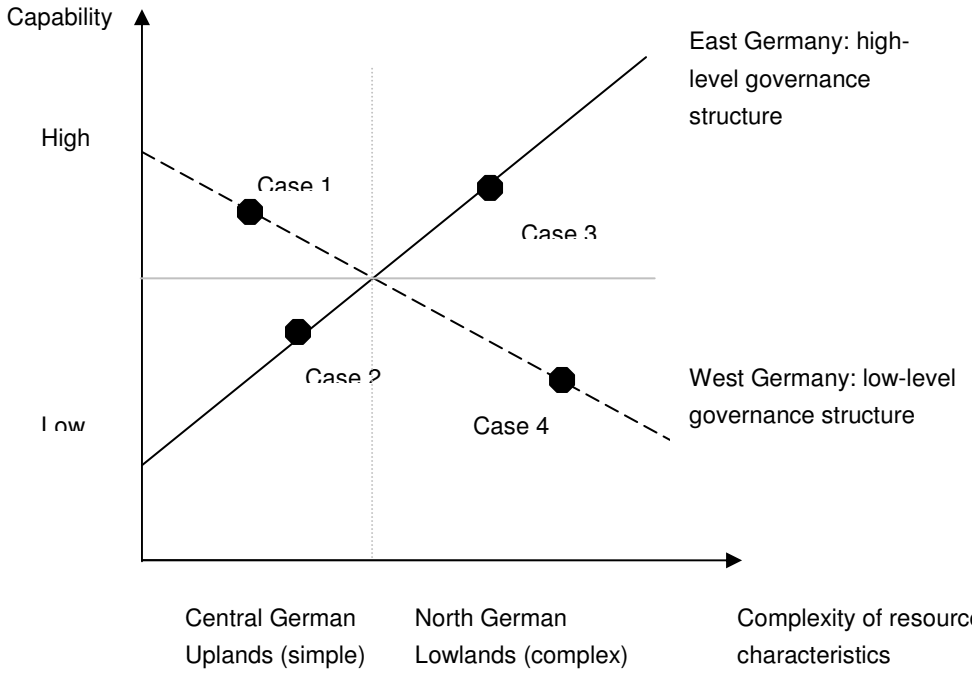


Figure 5: Capbility of distinct governance structures to manage for sustainability in varying resource characteristics

Hypothesis:

High-level governance structures in East Germany (case three) have a higher capability to manage access and use regulations, fish stocking measures, and multiple stakeholder's interests for sustainability in complex resource systems, such as the North German Lowlands, than low-level governance structures in West Germany (case four).

Complex water systems (lake-rich landscape with interlinked canals and rivers such as in North German Lowlands) increase the area that has to be controlled by enforcement of property rights, especially for access and use restriction by the owner. It is also more difficult to define clear property rights in large lakes, e.g. those shared by commercial fishermen and recreational fisheries associations. They also increase the area in which fish stocking measures take place and those measures have to consider the characteristics of fish populations over multiple lakes and rivers because of their connectedness. Complex water systems increase the number of owners and interests groups utilizing the fish or water resources. Rarely a single stakeholder would own an entire water system. This situation might lead to free-riding in resource management. On the contrary, large lakes and complex river/canal systems usually have multi-stakeholder settings that include, for example, commercial fishermen, public water transport administrations, tourist industry, nature conservation groups, farmers etc. Therefore, complex water systems usually increase management (financial and personnel costs) and transaction costs (search and information, bargaining and decision, monitoring and implementation costs) in comparison to simple resource systems. This further increases the boundedness of the rationality of recreational fisheries managers. More communication, information, interpersonal trust, and coordination within different stakeholder groups are necessary for sustainable recreational fisheries management. However, complex water systems usually increase anglers' catch and leisure

satisfaction because of the multitude of fish populations in large water areas, the short travel distances, the nature experience etc.

For this study it is assumed that high-level organized angling associations (property rights on regional or states' level) deal better in complex resource settings than local angling clubs with full property rights, because of the fact that their extent of resource management match with the wider spatial scale of complex resource systems. They also have a better bargaining position (more money and members) to get property rights for water resources and to enforce anglers' interests in policy-decision processes supporting their own interests against other water resource interests groups. The decision and bargaining costs are reduced for anglers overall. If anglers' interests are considered in policy decisions and laws, the costs of monitoring and enforcement of use, and access restrictions are decreased because anglers are more willing to comply with those decisions reducing illegal activities. Furthermore, they might have a stronger influence on fisheries authorities and higher changes to get property right on freshwater resources. Despite the higher information costs associated with the quality and quantity of the fish resources in complex resource systems, high-level angling associations might be more effective with regards to fish stocking measures because of the large amount of financial resources available (more members who pay for angling licenses and permissions), the consideration of wide ranging ecosystem characteristics and the recruitment of specialists in fish ecology and resource use. Property rights on higher level might also increase the concern of the owner to manage the resource carefully on wider ecological scale.

In contrast, low-level organized angling clubs with full property rights on locally constrained parts of complex water resources might bear higher costs in recreational fisheries management. They have lower costs associated with the monitoring of their small number of members regarding use and access restriction in their area. However, in complex water systems the fish populations migrate and the control of angling activities in connected water areas is much more difficult and costly. The same is true for gathering information about the quality and quantity of fish population in complex water systems. Therefore, the benefits of fish stocking measures become less predictable because fish populations can migrate to other parts of the resource system to which the angling club members do not have access. In addition, the position of low-level organized angling clubs within the policy-decision processes on a higher level is weaker. They have to arrange their position with other angling clubs. This usually takes place within representative angling associations. However, the representatives of those angling associations (without property rights on the resource) might have other interests and do not consider the interests of the fish resource owner on a local level. This makes the negotiation with other interest groups in the policy-decision process about water resource use more difficult and increases the bargaining and decision costs overall. Furthermore this might cause dissatisfaction of anglers with those decisions and the resulting laws which might lead to an increase in illegal angling activities and poaching.

Counter-Hypothesis:

Vice versa, low-level governance structures in West Germany (case one) have a higher capability to manage access and use regulations, fish stocking measures, and multiple stakeholder's interests for sustainability in simple resource systems, such as the South German Uplands, than high-level governance structures (case two).

Simple resource characteristics are supposed to create lower transaction costs associated with resource management in comparison to complex water systems because small lakes and rivers usually have very few interested stakeholders, and in some cases only have one

stakeholder, interested in the resource. These limited waters are not interesting for instance as water transport ways. Therefore, less bargaining between different interest groups and negotiation in the policy-decision process are necessary. The exclusion and monitoring costs are much lower in readily comprehensible water areas than in complex water systems. Thus, the implementation of access and use restrictions are easier for local angling clubs and the delegation of those tasks to higher governance structures would be more expensive than necessary. Furthermore the management and transaction costs of fish stocking measures might be lower. Fish populations do not migrate in enclosed waters, search and information gathering on fish populations is easier and the local knowledge of the owner is taken into account. It may also be expected that angling clubs with low member numbers trust and communicate better than in high-level organized governance structures and therefore the restriction on access and use of the fish resource receive better compliance by the angler community.

In contrast high-level governance structures in simple water resource systems might produce high organizational and transaction costs in managing small lakes and rivers because angling clubs on the local level are not able to bear the costs of recreational fisheries management on higher scales. They also might ignore particular traits of local resources, which are better controlled by the local anglers clubs. Furthermore the carrying out of fish stocking might be easier and cheaper on the local level, because wider ecosystem settings do not have to be taken into account.

These assumptions will guide this study. However, it will be kept in mind that the opposite can take place. High-level governance structures in Central German Uplands may achieve sustainable management by implementing and using a more local management setting to reduce e.g. information costs within the angling association. On the other hand, low-level governance structures in North German Uplands may use additional management tools on the higher (regional or states) level to gain more influence in policy-decision or for the management requirements of complex resource systems. To sum up, it has to be determined which kind of collective action on the regional/states' level and on the local level is appropriate to complex and simple resource systems.

8 Further steps

Following the delineated framework in this paper the further steps of research will include the discovery of the described problems in fish resource use and of the participants of GRF management on local level. Furthermore, an analysis of rules in use and of management decision process in angling clubs and angling associations on different spatial level will conduct to find out the reasons of choice for a particular management approach. Moreover, it is to clarify in how much angler's attitudes and specific characteristics of fish resource and waters are considered by managers. An additional crucial point is to identify the management objectives which are used to arrange a particular management approach. Finally, the research has to find out whether there exist traits of an adaptive cycle in GRF management.

The research will be conducted in four selected counties in Germany following the parameters of "governance structure on different levels" and "characteristics of the resource system" as pictured in figure five. The analytical framework will be used for every single case. Thus, it is possible to compare collective choice on different spatial levels in East and West Germany considering varying resource characteristics in North German Lowlands and South German Uplands.

To get the data for the analysis different methods will be applied. First, face-to-face structured interviews are planned with different stakeholders of fish resources and decision makers in GRF management like representatives of angling clubs and angling associations on local, regional or state level. Furthermore, it is required to interview members of the states and regional administration authorities and other stakeholders who are involved in decisions about recreational fisheries management (politicians, scientists, representatives of nature conservation and animal welfare associations). They will be asked, among other things, about conflicts and problems with other resource users, about scientific support for management, about monitoring mechanisms, information gathering, and alternative management strategies. Special attention will be given to actors who participate in the actual decision-making processes. This will lead to the second instrument which will be participant observation in the decision-making process, in angling associations and angling clubs meetings, where the implementation of management measures is organized. Both instruments make it possible to appraise the interests, motivations, perceptions, influence and behaviour of stakeholders within the decision-process, as well as the implementation and execution of recreational fisheries management (Scholz et al. 2004). Complementary mapping tools of decision and management networks can be applied (Lejano & Ocampo-Salvador 2006). Third, it is planned to collect data with standardized questionnaires from representatives of angler associations/clubs and fisheries authorities on countable violations of management regulations, on number of members or other fish resource users, on financial, and personnel resources for management measures, and on catch amounts or fish stocking costs. Furthermore, they will be asked about their perceptions of problems and solution possibilities in management regulations, and their practical application. It is also planned to survey the attitudes of anglers regarding these issues. Fourth, the content analysis of documents regarding fisheries regulations, policy decisions, management contracts, minutes of meetings, or court decisions will be carried out.

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Designing Agent-based Models of Water Management Regimes using the IAD Framework

Eva Ebenhöh*

Abstract

Different drivers and obstacles exist in management regimes aiming to increase the managed system's adaptive capacity. Hypotheses based on a theory of adaptive management about conducive or derogatory characteristics of management regimes are currently tested in case studies and case study comparisons. As a complementary method to field work agent-based models of management regimes are used to test some of these hypotheses. Models are built using the conceptual framework of Institutional Analysis and Development (IAD). Positions in this framework are substantiated as Functional Groups identified as being needed in order to build social memory. Rules in this framework are implemented using the Grammar of Institutions. This combination of conceptual frameworks allows implementing different regime characteristics in a coherent way, differing only slightly in their implementation and allowing for comparison. A prototype model presented in the appendix is an application of this framework to a simplistic decision environment designed to mirror a series of economic experiments. Changes in experimental design (e.g. including a sanctioning mechanism or communication opportunities) are reflected in changes of model elements. The model can be calibrated to replicate experimental results and then be used to trace changes in model elements to different model outcomes. This elementary first implementation paves the way for modelling real world settings. It aims at replication of real world situations, using the corresponding models to trace which elements are responsible for which kind of behaviour.

1 Introduction

This paper reports on first steps of an ongoing modelling process. Ultimate purpose is the creation of an agent-based modelling framework which allows comparison of water management regimes regarding their impact on the adaptive capacity (Berkes et al. 2003) of the managed resource system.

The idea is to compare and contrast simulated regimes, which are modelled based on the same conceptual framework. Thus they can be compared to each other by comparing their different parts. Since we are interested in adaptive capacity, we need to go one step further than comparing regime elements and create *dynamic* models. By modelling not only structure but also dynamics, impacts on adaptive capacity can be traced back causally to different regime elements. This allows testing and refining of hypotheses about which elements of

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a regime are conducive or derogatory with respect to enhancing adaptive capacity. The objective is to be able to compare regimes according to their parts and interactions of their parts, while fulfilling a certain function, as for example, flood and/or draught management, ecological goals, water supply, or waste water treatment. The management regime is assumed to decide on actions that affect the social and natural environment in such a way, that the regime's functionality is enhanced or declines. The fulfilment of a regime's goal is the means by which to measure its performance. This kind of measurement of the efficiency of interventions by their impact on the modelled ecosystem has also been proposed by Doran (2001).

If we have a variable input, like alterations in water levels, precipitation, or water demand the regime's ability to cope with these variable and uncertain inputs can be investigated. If the regime is understood and modelled sufficiently well, it can be traced, how the different regimes process the variable input and how they cope with it. Different regime models can be subjected to the same variable input and their performance can be measured.

This idea is depicted in Figure 1. A high degree of abstraction and simplicity of the regime models may, however, lead to model outcomes which are meaningless with respect to real world cases. It is, therefore, necessary to go through several steps of an iterative modelling process. In the meantime, model results are hints at where to investigate further.

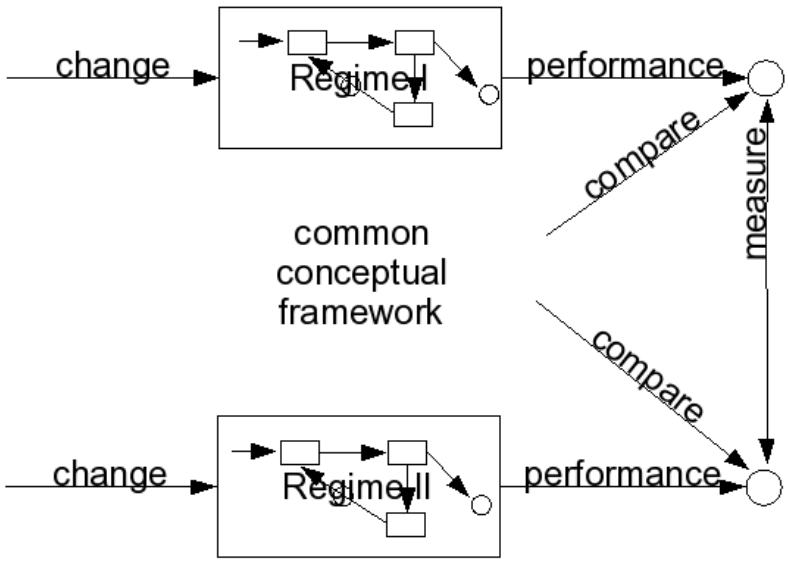

Figure 1: The idea behind this modeling approach is to create a framework in which behavior of regimes under certain environmental changes can be measured, using their performance. The framework allows looking into the regimes not as black boxes, but comparing and investigating, which elements and functionality are important for their specific behavior.

To achieve a first step in this iterative process, a model framework was built using the Institutional Analysis and Development framework and related concepts. These frameworks and their application as a modelling framework are described in Section Frameworks. The approach is discussed in Section Discussion.

This model framework is applied to a simple environment in which the data base is relatively broad compared to the simplicity of the decision environment. This data is obtained from a

series of economic experiments, which were designed to capture essential characteristics of collective choice situations in common-pool resource dilemmas (Ostrom et al. 1994). Since these experiments are used throughout this paper as examples for the application of frameworks and design of a corresponding model, they are presented before the frameworks, in the next Section. The corresponding model is described in the appendix. Please note that this experimental setting is simple compared with real world situations, but highly complex, compared with other economic experiments. Modelling this experimental situation can be seen as a test bed for both the approach and the conceptual framework. Only after this test, the framework is applied to real world situations based on data gathered in case studies.

The appendix is a model description contrasting a situation with and without communication. The description follows the ODD protocol for describing agent-based models (Grimm et al. 2006) and includes UML class diagrams to illustrate the model.

2 Experiments

For a detailed discussion of the experiments, please refer to Ostrom et al. (1994). Here, only a brief overview is given. Each experiment has been conducted with eight participants. Decisions were made anonymously. Participants were endowed each round of an experiment with 10 (low endowment) or 25 (high endowment) tokens. They had to decide, how much of these tokens to invest in a common-pool resource (market 2) with a negatively quadratic return function of total tokens invested. The expected returns were given to participants in form of a table. All not invested tokens were automatically invested in an outside opportunity (market 1) with a fixed return per token. In the parameter setting of the experiments, group optimum is at a total investment of 36 tokens in market 2, which corresponds to 4.5 tokens per participant. The Nash strategy is 9 tokens per participant. The experiment was conducted for 25 to 30 rounds.

Alterations of this baseline scenario include

- probabilistic deterioration of the common-pool resource depending on exploitation (previous investments)
- the possibility to pay a fee in order to fine another participant
- the possibility to meet face-to-face with the other participants and talk about investment decisions
- the possibility to decide in such a communication phase on adoption of a sanctioning rule

3 Frameworks

Frameworks used for model design are the Institutional Analysis and Development (IAD) framework (Ostrom et al. 1994, Ostrom 2005), Grammar of Institutions (Crawford and Ostrom 1995, 2005), and Functional Groups (Folke et al. 2003, Olsson et al. 2005).

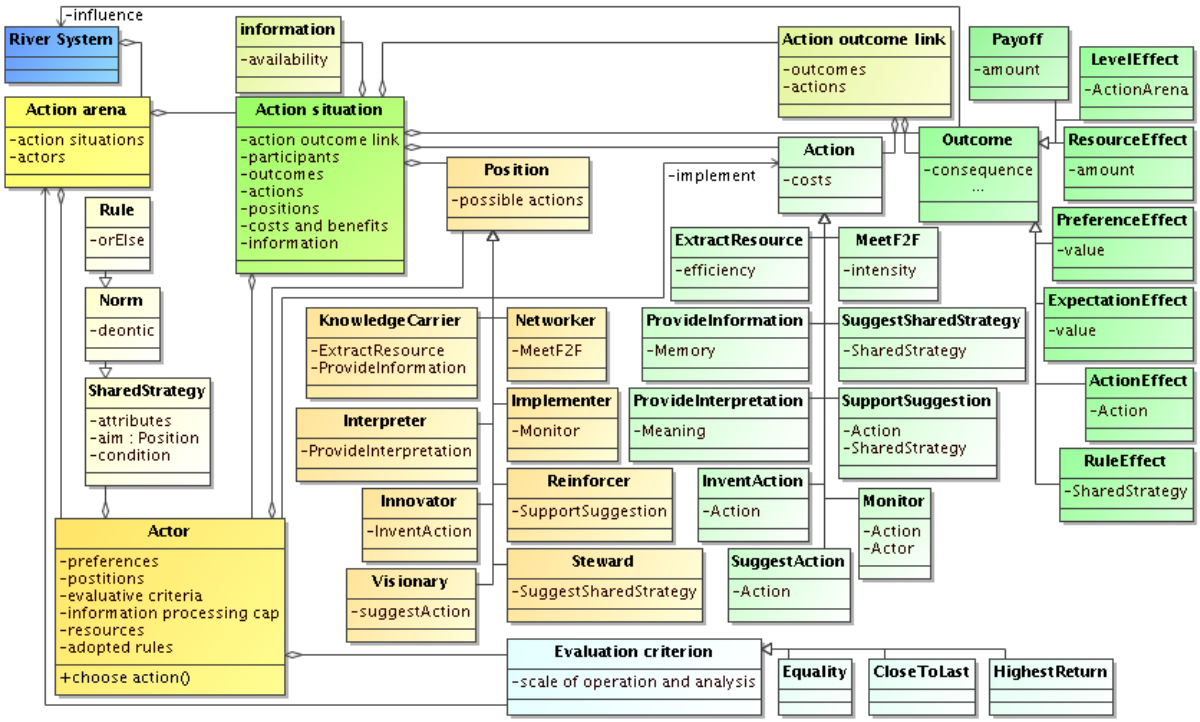

Figure 2: UML diagram of the IAD framework by Ostrom [2005] extended by Functional groups according to Folke et al (2003) and extended by a number of classes for the application to water management regimes.

The framework presented in Figure 2 as a UML class diagram is a straightforward implementation of the IAD framework, using functional groups as positions and describing rules with the grammar of institutions. It presents an overview of the first implementation of the model framework, which needs to be refined and anchored to reality in further steps. The frameworks and their adaptation in the modelling framework are discussed in the following subsections. This model design has been developed in collaboration with the management and transition framework (MTF) development process in the NeWater[1] project.

3.1 The IAD Framework

Elinor Ostrom and her colleagues pose the question whether there are unifying building blocks in diverse, regularized social interactions, which can help to explain human behaviour in these situations. They answer with yes, there are indeed building blocks, holons, we can find in diverse situations, which seem to explain differences and similarities of human behaviour in these situations (Ostrom et al. 1994, Ostrom 2005). The Institutional Analysis and Development (IAD) Framework is a “multilevel taxonomy of the underlying components of the situations human actors face” (Ostrom 2005, 6). It consists of holons identified to be universal building blocks, but also gives some means for analyses of meaning of holons and of their interactions. This characteristic of the framework makes it most suitable as a theoretical

[1] NeWater -- New Approaches to Adaptive Water Management Under Uncertainty, Integrated Project in the 6th EU framework programme, CONTRACT No 511179 (GOCE), PRIORITY 6.3 Global Change and Ecosystems, Project Duration: 01.01.2005 - 31.12.2008, <www.newater.info>

basis for an object-oriented computer model. Furthermore, since one important holon in the IAD framework is the decision making actor, it can be directly used as a theoretical basis for agent-based models. Decision making actors in the IAD are programmed as decision making agents in a model, together with their capabilities and flaws concerning information processing and decision making.

The various holons of the IAD framework and their application in the model example are discussed next.

3.1.1 Action Arena

The first holon, introduced here, is the action arena, „in which two holons -- participants and an action situation -- interact as they are affected by exogenous variables [...] and produce outcomes that in turn affect the participants and the action situation“ (Ostrom 2005, 13). This means, we first model the arena in which a situation takes place. Exogenous variables are the environment of the agents, but also rules and other community attributes. Outcomes of interactions taking place within the action arena have an impact on exogenous variables and the arena itself.

In the experiment example, one experimental session is modelled as an action arena. The eight participants are the participants in this action arena; one game is an action situation, which is repeated in this action arena 25 to 30 times. In the model, therefore, action situations are experimental sessions and the specific rules for this session, for example whether or not communication and sanctioning are allowed, is exogenous to the situation. A further exogenous element is the return function for the common pool resource, modelled as the laboratory river system.

3.1.2 Action Situation

An action situation can be described and analyzed using seven clusters of variables: “These are: (1) the set of participants, (2) the positions to be filled by participants, (3) the potential outcomes, (4) the set of allowable actions and the function that maps actions to realized outcomes [action-outcome linkages], (5) the control that an individual has in regard to this function, (6) the information available to participants about actions and outcomes and their linkages, and (7) the costs and benefits -- which serve as incentives and deterrents -- assigned to actions and outcomes” (Ostrom 2005, 32). Participants are assigned to positions and possible actions of a participant depend on his or her position. Actions are linked to outcomes, and both actions and outcomes have costs and benefits assigned to them. Participants have possibly limited information on the linkages between actions and outcomes, and some kind of control over this link.

The question what is internal and external to an action situation, as well as what is an action and what is an outcome, depend in part on the focus of analysis. For the experimental baseline scenario we define an action as an investment decision. Outcomes of these actions are first of all straightforwardly the payoff impacts they have. The control is partial, because the outcome of a participant depends not only on his or her investment decision, but also on the other participants' decisions. Outcomes are also expectation changes of other participants. But on this latter link, participants have no information and no control. In experiments with probabilistic deterioration, outcomes are also resource effects.

In communication settings, an action could be a statement made by a participant, for instance regarding his or her willingness to follow a proposed joint strategy. The outcomes in

this case, are expectation changes on the side of the listeners. These expectation changes can be expected and utilized by participants who either strive to reach an agreement or seek to exploit an agreement. Even without an agreement, a discussion can alter perception of a situation. In this particular case, for example, many participants may not view the situation as a social dilemma, until and unless they talked with others about their respective experiences.

If sanctioning is allowed and exerted, outcomes include payoff effects of fees and fines and, again, expectation changes of all participants. In principle, it is possible to establish group norms by using sanctioning, even without communication.

For real world management processes, there will be subclasses of action situations defined, which mirror phases in an adaptive management cycle or stages in double loop learning processes (Argyris and Schön, 1978). In these stages different kinds of actions can be chosen, including actions, which lead to further stages or back to previous stages.

3.1.3 Participants

“Participants in an action situation are decision-making entities assigned to a position and capable of selecting actions from a set of alternatives made available at nodes in a decision process. The participants in action situations can also be corporate actors” (Ostrom 2005, 38).

For a model of the IAD framework, the decision-making process is the most difficult to implement. Participants of action situations are modelled as agents with heterogeneous attributes, preferences and decision making heuristics (Ebenhöh 2006, Ebenhöh and Pahl-Wostl, 2006).

Decision-making can be implemented in various ways, as has been shown by a great variety of agent-based models. However, the main idea in the IAD framework is that participants choose among a set of actions those that promise outcomes (according to their information on action-outcome linkages) which lead to benefits according to their individual and/or joint evaluative criteria. Heterogeneity and information availability influence decision making. From the same set of actions, different agents can choose different actions, because of their individual attributes, preferences, information, or information processing capacities, which may be limited. As we will see in the appendix, one of the most important determinants for decision-making is expectation building. Expectations of others' behaviour may depend on institutional statements, experiences, calculations, or strategies. Model results potentially vary greatly with variations in the decision-making process. Decision making is, therefore, a module in the modelling framework, which can be exchanged, corresponding to different theories on decision making. This enables testing of results under these different theories.

3.2 Grammar of Institutions

The grammar of institutions (Crawford and Ostrom, 1995, 2005) is a logical syntax, in which institutional statements can be represented as well as compared and contrasted. Institutional statements “describe opportunities and constraints that create expectations about other actors’ behaviour” (Crawford and Ostrom 2005, 137). It is a logical language and therefore useful for implementing institutions as constraints for agent behaviour in an agent-based model.

According to this syntax, a rule consists of five components: attributes, deontic, aim, conditions, and an “or else” statement.

- Attributes define any attributes needed to distinguish actors from each other, in order to define to whom an institutional statement applies.
- A deontic statement is permission, obligation, or forbiddance, that is "may," "must," or "must not", respectively.
- Aim defines what it is that may, must, or must not be done.
- Conditions define states of the world in which the rule applies.
- The "or else" statement defines consequences for not following the rule.

The grammar distinguishes strategies, norms, and rules. *Strategies* consist of attributes, aim, and conditions. If a deontic is added, a strategy becomes a *norm*. A *rule* includes all five elements.

In the model of the experiment example, a strategy has been implemented in the form: *Cooperative agents invest no more than 9 tokens.* 9 tokens is the Nash equilibrium in the implemented parameter set and this strategy suggests not taking more than that. The attribute in this case is „cooperative agents", defined as all agents with a cooperativeness of 0.5 or higher (attribute values vary between 0 and 1). Less cooperative agents, in this case, do not adopt this strategy, because they may try to gain more if they expect general investment to be low. The aim is to "invest no more than 9 tokens," and the condition is „always": *All agents with cooperativeness 0.5 or higher - invest no more than 9 tokens - always*.

During a communication round, however, not only strategies, but also norms and rules can be established. Consider, for example: *All participants who signalled compliance - must - invest 5 tokens - as long as all comply, - or else, in the next round, all invest 12 tokens.*

In this example, the attribute is "those who signalled compliance in a communication round." The deontic is "must." The aim is to "invest 5 tokens." The condition is that it has not been violated. And the "or else" statement is to invest 12 tokens for one round. By defining what happens, if a norm is not followed it turns into a rule. Whether or not agents follow the rule depends on their individual preferences and on how severe they judge the sanction to be in comparison with the benefits of not complying.

The judgement of sanctions depends not only on the "or else" part, but also on monitoring and actual exertion of the sanction. If rule violation is not monitored or no one is willing to exert the punishment, potential sanctions do not carry much weight. The rule is not effective. On the other hand, a combination of shared strategies with no explicit sanctions mentioned may be effective, if the choice of future actions is depending on compliance in the past.

3.3 Functional Groups

The IAD framework identifies positions as one holon, which is an important factor of action situations. The modelling approach used here is to define functional groups (Folke et al. 2003) as pre-defined positions in action situations, which can either be present and filled, or not. Other positions are, of course, still possible and needed.

The IAD framework is extended in some detail here in order to focus on adaptive capacity. According to Folke et al. (2003) there are a number of processes needed to build resilience and enhance adaptive capacity in social-ecological systems, which include: learning to live with change and uncertainty, sustaining social-ecological memory, combining different types of knowledge, and creating opportunities for self-organization. They identify eight functional

groups, that is roles, which are needed for creating and sustaining social memory. These groups also play their parts in dealing with change, combining knowledge, and facilitating self-organization. These eight groups are given in the left column of Table 1.

This extension of the IAD framework by functional groups is not as trivial as it may seem. Positions according to Ostrom define possible actions for participants holding these positions. If a position is identified with a certain functional group, this entails that the functional group defines possible actions. In part, possible actions of functional groups can be drawn from Folke et al 2003 and Olsson et al. 04. Dietz et al. 2003 also gives a list of possible actions in collective choice situations. These approaches are synthesized in a tentative list, given in Table 1.

In this application I chose to model functional groups as positions rather than types of players, because their function in the model is to define possible actions for participants in these positions. However, an alternative approach would be to implement them as types of players, which would emphasis the aspect that taking such a position depends on individual attributes of participants.

In the baseline experiment, the only functional group identified is knowledge carrier. Each participant collects the knowledge of past rounds. On this basis individual strategies can be developed.

In communication experiments stewards suggest to decide on joint strategies, and reinforcers argue to commit to these ideas.

Sanctioning can also be seen as a way of reinforcement.

In experiments with probabilistic deterioration, there is even more room for knowledge gathering and sense making.

Functional Group	Possible Action
Knowledge carriers	Provide information on practical knowledge Provide information on effects of different behaviour Provide information on disturbances
Sense makers	Make abstract knowledge accessible for decision making Recognize patterns Analytic deliberation
Innovators	Bring together knowledge from different cultures Create novelty Conduct experiments to learn about uncertainties
Visionaries	Initiate renewal and reorganization Analytic deliberation Create visions of desirable future states
Stewards	Propagate vision Create rules Alter attitudes
Networkers	Deal with conflict Facilitate deliberation Enable nesting of decision making
Reinforcers	Corroborate vision Induce rule compliance
Implementers	Apply innovations

Table 1: Possible actions for positions synthesised from Folke et al. (2003) and Dietz et al. (2003).

4 Discussion

Using this combination of frameworks as template for the model was very useful in transferring decision situations into computer code. Holons as well as institutional statements could be identified and described with some precision, although not entirely unambiguously.

However, the model presented in the appendix has not been fitted to replicate experimental data, which it does only to a limited extent. The reason for this lack of data replication compared to Ebenhöh (2006) is the focus on the implementation as a framework. Since the goal is to implement decision making as generic as possible, it does not fit the specific decision making very well. One example clarifying these conflicting goals is the “highest return” evaluative criterion (see the appendix). The experimental data sets for the high endowment treatment start out at gross over-exploitation, which are usually explained by a lack of understanding of the environment, although participants have a table listing returns for various levels of total investment. If we assume at least some of the participants to adopt an evaluative criterion of „highest return“, in order for them to make high investments, their expectations of others' investments would have to be very low. Consequently, a better data replication is achieved by reducing the number of agents adopting the evaluative criterion of highest return. On the other hand, this criterion seems to be important in more realistic, higher-stakes situations. The most important and difficult aspect in a variable environment, like this experimental environment, is expectation formation. In the beginning, humans and agents have no

way of knowing what the others will do. Later, experiences may be the source for expectations, but since most human participants and software agents continually change their behaviour, this is not necessarily a good way of forming expectations. In the model, this problem has not been resolved.

One aspect of the model framework is supposed to be the possibility to trace influences of elements on outcomes. The model description given in the appendix contrasts a situation with and without communication. Communication enables two more positions to be filled, namely stewards and reinforcers. Their behaviour changes expectations of participants and institutional statements. In this case, tracing of communication possibilities to spreading of shared strategies is possible in the model. Different effects of communication, like trust building, information exchange, and institutional change, can be modelled separately.

Thus, as described in the introduction and shown in Figure 1 two regimes have been modelled quite similarly, differing only in one aspect, the possibility of face-to-face communication. The comparison can be based on total payoff, similarly to the comparison of experimental data in Ostrom et al. (1994). No variations in input, like a variable environment, have been investigated so far. The model design was intended as a test of applicability of the frameworks as model template, and this test, we conclude, was successful. Tracing of impacts of regime elements on outcomes is possible.

However, communication and its impacts can, of course, be modelled in many different ways (Deadman et al. 2000, Ebenhöh 2006). The way in which a real world process is replicated in a model determines what happens in a model. If the model is used as a social simulation model of a real-world situation, careful data collection and validation by domain experts is necessary.

The problem of ambiguity is alleviated, but not entirely solved by using IAD as a common framework for models of collective choice situations. Models help to contrast different representations of reality and their functionality within the modelled system.

The ongoing modelling process, of which this paper presents a first step, will use the modelling template developed on the basis of these frameworks for investigating different elements of water management regimes. Data will be based on case study research and expert knowledge. While the modelling process helps to extract abstract processes out of real world situations, case study research helps to anchor models to the real world.

Social simulation in this sense fits to the idea of adaptive management, which sees management practices as experiments to test responses of ecological and of social systems. Experiments as computer simulations may help to increase confidence in experimentation with the real-world.

A Model description

The model description follows the ODD (Overview, Design, Details) protocol for describing agent-based models (Grimm et al. 2006).

A.1 Overview

The model framework introduced in Figure 2 is adapted to the experimental baseline scenario and situations with communication possibilities as described in Section Experiments. A

UML class diagram of the application to the experimental baseline scenario is presented in Figure 3; a UML class diagram including communication possibilities is shown in Figure 4.

This version of the model runs as Java applet on:
http://www.usf.uos.de/~eebenhoe/newater/appropriation.0.8.html

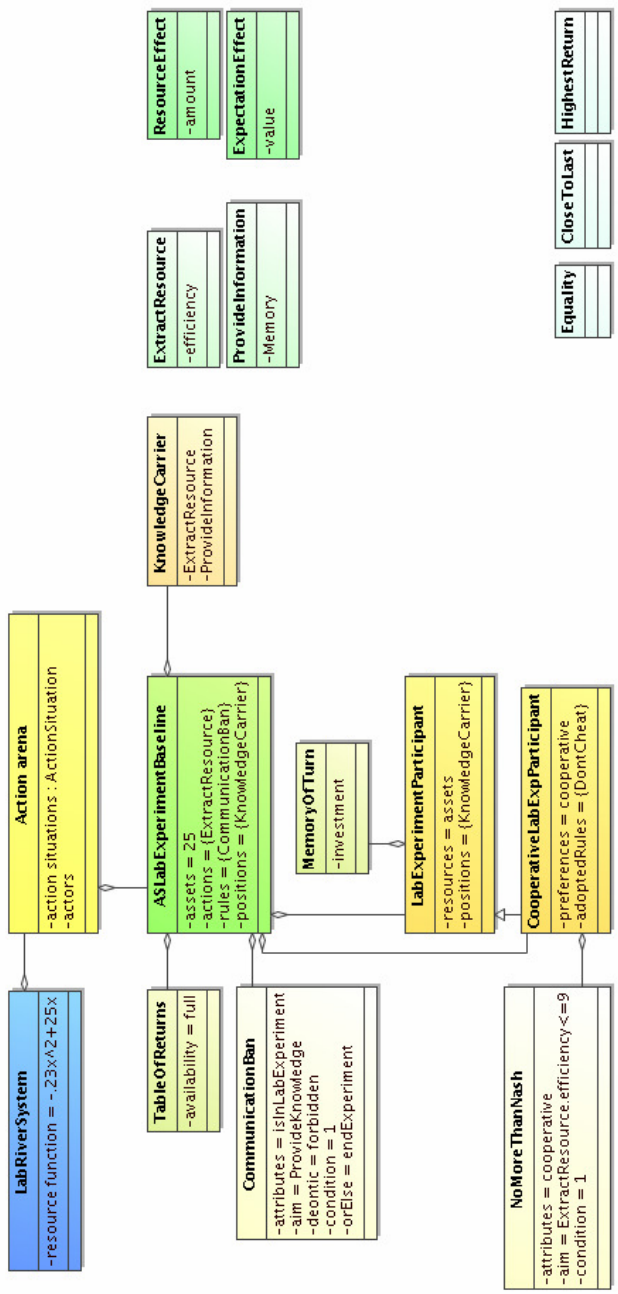

Figure 3: UML class diagram of an application of the model framework to the baseline experiments of appropriation games.

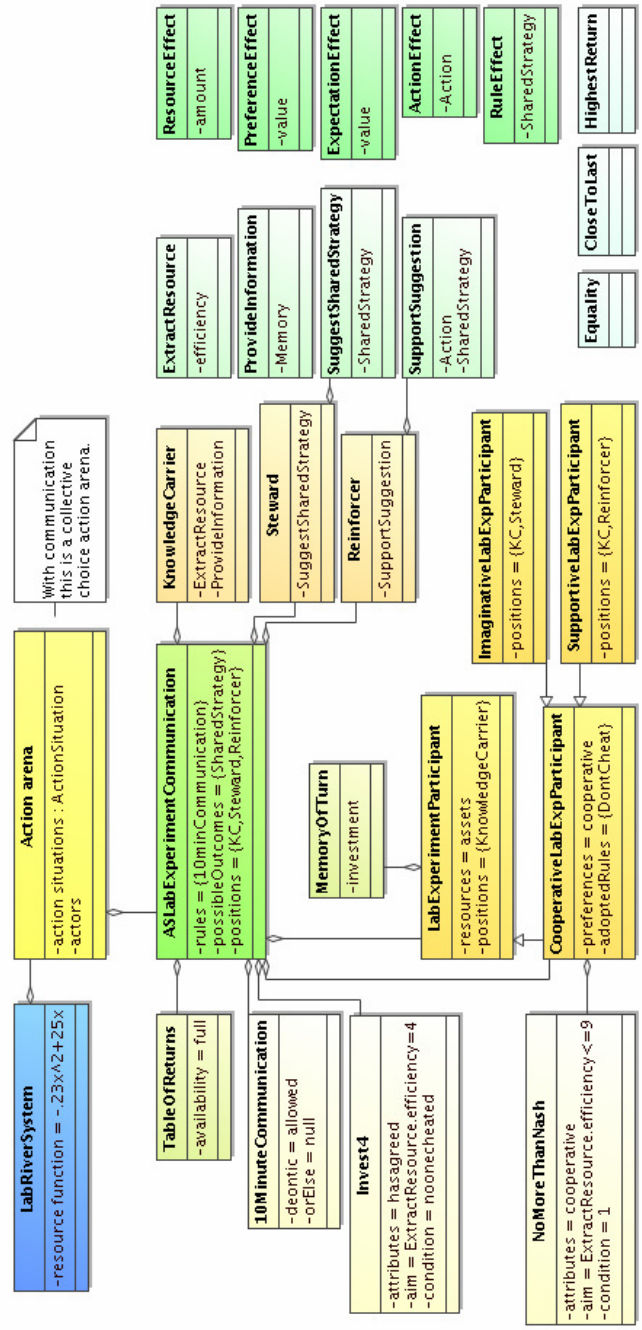

Figure 4: UML class diagram of an application of the model framework to appropriation experiments with communication.

A.1.1 Purpose

The purpose of this model is to investigate impacts of communication possibilities on participants' behaviour. Communication is not reduced to information on the decision environment, but encompasses expectation and preference changes.

This first implementation is also used to create a model structure which provides a framework in which eventually different governance institutions and stakeholder behavioural patterns can be altered and added in a modular way. By this process the social environment of stakeholders' decision making can be successively refined.

A.1.2 State variables and scales

Decision making agents are called *participants;* their decisions are made using different *actions* which are filtered according to the participant's adopted *institutions* and their *evaluative criteria*. Actions have direct and indirect effects on their actors, receivers, and the *decision environment*. These five categories are discussed in turn.

A.1.2.1 Participants

Participants are identified by a serial number, they have individual, heterogeneous attribute values (cooperativeness, conformity, fairness concerning others and fairness concerning itself (envy), positive and negative reciprocity) as well as a heterogeneous aspiration level. They accumulate resources. They are assigned one or more positions. Currently, this assignment is done by the environment. Depending on positions, they have a set of possible actions. These possible actions are filtered in a two-step process. The first step depends on the institutions a participant accepts as constraints on its behaviour. This depends on the individual importance of the institution and the participant's value for conformity. Only actions which are not forbidden by adopted institutions go through this filter to the next step of considered actions. Considered actions are evaluated according to one or more evaluative criteria. The action with the best expected results is chosen, or a random one of those that are equally good. Participants also have memory of previous decision situations and have and alter expectations about other players' attribute values as well as the actions they might choose. Expectation formation is a learning direction process which is the same for all participants.

A.1.2.2 Decision Environment

In this first implementation the environment is a two market system, the first market being an outside opportunity which yields a fixed return per input token, the second market being a common-pool resource which yields a return depending on total investment featuring a negative quadratic function (Ostrom et al. 1994).[2] As positions, this simple environment only defines „knowledge carrier", since all participants investing in market 2 learn about returns from market 2.
In experiments with communication, the model introduces two more positions: "Steward" and "Reinforcer". Stewards are allowed to choose the action to suggest a shared strategy. Reinforcers can support a suggested shared strategy.

A.1.2.3 Actions

Possible actions for knowledge carriers in this environment are all possible choices how much to invest in market 2. In the high endowment treatment participants can invest from 0 to 25 tokens in market 2.
The action to suggest a shared strategy assigns all participants this institution with a low importance. The more reinforcers support a shared strategy, the higher becomes the importance of this shared strategy for the other participants.

[2] The parameter constellations are taken from the series of experiments in Ostrom et al. (1994).

A.1.2.4 Institutions

There is one institution implemented in the baseline scenario. This is called “NoMoreThanNash” and suggests investing no more than the symmetric Nash strategy, which are 9 tokens in the given parameter set. Adoption of this institution depends on individual conformity values.
In communication scenarios the communication can result in a spreading and adoption of a shared strategy suggesting investing the group optimum, which is 4 or 5 tokens.[3]

A.1.2.5 Evaluative Criteria

All actions, which are considered by a participant to be possible according to adopted institutions are tested according to one or more evaluative criteria. For this, the participant formulates expectations of others' behaviour and the decision environment provides expected results to constellations of chosen actions and expectations.
Evaluative criteria in this model include „highest return“, „equality“, „closeness to last action“, and „random choice“. In case the latter is used, it filters out a single action out of the remaining set of actions, which could not be distinguished by previously applied evaluative criteria. „Highest return” and „equality” refer to expected outcomes, while the other two refer directly to the action.

A.1.3 Process overview and scheduling

In order to implement repeated decision making, a number of steps are repeated in the model, which are presented in the following list, four steps making up a game turn. In the beginning, a setup phase is used to create heterogeneous agents and their environment. In the current implementation 25 game turns are repeated.

1. Initialization
   All alterations that need to be made before agents make their decisions are made in the initialization phase. This includes endowment with assets and possible changes in the environment and institutions.

2. Agent Decision Making
   Agents perceive their environment to a limited extent. They learn about their return and the others' investment decisions. This knowledge is used to alter expectations. Predictions are made for them by the decision environment. Agents assess their options and evaluate expected outcomes according to some evaluative criteria. Then they choose one of the options available, in this case the decision is how much to invest in the common-pool resource (market 2). Decision making is quasi-simultaneous. No agent learns of other agents' decisions before making its own choice and decisions' effects are triggered when all decisions have been made.

3. Environment Reaction
   Agents' decisions have an impact on the environment. In this case the total investment in the common-pool resource determines the return from this investment. All agents are informed about their gains and losses and the decision total or average decision.

[3] Note: The condition "'NoOneCheated" indicated in Figure 4 is not yet implemented.

4. Data Collection and Learning
   Data is collected and displayed. In this phase, agents' learning processes can be triggered.

5. Meta Decisions (optional)
   If a need for decision making outside the operational action arena (which includes investment and sanctioning decisions) arises and the possibility for this exists (communication phases between turns), phases 1 to 4 are triggered in a collective choice action arena (communication) or constitutional action arena (communication on a decision to adopt a sanctioning institution). Results from decision making in these can have an impact on participants' preferences and on institutions in the operational action arena, which is then resumed by repeating phases 1 through 4.
   In the current implementation there are two types of communication settings, a one-shot communication after the 10th game and repeated communication from the 10th game on.

A.2 Design concepts

A.2.1 Emergence

System level phenomena result from individual decision making, but the link is straight forward. However, although the function determining the return rate of market 2 is deterministic, the development of the variable „total investment“ as the sum of participants' decisions is an emergent property of the system.

A.2.2 Adaptation

Decision behaviour of participants is modelled in an adaptive way in the sense that they decide to increase or decrease their investment according to previous results, the observed (average) behaviour of others and their institutions and evaluative criteria.

A.2.3 Prediction

Since the outcome is unpredictable for a participant, because it can not know other participants' decisions, prediction is not part of the baseline model other than the expectation that others behave as they have in the previous round.

A.2.4 Sensing

In addition to their own outcomes, participants are informed about the individual decisions of other participants between turns. During communication rounds they are informed of proposed shared strategies.

A.2.5 Interaction

Interaction only happens during communication rounds (and through sanctioning, which is not discussed here). In communication rounds a steward may suggest a shared strategy.

This is then added to known institutions of all participants with a low importance. Reinforcers can then support the strategy which increases its importance for all participants and thus the likelihood that it is followed.

A.2.6 Stochasticity

Preferences (attributes) and aspiration levels are generated by a random number generator. This process can be altered to investigate group effects. Attributes are equally distributed random numbers between 0 and 1. The attributes define whether to adopt an institution, which evaluative criteria to use, and which positions can be taken.

A.2.7 Collectives

A communication phase can be seen as a collective. A joint decision emerges from proposals of individual participants and others' indication of support. However, decision making following a communication phase is again undertaken individually.

A.2.8 Observation

An omniscient modeller observes the total investment and individual investment decisions, positions taken, and actions chosen.

Further, for each participant a decision path and its experiences are collected.

A.3 Details

The model is run with a single decision environment including eight participants and repeated for 25 rounds. It runs in three different treatments, either with no communication, with a one-shot communication after round 10, or with repeated communication from round 10 on.

A.3.1 Initialization

Participants' attributes are initialized randomly. On the attribute values depend adoption of institutions, use of evaluative criteria, and positions during communication according to Table 2.

The institution „NoMoreThanNash" is initialised with the Nash strategy of 9 tokens.

All evaluative criteria except „Closeness to last" are initialized with an epsilon of 0.05. This means that outcomes which differ by less than epsilon are treated to be equal. „Closeness to last" treats actions as close to each other that are less than 5 steps from each other in the vector of actions.

Steward and reinforcer are initialized with the shared strategy of the group optimum. In this implementation this equals investment of 4 tokens.[4]

Expectations are initialized as a random investment between 0 and a maximum initial expectation set per default at 10.

[4] Note: 5 tokens would yield the same result. It would be interesting to implement both strategies and their competition.

For the evaluative criterion „closeness to last“ the actions assumed to have been chosen before the model starts are set to initial values depending on the value for cooperativeness of a participant. The initialization of the actions in round -1 are also given in Table 2.

Institution	Attribute	Range
NoMoreThanNash	conformity	≥ 0.5
Evaluative Criterion	Attribute	Range
1. Highest return 2. Random choice	cooperativeness	< 0.33
1. Close to last 2. Random choice	cooperativeness fairness	≥ 0.33 < 0.67
1. Equity 2. Random choice	cooperativeness fairness	≥ 0.33 ≥ 0.67
Position	Attribute	Range
Steward	fairness	> 0.8
Reinforcer	cooperativeness	> 0.5
Action before start	Attribute	Range
Invest 5	envy	< 0.37
Invest 10	envy	≥ 0.37 < 0.58
Invest 15	envy	≥ 0.58 < 0.85
Invest 25	envy	≥ 0.85

Table 2: Initialization of institutions, evaluative criteria, and positions during communication according to attribute values.

A.3.2 Input

No input is needed except for the parameters given in Ostrom et al. (1994).

A.3.3 Submodels

Settings without communication, with one-shot communication, and with repeated communication are submodels presented here. However, this implementation is to be complemented with sanctioning submodels and submodels including probabilistic deterioration of the resource.

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Local Decision-Making Processes for Governance of Marine Social-Ecological Systems

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ABSTRACT

An institutional framework explores the *mechanisms* of inclusive decision-making for governance of two marine social-ecological systems in a developing country context. As the medium through which conflict, consensus and collective action are constructed, decision-making instances provide opportunities for actors to negotiate and, as such, their *inclusive* nature is important. Mombasa Marine National Park and Reserve and Diani-Chale Marine National Reserve situated along the southern Kenyan coast, East Africa, were selected as case studies. Both case-study systems are characteristic of current and ongoing global changes as opposed to being 'ideal' isolated examples of successful commons governance. They both reflect the interactions between local and global tensions politically, institutionally and ecologically but differ in some key governance structures. The paper draws from primarily qualitative data collected between April 05 and June 06. Opportunities for inclusion created by institutional structures emerging from sectoral government agency interplay is contrasted against historically and continuing exclusionary, control and command structures of MPA governance that afford no opportunity for interaction. Where decision-making processes are not available or are exclusionary, local actor negotiations take on a political turn as they utilise resistance, newly emergent spaces of decision-making and conditional co-operative collective action to highlight issues neglected by current governance structures.

INTRODUCTION

This paper is concerned with decision-making for governance of marine resources within coastal social-ecological systems (SES). Recognising the dialectic relationship between society and nature, systems of resource use are conceptualised in this paper as social-ecological-systems[1]. As articulated by Berkes (2003), this argues for the redefinition of *resources* to mean, not commodity, but ecosystem that supports essential processes as well as human needs and *management* to refer to governance, learning and adaptive management. Marine resources are usually recognised as common-pool resources and as such governance involves designing institutions (and other incentive structures) to arbitrate

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1 A SES describes an ecological system (interdependent system of organisms or biological units) intricately linked with and affected by one or more social systems (interdependent system of connections with others of one's kind) (Anderies, Janssen and Ostrom, 2004).

Ostrom, Schlüter (eds.) The Challenge of Self-Governance in Complex, Globalizing Economies, revised papers of the PhD school in Freiburg April 2007; IFE Working Paper 47d; pp. 99-134.

resource access and to encourage investment into resources (Ostrom, 1990). Decision making processes[2] provide instances or arenas within which actors interact to accomplish this. Such interactions construct and perpetuate conflict, consensus and collective action and ultimately impact on a social-ecological system through the eventual actions of the actors involved: policy makers, resource managers, researchers, donors and resource users. Examining the *inclusive* nature of these arenas is an essential component in understanding the resulting decisions, attitudes towards the governance structures decided upon and essentially, actor behaviour. The empirically supported ontological assumption is that inclusion of a diversity of actors in decision-making can facilitate improved social-ecological system governance by improving the *substance* and *legitimacy* of decision-making procedures and decision outputs and outcomes[3] (Brown, 2003; Raakjaer-Neilson, 2003; Francis and Torrell, 2004). This paper contributes to the debate by asserting that participatory processes are not necessarily synonymous with alternative development, integrated conservation-development programmes or collaborative commons management (co-management / community-based management) but that inclusion of actors within all property regimes, including government regimes of commons management, is a valid line of enquiry. Inclusion is taken here as facilitating negotiation by situated actors over diverse structures of governance, rather than representing alternative regimes. This paper examines the nature of inclusive decision-making at two case-study sites in Kenya, East Africa. The case-study sites provide a spectrum of instances in which governance is expressed and experienced in different ways so should facilitate an intricate understanding of how institutional, political and socio-cultural factors, unique to or shared between the two sites, mediate inclusion in decision-making. A conceptual analysis is presented next. This guides a multi-scale exploration of the decision-making processes in action concentrating on 'lived experience' at the local and coastal scale. This empirical analysis allows for a critique of current and emerging institutional structures and how they mediate the inclusion of actors in decision-making in practice.

This paper is one of a series that constitutes a PhD project. Beyond a concern for the inclusion of actors, addressed here, the next paper examines the inclusion of ecological knowledge and world-views in decision-making and the implications for the institutions designed to govern ecosystem ownership, access, management and use. How resulting actor behaviour feeds back into the governance system and affects social-ecological resilience will be the theme of a third paper.

CONCEPTUAL FRAMEWORK

The inclusion of actors and the development of legitimate forms of decision-making are purported to underlie both *integrative* and *adaptive* mechanisms of ecosystem governance (Lal *et al*., 2001; Lau, 2005; Brown, 2006). The discourse of inclusion in decision-making encompasses many strands ranging from broad public involvement to participatory or deliberative inclusionary processes (DIPs) concerned with stakeholders, but more precisely

[2] Decision-making processes are the means by which actors envision various potential paths of action and decide between alternative options

[3] Outputs refer to the relationships between actors as well as to the institutions designed to co-ordinate and regulate collective action for ecosystem governance. Outcomes refer to the impacts that governance institutions and processes have specifically on indicators of ecosystem health, resilience and sustainability.

with the local actors impacted most by the decisions made (Dalton, 2005). As a means by which local actor perceptions, knowledge and world-views are integrated into governance functions, participation is assumed to facilitate conflict resolution, social learning and commitment to agreed courses of action through the convergence of values and beliefs (Rockloff and Lockie, 2006). There is a general consensus that this can go on to contribute to the sustainable governance of ecosystems (Garaway and Esteban, 2003; Bryan, 2004; Ribot, 2006; Silva 2006). Empirical observation has supported the assumption that cooperation and compliance to institutions is improved in situations where wider representation of actors in decision-making processes occurs (for fisheries see Raakjaer-Neilson, 2003; Sekker, 2000 in Ostrom, 2005). Similarly, Pollnac *et al*., (2001) have observed that providing participatory opportunities for input into the management process is positively correlated with MPA success (in Dalton 2005). DIPs are advocated in initiatives such as Agenda 21 and the Lisbon Declaration for these reasons (Brown, Tompkins and Adger, 2002; Rayner, 1999). Stakeholder participation is often considered a core component of Alternative Development, Integrated Conservation-Development Projects, Integrated Coastal Zone Management and collaborative commons management initiatives, including approaches ranging from community-based to co-management with government (Wells and McShane, 2004).

There are a variety of governance *functions* (policy, service delivery, research and monitoring, learning, institutional design, enforcement), *stages* (planning, implementation, evaluation), *levels* (instructive to informative) and *scales* (geographical and institutional) at which stakeholder participation can occur (see Sen and Raakjaer-Nielson, 1996). Stakeholder participation can also refer to the inclusion of actors as diverse as local governments, NGOs and resource users (Mascia, 2003). Exactly how and when participation should occur remains a highly debated topic in conservation and development discourse. Critiques of participatory processes are generally founded on the uncritical assumption that participation is a panacea for past failures of development and conservation projects and that it is synonymous with power-sharing in initiatives of alternative governance and empowerment of actors in the local sphere (Tompkins, Adger and Brown, 2002). There are questions posed about the delays, costs and risks of participatory processes, which can become a tool manipulated in the service of powerful interests or can collapse if too many interests are represented (Pinkerton, 1989 in Alidina, 2004).

Inclusion as conceptualised here draws on the participation literature in its assumptions of potentially more legitimate and sustainable governance of ecosystems. However, inclusion is not automatically taken here as meaning the converse to top-down, command-and-control, centralised resource management. It is taken as facilitating negotiation by situated actors over such structures. The assumption is that participation can provide for the potential inclusion of a diversity of knowledges, world-views and interests that could challenge the hegemonic discourses of conservation and development as well as the application of dominant resource management models (see Meppem, 2000). Empirical observation in Kenya suggests that there is a movement towards adopting multiple levels of collaboration (inclusion in decision-making processes) between different actors in practice, even within broad property regimes, such as government property regimes. These collaborations are packaged as tools to support more inclusive decision-making processes and result in more sustainable resource conservation. Whilst, these partnerships may open up access to decision-making arenas for different actors at local to coastal scales these are not guaranteed outputs and the processes of inclusion need to be examined in detail. Further, social-ecological system governance, in practice, consists of nested systems of Marine

Protected Area (MPA), fisheries, tourism, development and land management each involving a slightly different set of stakeholders, with different bundles of power. Governance is complex and is expressed and experienced in a plethora of ways with inclusion in decision-making varying with resource system and spatial, temporal and institutional scale. Broad categorisations are therefore not useful. For instance, all sectoral management remains top-down and centrally organised in Kenya and yet the opportunities afforded by different government agencies' institutional structures to inclusion of actors as experienced on the ground vary considerably, hence a primary focus on the local-coastal scales.

Despite increased recognition in conservation politics, local resource users remain peripheral to defining the ways in which nature and conservation are perceived and governed (Goldman, 2003). Indeed, institutional, political and socio-cultural factors are recognised as major barriers to meaningful inclusion, which remains elusive within all types of management regime (Goldman, 2003; Ribot, 2006). Institutional structures are the focus of this paper, yet these do not work alone but in concert with socio-cultural attributes (of a community, or a decision-making body) and biophysical or material processes (as detailed in Elinor Ostrom's IAD framework, 2005). In effect, an institutional analysis with a concern for power relations is employed in this research to distinguish between institutional and socio-cultural mediators of inclusion of actors in decision-making processes. It is considered important to understand how institutional mechanisms might be better designed to overcome other barriers (age, ethnicity, gender) to inclusion. Whilst not explicitly concerned with policy processes, the discussions developed within this paper provide insights that are important for policy makers concerned with the legitimacy and sustainability of SES governance.

Institutions are socially constructed rules, norms and shared strategies that structure and legitimise human interaction (including decision-making processes) and their enforcement characteristics (Ostrom, 2005; Scott, 1995). Rules, according to Elinor Ostrom are enforced prescriptions about what is required, prohibited or permitted (2005). Norms refer to the generally accepted moral fabric or cultural prescriptions of a 'community' and strategies consist of the plans of action within ongoing situations (Ostrom, 2005). Enforcement characteristics have ethical (normative) and cognitive as well as regulative dimensions (Scott, 1985). Institutions fail when the enforcement pillars (regulative, cognitive and ethical) are insufficient to induce conformity of members to the institution. Employing an institutional analysis asserts that these rules, norms and shared strategies and their enforcement characteristics are central in determining collective actor behaviour. In *Understanding Institutional Diversity* Elinor Ostrom and Sue Crawford classify institutions according to their levels of action - operational, collective choice and constitutional choice. Operational rules structure what actors in operational situations are required, permitted or prohibited from doing, so affecting their day-to-day decisions (2005). These rules were crafted in a collective-choice situation structured by collective-choice rules that determine who is eligible to participate, in what position, chosen how to make and change operational rules (ibid, 2005). The collective-choice rules were themselves crafted in a constitutional situation. These institutional scales are not synonymous with spatial scales. Constitutional and collective choice rules can be designed by local actors and can function within the local sphere as can operational rules be active at national and international scales. Analysis of operational and collective choice levels is important in the context of this paper. First, both sets of rules are expected to mediate the inclusion of actors in collective-choice situations within which decisions over the operational rules for resource governance are negotiated over. Second, inclusion of actors in decision-making arenas can also influence their perceptions of and compliance to the operational rules even where they were not included in the collective-

choice design of such institutions. The analysis presented here focuses on the institutions that structure the inclusion of actors, not on the institutions (operational rules) negotiated over and decided upon within these collective-choice situations for governance of the ecosystem itself. Theoretically, it is important to distinguish between institutions and organisations. Here, institutions as arrangements of rights, rules and relationships are distinct from organisations (and agencies) as material entities bound by roles not rules. This is important as the organisational structures of agencies (such as staff skill), separate from institutional structures, can also mediate the inclusion of actors in decision-making processes but are not explicitly considered here.

Institutional analyses have often been accused of underplaying the importance of politics, power and resistance (Knight, 1992 in Agrawal, 2005; Agrawal, 2003). Institutions are not actors in their own right but function through the agency and behaviour of individuals that constitute them and yet, power emergent from these actions can then be perpetuated through resulting institutional forms and socio-cultural practices as exercised by other actors converted to that particular structure (Agrawal, 2005). It is recognised, here, that the emergence and perpetuation of institutional forms is a negotiated and coercive process involving the application of choice (co-operation / resistance) by actors that constitute the institutions (Agrawal, 2003). Specifically, *cross-scale* interactions of actors can reaffirm or reject multi-scale institutional frameworks (Adger *et al*., 2005). The construction of cross-scale interactions is conceptualised as networks or spaces of decision-making by Adger *et al*., (2005) and Tompkins *et al*., (2002). These often reinforce existing inequalities in governance structures but can also provide resistance opportunities for local resource user groups.

So, the institutional architecture of the social-ecological systems as well as the agency of the actors constituting these institutions are factors that can determine the nature of inclusion in decision-making for governance. Further, the perceived legitimacy of decision-making processes (among other factors) can arguably influence whether actors employ agency to subscribe and conform to (or challenge) the institutions designed for governance of ecosystems themselves. This is important in circumstances where enforcement of institutional rules is imperfect and expensive as is characteristic of natural resource governance in developing countries. Procedural fairness/justice is identified as the most important factor influencing legitimacy (Raakjaer-Nielson, 2003). Procedural fairness constitutes a concern with inclusion in governance processes as well as personal experiences with management authorities (Tyler 1990 in Raakjaer-Nielson, 2003; Jentoft, 2004; Lawrence, 1997). Procedural fairness arguments from the social psychology literature assert that perceived legitimacy of procedures is as important to public satisfaction as the decision-making output. Natural resource management literature usually concentrates on the latter concern without recognising that legitimate processes can induce higher levels of compliance with decisions and ownership of problems somewhat independent of the outcome (Lawrence 1997).

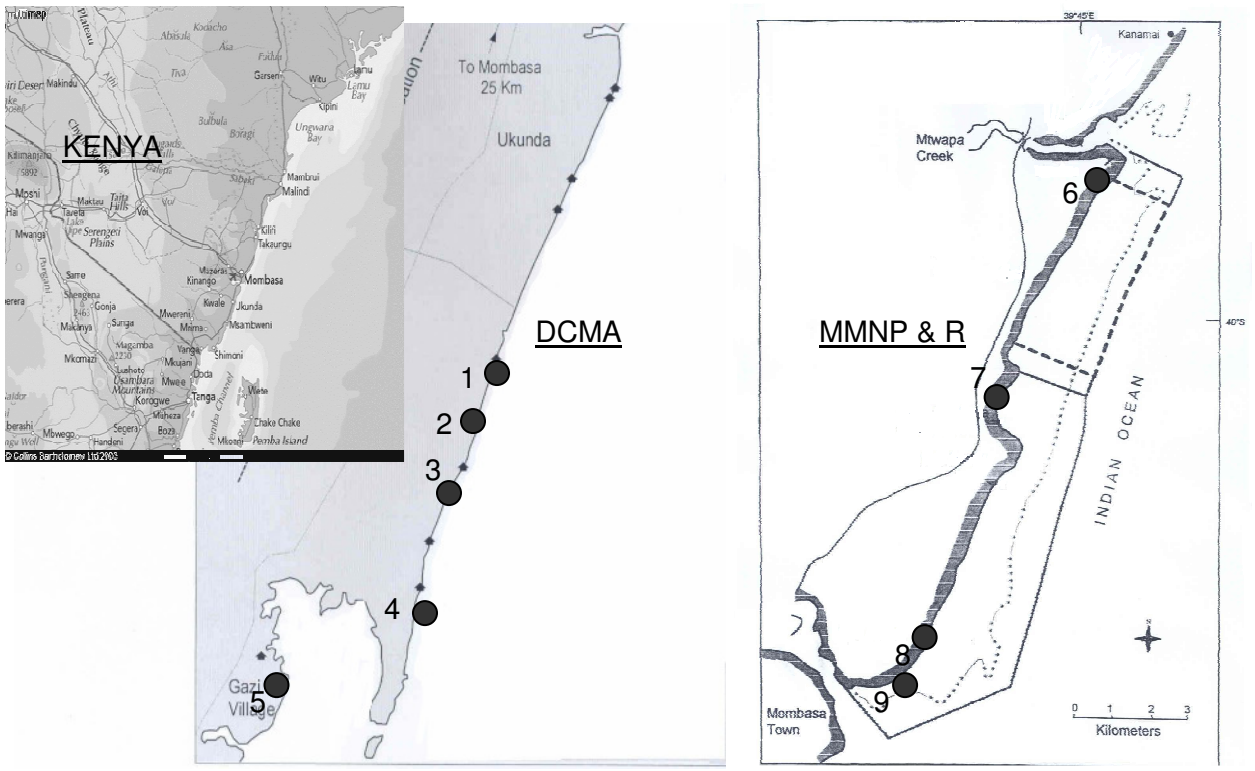
Finally, a major assumption of research in actor perceptions is that the attitudes and intentions of individuals influence behaviour. This relationship is reflected in the theory of reasoned action (Ajzen, 1988), which argues that behaviour can be predicted by the intentions of actors, which in turn are affected by their attitudes and the influences of significant others on their intentions to act. Alternative models also highlight attitudes as important elements that influence behaviour (Gelcil, Edwards-Jones and Kaiser, 2005). Therefore understanding the perceptions of different actors regarding their importance and

influence in decision-making and their inclusion in decision-making is seen here as a valid and important line of enquiry.

Reflecting Long's (2001) social interfaces, as 'critical points of interaction' where discrepancies in values, interests, knowledge and power are negotiated, one essential concern for decision-making analysis is uncovering *who* is interacting. The relevant stakeholders involved in the two social-ecological systems will be characterised through a stakeholder analysis. This is followed by a critical reflection of the institutional structures and political relationships that constrain or enable inclusion of actors in decision-making instances. First the research context and approach are presented.

RESEARCH CONTEXT

Mombasa Marine National Park and Reserve (MMNP & R) and Diani-Chale Management Area (DCMA) situated along the southern Kenyan coast, East Africa, were selected as case-studies. These marine protected areas (MPAs) represent social-ecological systems and are modelled on no-take *parks* (regulated access for tourism and research) and/or regulated *reserves* (regulated for all types of resource user). The case-study sites provide a spectrum of instances in which governance functionalities are expressed and experienced in different ways. Both sites are challenged by Kenya's most critical coastal issues as a rapidly expanding international tourism industry develops alongside artisanal resource use, characterised by dependence on declining resources, leading to potentially high levels of conflict in decision-making processes for resource governance (Berkes, 2003; Martin-Smith *et al*., 2004).



Map 1: Diani-Chale Management Area (DCMA) and Mombasa Marine National Park and Reserve (MMNP & R) including the gazetted park (---) and reserve boundary ( ) and fish landing sites: 1 Mwaepe, 2 Mvuleni, 3 Mwanyaza, 4

Chale, 5 Gazi. 6 Marina, 7 Kenyatta, 8 Msanakani, 9 Nyali.
(Sources Multimap.co.uk; KWS Management Plan 2000; CORDIO literature).

With the focus on marine resource and MPA governance, sampling of defined resource user groups at fish landing sites and beaches was considered more appropriate than community-focused or household sampling. Four landing sites within each location are included in the questionnaire survey, with two extra sites (Chale in DCMA and Kuruitu in Kilifi) included in the interview stages of the research. Purposive sampling combining judgement (reflects analytical differences), snowball and convenience sampling was adopted (Corbetta, 2003). The case-study sites are represented below.

MMNP & R were gazetted in 1986, with active enforcement of park rules beginning around 1992 (ICAM Action Plan, 1996). The Park is 10Km^2 and the Reserve is 200Km^2. In 1995, an Integrated Coastal Area Management (ICAM) scheme was established and a broader coastal system, enclosing the MMNP & R was identified – Nyali-Bamburi-Shanzu area - although this is not a legal designation. The Diani-Chale Management Area (DCMA) lies 26Km south of Mombasa. It is an area covering approximately 250Km^2. The DCMA was gazetted as a reserve in 1995 but official government agency MPA management was not implemented due to intense conflict over its legal gazettement and purpose, on the part of the local communities. DCMA is a terminology often utilised by the different stakeholders of the area, as reference to its reserve status is controversial and contested (hence the reserve is not shown in the map above).

RESEARCH APPROACH

The paper focuses on the institutional and political structures that mediate (constrain or enable) the inclusion of actors within decision-making processes. As such, there are some key interests that the methodology must address: 1) the multi-level actors whose actions impact on the social-ecological system 2) the social interfaces in which intra- and inter- group interaction can be observed or discussed; 3) the change or persistence of institutional and political structures as an indication of emergent processes. Various methods address these three concerns and triangulate information.

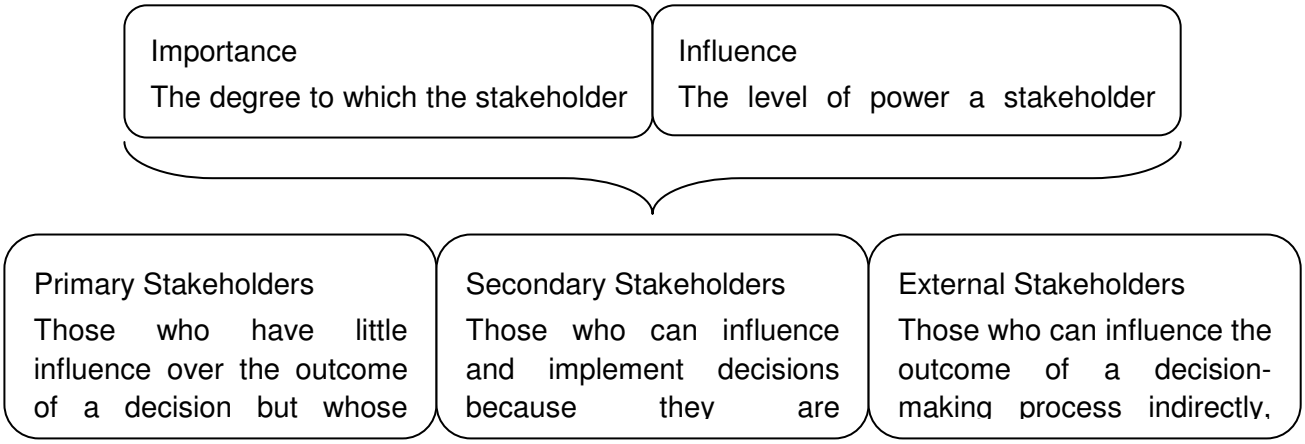


Figure 1: Attributes and typologies employed in a stakeholder analysis (Source Brown, Tompkins and Adger, 2002)

First, a stakeholder analysis categorises information on individuals and groups in order to illuminate active inter- and intra- group interactions including exclusionary and inclusionary processes (Brown, Tompkins and Adger, 2002; Mikalsen and Jentoft, 2001). Actors are graphically represented according to attributes of *Importance* and *Influence* determined from document analysis and key informant interviews. From here they are categorised into typologies: *Primary Stakeholders*, *Secondary Stakeholders*, *External Stakeholders* (see figure above).

To develop the tool further, ranking of stakeholder groups by local resource users was undertaken to indicate their perceptions on the *importance* and *influence* of themselves and other groups. The combination of document analysis, key informant interviews and questionnaire survey ranking allows for an interesting comparison of actors that are officially sanctioned through acknowledgement in management documents and those recognised by the local resource users in practice. The following table highlights the methodological techniques employed in this research.

Technique	Sample	Data collected
Document Analysis		Historical Background Policy and Legal Documentation Management Plans Research Reports Association Constitutions
Questionnaire Survey	173 8 landing sites 30% of individuals per landing site	Socio-cultural Backgrounds Perceptions on Inclusion in and Effects of Decision-making processes. Note, beach operator data not differentiated by location or enterprise due to relatively small sample size
Key-informant Interviews (English)	60 Top management and ground staff. Management organizations, Research organizations, NGOs, Donors Resource user association leaders	Organisational structures and responsibilities, objectives, activities, relationships with other actors, perceptions on progress, perceptions on barriers to success
In-depth Interviews (Kiswahili)	58 10 landing sites Local resource users	Local level institutions, collective action, relationships with other actors, objectives, perceptions on management
Group Interviews (Kiswahili)	6 groups 5-10 individuals	Incorporated the views of female fish mongers at different landing sites. Beach operators included a selection of male and female respondents.
Participant Observation Passive & Active		Observation in meetings, seminars and other decision-making forums where possible. Interviews also collected information on past interactions in such forums. Participation in some resource user activities including spear fishing, line and trap fishing, and beach seine fishing as well as observation along beaches of beach operators – tourist – government interactions.

Table 1: Summary of the methodological techniques employed to collect data

For the majority of the issues raised in the questionnaire survey respondents were asked to priority rank the options in order of importance / relevance from 1 – 5 (1 most important…5 5th most important). Respondents were not required to use all the rank numbers nor were they required to rank higher than 5. In instances where options were identified as being of equal importance they were assigned the same rank number and any subsequently ranked options were ranked to account for the tie. Respondents were read all the question options before being asked to rank so they could consider their prioritisation of issues (where this condition was not met questionnaires were disqualified). Prioritisation of issues was thought appropriate in light of the necessity for trade-offs in decision-making for resource governance and MPA management. A technique adapted from risk mapping is utilised to represent the priority ranked data. Risk mapping or participatory risk mapping is a technique that has been applied by Quinn *et al.*, (2003) and Smith, Barrett and Box (2000) to attend to *prioritised*

ranking data concerning local perceptions of risks to livelihoods. The technique facilitates the presentation of data on the relative importance of perceived issues identified by actors. Respondents are requested to rank a number of options given per question (options determined in preliminary key informant interviews). The proportion of respondents that rank/identify a particular issue is calculated into an *incidence index* (i) ranging from 0-1 (not ranked - ranked by all). The ranked order (1-5) is computed into a *severity index* (s) that is tallied to a scale of 1-2 (most important – least important) using the following equation:

$$Sj = 1 + (r-1) / (n-1)$$

Sj = Severity index value for issue j

r = rank order

n = total number of issues/options

The mean value of Sj can then be calculated for the subset of respondents who identified with a particular option. For each option ranked a risk map can be produced by graphically plotting the *incidence* and *severity* indices. Finally, a *risk index* (priority index for our purposes) can also be calculated from the *incidence* and *severity* values. The priority index ranges from 0-1 (no relevance – most serious relevance) and is calculated as follows:

$$Rj = Ij / Sj$$

This allows for proportional comparisons of issue relevance differentiated according to relevant subsets of respondents. This technique is appropriate for this research as it provides a tool for presentation and comparison of subjective data on respondents' perceptions.

Transcriptions of key-informant and in-depth interviews and notes on group interviews and observed events and interactions provide the primary source of data for this research. Qualitative, narrative techniques are considered highly suitable for research into the intricacies of attitudes / perceptions, intentions and behaviour (Lepp and Holland, 2006; Kuriyan, 2002; Shanahan *et al*., 1999).

Analysis categories were created with the questionnaire data in order to facilitate intra-group differentiation of responses for all the different types of data. There is no less than approximately 10% of total sample representation within each analysis category distinction. Three primary analysis categories were delineated: Governance category - individual landing sites are grouped into representative governance categories: *Park* (Kenyatta), *Reserve* (Marina, Msanakani, Nyali), *Traditional* (Mwaepe, Mvuleni, Mwanyaza) and *Gazi* (larger scale, diversity of fisher nationalities and gears). Gear category - delineated here as Beach seine, Speargun, Traditional (basket trap, fishing line), Nets (gill nets, cast nets) and Ring net; Experience/Age categories - age and/or the number of years of experience of local resource users may influence their perceptions on certain issues. Expertise is not a direct reflection of age and therefore both categories are tested for relevance in explaining intra-group differences.

STAKEHOLDER ANALYSES

Management Agency Perspective

The multi-level actors whose potential actions impact on the social-ecological system are identified below - positioned according to attributes of *importance* and *influence* as interpreted by the author from official management documents and key informant interviews.

Figure 2: Stakeholder analysis revealing officially recognised positioning of stakeholders Importance *and* Influence *as interpreted by the researcher from document analysis and key informant interviews.*

PRIMARY STAKEHOLDERS

1. Fisher Groups and Associations
2. Migrant Fishermen
3. Mombasa Boat Owners Association (MBOA)
4. Women traders (Mama Karangas)
5. Dealers (Tajiri), gear owners
6. Curio Dealers
7. Local Safari Sellers
8. Other beach operator groups (tube operators etc)
9. Unlicensed beach operators
10. Hotels & associated Watersports Operators
11. Diani-Chale Mgt Trust (DCMT) **(only in DCMA)**

SECONDARY STAKEHOLDERS

12. Kenya Wildlife Service (KWS) **(only in MMNP & R)**
13. Kenya Fisheries Department (KFD)
14. Kenya Marine and Fisheries Research Institute
15. Coast Development Authority (CDA)
16. Tourism Department
17. Tourism police Unit (TPU)
18. National Environmental Mgt Authority
19. Provincial / District / Municipal Council

EXTERNAL STAKEHOLDERS

20. Wildlife Conservation Society (WCS) / Coral Reef Conservation Programme (CRCP)
21. Coral Reef Degradation in the Indian Ocean (CORDIO)
22. PACT Kenya
23. Kenya Marine Forum (KMF)
24. Kenya Association for Hoteliers and Caterers (KAHC)
25. Kenya Association of Tour Operators (KATO)
26. Kenya Association of Tour Agencies (KATA)
27. Eco-ethics International Union Kenya Chapter (EEIU)
28. International Union for Conservation (IUCN)
29. United Nations Environment Programme (UNEP)

As is typical of historically top-down resource management initiatives in developing countries, local resource user groups are predominantly confined to the primary stakeholder group. Whilst many of these groups (fisher associations, beach operator groups and hoteliers) are impacted highly by decisions concerning marine resource and MPA management, their levels of influence do not reflect their positions of importance. Primary stakeholder groups associated with the tourism industry (beach operators (*3,6,7), hoteliers (*10)) experience slightly higher levels of influence relative to fisher associations (*1) whose members are excluded from marine parks and who are associated with a relatively less prosperous artisanal coastal fishery. Actors that are excluded from resource-user group associations, such as unregistered/illegal beach operators (*9) or women fish mongers (*4) and migrant fishermen (*2), are positioned poorly in terms of both importance and influence due to management agencies' necessity for organisation and the dismissal of the rights of individuals. Beyond resource-user associations, representative local-stakeholder organisations are also categorised here as primary stakeholders. Whilst acknowledged in management documents as stakeholders, these representative organisations do not currently exercise high levels of influence over decision-making processes. They are, however, relatively important in that they can legitimise the interactions between government agencies and other primary stakeholders. The case of the Diani-Chale Management Trust (DCMT) founded as a community-based stakeholder organisation to pilot collaborative management of coastal resources along Diani-Chale is the most pertinent example for this research. In Mombasa, through Integrated Coastal Area Management initiatives, the Coast Development Authority is attempting to replicate the DCMT model (Wainaina, ICAM, n.d.).

Government agencies make up most of the secondary stakeholder group. They exercise most influence in decision-making and by association recognise themselves as among the most important stakeholders. Here, secondary stakeholders are positioned in the context of MPA management, recognising the integration of Kenya's MPA systems in wider fisheries management, tourism development and Integrated Coastal Area Management (ICAM) schemes. The Kenya Wildlife Service (KWS) as the primary management agency responsible for the governance of Kenya's MPAs, maintain the dominant role in the management of MMNP & R. However, they were prevented from establishing active management of the Diani-Chale Marine National Reserve following heated rebellion by the local resource users in the mid 1990s. Even within MMNP & R, the legislation that supports KWS is not sufficient for regulation of the reserve area nor the beaches adjacent to the park-reserve complex, hence the involvement of a plethora of other government agencies. The Kenya Fisheries Department (KFD) plays a role in governance of reserve areas in collaboration with KWS or, in the case of DCMA, instead of KWS. The Tourism Department supports KWS through the regulation of beaches and tourism related enterprises adjacent to

MPAs and beyond. Land use and land planning Ministries as well as Provincial, District and Municipal councils are also involved in environment-development issues along the coastal region to varying degrees. Beyond sectoral management, regionally, the Coast Development Authority (CDA) was created to promote integrated, long-range planning, co-ordination and implementation of development projects to exploit natural resources (Weru *et al*., 2000; Njuguna, 2001; ICAM, 2002). As such, CDA was nominated as the host institution for Integrated Coastal Area Management (McClanahan, Mwaguni and Muthiga, 2005; Njuguna, 2001). Pilot sites have been identified along the coast for experimental implementation of ICAM. Nyali-Bamburi-Shanzu area in Mombasa, incorporating the MPA, was initially selected to demonstrate a model public beach. Later, a fish landing site in Diani-Chale was selected to demonstrate a model fish landing site (CDA, KCMP, 2005). It is expected that the continuing ICAM experiences will be used to develop a National Coastal Zone Management Plan through the National Environmental Management Authority (NEMA).

External stakeholders, as those who can exert influence over decision-making, but whose welfare is not important, include research organisations (CRCP, CORDIO), donors (USAID, Eco-ethics), NGOs (PACT Kenya, KMF, IUCN, UNEP), and representative membership groups (KAHC, KATO) who can lobby, invest and provide research and information for change. These groups are recognised by the management agencies as stakeholders and are increasingly consulted in collective-choice decision instances, primarily concerned with 'problem-solving' through what the government package as multi-stakeholder, issue-driven "task-forces". Previously, neither sectoral departments nor external agencies cooperated in the management initiates of specific government agencies (Fisheries Policy, 2005). PACT Kenya and the Kenya Marine Forum (KMF) differ slightly from the majority of external stakeholders in that they are not independent, external organisations. Instead they are emerging through ICAM efforts aimed at designing coastal organisations for advocacy and capacity building to counter the dominance of government agency control of resource management. Both organisations are funded by USAID although their budgets and financial allocations are controlled by CDA[4].

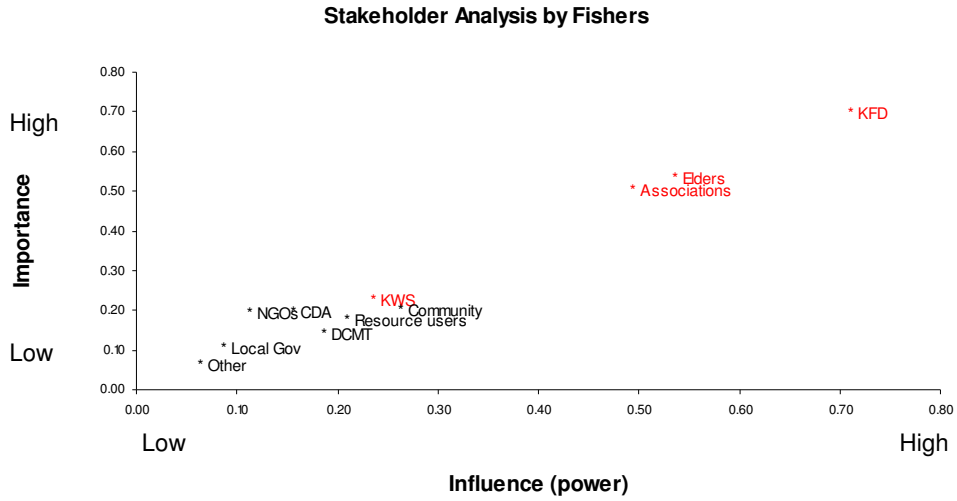
The primary, secondary and external stakeholders broadly represent different spatial scales of governance. Primary stakeholders are generally represented by basic resource units at the local level, although representative local-stakeholder groups, also primary stakeholders, function at the social-ecological system level (case-study level). Government agencies are primarily components of national Ministries with departments at the coastal scale. The only exception is the Coast Development Authority designed specifically to co-ordinate coastal issues. External stakeholders function primarily at the coastal scale with linkages at other regional (East Africa) and international scales. The external stakeholders play an important role in mediating coastal relationships between primary and secondary stakeholders, as well as facilitating international networks. However, they do not provide a strong connection to national level sources of power as they do not interact with government agency Ministries to the same extent as they do the regional department offices.

[4] In recognition of the change in Kenya's political climate since 2002 signalling the end of Daniel Arap Moi's single-party government to a multi-party democracy, USAID channel their aid support through Kenyan government agencies.

Grounded Stakeholder Analysis

Local resource user respondents were presented with two separate questions, one ranking the importance of different stakeholder groups and one ranking their power over resource governance. The priority index for each question was plotted as an axis in a combined stakeholder map (see below).

3a)



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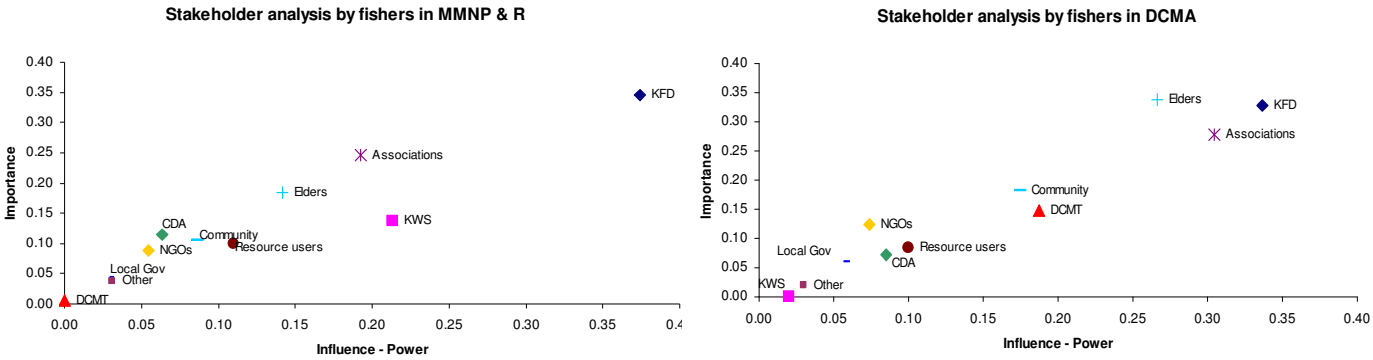

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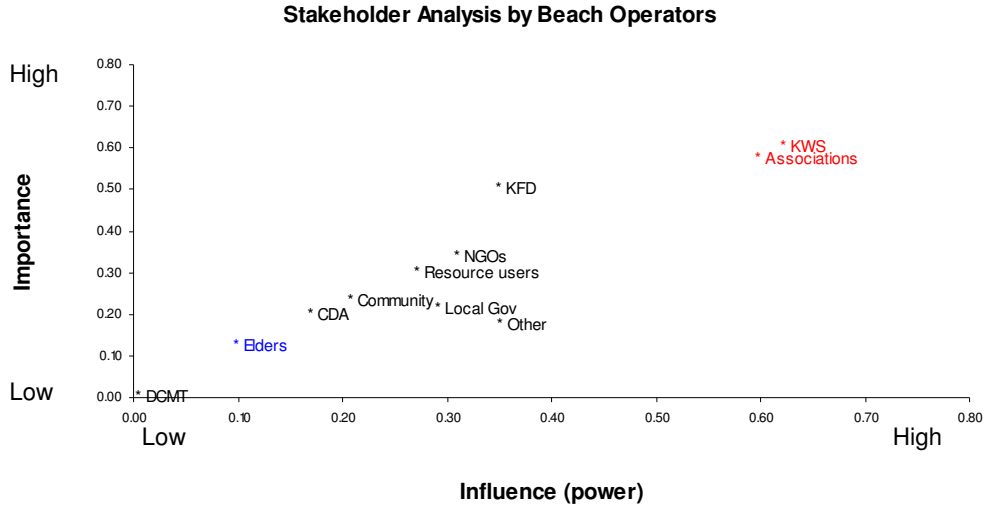


Figure 3: Ranked Importance *and* Influence *of stakeholders. 3a) by fishers, 3b) by fishers differentiated by case-study site and 3c) by beach operators. Scales represent the priority index.*

First, it is clear from figure 3a that the Kenya Fisheries Department (KFD) attains substantially more recognition than the Kenya Wildlife Service (KWS), Coast Development Authority (CDA) or local government in terms of both importance and influence according to fishers. Second, it is clear that, to fishers, their associations and their elders play a lead role for them in governance processes. These two local-level institutions are seemingly converging as association structures and social cohesion gain more recognition within official decision-making arenas.

Figure 3b differentiates between the case-study sites, highlighting the more prominent role for elders and associations in DCMA compared with MMNP & R. This reflects the more traditional nature of the majority of the landing sites in DCMA. It also emphasises the relative cohesion and autonomy that the fishers in DCMA vehemently defend against government intervention. As is expected, the KWS is more prominent in the analysis for MMNP & R, although it remains considerably less recognised than the Fisheries Department. This is in clear contrast to its position in the stakeholder analysis (figure two) representing management opinion. This may be because the ranking exercise, rather than reflecting perceptions on actual KWS influence or importance in decision-making, is itself a mechanism by which local fishers in MMNP & R are rejecting the authority and legitimacy of the KWS. From interview data, whilst the relationship between fishers and the KFD is certainly not without controversy, the KFD are viewed as the guardians of the fishers and are recognised, primarily, as advisors (Marina, May 05; Msanakani, May 05; Nyali May 05). When asked about the KWS, however, many fishers from MMNP & R stated that they “had no relationship, just troubles” with the KWS, (Marina Apr 06; Mar 06; Msanakani, May 05; Apr 06). The KWS ranks marginally more highly than local-level institutions (associations and elders) in terms of influence but substantially lower in terms of importance. Unsurprisingly, KWS ranks lowest for both importance and influence compared with any other stakeholders in DCMA confirming the ongoing rejection of KWS presence in this area. Instead, the DCMT and Community rank relatively highly in DCMA, a positive reflection of cohesion and ongoing efforts to encourage the emergence of collaborative management structures in the area in place of the rejected command-and-control KWS model.

What is surprising, overall, is the ranked position of NGOs in this analysis. Research organisations and NGOs play a central role in sharing knowledge and developing research, organisational and leadership capacity in the two case-study sites and they are expected to be better recognised. However, it may be that in this analysis the NGO option was not understood to represent these different organisations. Further, in the case of some NGOs and research organisations, particularly CRCP, many initiatives are channelled through the Fisheries Department, in order to perpetuate existing governance structures, rather than creating new ones. For this reason, the high recognition of the Fisheries Department may be, to some extent, a reflection of the importance and influence of NGO and research organisation activities, credited to the government agency through which they are channelled. Interview discussions compensate for the aggregation of external stakeholders in the ranking exercise.

The low level of recognition for CDA in terms of importance and influence is also unexpected in light of their role in channelling USAID funding under ICAM. There are several possible reasons for this. First, ICAM and related investments have only really targeted two out of the eight landing sites included in the questionnaire survey so, as an aggregate, their levels of recognition are likely to be diluted. Second, in interviews, fishers often cite USAID support as opposed to the ICAM initiative or CDA through which the support is channelled. Finally, there is some tension over the means by which CDA is handling and channelling USAID funding

due to a perceived lack of transparency and accountability. So, again the ranked position may be a case of respondents expressing a relative lack of support for this agency in both MMNP & R and DCMA.

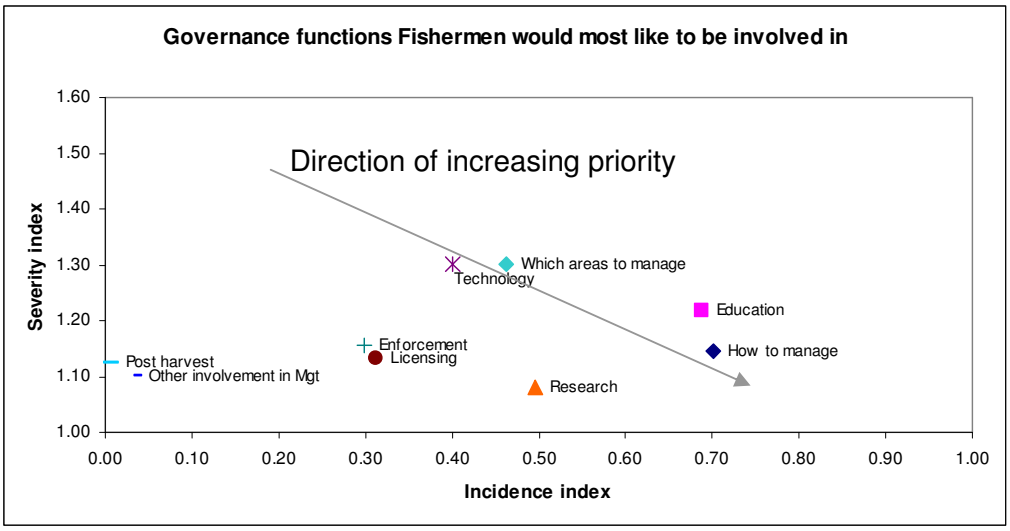
According to beach operator opinion portrayed in figure 3c (sample dominated by respondents from Mombasa), the KWS and beach operator associations dominate decision-making processes in terms of both importance and influence. Elders do not apparently play a significant role within institutions designed to regulate the tourism industry. CDA receives a low level of recognition in decision-making, again, despite some investments into infrastructure as part of ICAM.

These two stakeholder analyses (figures one and three) detail the divergence between official, management agency and grounded, local resource user opinion on the importance and influence of different actors in the coastal zone. These divergent interpretations of actor position are reflective of both historical top-down management structures that prioritise management agencies in decision-making as well as highlight a questioning of the legitimacy of these structures. It is acknowledged here that the stakeholder analyses techniques employed represent perceived stakeholder positions relative to each other not as absolute, fixed positions. However, as argued by Sen and Raakjaer-Nielson (1996) the role of user groups in decision-making processes is determined by their relative negotiating capabilities, knowledge and strengths vis-à-vis each other and government. Therefore, understanding the perceived relative positions of primary, secondary and external stakeholder is seen here as valid. These issues provide a foundation from which an institutional analysis of constraining and enabling governance structures for inclusion of actors in decision-making can proceed.

INCLUSION OF ACTORS IN DECISION-MAKING PROCESSES

Ownership, access, management and use of MPAs, fisheries, beaches and land is mediated by a matrix of operational rules, norms and strategies designed at the national-coastal (legislation, policy, ticketing/licensing, tenure rights) and local (traditional rules, association rules) levels. Many of these operational institutional structures as well as guiding resource governance can influence the level of inclusion of actors within the decision-making processes in which these institutions are designed, perpetuated and challenged. More directly, collective choice rules mediate inclusion by determining who, in what positions can change rules through which means within collective-choice decision-making arenas. The collective choice and operational rules, their enforcement characteristics, as well as the process of their design play an important role is determining actor perceptions of the legitimacy of these institutions and their implementing agencies and thereby these structures can mediate whether actors want to participate as much as whether they are able to. First, an assessment of local resource user perceptions on the decision-making opportunities they would most like to be involved in is presented. This helps to contextualise the appropriateness of opportunities developing at the coastal scale as well as highlights what factors should be addressed in developing local-level and SES-level capacity to participate. Second, the institutions and power relations functioning at the national-coastal scale designed and implemented primarily by secondary stakeholders are examined. Finally, the local-SES scale institutions created and maintained by primary stakeholders are explored. The discussion focuses on the constraints and opportunities afforded by these structures to inclusion of actors at different spatial and institutional scales.

4a)



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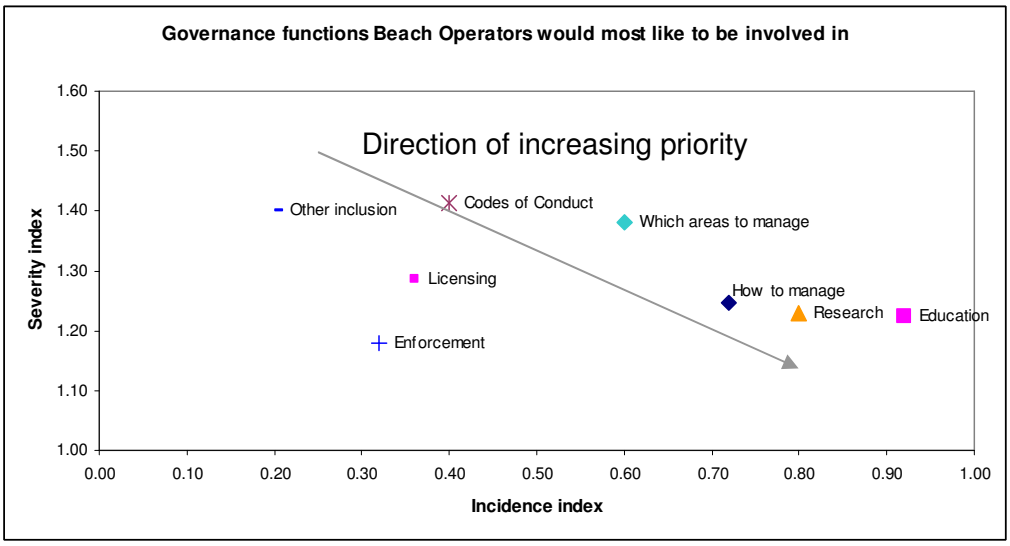

Figure 4: Governance functions that 4a) fishermen and 4b) beach operators would most like to be involved in. Incidence increases from 0-1. Severity is highest closest to 1. Priority index is I/S.

Local resource users were asked to rank the decisions they would most like to be involved in (see figures below). These figures differ from the stakeholder diagrams in that they plot incidence (increases from 0-1) against severity (highest closer to 1).

It is difficult to differentiate the importance of issues as ranked by fishermen in figure 4a as they differ in terms of incidence and severity. Looking at the priority index (incidence/severity) the prioritisation of issues becomes clearer. Overall fishermen would most like to be involved in decisions concerning 'How to manage', 'Education', 'Research' and 'Which areas to manage' before those concerned with regulation (Licensing and Enforcement). Beach operators rank 'Education', 'Research' and 'How to manage' most highly with Licensing and Enforcement, again, not a preferred area of interest for involvement. From this assessment it can be argued that all local resource users are relatively disinterested in involvement in

governance structures that are already designed by secondary stakeholders (such as licensing and enforcement). Instead they would prefer inclusion in instances that enable negotiation over development and planning of institutional structures for governance (how to manage, which areas to manage). For this reason the following discussion on institutions designed at the national-coastal scale will primarily focus on opportunities for involvement at this stage of governance. Issues of education and research are not addressed here, but in the next paper on ecological knowledge.

National-Coastal Institutional Structures

There are several movements to discuss here as informed by the data analysis process 1) the uncompromising control and command nature of MPA management; 2) the changing structures of other sectoral management (fisheries and tourism); 3) the inadequate/absent structures of land use regulation; 4) the overlapping initiatives of explicitly integrative management initiatives (ICAM, NEMA) and 5) the agendas of external stakeholders.

Inclusion in MPA Governance

It is the no-take park that resource users (in Mombasa) identify as affecting them the most. As is recognised by KWS themselves, communities and stakeholder groups were not satisfactorily consulted on introduction of MMNP & R in 1989 and they have had no role in management (Weru *et al*., 2000). This is confirmed by fisher testimony. Not only did this deny resource user groups the chance to express their views, concerns and indeed objections at the time, but it alienated local resource users from this entity now known as the 'Marine Park' which they continue to see as a foreign and/or government asset. Almost all fishermen interviewed stated that they see no benefit from the MPA and that it is for the tourists and the government. Ongoing involvement in management of such a foreign entity remains clouded by these first interactions (McClanahan, Mwaguni and Muthiga, 2005). The introduction of the marine park also imposed entry fees for boat operators and their vessels. Like other legislated operational rules, the entry fee requirements for MPA entry is a national standard and is gazetted in legal notices through parliament. Opportunities to negotiate over KWS legislation are non-existent at the local and coastal scale. Whilst a new Wildlife Policy and Bill has apparently been in progress for at least the last six years (Weru *et al*., 2000), there is no evidence at the local or coastal scale of involvement of different actors in this process, in contrast to other sectoral policy development, outlined below. Further, national level decisions, such as the doubling of marine park and reserve fees as of July 2006 (from $5 to $10) do not pass through a process of consultation at the coastal or local scale, providing no opportunity for debate over ongoing KWS policy and legislative decisions.

By the end of the 1990s there was a widespread (to national level) agreement that a more collaborative approach to the management of Kenya's MPAs was needed (Muthiga, N., May 05). For this reason and due to various weaknesses in the legislative and human resource abilities of KWS, *strategic partnerships* were instigated that purport to widen the diversity of stakeholders involved in MPA management including that of MMNP & R. The Wildlife Conservation and Management Act (1989) facilitates delegation by the Director of the KWS of duties to other Ministries and provisions for the drafting of Memorandum of Understanding (MoU) between KWS and other government departments or external organisations. Further, beyond legislation, the KWS use management plans to document mechanisms for regulating park (and reserve) access. Management plans (2000-2005) for all MPAs were apparently drafted with the involvement of stakeholders, elicited through workshops and meetings with

the park wardens. However, it is clear from KWS documentation and the above legislated provisions that, to the KWS, *stakeholders* are primarily restricted to other government agencies:

> *…given the legal status of the MPAs, the most outstanding stakeholders are KWS, KFD, KMFRI and the Tourism Ministry (KWS Management Plan, Weru et al., 2000).*

A KWS review of its own policy recognised that as an organisation the KWS is weak in community involvement, both in planning and implementation. The Wildlife Conservation and Management Act only goes as far as establishing the need for education and extension services to create public awareness of policies (1989, 3Ae). Similarly, the mission statement under the title of Community Participation in the 2000-2005 Management Plan for MMNP & R only establishes the need to "ensure information flow to stakeholders so that they are in a better position to understand management decisions". Further, I would argue that KWS planning is not institutionalised within the organisation, meaning that it is often down to individual management personnel initiative to attract funding and input for development of management documents. Currently, with a recent change in personnel, there is no-one seemingly in a position to review and develop a future management plan nor is there any apparent pressure to do so and by extension no opportunity is created for other actors - government agencies, NGOs, research organisation or resource users - to negotiate over planning processes and outcomes.

Where resource users or other local actors attempt to challenge KWS decisions such as park boundaries or entry fees, KWS simply defer conflict at the local-coastal level by diverting blame to headquarters in Nairobi, where many local resource users cannot easily visit and where they are not known.

> *They [KWS] say "the order is from the top, Nairobi, and nothing can be done at the provincial offices" (MBOA in reference to doubled park fees, May 06).*

In an attempt to dissipate antagonism towards its activities, the KWS involve itself in other sectoral and ICAM collaborative multi-stakeholder task forces or independent workshops initiated by external stakeholders and to some extent this appears to have reduced conflict at the scale of KWS presence. However, these instances do not specifically consider MPA governance.

As a consequence of these exclusionary planning processes it can be argued that the only means by which actors can challenge these structures is to reject them outright. MPA systems established between 1968 and 1989 achieved legal gazettement and implementation of model park-reserve systems, whilst MPAs initiated after 1989 have only managed to gazette Marine Reserves (Kiunga and DCNMR). In northern Kenya, the local government have retained ownership of the Kiunga reserve, whilst in DCMA active management associated with the presence of KWS was rejected outright. However, not only do these exclusionary structures undermine the legitimacy of the KWS as a management organisation but they also perpetuate suspicion over Marine Protected Areas as a viable management option as the two are seen to be intimately connected. This antagonism and suspicion is not restricted to the scale at which KWS are present, but has dispersed regionally and impacts on other attempts to implement community or collaborative ecological management of marine resources. For instance, in Vipingo where resource user groups are organising across landing sites to initiate their own conservation area (Kuruitu Community Conservation Area), suspicion and opposition by some resource users persists. Those in

objection suspect KWS involvement and the intention to introduce a 'Marine Park' to their area. The KWS-Marine Park spectre also impacts on other resource management initiatives as the perception is that the marine park is the instigator of other restrictions that are actually independent sectoral regulations. This is most obvious in DCMA where local actors remain suspicious of all external intervention:

> *In an area called Bamburi [park]…I speak with my friends…I get some people who are doing fishing, some are beach boys… They said "Take care. Ourselves we are suffering now. We are in a bad place now. We have to pay for everything in the beach, we pay to go fishing, we pay to go down to look for tourists, we have to pay for everything so you take care of your place"…That is why we are afraid (Mwaepe, Apr 06).*

Ten years after the conflict in DCMA between KWS and local stakeholders, many actors remain suspicious of all government initiatives, external organisations and researchers as well as distrusting some of their own institutions as a result (suspicion of DCMT and associations by younger fishers). KWS need to seriously reconsider the opportunities that their institutional structures provide to inclusion of actors in MPA planning. It is likely that these opportunities are closed to prevent dialogue over the lack of power-sharing and benefit-sharing characteristic of this organisation. Tompkins *et al*., (2002) suggest that this is a widespread constraint to inclusive management as regulatory authorities defend their authority and power against wider networks. It is only in areas where the KWS is absent, such as DCMA and Kuruitu where alternatives to top-down models of MPA and marine governance are emerging. Tompkins *et al*., (2002) confirm that top-down management strategies exclude and ignore alternative institutional arrangements that could facilitate co-management or collaborative institutions.

Inclusion in Sectoral Management

In terms of planning, both the Fisheries Department and the Tourism Department are amidst development of new national policies, encouraged by the ICAM secretariat, discussed below. In addition to the new policy the Fisheries Department is creating complementary Beach Management Unit Regulations (2005). To legitimise the process, the Fisheries Department invited many relevant stakeholder groups to review drafts of the policy and the BMU regulations within local, coastal and national meetings and workshops. Consultation of fishermen's representatives (along with other interested parties) and their participation in formal workshop discussions on fisheries policy was observed during fieldwork (2005-2006). Whilst the input from local fisher groups was limited to a number of pro-active individuals from a handful of landing sites, there was an attempt to consult with other representatives along the coast to co-ordinate their response to both draft documents as this opportunity was seen as a first in terms of inclusion in government planning over coastal resources. The recognition of the implications of the Fisheries Policy on fishers' livelihoods in the future and therefore the interest in participating in its drafting was a definite reflection of progress in terms of inclusive planning. A more formal Project Co-ordination Committee (PCC) was constructed to facilitate actor involvement in the development stages of the new National Tourism Policy. Involvement of national stakeholders such as the Kenyan Association of Hotel Keepers and Caterers (KAHC), government agencies and local level stakeholders (fishers, beach operators) has clearly worked to legitimise the process as is evidenced by widespread acceptance of the significant compromises suggested in the policy. Figure 4a, above, suggests that the inclusion of actors in fisheries and tourism policy development is relevant to the interests and expectations of local actors.

Structures designed to institutionalise inclusion of actors in ongoing planning are outlined in these policy documents. However they are openly contested through the inclusionary policy debate. The National Fisheries Policy advocates for the development of a multi-stakeholder Fisheries Board (KFDA), in which negotiated agreements are binding to the parties involved, and the establishment of Beach Management Units (BMUs) at select landing sites. There are ongoing concerns expressed about these structures. Local resource users question the representation within the proposed Board and its authority over key decisions with implications at the local level (neither fishers nor their associations are included as members). Whilst purporting to secure participation of fishers, it appears the multi-stakeholder board is intended to act upon the fishers as an extension of the Ministry of Fisheries, rather than act as a tool to institutionalise the inclusions of local actor at that level of decision-making. The Board purports to *partner* (not include) the BMUs. Yet, these emergent organisational structures are not yet established and have the potential to both constrain and enable better actor interaction in practice[5]. BMUs are designed to allow local BMU members, committees and leaders to design operational rules, in addition to those designated by KFD, to control access, management and use of the marine resources adjacent to the BMU landing site. Fisher groups are wary of taking on the responsibility of implementing BMU regulations as this transfers authority onto landing sites to self-impose fisheries gear and license regulations, many of which remain contested (through informal but coordinated processes of resistance rather than deliberative inclusionary processes). Further, questions have been asked as to why the Fisheries Department need to design such organisational units (ultimately under their control) rather than recognising and sanctioning the self-help groups, fishermen's associations and networks already established at most landing sites and occasionally across sites. Many fishermen's groups had rejected implementation of BMUs at the time of fieldwork completion and had demanded an extended period of consultation with the Fisheries Department before committing to these new structures.

The new Tourism Policy also purports the need for inclusive processes of decision-making and benefit sharing from tourism enterprises (National Tourism Policy, 2005: 33-34). However, the static participatory forums suggested by the policy to accomplish some level of ongoing inclusion are restricted to planning reviews, including an Implementation and Monitoring Committee to review policy implementation progress and an annual National Tourism Conference to review remedial actions. Neither of these forums is likely to be sensitive enough to be able to include and prioritise continuous, local, situated coastal issues.

One of the primary concerns for inclusive coastal governance, I would argue, is the segregation of national and coastal decision-making forums. Central governments can use a variety of strategies to hinder power-sharing and development of autonomous decision-making within decentralised structures (Ribot, Agrawal and Larson, 2006). In the case of changing sectoral management, national-coastal scale segregation of Ministries and departments constrains the establishment of more inclusive processes. Whilst local actor inclusion in national seminars was facilitated financially during processes of policy review it is the more informal and continuous interactions and understandings that are absent. It is not easy for a local resource user to abandon necessary daily livelihood endeavours to visit national headquarters or Ministries and powerful national actors rarely visit and integrate into coastal processes. This allows terrestrial tourism, terrestrial protected areas and inland

[5] See work on Beach Village Committees in African Lakes, e.g Allison and Mvula, 2002

fisheries to dominate government agendas. This is clear in current legislation and remains a factor in the newer policy frameworks presented for review at the coastal level.

Advocating for Tenure Rights

Government land can be held in trust for resource user groups by their respective Ministry. Through the ICAM multi-agency steering committee, KFD were encouraged to investigate, gazette and map fishers' landing beaches to initiate the process of securing land in trust for fishers. However, most government land along the coastal region has been privatised, including areas thought to be public/government land meaning little or no opportunity to secure tenure rights for local resource users. Indeed, it has recently been highlighted by fishermen that the portions of the Kenyatta Public Beach on which the fish landing site and the KWS camp are located have been sold by the Municipal Council to a private developer, meaning the area cannot be actualised and claimed by the fishermen and that both the fishermen and the KWS are effectively squatting. In DCMA the situation is similar with no landing sites holding title deeds to their areas. Mwaepe landing site, as a pilot site for ICAM, is the only area where an allotment letter is being sought by government agencies (CDA, KCMP, 2005). There appears to be a lot of deflection between government sectors over the issue with local resource users who are advocating for their tenure rights, being tossed between different Ministries and district / provincial level administration. Overall, there does not appear to be a comprehensive strategy for dealing with property rights (terrestrial or marine). The onus has instead been put onto the *wanainchi* (local people) to actualise or bring to attention their areas. Fishermen are expected to lead the process of surveying, mapping and securing ownership documents but often portions of what they consider to be their areas have already been 'grabbed'. This process has meant the marginalisation of fishermen from ancestral land and the loss of *mzimu* (spiritual sites), but also, the lack of title deeds for landing sites is a major constraint to infrastructure development by donor organisations in these areas (Kenyatta, May 05).

The lack of opportunity available to negotiate over tenure rights, exacerbated by exclusive and non-existent institutional structures, means a surge of local actor agency as latent power. This has been exercised by resource user groups in various ways. Some groups are rejecting all forms of resource management / external intervention (eg Mwakamba in DCMA) whilst others are drawing attention to themselves, politically, by 'illegally' closing off their areas to public access (eg. Kenyatta), or spatially, by clearing scrub around their sites (eg Marina). By closing off their area on a public holiday fishermen at Kenyatta were able to attract the attention of the District Officers and other political actors bringing them into dialogue at the local scale. It is often stated by local actors that opportunities to interact with such political figures through official routes is not possible without coercive tactics (graft) (MBOA, May 06). Fishers raise the issue of land tenure in any social interface they can, whether it be with the donor community, NGOs, research organisations or individuals in order to raise the profile of the issue and to garner support and influence over the process. Actors are also increasingly using other opportunities provided within sectoral decision-making forums to raise the issue of land tenure.

> *I have been trying to voice it up through the new Fisheries Policy, like we don't need a policy if we don't have the landing beaches (Kenyatta, Jun 06).*

Finally, some local actors are using conditional cooperation in new government initiatives, such as BMU initiatives, to demand attention to these issues, for which alternative decision-making spaces are not available:

I think this landing beach issue was raised and they came because we are trying to use this BMU like our weapon (Kenyatta, Apr 06)

Opportunities Created through Integrated Coastal Area Management

Integrated coastal area management was instigated by Kenya's commitment to international conventions, including Agenda 21 (1992) and the Arusha declaration (1993).

As the first initiative requiring formal input from a diverse section of stakeholder groups, ICAM is managed by a multi-agency decision-making body (mainly government agencies referred to as the 'institutional members'). Through support of PACT Kenya, a regional NGO, and the establishment of the Kenya Marine Forum (KMF) for advocacy, ICAM processes further assert the need for inclusive decision-making structures as well as the need for a powerful alternative to collaborative task forces dominated by government agencies. ICAM 'institutional members' plus Pact Kenya and KMF review the proposed yearly activities of the initiative (CDA, KCMP, 2005). It is only really in the implementation of service provision that primary stakeholders (local resource user groups and representative local-stakeholder groups) are involved in ICAM decision-making processes. The Coast Development Authority (CDA) continue to assert that local actor involvement is necessary to promote and encourage support, awareness and learning from the ICAM process without recognising the absence of local actors in the planning phases. Local actors are aware of their own exclusion from initial phases of decision-making, which has been a source of conflict in the Nyali-Bamburi-Shanzu area (McClanahan, Mwaguni and Muthiga, 2005). Further, inter-sectoral linkages and government agency participation in ICAM are arguably blurring lines of accountability. For instance, ICAM initiatives are facilitating small-scale development at pilot landing sites and beaches. KWS, the Fisheries Department and to some extent the Tourism Department (acknowledging the existence of a Tourist Trust Fund) co-operate in these initiatives and their public relations benefit by association. However, there is a distinct lack of fundraising activity or investment in the local scale originating from these sectoral agencies as a result.

The National Environmental Management Authority (NEMA) is due to adopt ICAM once its organisational and legislative structures are established. The Environmental Management and Co-ordination Act guiding NEMA, in addition, provides for the formalisation of decision-making committees at different levels of local administration, including Municipal, District and Provincial level through Development Committees and Environment Committees, among others. These decision-making forums are now (as of 2002) active although it is clear that the capacity of these decision-making bodies is somewhat undermined by past discrepancies and inadequate planning but also by past decisions taken at a municipal level (or so NEMA representatives attribute continued haphazard development to). It is expected that local resource user groups participate in these forums. However, whilst farmers and pastoralists, women and youths are specifically mentioned in the legislation guiding NEMA, fisherfolk and beach operators are not specifically documented as participants. Nevertheless, the availability of such decision-making forums has been communicated to local resource users through booklets developed through CDA (Matiru, Muthiga and Waweru, 2002). These forums provide official routes for negotiation on high priority issues. Yet, as highlighted above, primary stakeholders appear to be either unaware or excluded from such forums, hence the need to attract political attention to the local scale through attention seeking or resistance tactics or to perceive no space within Provincial, District of Municipal decision-making processes, as is the case with beach operators:

External Stakeholder Agendas

External stakeholders are included in some decision-making processes. In terms of MPA management this is restricted to seemingly apolitical issues such as research and monitoring and information dissemination. Within broader sectoral and ICAM initiatives external stakeholders are invited to participate in collaborative task forces (as information providers or donors) and within inclusive planning processes such as fisheries and tourism policy review. Some are also involved in planning for ICAM.

Many of the more informal opportunities for actor interactions, including those at the local level (landing sites) and broader collaborations (such as research seminars and conferences) are created and led by the external stakeholders themselves. Where they function at the local level, international NGOs such as IUCN (which has now exited from DCMA), World Wide Fund for Nature (WWF) and East African Wildlife Society (EAWLS) who are involved in a variety of coastal and marine conservation projects in Kenya, can provide key opportunities for empowerment, organisation and funding of local resource users and their activities. The external stakeholders working at the coastal level such as CORDIO, CRCP and PACT Kenya also provide important linkages to decision-making opportunities at different scales for local actors in terms of raising awareness through research, social exchange (visits to Tanga) and attracting aid and support. These stakeholders enjoy a relatively high level of legitimacy in the eyes of local actors. As such local resource user group issues are often channelled through external stakeholders to the more formal spaces within collaborative task force arenas. This can be seen to reflect Agrawal's (2005) proliferation of agencies of power as more actors become involved in resource governance. However, this can work to camouflage decision-making processes that are representative of primary stakeholders but not inclusive of them.

The interrelationships between primary and external stakeholders at the local, coastal and international levels are often mediated through secondary stakeholders. Such interception can function as an important mechanism for reaffirming existing institutional structures, which can play an important role in strengthening the position of coastal stakeholders in relation to central political powers as well as maintaining sustainability of institutions. In this vein, Ribot (2006) argues for conscious channeling of external resources through decentralized government institutions, particularly local government, in order to promote democratization processes. However, in some cases the channeling of interrelationships between primary and external stakeholders through secondary stakeholders constricts the potential of these spaces if they are tainted by government self-interest and suspicion of government agencies on the part of local actors. By collaborating with external stakeholders, government agencies benefit from trust relationships built through research, capacity building and investment activities but without providing these services themselves. Ribot (1999) confirms that participatory efforts often garner legitimacy through non-state authorities. Finally, it is recognised that where international-local linkages are channelled through national or regional stakeholders, such as government agencies or NGOs, particularly in the case of financial support, the international components can impose constraints by establishing conditions such as project cycles, budgetary reports, progress reports and such like that limit resources available for inclusive planning processes in practice (Tompkins *et al.*, 2002).

This section has explored the available and absent opportunities for negotiation by different actors - primary, secondary and external stakeholders – within decision-making for governance of MPA, fisheries, tourism, land tenure and ICAM. The introduction of ICAM and the associated promotion of multi-stakeholder decision-making forums, often restricted to

government agencies and external stakeholders but in some instances, such as sectoral policy development, incorporating local resource user groups, has had a significant influence on formal decision-making for planning. This process was in the past sectorally divided and exclusionary. In stark contrast is the absence of opportunity for actor negotiation over MPA management at the coastal and local scales. KWS legislation and policy do not seem to be updating in line with other sectoral and integrated initiatives. Further, past and present confusion over land tenure planning, regulation and enforcement, inconsistent development legislation within different government agencies and the lack of an overriding authority for coastal development mean that there are no apparent opportunities for resource users to debate over and secure their landing sites as most coastal land has been privatised. The inclusion of actors within local-level processes of decision-making is now examined.

Local-SES Institutional Architecture

When asked whether they felt included in decision-making, out of the small majority of fishermen that answered 'yes' (53%), the vast majority referred to local level processes concentrated around fish landing sites and fisher associations (69%). Overall, 26 percent of fishermen identified their involvement as participation in regional initiatives such as research, seminars and workshops. These figures are only used here to signify the relative importance of the local level as a decision-making arena (landing sites and associations) for fishermen, not to criticise the level of involvement in regional initiatives. It is difficult to judge whether 26 percent is a poor, moderate or good level of representation at higher scales.

There was no significant association between any analysis category (governance, location, gear) and perceptions on inclusion in decision-making with the exception of the broad age categories (p=0.013) (see the table below).

		Inclusion in Management		Total % (N)
		Yes	No	
Age category 1	0-49	49	51	100% (119)
	50+	76	24	100% (25)

*Table 2. Age category*inclusion in management crosstabulation.*

Fishermen over 50 yrs appear to perceive greater inclusion in decision-making most probably reflecting their role as elders, leaders and possibly fishing experts within their communities and landing sites. This stresses the dominance of local scale processes in fishermen's interactions with others. Beach operators perceiving they were included in decision-making were in the majority (68%). Inclusion for beach operators refers to participation in association meetings and beach clean-up exercises with no reference to regional meetings or workshops. The institutions that structure and legitimise collective

action at the local level are outlined here with a concern for constraints and opportunities for inclusion of different actors at different scales.

Fish landing sites (*bandari*) are considered, here, as the lowest level of organisation at which decision-making interactions for marine resource governance occur (McClanahan, Mwaguni and Muthiga, 2005). It is at this level that fisher groups establish consensus and conflict among themselves and with other stakeholders, so determining the nature of their collective action. Access to the landing site is taken here as reflecting inclusion in a decision-making arena where negotiations over issues such as gear, good fishing behaviour, where and what to fish or not, the environment, politics, and communal participation in external initiatives take place, among many other things.

For a local individual, coming from a proximal village and being recognised as a fisher, trader or fish monger in the area entitles access to specific landing sites. In areas where the communities are not so directly tied to an associated landing site, such as in Mombasa, a fisher is generally required to know a contact at the landing site to gain an introduction and access (Msanakani, Apr 06). Visiting Kenyan and foreign fishermen are also expected to function as members of a landing site for the duration of their visit in order to promote trade, facilitate the collection of an 'anchor' fee (*ubani*) and to enable monitoring of fisher behaviour (gear, personality) by local fishers (Nyali, May 05; Chale, Apr 06). Visiting fishermen must gain permission to conduct their daily activities through that specific landing site. Individual landing sites choose to accept or decline the inclusion of these fishers depending on the gears they use. Landing site activities are generally co-ordinated by traditional leaders (*Kaya* Elders / *Bandari* chairmen) who have inherited their positions along with the knowledge of traditional regulations and practices and the authority to mediate fisher conflicts (see Glaesel, 1997, 2000; McClanahan *et al*., 1997 for details). Many of the traditional institutions are no longer in practice (Glaesel, 1997) although the role of elders as *bandari* leaders continues often in partnership with newer association structures. It is the elders who are approached by visiting fishermen who seek permission to fish in a certain area.

Landing sites that are founded on and dominated by beach seine crews are an exception. These landing sites (Msanakani, Nyali and Marina) are not co-ordinated through the institutions of the elders but by those of boat captains. Access to these landing sites for fishers is through introduction, as outlined above, however, the regulations imposed on landing site participants and their role in *bandari*-level decision-making is slightly different. Boat captains are often the Tanzanian/Pemban gear owners but can be local expert fishermen that have been nominated by the gear owners. As these crew work as a team of up to 35 fishers using one canoe and one net, the role of the captain is to discipline the fishers, designate the fishing area and time, mediate fisher conflict and manage the distribution of payment on a daily basis (Msanakani, Apr 06). Gear owners (whether captains or not) also play a role in determining collective action of these fisher communities. Importantly, fishermen often cite the gear owners as being the actors most adverse to gear change:

> *We can only improve by changing the gears. Fishermen want to change. The owners are not interested in changing (Nyali, May 05).*

Interview data suggest that decisions over gear choice are essentially done on an individual basis, influenced by exposure, experience (what you were taught on and what you are used to using) and capital (whether you can afford to invest in your gear of choice). However, the *bandari* culture, leadership and gear norms in which an individual fisher is situated also plays a central role in justifying their decisions. Further, it is at this level that collective conformance

to fisheries licensing is established or not. Often landing sites either reject (Chale, Apr 06) or conform to licensing requirements collectively (Nyali, May 05).

The next level of organisation is the fisher association. Following the collapse of unsuccessful cooperatives along the coastal region in the mid 1990s, the first units of organisation to resurrect developed in resistance to the implementation or attempted application of MPAs in Mombasa and DCMA, at separate times, and generally spanned different landing sites in each area. More recently the establishment of registered groups at individual landing sites is promoted by external agents with support from government agencies. These associations are intended to function as democratic political models with relatively secure financial arrangements. Generally the associations are guided by elected chairmen, secretaries, treasurers and committee members (elected by association members) and institutionalised through the documentation of a written constitution (designed by members with the help of external agencies) that define roles, responsibilities and regulations, although these are not legally supported.

Access to landing sites and ecosystem resources is not conditional on fisher association membership and fishermen can chose not to join (Mvuleni, Mar 06). Association membership is more formal than landing site membership and requires the payment of registration and monthly subscription fees. In general, women fish mongers are not permitted to join these fisher associations. Further, migrant fishermen, where included at the landing site level, do not often join as they cannot sustain payment of year long monthly membership fees.

Whilst designed to enhance control of local resource users by government agencies and to promote integration, these local-level associations have functioned as a mechanism that allows resource user groups to collectively save and potentially attract external funding. Resource users cite their association as their primary means of working towards their own development, empowerment and autonomy. These fisher associations now provide the primary link between landing site actors and external agents (government agencies, NGOs, donors, research organisations) with access to landing sites generally granted by association leaders. Actors that participate in *in situ*, regional and national research, seminars and workshops are also generally selected from the association membership as opposed to the fish landing site as a whole. However, investment into the landing site, whilst under the aegis of the association generally benefits all the landing site fishermen, traders and fish mongers. Project proposals for attracting aid, designed by association committees, state that the benefits of investment will accrue to all members, traders and fish mongers (e.g. Msanakani Project Proposal, 2006, 3). Similarly, fisher associations purport to represent the entire *bandari* in meetings at the coastal scale.

A point to note here is that whilst these institutional structures may provide space for inclusion of actors this does not ensure that actors will participate. In essence, one of the primary means of rejecting current structures is to resist perpetuating them. At the most local level it is clear that the establishment of fisher associations is not without contest. There are several reasons given for non-inclusion by local actors. One of the main barriers appears to be founded on negative experiences of past co-operatives. Another is based on a chasm between the perspectives of elders and younger fishermen on the objectives of the groups. Younger fishermen, in some areas, reject what they perceive as organisations controlled by elders and open to co-option by government:

> *The young boys think that the old people or the other people who are in the group are being cheated by the other people who are coming to work with them so that*

> *they can do the parks. They pretend that they know everything and cannot be cheated easily (Mvuleni, Mar 06).*

This provides a major constraint to the legitimacy and effectiveness of local-level institutions designed to govern the ecosystem. Younger fishers are most strongly associated with the speargun, a contested gear. They maintain a level of autonomy as fishers in order to protect their livelihood practice from control by their elders, associations and government but by doing so exclude themselves from other decision-making instances. Related to this, leadership roles in local-level associations, particularly those of fishers, are dominated by elder members of the fisher community meaning little opportunity for younger fishers to define the nature of these associations. Actors who are not included in local-level institutions (by choice or due to exclusive institutional structures) find it more difficult to access decision-making arenas at different geographical scales by developing cross-scale linkages (Tompkins *et al*., 2002). For instance women fish mongers who are excluded from the majority of fisher associations and who have not constructed institutional forms of their own are poorly recognised as stakeholders in official management documents (see figure one) and are less likely to be involved in cross-scale networking.

Whilst newer association structures have developed in response to external incentives, there is yet another layer of decision-making that arises from actual donor investment into new technologies at particular landing sites. Institutional structures are emerging to guide and legitimise collective use, maintenance and benefit from these technologies. These include organisational rules, norms and strategies determining leadership, crew constitution as well as determining benefit sharing and cost-saving mechanisms for maintenance and further investment. Different landing sites are handling these challenges in different ways as new actor interactions develop that differ from those structured by association institutions. The inclusive nature of these newer decision-making processes and the associated legitimacy of the operational institutions designed to structure technology usage, will increasingly impact on marine governance as infrastructure development and technology investment continue along the coast.

To work as a beach operator on high profile tourist beaches it is obligatory to be a member of the association relevant to your enterprise (boat owner, curio dealer, safari seller). In 2004, MBOA changed its name to Mombasa Boat Owners (rather than operators) Association in order to re-organise its members. Currently only those owning boats are members and they are required to pay an extensive registration fee, a monthly subscription and a fee for every trip they make. These members then employ staff (salesmen/captains) who are paid a fee as and when they obtain clients. Staff are not considered to be members of MBOA. Staff and members are required to obtain ID from MBOA and pay for the official shirt logo to differentiate themselves from unregistered boat operators. MBOA is also organised by area. Each beach has a committee of six representatives headed by an umbrella committee and MBOA chairman. The identification badges required by MBOA specify which branch/beach you belong to so limiting movement between areas. All boat operators attempt to obtain recognition as members/staff of MBOA as the harassment from the Tourist Police Unit (TPU) (and KWS), whilst allegedly extensive for members and staff is worse for unregistered boat operators. Curio sellers are also required to be vetted members of the Curio Sellers Association of their area, behave accordingly and wear colour-coded uniforms in order to access beaches and tourists at a particular site to which they are restricted.

Beach operator groups differ in five main ways to fisher associations. First, membership of these groups is compulsory if you are to gain (semi)sanctioned access to beaches and

enterprise. Fishermen can fish from a landing site without being a member of the association. Second, membership of beach operator groups is capped by the Tourism Department hence self-inclusion is not possible for many individuals. Fisher associations are generally open for recognised fishers at that landing site who wish to join. Third, beach operator associations have developed hierarchical structures within districts (Mombasa, Kwale (DCMA)) and regionally (coast region) to strengthen their position relative to government. Unfortunately, for fishers, locally-instigated, cross-scale organisations to structure collective action at the SES scale, such as associations that spanned landing sites, have been inadvertently undermined by external pressure to organise per landing site. SES scale and coastal scale networks remain weak for fishermen. Attempts to expand fisher networks for more co-ordinated collective action are observed but co-ordination of these networks is difficult and there is little support from secondary or external stakeholders. The Kenya Coast *Fishers* Development Association (KCFDA, distinct from the Fisheries Department's KFDA) is intended to represent Mombasa, Diani, Shimoni and elsewhere on the south coast through meetings of representatives to discuss fisherfolk perspectives on issues of national importance, such as Fisheries Policy. However, these institutions, developed purely by local actors, are not recognised in official documentation as a viable means of including local actors in decision-making. Instead government agencies prefer to utilise structures that they have been involved in developing yet these have difficulties with ownership and legitimacy. One exception is the DCMT as it is perceived to be both a local construction (developed in resistance to KWS presence in DCMA) and one sanctioned by external involvement (IUCN, CDA and PACT Kenya). The importance of coalitions of organisations at the grass-roots level in enabling political empowerment of resource users has been highlighted by Brown and Rosendo (2000). In contrast, the development of a representative local-stakeholder association in ICAM's Nyali-Bamburi-Shanzu is progressing slowly as it is purely a conceptualisation of CDA. Similarly, the BMU concept remains debated. Fourth, from interview data it appears that fishermen from different landing sites generally alternate who attends coastal-national meetings, seminars and workshops in addition to the landing site and association leaders. However, beach operators tend to be more strictly represented by their leadership (due to more hierarchical structures) with less opportunity for the general membership to participate in coastal, national and regional initiatives. Finally, it is obligatory for beach operators to attend and participate in committee/general meetings organised for their section of beach. These usually occur at a set time and place and non-attendance without prior apologies, according to the beach chairman, is "punished" with two-days off the beach. Fishermen are not obliged to attend their general meetings which tend to occur on a less regular basis (every 3 months) (committee meetings are generally held more regularly, every 2-4 weeks depending on the site). In the case of both fisher associations and beach operator associations, committee meetings generally sift in or out the topics for discussion at the general meetings.

The above section has outlined the institutional structures (designed at the local level) that mediate inclusion of fishers and beach operators at different scales of decision-making. The association is becoming increasingly powerful at the local-scale and provides both opportunities and constraints to local actors for inclusion depending on their positions vis-à-vis the association. Attention needs to be given, in particular, to the inclusion of younger fishermen, women, fish traders and dealers/gear owners in these organisations as inclusion in the association is the primary means of reaching higher levels of decision-making. Membership of Beach Management Units is intended to be obligatory (reflecting the structures of the government-designed beach operator associations) for all fisherfolk working from a specific landing site. However, obligatory membership removes the option for actors

to challenge such structures through non-compliance and undermines some of the possible controls on issues of accountability for instance.

CLOSING DISCUSSION

This paper has presented a stakeholder analysis to introduce the actors involved in marine governance of two social-ecological systems in Kenya and to indicate the nature of relations between different stakeholder groups. In particular the development of a grounded, ranked stakeholder analysis illuminates some key concerns for those involved in resource governance in practice. The most obvious concern, in this case, would be the apparent discrepancy between how the key management organisation, KWS, views itself, compared with how it is viewed by local actors impacted by its decisions. The paper then critiques the institutional architecture of governance as constructed by the different stakeholders. Institutional barriers and opportunities for inclusion of actors in decision-making are highlighted. Here, the discussion closes with an explicit focus on issues of power and legitimacy.

Power Dynamics

Where decision-making processes are seemingly inclusive of different actors it is important to question the extent to which this means opportunities are presented for meaningful negotiation and conflict resolution. For instance, sectoral planning processes are for the first time including a range of stakeholders from the coastal zone and yet the policy drafts to be reviewed are already written, the main agendas delineated and the discourse dominated by inland fisheries or terrestrial tourism. Further, local actors (and external stakeholders) perceived that their suggestions were not included into subsequent policy drafts suggesting that participation is being employed as a means of securing political support for plans and strategies pre-determined by government stakeholders. Where a variety of actors are included, the local, situated voice is not weighted and so their ability to influence decision-making does not reflect their level of importance as primary stakeholders. Rockloff and Lockie (2006) similarly observe that local stakeholder perceptions, as one of many stakeholder voices, are lost in the general consensus of decision-making arenas in which powerful government agency actors are also represented. Representation, capacity and democratisation (fairness of how decisions are made) have been identified as factors key to meaningful participation (Mascia, 2003; Mascarenhas and Scarce, 2004; Rockloff and Lockie, 2006). Interactions developing between local actors and government agencies within ICAM and sectoral fisheries and tourism policy development at least provide an opportunity for management agencies to monitor relations and understand the needs and expectations of the different actors they are trying to include.

Where decision-making processes do not present opportunities for inclusion of actors, such as MPA governance and land use planning as outlined above, the agency of actors becomes even more central as they must attempt to create their own spaces of decision-making. Local actors are exercising agency through various means to direct and create opportunities for negotiation. Local actors use a range of mechanisms to do so including co-opting spaces in deliberative inclusionary processes, such as fisheries / tourism policy debate, placing conditions on cooperation with government initiatives (old and new), complete resistance and rejection of all cross-scale linkages, and physically asserting their presence through informal

means (closing off 'public' areas, clearing scrub). However, this political turn is often restricted to particular areas and does not encompass all primary stakeholder groups. Many groups are inactive and continue to lament the absence of chances to be heard. Often, more powerful actors, with the confidence and experience of cross-scale networking are more likely to successfully challenge operational institutions in their interests where decision-making processes are absent or exclusionary. For instance, the hotels, through their representative organisations, rejected a programme of park management that was beneficial to the KWS and local resource users (Beach Management Programme, 1996), denying the KWS millions of shillings in park fees and local resource users the potential of a more secure livelihood.

Issues of process and subsequent power dynamics have implications for the legitimacy of decision-making and by extension, governance.

Legitimacy

Procedural fairness was conceptualised above as central to legitimacy - a concern with inclusion in governance processes as well as personal experiences with management authorities (Tyler 1990 in Raakjaer-Nielson, 2003; Jentoft, 2004; Lawrence, 1997). Legitimacy is important at many levels. Illegitimate exclusionary governance structures can directly and indirectly undermine organisations, institutional and management approaches within and beyond the scale of management (Garaway and Esteban, 2003). This can be a powerful and widespread factor in constraining the self-inclusion of actors in decision-making spaces that they perceive to be linked to illegitimate structures of governance. It is argued in this paper that the KWS model of resource management is undermining alternative processes on national, coastal and local scales to a considerable extent so constraining cross-scale networks and de-legitimising inclusionary governance processes as relations are strained by distrust and local actors opt out of participation.

Within more inclusionary structures, legitimacy of both process and product are important. Rockloff and Lockie (2006) warn that actor investment into inclusionary processes may be unsustainable without meaningful recognition of their knowledge, values and existence in decision-making outputs. On the other hand, many writers support the view that inclusionary decision-making is also about creating processes of understanding and interaction – relational qualities – as much as the outcome (Pahl-Wostle and Hare, 2004; Parkings and Mitchell, 2005). For instance, whilst the recommendations of the fisher representatives were not often evident in subsequent policy drafts, the inclusive nature of the process, particularly when compared to past approaches, was viewed positively as an opportunity for fishers to engage in wider debates whose outputs would affect them in the long-term.

In comparison to historical structures of decision-making along the Kenya coast, it could be argued that all processes are relatively more inclusive (excluding those for MPA management and land use), as government agencies now invite each other to participate in collaborative, issue-driven task forces. However, it is argued here that it is the *diversity* of actors (and by extension values and knowledges) included in decision-making processes that is core to ideas of legitimate and sustainable governance, as well as integrative and adaptive management as advocated by deliberative democratic and natural resource management proponents. This acknowledges the diversity of actors that can have an impact on complex social-ecological systems as policy-makers, researchers, managers, investors, mediators and resource users.

It is important to recognise that the potential benefits from the inclusion of actors can change over time as expectations and interests change. However the inclusion of actors in decision-making is seen here as the construction of opportunities for actors to express, negotiate over and define their needs and expectations allowing for a potentially more adaptable process of resource governance. For instance, the inclusion of fisher representatives in Fisheries policy debate provided an opportunity for fishers to document their wish to be represented in “any new institutions designed for coastal fisheries” (Fisher Response to Fisheries Policy Draft II, 2006).

Beyond a concern with legitimacy of governance, the implications of decision-making processes on ecosystem sustainability, resilience and integrity must also be considered in social-ecological system scale analyses. This is likely to complicate the argument as literature suggests that the KWS model of management is likely to be the most effective in terms of sustaining biomass, abundance, biodiversity, endemicity, key-stone species and ecological processes (McClanahan *et al*., 2006).

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Simulating the Evolution of Policy-Relevant Beliefs: Can Rational Learning Lead to Advocacy Coalitions?

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Abstract

Social networks within contentious policy systems often demonstrate a high degree of "belief homophily," such that policy actors tend to interact primarily with others who share their basic values, beliefs, and policy preferences. This paper uses agent-based modeling to explain how these network structures may arise as a function of biased versus rational learning processes. One theoretical approach, called the Advocacy Coalition Framework (ACF), asserts that these network structures arise because biased information processing causes learning to occur easily among like-minded individuals and breeds distrust among individuals who disagree on policy issues. On the other hand, an Institutional Analysis and Development (IAD) perspective suggests that these network structures may arise despite the assumption that policy actors are boundedly rational unbiased information processors. This would occur when institutional conditions create isolated community structures, causing consensus to emerge easily within communities but impeding the diffusion of competing ideas across communities. Simulations examine these competing assumptions of how policy actors learn. The results point to the tentative conclusion that actors do seem to be prone to some degree of biased information processing. However, a model of endogenous network formation is needed to more rigorously demonstrate the actual formation of networks around shared belief systems.

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Introduction

The design of successful governance institutions, especially at the local level, plays an important role in our efforts to achieve a sustainable future – one that maintains human well-being whilst preserving the integrity of environmental systems (Kates et al. 2001). Local governance institutions have the potential to overcome common pool resource dilemmas famously described in Hardin's (1968) well-cited *Tragedy of the Commons*. This is demonstrated in a growing literature (Ostrom 1990; Ostrom et al. 2002; Dietz, Ostrom and Stern 2003), and augurs well for our ability to design decision-making processes that facilitate both environmental and economic sustainability.

A common theme in this line of research is that successful decision-making processes should be designed to facilitate policy-oriented learning. "Learning" is here conceptualized as the process by which belief systems relevant to policy debates (many of them largely normative) diffuse across competing interests, levels of government, and professional communities. The success or failure of policy-making processes in promoting learning has a number of important implications for sustainability. Many of the conflicts that rage in environmental policy, for example, stem from underlying differences in values and basic policy preferences (Lackey 2006; Dietz, Stern and Rycroft 1989; Dietz 2001). When decision-making processes fail to promote consensus on key policy issues, ideological losers are apt to stalemate the system using whatever strategies are available to them – two widely-used strategies in the American case include litigation and venue-shopping. On the other hand, the successful learning of underlying values and beliefs can lead to a shared understanding of problems to be addressed and, eventually, to major and lasting policy change (Sabatier and Jenkins-Smith 1999).

This paper seeks to draw more attention to the issue of how and why policy elites learn by employing an agent-based model of belief change on a social network. This modeling exercise is motivated by a key hypothesis derived from the Advocacy Coalition Framework (ACF), a policy process framework that devotes a great deal of attention to beliefs and belief change. The ACF hypothesizes that biased learning processes lead to the formation of policy networks around shared systems of beliefs, leading to what Sabatier and Jenkins-Smith (1999) call "advocacy coalitions." Recent empirical work using cross-sectional survey data lends support to this hypothesis by showing that the structure of policy networks correlate well with shared belief systems (Weible and Sabatier 2005; Weible 2005).

These cross-sectional data, however, are insufficient to demonstrate that the ACF model of the individual – and hence the ACF model of learning – is correct. This is because learning is a dynamic process over time, and multiple learning processes may lead to the types of network structures predicted by the ACF. Agent-based modeling is a useful tool for exploring these dynamics because it allows a direct specification of learning processes. This paper will explore the consequences of learning under two competing frameworks – the ACF, and Ostrom's (2005) Institutional Analysis and Development (IAD) framework. IAD utilizes a model of the individual that is boundedly rational, and generally assumes that learning occurs relatively easily when actors are allowed to repeatedly interact. In these conditions, we expect to find that networked individuals tend to reach consensus over time. Ideological conflicts may persist in the aggregate, however, if groups of tightly networked actors lack institutional structures that allow them to interact and learn. The result would be network structures that look like advocacy coalitions, where shared ideology is strongly correlated with network cohesion.

Is it therefore possible that rational learning processes can lead to “advocacy coalitions,” or the types of networks predicted by the ACF? Under the ACF assumptions of biased learning, what potential role can institutional structures play in the promotion of successful learning and agreement in contentious policy debates? These questions drive the development and use of the agent-based model described here.

Theoretical Background

Any serious treatment of policy-oriented learning needs to deal first with clearly defining its terms. Although scholars have long recognized the importance of successful learning in effecting policy change, there are a number of inconsistencies in the way that learning has been conceptualized in the literature. Bennett and Howlett (1992) point out three critical ambiguities in the collective literature on policy learning: assumptions of what is learned, who learns, and the consequences of learning. I will elaborate my use of term by focusing on these three questions.

Who learns?

This research is focused on individual learning by “policy elites,” or people who spend a significant amount of time attempting to influence policy within a specific policy subsystem. Following Sabatier and Jenkins-Smith (1999), policy subsystems are defined by two key features: a substantive issue area, and a specific geographic scope. Thus, the policy realms defined respectively as “transportation and land use planning” and “policy making in Loudoun County, Virginia” do not qualify as proper policy subsystems. The two may be combined, however, to define a valid subsystem boundary: *transportation and land use planning in Loudoun County, Virginia*.

The definition of elites is loose by design. This is because one does not have to be a powerful bureaucrat or legislator to participate in policy-making processes, especially given the trend towards decision-making in pluralistic subsystems (Putnam, 1976; Parry, 1976). In a given policy subsystem, the ranks of policy elites may be filled by government officials, scientists, journalists, lobbyists, or even citizens-at-large who make a serious effort to influence policy outputs. Membership in a given subsystem’s elite is governed by two criteria: specialization and engagement. Specialization is critical because many policy issues are extremely complex. In order to make an impact, one must be familiar with the political landscape, the relevant institutional structures, and the nature of the good – knowledge that often requires some level of technical expertise. Engagement is then important because policy elites are more than just specialists; they also use their knowledge and expertise to make an impact on policy. Engagement may take a number of forms, ranging from active participation in decision making processes to the more “passive” dissemination of politically-relevant information.

Why is it important to make the distinction that policy elites are the subjects of learning, versus, for example, members of the lay public? The distinction is important to reconcile this study with a vast literature that has focused on the general psychology of learning. In some ways, learning by policy elites represents a special case. I elaborate on two special features of elite learning here.

First, the engagement of policy elites tells us that they are likely to exert more effort than most people in seeking out information and updating their beliefs accordingly. The idea that

individuals engage in substantive rationality – or an extensive, deliberate process of information-gathering to update their beliefs about the world – has come under heavy fire. Although many criticisms are well-deserved, we should be careful in generalizing these ideas to policy elites. Much of the political science literature on learning has focused on the how citizens are able to acquire the knowledge they need to make reasoned choices in the voting booth, even though most voters lack even a rudimentary knowledge of basic political facts (Converse 1964). The voting public normally has neither the time nor the incentives to engage in detailed searches for information about policy issues. They must therefore rely on other methods of political learning, such as searching for "knowledge" rather than "information" (Lupia and McCubbins 1998) or relying on shared mental models (Denzau and North 2000).

For elites who are heavily invested in their respective issue areas, however, more is at stake when one is wrong or uninformed. We therefore expect for elite learning to be driven by strong accuracy goals (Kunda 1999), such that they will seek out diverse opinions, accumulate technical knowledge, and carefully consider the consequences of various decisions. For elites involved in climate change policy, for example, the risks associated with ignoring or misusing scientific evidence is potentially far worse than it is for members of the lay public. This does not mean that members of the lay public cannot *become* informed; for elites, however, becoming well-informed is an important part of their job.

Second, the assumption that elites are specialists tells us that prior knowledge and beliefs should play an important role in subsequent learning processes. In policy debates, the purpose of information exchange is not to form brand new beliefs out of the ether. Rather, the exchange of information and ideas is meant to update what specialists already know, or think they know.

What is learned?

Empirical treatments of learning have appeared in the literature under a number of guises, and the object of learning often changes depending on the research questions being asked. It has been shown, for example, that a little bit of "cheap talk" can help participants of cooperative games build trust and learn norms of reciprocity, thereby improving policy outputs in common pool resource dilemmas (Ostrom 1998; Dietz 2005). From the environmental movement literature, it has been suggested that the acquisition (or learning) of beliefs that valued objects are threatened can lead to the support of environmental causes and can "activate" altruistic behavior (Stern et al. 1999).

In this paper, I view the objects of learning more broadly than just values or norms. The object of learning is here conceptualized as a set of "policy-relevant beliefs." These are ideas (to use a neutral term) that, taken together, guide understandings of problems within a particular subsystem and the policy instruments that are likely to solve these problems. Many of these "beliefs" include scientific understandings – an important part of learning is therefore a process of reducing the scientific uncertainty that confounds our ability to address complex problems. There is, however, much more to policy learning than reducing uncertainty through scientific research. This is because many policy-relevant beliefs lack a strong empirical component. In this case, the object of learning is not an objective scientific truth, but rather normative theories that guide an individual's most basic understanding of problems to be addressed and appropriate strategies (Sabatier and Jenkins-Smith 1999). For example, this may include beliefs such as liberalism versus conservatism, or the degree to which an individual is willing to make tradeoffs between environmental and economic sustainability.

The Advocacy Coalition Framework provides a useful method of defining policy-relevant beliefs for a particular policy subsystem. The ACF organizes beliefs into a three-tier hierarchy comprised of deep core beliefs, policy core beliefs, and secondary aspects. Deep core beliefs are broad normative values that act as a general guide for political behavior, and are normally applicable to a wide variety of policy subsystems. The policy core includes basic strategies and beliefs concerning a specialized policy area, and is usually subsystem-wide in scope. Secondary aspects include specific policy rules and preferences that are constrained by the policy core, and are more narrow in geographic scope than either deep core or policy core beliefs[1].

What are the consequences of learning?

Put simply, policy-oriented learning leads to belief change, and is therefore one avenue towards major policy change (Sabatier and Jenkins-Smith 1999). This is because learning leads to a convergence of ideologies regarding problems and solutions, and facilitates policy innovation. It should be noted, however, that lasting policy change is not necessarily conditional on successful learning; indeed, many methodological difficulties confound our ability to show that learning is both causally prior and a necessary condition for major policy change (Bennett and Howlett 1992).

The consequences of learning, however, are simply a factor that motivates this research. Suffice to say that the effective exchange of ideas and the increased agreement that accompanies learning is often, in of itself, a positive thing. Scholars and practitioners are increasingly sensitive to the importance of promoting successful learning. In regional planning efforts, for example, when stakeholders achieve shared meanings of a problem they "acquire a new power to act and accomplish," and become empowered to find mutually beneficial policy solutions (Booher and Innes 2002: 228).

Biased perception and the ACF approach to learning

The Advocacy Coalition Framework is largely concerned with belief change, and provides one of the more sophisticated treatments of learning in the policy process. The ACF views policy-relevant beliefs as being highly resistant to change in the face of contradictory evidence, leading to situations where "coalitions" of like-minded policy elites entrench themselves in ideological bunkers and talk past one another about scientific evidence.

This resistance to ideological change is explained by the ACF model of the individual, which assumes a process of "biased assimilation," whereby policy elites tend to interpret evidence in a way that supports their prior beliefs and values (Innes 1978; Lord, Ross, and Lepper 1979; Munro and Ditto 1997; Munro et al. 2002). This phenomenon is the most basic engine that drives coalition formation around shared beliefs. Since elites with shared beliefs have similar perceptual filters, information exchange, learning, and the development of common views occurs easily among them. Conversely, shared learning is exceedingly difficult between people with conflicting beliefs, since their perceptual filters will cause them to interpret the same piece of evidence differently. This breeds distrust among people with

[1] I try to remain faithful to the ACF convention of calling these policy-relevant "beliefs," although it should be noted that the usage of terms varies somewhat across literatures. I argue, for example, that values, attitudes, and certain types of norms also fit well into the ACF hierarchy of beliefs.

conflicting beliefs, and causes trust and collaboration networks to form among those with shared perceptual filters.

Thus, biased assimilation impacts learning processes in two ways. The first is that the ease with which two elites are able to learn from each other is directly related to their ideological similarity. To illustrate how this may play out in the real world, consider an environmentalist planner with a radical view on transportation improvements in his local city. He argues that transportation projects reducing travel times from outlying areas to the city center induce urban sprawl, and so the city should not invest in any improvements that increase capacity into the city – including mass transit. This person is closely involved in planning policy, and communicates with both environmental groups and developers. Both of these groups disagree, and present the same argument: the city *should* invest in mass transit, they argue, because growth is inevitable and the region needs to invest in strategies to avoid increased automobile dependence later. Although both groups present identical arguments to refute our hypothetical elite's prior beliefs, the ACF hypothesizes that he is more likely to be convinced by the environmental groups. Their prior similarity in beliefs and values causes learning to occur more easily when the information comes from environmentalists rather than developers.

Second, biased assimilation further constrains learning processes by influencing where policy elites go for information and to discuss policy issues. When individuals with conflicting core beliefs interpret the same piece of evidence differently, distrust tends to breed between them. This result is a belief homophily in the formation of policy networks; that is, elites will demonstrate a bias for forming network relationships with others whom they perceive to be ideologically similar. This effect is compounded by a "devil shift" phenomenon, which further inhibits the formation of ties across actors with competing ideologies (Sabatier et al. 1987).

Taken together, the ACF predicts two salient features of policy networks: a high degree of belief homophily (because biased assimilation and the devil shift have influenced endogenous network formation), and small variance in the policy-relevant beliefs held in each networked cluster of actors (because learning occurs easily within these clusters). The hypothesis that belief homophily is at work was demonstrated by Weible and Sabatier (2005) and Weible (2005), who looked at policy networks and belief systems within California Marine Protected Areas. They find that shared beliefs are a better predictor of network cohesion than the alternative, "rational" explanation that elites form networks to maximize their access to political resources (Weible 2005).[2]

IAD and the rational approach to learning

Another competing approach to learning is provided by Ostrom's (1999) Institutional Analysis and Development (IAD) framework. At the heart of this framework is a model of the individual that is rational, but only boundedly so. We can use this model of the individual to derive hypotheses of learning, although IAD does not devote much attention explicitly to the subject of how actors learn. Despite this, beliefs remain important from an IAD perspective. For example, Schlager (1995) derives a number of IAD hypotheses regarding the emergence of successful policy-making partnerships. These include: a common valuation of benefits received from a common good, a shared (low) discount rate, and a shared perception that a resource is under threat (Schlager 1995). This list was expanded somewhat by Sabatier et

[2] The extent to which shared beliefs correlate with network relationships is stronger for ally and coordination networks, however, than for information and advice networks (Weible and Sabatier 2005).

al. (2005) to identify belief homogeneity and low scientific uncertainty as additional factors contributing to the potential success of governance institutions. All of this points to ideological convergence as a critical factor in getting individuals to cooperate effectively in CPR dilemmas.

Ostrom (2005) also stresses the importance of shared mental models in improving the outcomes of interactions within an action arena. Mental models provide predictions about the nature and structure of an individual's environment, and shared mental models constitute ideologies (Denzau and North 2000). In other words, mental models are belief systems. Given the importance of shared mental models, how do actors come to adopt and agree on these common belief systems?

An IAD perspective maintains that this is accomplished through repeated interaction and face-to-face communication (Ostrom 2005: 107). The rationality of policy actors is captured by a desire to reduce uncertainty and use all information received – whether they like or dislike its content – to achieve this end. Unbiased information processing is crucial if one is to optimize an objective function given a scarcity of information. Because of this, the primary impediment to learning is having clear lines of communication between actors with disparate beliefs. Bringing conflicting interests and values to a common table where there is a free exchange of information can therefore "spark learning and change" (Dietz, Ostrom, and Stern 2004).

In the parlance of policy networks, learning and agreement among a group of elites should therefore be positively correlated two network features. These are network density (total number of interactions between subsystem actors) and the extent to which networks close "structural holes" (Burt 2004) by spanning diverse sets of stakeholders. In networks without structural holes, competing interests have opportunities to interact in a non-adversarial manner. For this reason, one of the main goals of collaborative policy-making efforts is to promote learning, agreement, and collaboration by introducing institutional structures that create policy networks spanning conflicting interests and fragmented authorities (Schneider et al. 2003).

The problem: Multiple pathways to advocacy coalitions?

The ACF identifies advocacy coalitions as groups of elites "from a wide variety of institutions who share policy core beliefs and coordinate their behavior in a variety of ways" (Sabatier and Jenkins-Smith 1999: 130). From an ACF perspective, subsystem policy networks should therefore appear highly clustered around shared belief systems. Policy networks should have as many dense clusters as there are advocacy coalitions, where linkages are dense within clusters are sparse between clusters. This type of network structure is drawn schematically in Figure 1, below. Two coalitions are represented, where red nodes and green nodes represent ideological competitors.

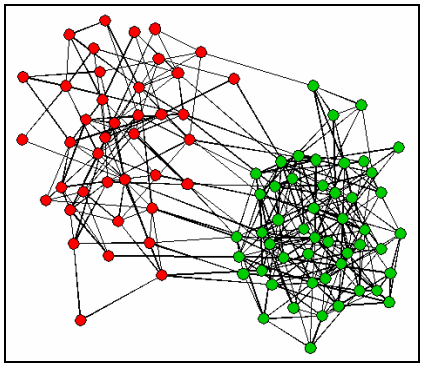


Figure 1: A hypothetical subsystem network with two advocacy coalitions

The ACF hypothesizes that this particular type of network structure arises primarily because of biased learning processes. But does IAD – and rational learning – provide an alternative explanation for how these network structures might arise? I propose that it does.

IAD would begin with the hypothesis that elites do not necessarily seek to interact exclusively with those whom share their core beliefs (Schlager 1995). Rather, institutions are the main driving force behind network formation. Legal mandates, for example, may require that certain groups or agencies interact on a regular basis, regardless of their underlying ideologies. Once networks exist and interaction takes place, learning is then hypothesized to occur easily.

The problem is that institutional structures often cause actors involved in policy subsystems to become clustered, so that a number of relatively segregated communities begin to emerge. If there are no institutions that promote interaction across these clusters, then ideas cannot diffuse across disconnected communities. Thus, we may find a situation where actors are able to reach ideological consensus within their own community, but ideological conflict persists in the subsystem as a whole.

This IAD pathway to advocacy coalitions is compared schematically with an ACF perspective in Figure 2, below. The bottom pathway illustrates an IAD perspective, where policy actors are assumed to be relatively indifferent about whom they interact with and learning occurs easily. The top pathway illustrates the ACF logic of coalition formation, where there are many opportunities to interact – beliefs are resistant to change, however, and policy elites prefer to interact with others who share their beliefs.

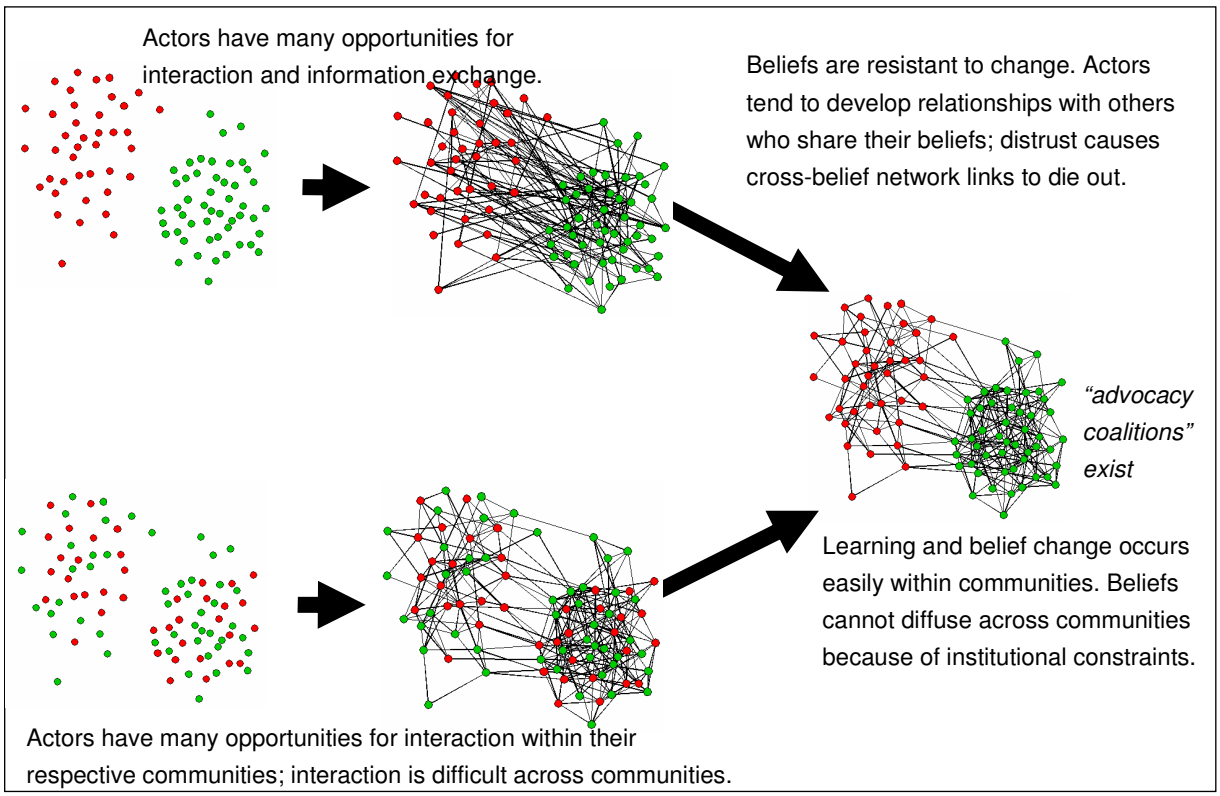


Figure 2: Alternative pathways to advocacy coalitions

This paper seeks to explore the dynamic implications of rational versus biased learning processes on the formation of networks that look like classic advocacy coalitions. Several questions drive the hypotheses to be tested here:

1. Under the IAD assumption that policy elites are rational learners, can institutional constrains lead to network structures that look like advocacy coalitions?

I hypothesize that, under the right institutional conditions, rational learning can lead to networks that are highly clustered around shared systems of beliefs. This is conditional, however, on elites having a large number of opportunities for interactions within their respective communities and relatively few opportunities for interaction across communities. This will lead to a situation where elites within groups will tend to reinforce each other's belief systems without being seriously challenged by competing ideas from other communities.

> *Hypothesis 1: The IAD model of the individual can lead to the formation of advocacy coalitions, but only if institutional constraints allow for frequent interactions within communities and limited interactions across communities.*

In addition to this, we also want to explore the consequences of biased assimilation – and the ACF model of the individual – on the development of ideological conflict in policy subsystems. If policy elites are prone to biased assimilation, then it is possible that institutional arrangements promoting interactions between competing groups can help lead to successful learning and agreement.

2. If policy elites are biased assimilators, then can institutions that promote networking across groups with competing beliefs lead to ideological convergence?

If elites are biased assimilators, then beliefs will become even more strongly reinforced within communities and even more difficult to diffuse across communities. The natural tendency will be for beliefs to become homogenous within groups and different across groups. If forums exist that promote cross-community interactions, however, then it is possible that ideas can diffuse successfully throughout the network even if elites remain resistant to changes their prior beliefs. Thus, I hypothesize that institutional structures promoting communication across otherwise isolated groups can lead to successful learning, agreement, and ideological convergence, even if biased assimilation is at work.

> Hypothesis 2: *The ACF model of the individual can lead to ideological convergence, but only if networks linking communities are dense.*

Methods

Overview of the model

The consequences of different behavioral assumptions of how learning occurs are explored via an agent-based model of learning occurring on a social network. This model was written and run using *R*, a statistical computing package (R Core Development Team 2006), and results were visualized using graphical utilities provided in the *R* social network analysis (sna) package (Butts 2006).

In the model developed here, hypothetical policy elites are allowed to interact and learn on a fixed social network. "Learning" is defined as change in an agent's beliefs, based on the beliefs of linked agents. The assumption here is that agents are involved in a continual process of discussion, persuasion, and adjustment of their own beliefs based on information received from their neighbors. The most important feature of this simulation is that learning processes are constrained by the underlying social network, which governs opportunities of agents to communicate and learn from one another.

Agent-based modeling has, in general, been improved by efforts to model interactions among agents as being constrained by underlying social networks, usually assumed to have a lattice structure (e.g., Axelrod 1997, Johnson and Huckfeldt 2005). Recent work has shown, however, that equilibrium conditions can change radically when different assumptions are made about underlying network structures (Ohtsuki et al. 2006). Thus, a key point of departure is to make a decision about what the underlying network should look like.

We start by assuming that policy actors (agents) have membership in one of two communities. There tends to be many opportunities for interaction within communities, and fewer opportunities for interaction across communities. Agents in different groups may find it difficult to interact, for example, because no forums exist that encourage effective interaction and information exchange. These communities may be thought of in a number of ways. For example, they may represent adjacent city or county governments, interest group communities, or professional communities such as scientists, agency bureaucrats, or legislators. A number of factors contribute to these relative ease of communication within these groups. One factor may be geographic proximity: dissimilar individuals who work in the same building often have more opportunities for interaction than similar individuals working on different towns. Another factor is institutional structures – in land use planning in the United States, for example, county and city governments often make planning decisions independently from neighboring regions. Yet another contributing factor may be personal

predispositions: scientists share many common experiences and problems, and so may find it easier to relate with one another. This would cause them to be biased in favor of interacting with other scientists.

Initial conditions: N, P, and bi

We begin by populating a subsystem with a fixed number of agents, *N*, each of whom is assigned to one of *P* communities, or "partitions." Communities need not have the same number of agents, but for simplicity the simulations described here always assume communities of equal sizes. In addition, these simulations always use P = 2 communities, and N = 100 agents (50 agents within each community). Agents are represented graphically as nodes, where the shape of their node (circle or triangle) indicates their community membership.

After the network is populated with agents, each agent is then assigned a belief score, bi. Belief scores may take on any value in the interval [-1, 1]. This range of possible belief scores allows us to do two things with agents. First, it allows us to specify an underlying orientation of beliefs: negative and positive values of b_i indicate competing orientations, whereas a belief score of zero indicates ambivalence. Second, assuming that b_i lies in a continuous interval allows us to specify an intensity of belief. An absolute value of b_i close to zero indicates that the ith agent is relatively moderate within their underlying orientation, while a value of b_i close to zero indicates a moderate belief. In the network diagrams, underlying belief orientation is symbolized by the coloring of nodes. Agents with negative belief scores are colored green, agents with positive belief scores are colored red, and neutral agents are colored black. The size of nodes represents agents' intensity of belief – large nodes indicate large absolute values of belief scores, whereas small nodes indicate belief scores close to zero.

Belief scores are randomly assigned to agents according to one of three distributions: normal, uniform, or bimodal. Each of these distributions represents a different assumption about the nature of elite beliefs within the subsystem. A normal distribution around mean zero, for example, would represent a situation where there is rough consensus; elites have yet to form very firm belief orientations one way or the other, although ideologues will exist in the network. A bimodal distribution indicates a situation where there is fairly intense conflict at the outset. A uniform distribution represents a situation where there is virtually no consensus in the aggregate; views are all over the place with some strongly held, and some ambivalent.

The preferred method for the simulations described here is to use a uniform distribution, so as to start with the largest possible variance in beliefs. In addition to this, however, we need to resolve a problem that is bound to arise. We should expect that, in densely connected network components, over time beliefs will converge to the initial mean belief score. In the IAD pathway to advocacy coalitions described above, beliefs in each partition have different points of convergence. Thus, we should expect that mean beliefs in each partition were different at the outset. If the entire population of agents is assigned beliefs from a given distribution, however, the initial mean belief within each community should be the same[3].

[3] This is speculation, however. This may also be a chaotic system where small differences are magnified over time.

To ensure that the communities of agents have different mean beliefs, I introduce an additional parameter called *partition bias*. Once agents have been randomly assigned a belief from the distribution for the entire population, they randomly shift their belief score towards a fixed score for their partition. The intensity of the belief shift is random (chosen from a uniform distribution), but the result is that we can construct different average belief scores across communities. These simulations always use a partition bias that causes the beliefs in the first partition (circles) to move towards +1 (red), and beliefs in the second partition (triangles) to move towards -1 (green).

The process of setting these initial conditions is described schematically in Figure 3, using all of the fixed input parameters utilized in the model runs reported in this paper.

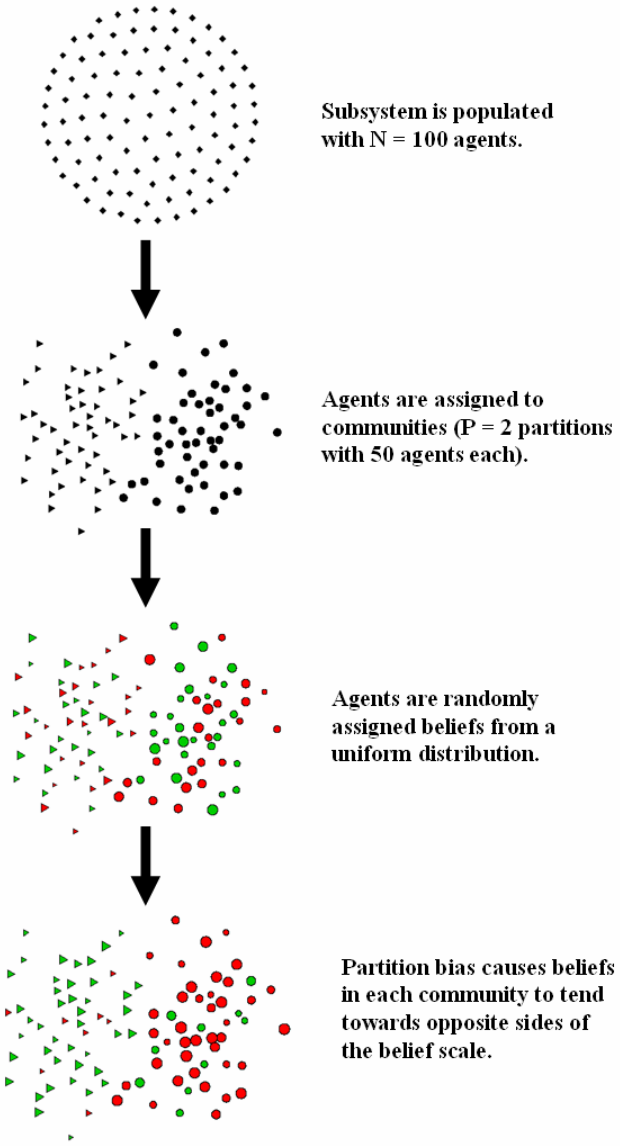
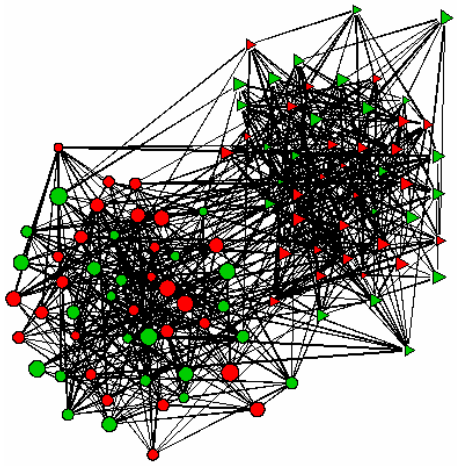


Figure 3: Setting initial conditions: N, P, bi, and partition bias

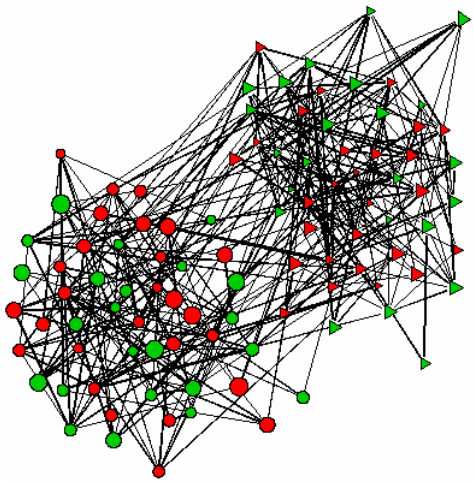
Initial conditions: in- and between-group probability

The next step in setting up the simulation is to specify how agents are connected. The network is populated with links as an Erdös-Renyi random graph (Newman 2003), where agents are connected in the network (and hence adjacent to one another) with a certain probability. To artificially construct a partition within the network between communities, we specify two types of probabilities. The first is the *in-group probability*, or the probability that, for each pair of agents within the same community, a link exists between them. The second is the *between-group probability*, or the probability that a link connects each pair of agents across communities. These probabilities are used as input parameters to the model, and govern the extent to which mixing is easy within groups but difficult across groups. Figure 4, below, illustrates some example initial conditions for the underlying social network on which agents will interact and learn.

Agents in each partition = 50; Within-group probability = 0.2; Between-group probability = 0.03



Agents in each partition = 50; Within-group probability = 0.1; Between-group probability = 0.03



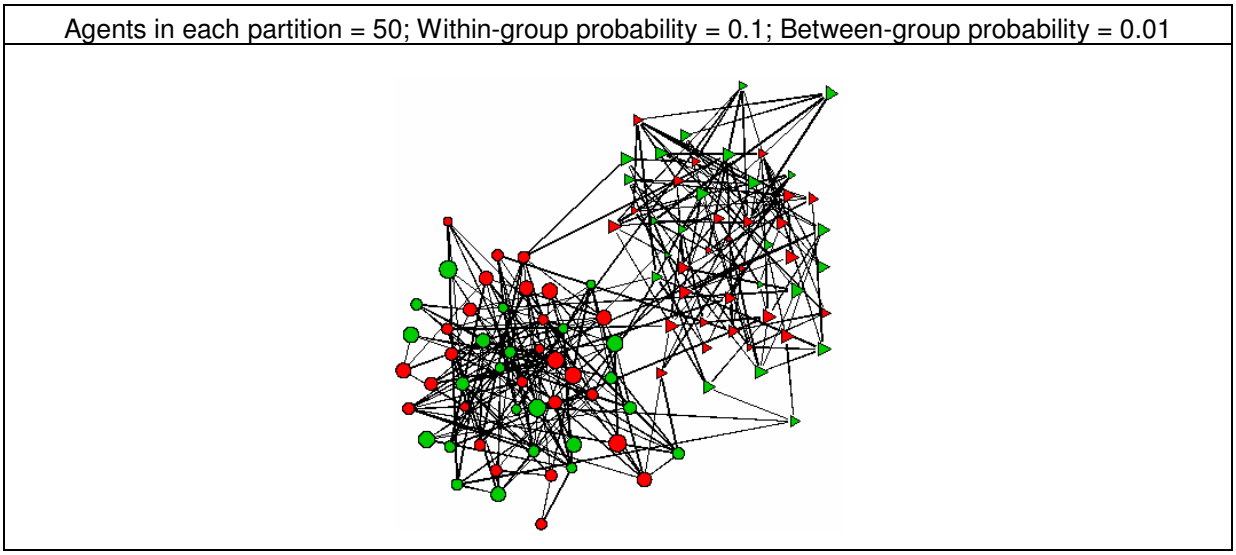


Figure 4: Three example initial conditions

Learning on the network

At each time step, all agents are given an opportunity to update their beliefs based on information received from adjacent agents. This is done sequentially, where agents are selected at random to learn from their neighbors until all agents have updated their beliefs. Thus, learning occurs at the level of egocentric networks[4]. When an agent is selected to learn, they become *ego* while adjacent agents (agents who have a link to ego) become *persuading agents*. Ego has *d* persuading agents, where *d* is the degree of ego's vertex, that is, the number of other agents with who ego has direct links.

[4] A previous version of this model assumed that learning occurs at the level of the dyad. That is, at each time step, pairs of agents were randomly selected to interact until all pairs of agents had interacted one time. This approach was problematic for two reasons. First, it lacked the realism of egocentric learning, since many agents will simultaneously interact with ego. Egocentric learning is also more consistent with prior work in this area (e.g., Johnson and Huckfeldt 2005). The second problem with dyadic learning is that, when biased assimilation was introduced into the model, the results were entirely deterministic: belief orientations never changed, and all agents' belief scores polarized to either +1 or -1.

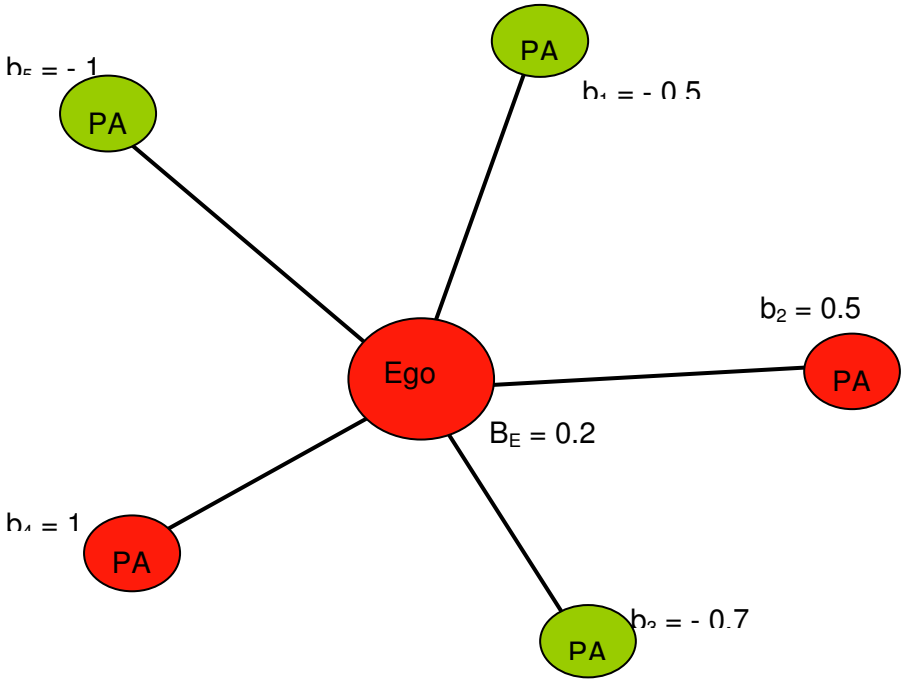


Figure 5: An example of ego interacting with d persuading agents

Before ego interacts with the *d* persuading agents, she has belief B_E. Each persuading agent simultaneously attempts to convince ego to update her beliefs to be in closer agreement with that of the persuader. Ego "learns" from all of these persuading agents by balancing the competing forces of persuasion and choosing an actual belief change, ΔBE.

In the example illustrated in Figure 5, ego is being persuaded by 5 actors, each of whom want ego to adopt their beliefs. While none of the persuading agents agree entirely with ego, two of them (PA_2 and PA_4) share ego's underlying belief orientation, since all of their belief scores are positive. The belief orientations of the other three persuading agents are in competition with ego's orientation. In this schematic, node size does not represent belief intensity.

In choosing ΔB_E, ego first determines the belief change that would best balance out the competing forces of the ideologically diverse persuading agents. If ego is a rational information processor, then this is done by simply averaging out the change in belief that each persuading agent is pressuring ego to undertake. Thus, in the rational case,

$$\Delta \mathrm{B_E}(\max) = \frac{\sum_{i=1}^{d} (b_i - B_E)}{d} . \qquad (1)$$

Ego does not, however, have a diffuse prior about the correct belief to adopt. Rather, these persuasive forces must also be balanced by ego's prior belief (B_E). We therefore assume that this "optimal" belief change (given the persuasive forces of ego's adjacent agents) represents an upper bound of change rather than an actual change to be undertaken. The next step taken by ego is to randomly choose an actual belief change ΔB_E that lies between zero and $\Delta B_E(max)$, inclusive. In the above example,

$$\Delta B_E(\max) = \frac{(-0.5-0.2)+(0.5-0.2)+(-0.7-0.2)+(1-0.2)+(-1-0.2)}{5}$$, or

$$\Delta B_E(\max) = \frac{(-0.7)+(0.3)+(-0.9)+(0.8)+(-1.2)}{5}$$, or

$$\Delta B_E(\max) = -0.34$$.

Thus, ego chooses a random actual belief change to adopt such that her new belief, B_E', lies somewhere between her initial belief B_E and the belief that averages out the competing persuasive forces, $B_E + \Delta B_E(max)$:

$$B_E' \in [B_E, B_E + \Delta B_E(\max)] = [0.2, -0.14]$$.

In this case, there is nearly a 50% chance that ego will shift her underlying belief orientation, from red to green. This is not only because a majority of her persuading agents have competing belief orientations, but also because she began with a fairly moderate belief score.

Incorporating biased assimilation

The above specification of learning processes assumes that each agent will give equal weight to the competing beliefs of all other adjacent agents. What if agents are susceptible to biased assimilation, as the ACF suggests? In this case, ego will give disproportionate weight to persuading agents who share her underlying belief orientation. Conversely, the arguments of persuading agents with competing orientations will be perceived as less influential, and will have a comparatively weak effect in ego's learning process.

To capture the effect of biased assimilation, we introduce a new model parameter called the *biased assimilation index*, denoted β. This index may take on any value between 0 and 1 (inclusive), and represents the strength of the biased assimilation effect. In the case of "rational" learning described above, $\beta = 0$. If ego gives no weight whatsoever to the arguments of persuading agents with competing belief orientations, then $\beta = 1$. If the biased assimilation index lies strictly between 0 and 1, then it is possible that an agent may be persuaded to change their underlying belief orientation (e.g., turn a red node green and vice versa), but this becomes more difficult as β gets closer to 1.

To incorporate the role of biased assimilation in the model, we can reformulate equation 1 into a more general form:

$$\Delta B_E(\max) = \frac{\sum_{i=1}^{d}(1-\beta_i)(b_i - B_E)}{d}, \qquad (2)$$

where $\beta_i = \beta$ if $b_i \cdot B_E < 0$,

and $\beta_i = 0$ if $b_i \cdot B_E \geq 0$.

Consider, once again, the ego from our example and her five persuading agents. How would we revise our estimates of her potential belief change if biased assimilation were at work? Suppose that $\beta = 0.2$. Then,

$$\Delta B_E(\max) = \frac{(0.8)(-0.7) + (1)(0.3) + (0.8)(-0.9) + (1)(0.8) + (0.8)(-1.2)}{5}$$, or

$$\Delta B_E(\max) = -0.228$$.

Thus, under biased assimilation, ego will choose

$$B_E^{'} \in [0.2, -0.028]$$.

The likelihood that ego will shift her underlying orientation from positive (red) to negative (green) is now very small, despite the fact that a majority of her persuading agents are green. Disproportionate weight has been given to the arguments of the red minority.

Simulation runs

The first question, whether advocacy coalitions may evolve in a network under an IAD hypothesis of learning, was explored by performing 1,100 simulation runs under $\beta = 0$. Simulations were run with various degrees of in-group and between-group probabilities. For each set of fixed initial conditions, five separate simulations were run to check the stability of equilibrium conditions.

These simulations were then run again, under four different assumptions of the strength of biased assimilation ($\beta = 0.2$, 0.4, 0.6, 0.8, and 1). Thus, an additional 5,500 simulations were run under the assumption the biased assimilation is a work. These simulation runs allow us to test for the strength of biased assimilation in overcoming institutional structures that would normally allow ideas to diffuse completely throughout the network.

Each simulation was run to convergence. “Convergence” is assumed to occur at time *t* if the maximum belief change (in absolute value terms) for any agent between time steps *t-1* and *t* does not exceed 0.005.

Summary statistics

Summarizing the results of complex simulations with multiple input parameters is difficult. Nonetheless, there are a number of key features of interest that we can use as a starting point to summarize the simulation results. What follows is a brief description of these features, and how they will be empirically identified in networks that have run to convergence.

Ideological rift. The primary result of interest is whether or not model runs with a given set of input parameters tend to produce network structures that look like advocacy coalitions. We are thus interested in the extent to which agents’ beliefs have converged to a state where beliefs are relatively similar within communities and different across communities. This ideological conflict across densely connected network clusters is captured by a statistic called “ideological rift.” In order for ideological rift to be positive, we must have a

convergence state where mean belief scores in each community are different, and there exists little or no overlap between agent belief scores across partitions.

Suppose that b_1 is the mean belief score for agents within the first community, and b_2 is the mean belief score for agents within the second community. The standard deviation of beliefs within each community is given by σ_1 and σ_2, respectively. Then,

$$\text{ideological rift} = \left|b_1 - b_2\right| - (\sigma_1 + \sigma_2). \qquad (3)$$

Ideological rift is a continuous measure that identifies the presence or absence of advocacy coalitions that follow community boundaries, and tells us the intensity of the aggregated ideological conflict[5].

Ideological consensus. An alternative to ideological conflict is a convergence state where roughly all agents share the same belief. The degree of ideological consensus that exists in the entire network is measured simply by the variance of all agents' beliefs. Variance scores approaching zero indicate ideological consensus, whereas increasing variance in beliefs indicate decreasing consensus.

This parameter may be summarized by ideological rift: when ideological rift is close to zero, the degree of ideological consensus in the network is high.

Ideological heterogeneity. When ideological rift is large, we have advocacy coalitions that match community boundaries. When ideological rift is close to zero, we have ideological consensus. When ideological rift is strongly negative, we have "ideological heterogeneity." This measures the extent to which *neither* consensus exists within the network, nor do advocacy coalitions exist. As noted above, this situation represents a state where there is significant overlap in beliefs across communities, but variance in beliefs across the network as a whole remains large.

Results

Convergence states under IAD

There is very little evidence to support Hypothesis 1 – that advocacy coalitions will arise under rational learning assumptions, even if between-group linkages are sparse. This is a surprising result. Almost all of the 1,100 simulation runs under $\beta = 0$ resulted in an equilibrium state where beliefs were moderate and relatively homogenous throughout the entire network. When communities begin with different mean beliefs and dense connections exist among agents in the same community, even a trivial number of linkages between these groups normally lead to full ideological convergence.

The expectation is that small between-group probabilities and relatively large in-group probabilities should have a significant and positive effect on ideological rift. These

[5] Ideological rift is positive, and hence advocacy coalitions exist, when there is no overlap within one standard deviation of the mean belief score in each partition. To see where the equation comes from, suppose that b_H is the larger mean belief score for the two communities, and b_L is the smaller mean belief score. The standard deviation of beliefs within each community is given by σ_H and σ_L, respectively, then
ideological rift = $(b_H - \sigma_H) - (b_L + \sigma_L) = (b_H - b_L) - (\sigma_H + \sigma_L) = | b_1 - b_2 | - (\sigma_1 + \sigma_2)$.

parameters appear insignificant, however. In an OLS regression of ideological rift on between- and in-group probability, no significant relationship is found[6]. This is seen schematically in a scatter plot of ideological rift against the ratio of between-group probability to in-group probability. The norm is clearly ideological consensus:

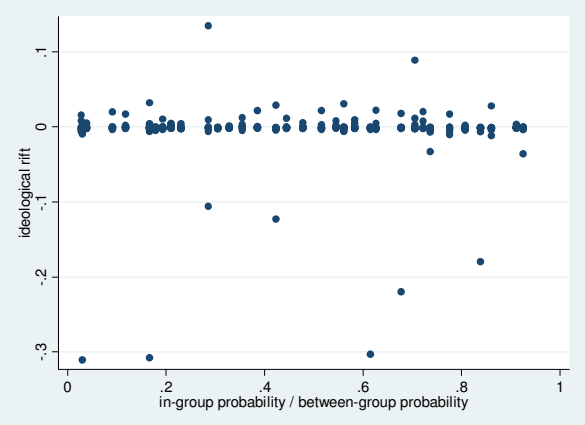


Figure 6: The effect of in- and between-group probability ratio on ideological rift

In a small number of cases (172 simulation runs), an IAD model of the individual does lead to positive ideological rift. In these cases, however, the extremity of the rift is consistently small. It is also worth noting that only 22 of these 172 cases converged to a state where there was not only positive ideological rift, but the mean beliefs in the two partitions also had competing orientations (e.g., all the nodes in one partition were red while all the nodes in the other partition were green). Thus, it appears unlikely that network structures consistent with advocacy coalitions will appear under IAD assumptions of learning.

Another feature of this scatter plot deserves attention. Although ideological rift is usually around zero (indicating ideological consensus), small between-group probabilities relative to in-group probabilities often result in negative ideological rift values. This indicates that the beliefs of agents in the two communities often overlap (such that advocacy coalitions do not exist), but a great deal of belief heterogeneity persists in the network. This result seems to occur under very particular types of network structures, but is entirely consistent with empirical research demonstrating that politically-relevant beliefs do not tend towards consensus within social networks (Johnson and Huckfeldt 2005).

Although a consensus tends to emerge under most IAD model runs, another interesting result emerges based on the structure of the underlying social network. Although beliefs tend towards converge under $\beta = 0$, network structures that are less dense tend to take longer to reach equilibrium. Thus, although beliefs tend towards homogenization in all cases, dense networks lead to homogenization more quickly.

Figure 7, below, displays two typical simulations runs performed under the IAD model of the individual. The densities of these networks are fairly similar relative to the range of densities found across all simulated networks, and so it is unsurprising that they took roughly the same time to reach a convergence state.

[6] N = 1,100; R^2 = 0.002; 95% confidence interval for effect of in-group probability = [-0.012, 0.037]; 95% confidence interval for effect of between-group probability = [-0.015, 0.045].

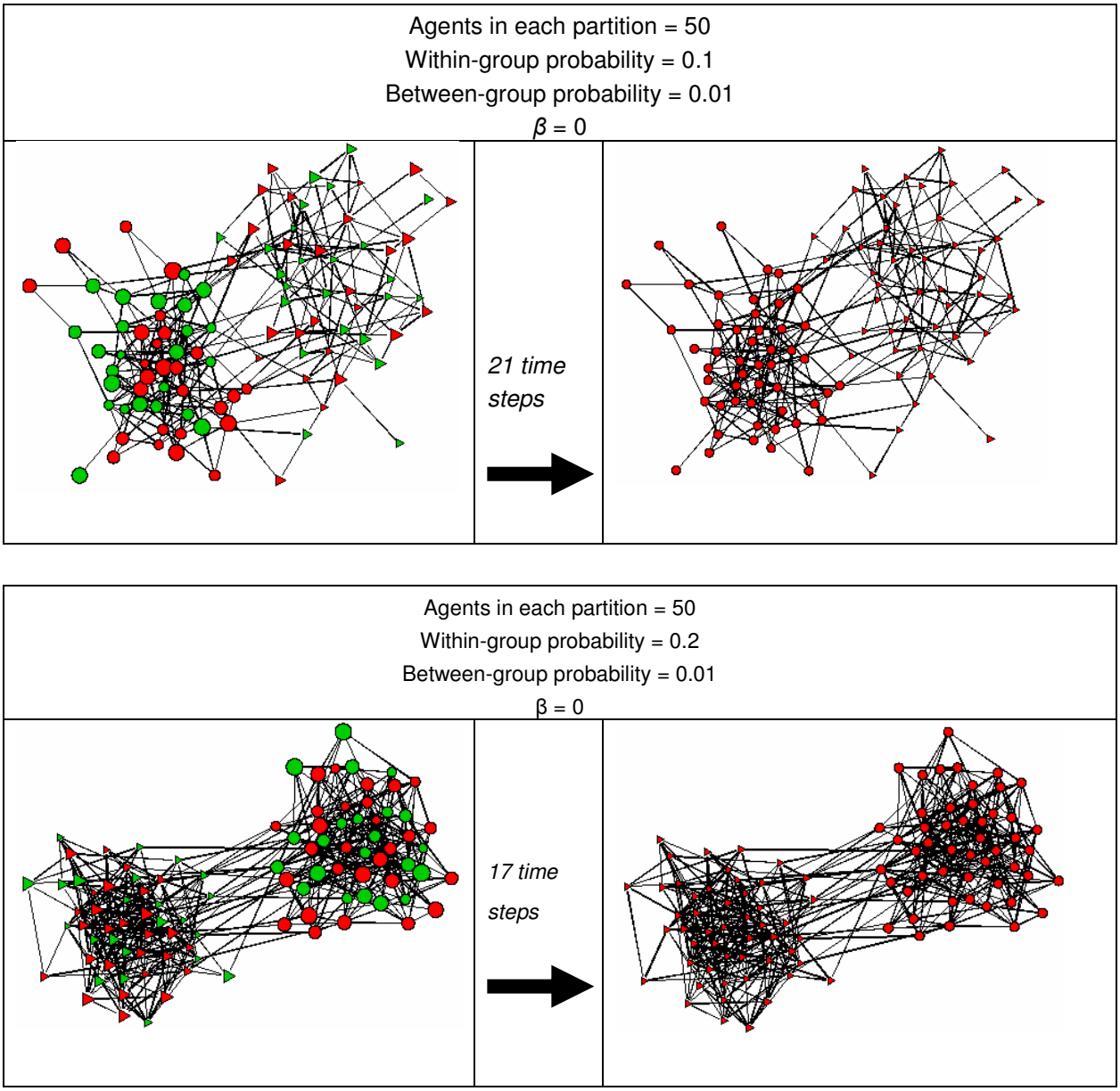


Figure 7: Two example simulation runs under an IAD model of the individual

Convergence states under the ACF

Incorporating biased assimilation into the model produces some unexpected but interesting results. Just as rational learning processes rarely produced network structures with positive ideological rift (advocacy coalitions that correspond to community boundaries), biased assimilation rarely led to these network structures, as well. Biased assimilation indices greater than zero produced positive ideological rift values with a slightly greater frequency that did rational learning. More interesting, however, is that biased assimilation tends to result in *negative* ideological rift values, indicating heterogeneity throughout the network. This is illustrated in Figure 8, below.

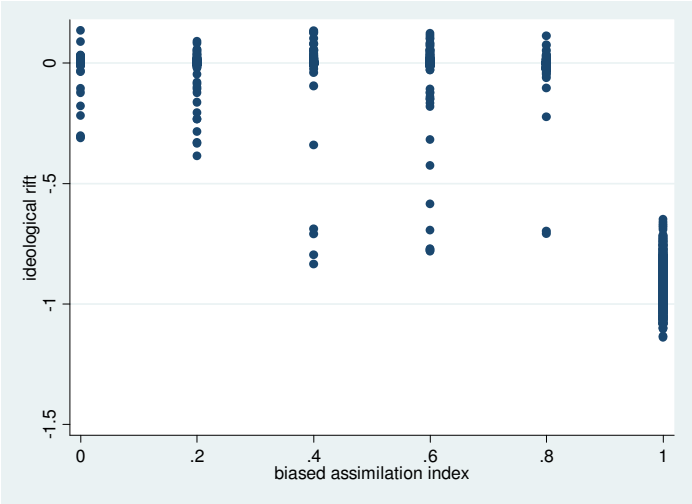


Figure 8: The effect of biased assimilation on ideological rift

These findings have some bearing on Hypothesis 2, that consensus can emerge in a network under the right institutional conditions, even if elites are biased assimilators. Clearly, however, the possibility of reaching consensus deteriorates as the intensity of biased assimilation increases.

But how likely is it that cross-community linkages can lead to consensus in the face of biased learning? In the context of the model described here, it appears unlikely that increasing the probability of cross-community interactions will alter ideological rift, when we control for biased assimilation. This conclusion must be tempered, however, against the observation that ideological consensus *can* arise under biased assimilation. Unfortunately, I was not able to clearly identify the circumstances under which this result occurs. This is left as a subject for further study.

Conclusion

When simulations take even a modest number of input parameters, making sense of the results can become a combinatorial nightmare. Although the agent-based model described here has a number of other potential applications, this paper presents a simplified first analysis of a few simulation results. It appears that fully connected networks, such as the ones under consideration here, tend to allow agents to reach full agreement in relatively short time periods. Although there is some variation in beliefs at equilibrium, the result that disparate belief systems tend towards homogenization appears to be a fairly robust result under “rational” learning assumptions.

Thus, it is unlikely that the IAD model of the individual, as specified in this model, can lead to the formation of advocacy coalitions. One important caveat to this result, however, is that the ACF model of the individual can also lead to agreement in the long run, albeit much less often. The uncertainty of why ideological consensus arises, however, suggests the need for more work in this area. We still need to identify the key features of networks and learning that causes agreement – and disagreement – to evolve in the long run.

The results of this modeling effort suggest a number of directions for future research. One important limitation of the model developed here is that the underlying social network on

which learning takes place remains static over time. This is an unrealistic assumption. Institutions can certainly encourage or even force certain interactions to take place, but they are unlikely to *prevent* agents from speaking with other elites. To deal properly with this facet of real-world networks, future iterations of this model should incorporate a model of endogenous network formation. Thus, agents will be allowed to update their network links at each time step, based on any biases we wish to program into the model. They may, for example, demonstrate a preference for interaction with other agents who share their beliefs, who they perceive to be powerful, or who are geographically close.

More importantly, this model has made some fairly bold claims about learning from an IAD point of view. One hope is that this first attempt will generate more discussion about how to model policy-oriented learning in a way that accurately reflects the IAD model of the individual[7]. Ideological consensus in policy subsystems is rare, and biased learning processes do a better job of modeling the survival of belief heterogeneity within networks than do "rational" learning processes. This suggests that the IAD framework can benefit from incorporating aspects of the ACF model of the individual, or at least seriously address the rationality of bias.

Ultimately, this is all about decision making. In both frameworks, there is some decision made when there is a consensus – or at least a majority. This could be the adoption of a policy or agreement to stay with quota for commons harvesting. The question then becomes, what are the dynamics by which subsystem elites come to a consensus? When do they remain divided, or even become more polarized? This paper began with an attempt – hopefully successful – to define policy-oriented learning in a way that makes sense from both traditions. Learning in the IAD tradition is mostly about facts, including the "facts" about what others value and what their likely behaviors are. The ACF tradition emphasizes beliefs, values, and ideologies. Both traditions, however, look at the conditions under which consensus arises, and actors begin to share a common view about policy. This research represents a further step in understanding how consensus may arise, and how conflict may survive, as a function of both institutional structures and competing models of how policy elites learn.

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[7] One likely extension is to incorporate a payoff associated with beliefs. Agents may have a reward function where payoffs are based on how close their belief is to a "perfect" belief, or how close their belief represents the true nature of the world. This model does not incorporate such a payoff function, since the emphasis here is on normative belief systems.

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Constitutional Ecological Economics[1]

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Abstract

Although neoclassical environmental economics provides deeper insights into the study of environmental issues, the approach has had only a modest impact on shaping environmental policy. Theoretical and abstract neoclassical models often fail to give adequate policy advice on the precise instrumental and institutional political design. Among social scientists many thoughts have been given to the fact that the choice of any individual is constrained by social institutions evolved over time and space. Recognizing the small importance environmental economists give to social institutions and the "rules of the game" when analysing environmental problems, the purpose of this paper is to highlight the link between economy, ecology, and society. The research program of ecological economics integrates both economic and ecological models. By applying the framework of constitutional economics (in line with James Buchanan) the study of ecological economics is broaden twofold. First, a constitutional ecological economics approach is capable to legitimize environmental action normatively. Second, a constitutional ecological economics approach is suitable to compare the existing institutional arrangement to alternative rule settings.

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1 Introduction

> *The economic paradigm – neo-classical theory – was not created to explain the process of economic change. We live in an uncertain and ever changing world that is continually evolving in new and novel ways. Standard theories are of little help in this context. Attempting to understand economic, political, and social change (and one cannot grasp change in only one without the others) requires a fundamental recasting of the way we think. Can we develop a dynamic theory of change comparable in elegance to general equilibrium theory? The answer is probably not. But if we can achieve an understanding of the underlying process of change then we can develop somewhat more limited hypotheses about change that can enormously improve the usefulness of social science theory in confronting human problems.*
>
> *(North 2005: vii)*

Although neoclassical environmental economics – that is welfare economics – provides illuminating theoretical, empirical, and instrumental basics to the study of environmental problems, the approach has had only a modest impact on shaping environmental policy (see Hahn 2000). Theoretical and abstract neoclassical models do not seem to be qualified to give advice on the precise instrumental and institutional political design. In many cases, these models produce biases because the strict mathematical conception allows for an arbitrary variation of theoretical assumptions. With respect to this, neoclassical environmental economic models have to be accused of being unrealistic. In fact, there is a vast literature criticizing the traditional approach of environmental welfare economics (e.g. Bizer, Linscheidt & Truger 2000; Costanza 1991, 1996; Frey & Schneider 1997; Gawel 1994, 1996; Gerken & Renner 1996; Hahn 2000; Söllner 1993; and Suchanek 2000).

To overcome these methodological shortcomings, the research program of ecological economics is of much importance for the analysis of environmental issues today. Yet, Inge Røpke articulates: "Some (mainly economists) see ecological economics as a contribution towards changing the discipline of economics in a radical way: ecological economics is 'economics done properly' […] based on the acknowledgement of the embeddedness of the economy in nature and society. This implies a clash with the dominant paradigm of neoclassical economics, which is seen as basically blind with regard to both nature and society" (Røpke 2005: 281). Thus, ecological economics integrates both economic *and* ecological models.[2] Since ecosystems are under threat of a host of human activities, protecting and preserving them requires the ability to understand the *interrelations* between human behavior and natural consequences. In a nutshell, ecological economists have widened the study of environmental problems to ecological issues and have made an important contribution by showing that complex ecological systems cannot be treated adequately within the scheme of mainstream neoclassical welfare economics.

However, for implementing a strategy of sustainable development, it is fundamental to consider the structure of incentives – the institutional setting. In this paper, I will argue that the framework of ecological economics is not yet based sufficiently on a theory that links individ-

[2] To get a general idea of ecological economics see Costanza (1991, 1996); Faber, Manstetten and Proops (1998); see also The Journal of Ecological Economics.

ual economic behavior to the politically designed institutional framework. Though some of the initiators of ecological economics emphasized that the economy is embedded in a broader social and cultural system (Røpke 2005) and though there are calls for a broader socio-ecological economics perspective today (Jacobs 1996) it seems to me that the field is still dominated by non-societal thinking. Therefore, the underlying question of this paper is: In which direction should ecological economics be developed in the future?

Recently, a couple of economists based their arguments on the methodology of constitutional economics, best described as "the economics of rules" (Vanberg 2005: 26), to develop an environmental theory that could derive policy recommendations to change a society's evolution towards sustainable development (cf. Döring & Pahl 2003; Gerken & Renner 1996; Hansjürgens 2006; Klemmer 2002; Renner 1999; Renner & Hannowsky 1999; Pahl 2001). To include institutions and therefore the rules of the game within the study of ecological economics, I propose a framework of constitutional ecological economics, applying the framework of constitutional economics (in line with James Buchanan) to the study of sustainability. There are two contributions of such a framework which are considered to broaden the study of ecological issues. First, a constitutional economics approach uses methodological individualism to arrive at policy recommendations. Instead of using a holistic approach which would conceal individual incentives a constitutional ecological economics approach would be able to arrive at the autonomy of preferences. Second, a constitutional economics approach is capable to legitimize environmental action. This relates to the normative question concerning whether or not the existing ecological arrangement might be in the common interest of each individual relevant. The argumentation is structured as follows:

The next section (section 2) briefly recapitulates the fundamental criticism of neoclassical environmental economics. The section following (section 3) reviews the main concept of ecological economics and highlights the contribution ecological economics adds to the study of ecological issues. The forth section then presents an analysis of environmental issues from the perspective of constitutional economics – a constitutional ecological economics framework – which is a synthesis of constitutional economics and ecological economics. Section 5 presents an analysis of different outlooks at environmental economic policies from the different perspectives discussed above. In section 6 policy recommendations are drawn from the analysis of constitutional ecological economics. Section 7 concludes the paper.

2 Neoclassical Environmental Welfare Economics

Since the 1950s the neoclassic welfare economics approach with its core behavioural assumptions and mechanical equilibrium thinking has been established and is dominating environmental economics ever since (Crocker 1999: 35).[3] Neoclassical environmental economics concentrate mainly on two issues: valuation of the benefits of environmental amenities and the costs of pollution control, and the design of and choice among policy instruments – both issues strictly inside the framework and methodology of welfare economics (Røpke 2004: 302). Correspondingly, the neoclassic dominance within environmental economics identifies the phenomenon of environmental pollution readily as a certain kind of negative externality which gives rise to market failure. Therefore, economists consider pollution oversimplifying the consequence of the absence of prices for scarce resources. "The economist maintains

[3] For more extensive reading on this methodological position, see Baumol & Oates (1988), Siebert (1992), Feess (1998), Gawel (1996), and Söllner (1993).

that, if pollution is a growing problem in our society, it is because we have allowed or even encouraged people to neglect certain important costs" (Heyne 1980: 251). In such cases, the economic policy advice calls for governmental intervention to remedy the market failure by applying policy instruments, like environmental regulation or adequate definition of property rights, to overcome the troublesome externalities (e.g. Cropper & Oates 1992; Feess 1998; Hussen 2000; Folmer & Gabel 2000). The predominant application of cost-benefit analysis in environmental politics is due to these theoretical considerations (Söllner 1993: 432).[4] The neoclassical approach to environmental economics has been widely criticized by various scholars during the last two decades (e.g. Ostrom 1990; Bromley 1992; Costanza 1996; van den Bergh 1999; Crocker 1999, more recently Hansjürgens 2005, Ostrom 2005). According to Söllner (1993: 433-53), there are three principle points of criticism:

1. Practicability: A neoclassical approach primarily gives policy recommendations (e.g. Pigovian taxes, tradable emission standards, cost-benefit analysis) for which it is nearly impossible to make a calculation under realistic settings.

2. Distribution and Value Judgments: Neoclassical environmental economics rather focuses on efficiency criteria than on distributional or moral issues (cf. Gawel 1996). For instance, in the case of maximizing the social welfare, the distribution problem is normally avoided by simplifying the aggregated social welfare function. The assumption that there are no re-distributional consequences narrows the analysis to only few cases, in which this holds true.

3. Historical Change: The mechanical construction of neoclassical economics does not allow for evolutionary and innovative changes over time. The neoclassical approach is distinctively unhistorical. Even if comparative-static models are increasingly replaced by dynamic ones, neoclassical thinking still neglects important consequences of time and change. At best, these models include uncertainty as an exactly assumed probability distribution.

Nowadays, findings from *New Institutional Economics*, *New Ecology* [5], and the claim for *Sustainability* [6] call for a broader theoretical approach to environmental economics which picks

[4] A classic paper on the limits of cost-benefit analysis is Pearce (1976). For a recent comment on cost-benefit analysis see Heinzerling & Ackerman (2002). They argue that in practice, cost-benefit analysis frequently produces false and misleading results whenever it is applied to any complex environmental problem. It puts dollar figures on values that are no commodities and have no price, it ignores the collective choice presented to society by most environmental problems, it systematically ignores future harms by discounting improperly and it ignores considerations of distribution and fairness.

[5] A "traditional ecology" recognizes the ecological system as a relatively stable equilibrium and therefore a predictable one. Man is viewed in an inferior, non-interfering, position to this equilibrium. Within this mechanical perspective, it is possible to keep the steady state of the equilibrium and to maintain the scope for design to human beings. The "new ecology" considers the environment in a non-ergodic world. It represents nature as unpredictable, complex, and diverse, conditioned by permanent interferences and perpetual change. Human beings shape the nature and there is permanent interaction between the eco-system and social system (e.g. Bramwell 1989; Scoones 1999).

[6] The term "sustainable development", first advanced in 1980 by the International Union for the Conservation of Nature and Natural Resources, gained fame when the Brundtland Commission Report (Brundtland 1987) brought the concept to the agendas of institutions like the United Nations and the World Bank (Cole 2000: 51). Note, there is no unique definition of the term sustainable development. Pretty (1995) claims that there have been over seventy definitions since the Brundtland Report. Perhaps the best-known definition is, "development

up the dynamic and complex socio-ecological processes. Clem Tisdell for instance points out that such a technocratic approach fails to give adequate environmental policy advice. He adds,

> *With growing interest in economics of sustainable development, in ecological economics and in evolutionary economics and with the progressive acceptance that individuals (organizations and groups) are bounded in their rationality, the limitations of the technocratic approach to policy making and implementation of policies have become more obvious. These considerations have highlighted irreversibility and hysteresis, uncertainty and learning, institutional arrangements, the degree of motivation of actors and several other factors as having an important bearing on successful policy formulation and implementation. Such factors, often overlooked in mainstream economic theory, frequently play an integral part in the success or failure of environmental policy and suggest the relevance of models of an organic rather than a mechanical type (Tisdell 1997: 98).*

With respect to these critics the research agenda of ecological economics intends to develop a complete alternative framework, rejecting the neoclassical methodology.

3 Ecological Economics

Ecological economics was institutionalized with the establishment of the *International Society for Ecological Economics* in 1988 and the journal *Ecological Economics* in 1989 (Røpke 2004).[7] On behalf of ecological economics Costanza, Daly and Bartholomew observed in 1991,

> *Increasing awareness that our global ecological life support system is endangered is forcing us to realize that decisions made based on local, narrow, short-term criteria can produce disastrous results globally and in the long run. We are also beginning to realize that traditional economic and ecological models and concepts fall short in their ability to deal with global ecological problems (Costanza, Daly & Bartholomew 1991: 2).*

Starting from their recognition, ecological economics differs from conventional environmental economics in some very important arguments. Firstly, the approach sees the human economy as part of a whole. Contrary to the worldview of welfare economics in which human consumers are the main characters (human preferences are taken for granted. *Homo sapiens* is

that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987: 43).

Hussen (2000: 117) presents a very good summary of the key concepts. Sustainability is about *biophysical limits*, and goes far beyond the neoclassical focus on the *efficient allocation* of scarce environmental resources (i.e. issues of fairness, equity and distribution have to be taken into considerations). It requires careful examination of the *technological choices* and *value systems* if they affect human preferences. Furthermore, sustainability deals with *uncertain* processes. However, the **concept** of sustainability is of no significance for my arguments here. Helpful literature for an introduction into this field might be Pearce et al. (1989, 1991); Costanza (1991); Tisdell (1991); Hussen (2000: Ch. 9); Cole (2000: Ch. 4).

[7] For an overview about the early history of modern ecological economics from the beginnings of the 1960s to the end of the 1980s see Røpke (2004). For the later history of ecological economics from the late 1980s to the early 2000s see Røpke (2005).

seen as the dominant determining force, which is why the resource base is viewed as essentially limitless due to technological progress and infinite substitutability) ecological economics adopts a more holistic view including human beings as an *inferior* component in the overall ecosystem. For this reason, environmental sustainability has a key role since it is prerequisite for both social and economic sustainability.

Secondly, ecological economics assumes that individuals are incapable or reluctant to recognize the existence of ecological constraints. Uncertainty is recognized as a fundamental characteristic of complex systems, and particularly processes in nature are essentially irreversible. Therefore, an ecological economics framework emphasizes precautionary principles instead of accepting individuals learning to overcome environmental shortcomings over time. Instead of neoclassical cost-benefit analysis – resting on individual preferences – ecological economics draws mainly on natural-scientific findings to evaluate environmental policy. To sum up, ecological economics focuses on three problem areas (cf. Costanza 1996: 4). These problems include:

1. assessing and ensuring that the scale of human activities within the biosphere is ecologically sustainable;

2. distributing resources and property rights fairly, both within current generations of human beings, between current and future generations, and also between human beings and other species; and

3. efficient allocation of resources as constrained and defined by the scale of activity and the distribution problem. In general, ecological economics does not neglect the fact that market economies support resource economization.

In such a framework there is a well-defined classification regarding these problems. Firstly, the ecological capacity – based on scientific experience – has to be identified. This argument is closely related to the demand of *dematerialization*. Dematerialization as a long-term goal will be a challenge for economic agents. Hence, to reach a dematerialization by a factor of 10 over the next 50 years, it will be necessary to strengthen an economy's innovative capacity (Hinterberger, Luks & Stewen 1996: 85-100). Secondly, occurring distribution problems have to be solved, to aim, thirdly, at the efficient allocation of resources (a three-step approach). The aim of such an environmental policy is a so-called "steady-state-economy", i.e. an economy with stable energy and resource input, solely orientated towards an ecological regeneration process. Nevertheless, ecological economics adopts traditional environmental command and control strategies (Gerken & Renner 1996: 60-1). Ecological economists claim for a "strong" mix of instruments fixing a given level of pollution, such as emission standards, licenses, quotas, and tradable permits to reach exact ecological targets. Within an ecological economics framework voluntary approaches, moral suasion and information instruments are extremely unsuitable to reach sustainable goals because they provide too many opportunities for individual (environmental harmful) choices.

However, ecological economics does not completely neglect the social dimension of policy making. Socio-economic approaches have been apparent in ecological economics since the 1990s, for example represented by Martinez-Alier, Norgaard and Söderbaum (cf. Røpke 2004, 2005). Following the socio-ecological economic perspective the analysis of environmental issues has to focus mainly on the level of social structures and institutions and the fact that politics and economics are combined and inseparable: "One of the most important points in relation to socio-economic research is that environmental problems relate to broad social issues – they cannot be dealt with by environmental policies alone, but have

to be considered in relation to all policy fields" (Røpke 2005: 280). Therefore, a socio-economic approach has to be based on the concept of interdependence (cf. Eucken 1952/90) rather than on a concept of functional differentiation where all spheres of action are separated. Interdependence exists when a decision in one area (e.g. politics) influences that of another (e.g. economy) – a situation often overlooked in conventional economic analysis. Therefore, the socio-economic perspective emphasizes the political character of environmental decision-making, the importance of social conflicts and the need for developing social institutions to solve these conflicts. Anyway, in my opinion ecological economics partly fail to integrate the importance of individual action and individual preferences to the research agenda. Admittedly, it is difficult – if not impossible – to subsume ecological economics to a homogeneous research field. Naturally, within the heterogeneous field of ecological economics there are competing approaches and some authors already focuses on similar issues (in this case especially Renner 1999). Nevertheless, it is worth reconsidering some methodological shortcomings still prevailing in ecological economics and trying to give some arguments how a constitutional economics approach could help overcoming these shortcomings.

Generally spoken, the approach of ecological economics can be summarized as follows: "The basic idea of what becomes ecological economics is that the economy ought to be studied also, but not only, as a natural object, and that economic processes should consequently also be conceptualized in terms usually used to describe processes in nature" (Røpke 2004: 296). By putting the focus on natural processes ecological economics run the risk of ignoring individual preferences as the driving forces of society. Therefore, without resting on methodological individualism, it is highly arguable whether an ecological economics research agenda would succeed establishing appropriate social and distributive policy instruments. However, the new field of ecological economics – integrating economic and ecological models – opens the study of environmental problems to ecological issues. Ecological economists have widened the study of environmental problems to ecological issues and "have made an important contribution by showing that complex ecological systems cannot be treated adequately within the scheme of mainstream neo-classical welfare economics" (Renner 1999: 327). Yet ecological economics fails to integrate ecology and economy and society as co-equally goals. There are two problems to be solved:

1. Partly, it is assumed that natural scientists are capable to identify the structure of environmental problems and arrive at efficient solutions. Such a "management of sustainability"[8] anticipates a nearly impossible amount of knowledge.

2. Some ecological economists undervalue the individual interests of citizens (and politicians). Therefore, the approach is able to reach sustainable stability but runs the risk of destabilizing the social order by putting ecological aims over economic and social goals.

As a result of this severe criticism ecological economics enters a phase of re-orientation. Renner (1999: 323) already pointed out that within ecological economics a distinction between two major methodologies has to be made:

1. a traditional "direct" approach, in which ecological economists tends to base their policy advice directly on natural scientific evidence, and

[8] Costanza, Daly & Bartholomew (1991).

2. a new “indirect” institutional approach, which focuses on the institutional setting of the political and economic order, i.e. the set of rules defining the possible forms of interaction within society.

The first methodology is related to a natural science based concept whereas the latter highlights on institution building, that is on social science. A development Renner accurately relates to as “from Ecological Economics towards Socio-Ecological Economics” (Renner 1999: 322; see e.g. Faber, Manstetten & Peterson 1997). He argues that, if natural scientists define ecological targets and social scientists propose policy instruments, it is a poor, non-interdisciplinary, methodological approach. Instead he suggests a theoretical approach which deals with environmental change caused by social processes. According to Renner, it might be more fruitful to take natural scientific knowledge into account additional (Renner 1999: 326).

Modern ecological economics tries to integrate both economic and ecological claims. It puts – depending on the concept of sustainability – the reasonable compensation of economic and ecological aims into the center of its research interest. Therefore, the perspective of ecological economics has to be extended because neither nature nor economy must be preferred. This means that neither economic assessment criteria (e.g. cost efficiency) nor ecological assessment criteria (e.g. the preservation of nature) are suitable as a reference criterion to decide on the degree of environmental protection. Particularly with regard to conflicts between economic and ecologic objectives an external valuation raises many difficulties. Economic (like ecological) centered guiding principles claim an order without questioning if such an order is wanted by the people concerned. Scientifically, such an economic position is not maintainable because for arriving at policy recommendations human beings have to be the point of reference. No economist, no ecologist and no ecological economist can claim to know what degree of environmental protection is necessary from the perspective of nature. Such a value judgment is a subjective and an elitist one, because it does not respect the opinion and valuation of *all* individuals but simply rely on one’s own thinking.

Consequently, environmental problems have to be seen as social problems caused by human individuals. Collective action is needed to overcome ecological shortcomings. A stable and well functioning development of society implies a stable and well functioning ecological system within which society is embedded. In this sense, sustainability implies a co-evolution of nature and society, of ecological and socio-economic systems (Hinterberger 1994; Norgaard 1994). Recognizing the little importance ecological economists give to social institutions and the “rules of the game” when analyzing environmental problems, the purpose of this paper is to highlight the link between economy, ecology, and society from the viewpoint of constitutional economics. As shown before, some ecological economists argue that modern democratic societies are in principle incapable of meeting ecological challenges. Therefore, some kind of *ecological dictatorship* is favored (e.g. Hannon 1985). In contrast – like many political economists – I hold the opposing view that democracy provides the best possible political institution for the solution of fundamental ecological problems. Therefore, one of the major challenges of ecological economics is how to understand and guide environmental policies and governance institutions.

Institutional economics has already been an influential source of ideas for ecological economics (cf. Paavola & Adger 2005). Ecological economics has turned to institutional economics for sophisticated models and understanding of human behavior (Söderbaum 2000) and for explaining the role of institutions in collective action and environmental outcomes (Randhir & Lee; Spash & Villena 1999). Institutional economics has also been a source of alternative views regarding policy analysis and the normative basis of policy prescription (Hukkinen

1998; Söderbaum 2000; Bromley 1998). Furthermore, public choice theories (Buchanan & Tullock 1962/92; Mueller 2003) have extended the study of environmental economics by being skeptical of non-market institutions and their efficacy in promoting sustainable growth, highlighting rent seeking and government failure. In this regard, "the institutional approach suggests that more attention ought to be given to processes and procedures in environmental decision making in order to guarantee adequate learning and fair representation of affected parties and legitimacy of environmental decisions" (Paavola & Adger 2005: 365).

Therefore, this paper approaches the social and ecological question how to sustain the environment from the perspective of *constitutional economics*, a research program that grew out of the tradition of public choice theory and that sees itself as a paradigmatic alternative to traditional welfare economics. Constitutional economics – mainly initiated by the work of James M. Buchanan (Brennan & Buchanan 1985; Buchanan 1990) – can be best described as the economics of rules. Starting from the recognition that human agents are imperfect agents with limited knowledge and limited mental capacities constitutional economics focuses primarily on the working properties of alternative rule regimes and on the practical question how people can improve the socio-economic-political arrangements to the mutual benefit of the human beings involved (Vanberg 2005).

4 Constitutional Ecological Economics

As a theoretical science constitutional economics seeks to provide insights into the systematic relation how the order of rules affects the resulting order of actions (Hayek 1964). As an applied science it seeks to provide answers to the question of what rules of the social game contribute to peaceful human coexistence and mutually beneficial cooperation. As a theoretical science it is bound to *methodological individualism* in the broad sense that it seeks to explain social phenomena in terms of the actions of individual human beings and of the collective effects of their interactions and co-operative efforts. As an applied science it is based on a *normative individualism* in the broad sense that the individuals involved must be respected as the ultimate judges on the qualification of 'good' or desirable in their social transactions and rule-arrangements and that, accordingly, the legitimacy of transactions and arrangements ultimately derives from their voluntary agreement (Vanberg 2005: 4). To make my arguments somewhat more explicit it is necessary to explain the approach of constitutional economics in more details.

First, methodological individualism makes two critical assumptions: (1) All actions are performed by individuals; therefore analysis of social reality must start from individuals, conceived as self sufficient, fixed entities confronting the external world and responding to its opportunities and constraints by making choices and devising strategies. (2) A social collective has no existence and no reality beyond the actions of its individual members; therefore it is false to argue that collectives could have their own will and purposes. Collectives as the government, the company, the union, the nation are all abstractions and have no reality beyond the individuals that compose them (Hodgson 1988: Chapter 3). Therefore, an alternative theory of value is proposed which attributes value to the subjective assessment of utility made by each individual. These preferences, aggregated through the processes of market exchange, underlie the prices that were formed in markets. Instead of trying to measure value objectively, it defines it as whatever was subjectively valued by individuals who could be known only through the actual behaviour and choices in a free market. However, methodological individualism is not to be meant to refuse institutional forces which mould individ-

ual preferences and purposes. But it is the only methodology that starts from individuals and their subjective valuations to discover the common principles that underlie all human societies.

Second, normative individualism states that political action can only be legitimized by agreement of the individuals concerned. Constitutional economics focuses on constitutional rules which are supposed to make the political decision-making more responsive to citizens' preferences. The basic idea of Buchanan's theoretical concept is to transform the idea of mutual-gains-from-trade from individual decision-making on economic markets to collective decision-making into the political arena. While the traditional focus of economics is on voluntary market-exchanges as the paradigm of mutually beneficial social transactions, constitutional economics extends the mutual-gains-from-trade notion to voluntary co-operation more generally understood, including arrangements for collective action. Whereas in economic markets people agree on the conditions of trade if both parties believe to realise gains-from-trade the citizens of a constituency will agree on a rule restricting their individual behaviour if they believe that their own situation will improve. Buchanan argues that collective action on the set of rules is only legitimate if it offers such mutual-gains-from-agreement that puts every single citizen in a better situation than before (Buchanan 1979). However, to reach such a win-win situation it may involve the compensation of those who believe that they will not benefit from a proposed change in the set of rules. For example, if citizens of a country judge climate stability to be less important than other issues (such as economic growth) or if they are simply affected less negatively by global warming they may have to be compensated for their commitment to participate within the Kyoto-protocol.

Mainstream environmental welfare economics is about choice *within constraints*. These constraints include not only the budget- and price-constraints explicitly accounted for in standard textbook economics. They also include the behavioral constraints, typically left aside in economic analysis, that are defined by the norms, rules and institutions enforced in the social environment within which individuals act. Constitutional economics focuses on *choice among constraints*. It is emphasised that – even though the rules that prevail in historically evolved social groups or communities are largely beyond deliberate control and intended change – people can choose to change the political rules under which they live and to adopt new rules that promise to make for a better, i.e. environmental sustainable game. In other words, while standard economic analysis focuses on how rational agents seek to be more successful in playing a *given game*, taking the existing rules of the game as datum, the constitutional economist's interest is to inquire how people may be able to play *better games* by adopting superior rules (Vanberg 2005).

The fact that constitutional economics focuses on the issue of mutual gains from *voluntary* co-operation and *voluntary* joint commitment does not mean, of course, that constitutional economics ignore the fact that self-interested individuals are searching for unilateral gains as well, and that they use many opportunities to take advantage at the expense of others to improve their share. The constitutional economist points out, however, that among socially interdependent agents attempts to secure unilateral gains at the expense of others easily result in outcomes that are inferior for all parties involved, compared to what could be achieved if they would all commit to rules that exclude such 'exploitative' strategies.

So how can we arrive at a sustainable order? Buchanan points out that it is the political economist's task to locate possible flaws in the existing social structure and to present possible improvements. The validity of any environmental policy suggestion that the constitutional ecological economist may propose in this regard depends on whether or not the institutional reforms or changes in rules are actually judged to be improvements by the very persons in-

volved themselves. Therefore, the constitutional ecological economist can seek to identify rule-changes that he expects to benefit all individuals concerned. To provoke self-interested agents to judge rules from an impartial perspective the role of a "veil of uncertainty" (Buchanan & Tullock 1962/92) or a "veil of ignorance" (Rawls 1971) has to be invoked.

5 Environmental Welfare Economics, Ecological Economics and Constitutional Ecological Economics: Alternative Outlooks at Environmental Economic Policy

Obviously, environmental welfare economics and ecological economics that are based on the maximization paradigm and ecological interventionism and a constitutional ecological economics that is based on the gains-from-trade paradigm must arrive at fundamentally different outlooks at economic policy recommendations. As applied sciences all of the three, environmental welfare economics, ecological economics, and constitutional ecological economics, seek to use theoretical knowledge that economics can provide to advise politics about possibilities for socio-economic improvement. But their particular views on the kind of knowledge that economics can provide and their views on what politics can do to achieve improvement are categorically different. Environmental welfare economics claims to be able to measure 'improvement' *directly* in terms of the welfare attributes of *outcomes*. Accordingly, it seeks to provide advice for how economic policy can *directly improve outcomes* by suitable interventions into the economic process. Ecological economics on the other hand aims at absolute ecological values which are setting a fixed amount of environmental pollution by scientific expertise. Therefore, it also seeks to improve outcomes directly. By contrast, constitutional ecological economics takes an *indirect* approach to measure improvements as well as in its views on what politics can do to achieve improvements. Constitutional ecological economics rejects the welfare economists' claim that as observing analysts we can, in a rather objective sense, assess the 'efficiency' of outcomes per se. Just as well it rejects the idea that natural scientists can measure the correct amount of environmental protection and that a government can implement such aims. Respecting individuals as sovereigns such an approach insists, instead, that inter-subjectively testable conjectures can only be made about the 'efficiency' of the processes from which outcomes emerge, namely about their suitability for enabling agents to arrive at economic and ecological sound solutions. Accordingly, constitutional ecological economics sees the principal role that environmental economic policy can play rather in seeking to improve outcomes by direct policy interventions in seeking to improve the nature of the decision processes from which economic outcomes result. Improving such a process means to enable the individuals involved better to advance their own purposes, separately and collectively.

From the perspective of constitutional ecological economics there are two main arguments why citizens are well advised to prefer a rule-focused, non discretionary environmental economic policy rather than an interventionist, outcome-focused policy advice. The first is Hayek's argument on the "limits of knowledge" and the second is the public choice argument on the issue of "rent-seeking".

As seen above, ecological economics call for a strong regulating authority that specifies the ecological capacity according to scientific research. Ecopolitical aims, depending on individual preferences, are expected to fail because individuals do not consider negative externalities and ecological boundaries. However, a theoretical approach to environmental economics, solely relying on scientific research and ignoring economic processes and individual

preferences, is unsuitable to consider complex social problems. As I have argued earlier, environmental constitutions have to be consistent with the interests of the citizens concerned. Furthermore, many economists acknowledge today that it is impossible to acquire sufficient knowledge in order to allow 'rational' environmental policy intervention (cf. Suchanek 2000). Evolutionary environmental economists even claim that this is true for **all** conventional environmental economics instruments, such as Coasian negotiations, Pigovian taxes, certificates or environmental liability rules (cf. Hinterberger, Luks & Stewen 1996: 282).

The very important question what should be left to the spontaneous coordination of economic activities in markets and what should be deliberate coordination by government is a central task in rethinking environmental issues. This notion is closely related to Hayek's thoughts on the limits of knowledge and the reasons of rules, in which Hayek focuses on the knowledge problem that economic agents face (cf. Vanberg 1994a). He emphasizes on the diffusion of scattered knowledge among individuals in social interaction and upon the possible benefits achievable by a convenient matching of informational and institutional structures. In Hayek's diagnosis the ambition to bring about "good outcomes" through discretionary interventions, by "altering a particular action of the system" (Hayek 1976: 129), reflects an attitude that he terms "constructivist rationalism," an attitude that is based on a "pretence of knowledge," on the illusion that the policy makers – or their economic advisors – are able to predict accurately and assess the overall welfare effects of specific policy measures. As Hayek criticizes – given the complex interdependencies in socio-economic systems – this means to claim to know more than anybody can possibly know. The notion of random distribution of knowledge stresses the spontaneous coordination of the results that emerge from the decentralized operation of the market. This coordination emerges as an unintended consequence of human practices that is motivated by individual purposes.[9] "Central to F.A. Hayek's theory of cultural evolution is the notion that the rules and institutions upon which human social life is based have been shaped in an evolutionary process of trial and error, a process in which experience with the working properties of such rules is accumulated over generations" (Vanberg 1994b: 171). In the same sense, market competition works as a "discovery procedure".

The core of this argument is that there are knowledge problems that make the outcome of interventions uncertain elaborations from an advanced market process view. This matches the argument of many ecological economists who claim limited knowledge regarding the behavior of ecological systems. In the context of human interference with nature unintended effects arise. However, imperfect knowledge and uncertainty is germane to many environmental problems (cf. Hinterberger & Wegner 1997: 348). Global warming is a prime example because the precise relationship between atmospheric accumulation of carbon and the rise of global temperature is still poorly understood. While scientific observation documents a significant increase in atmospheric levels of CO2, the effect of these levels on temperature fluctuations is just getting to become understood. In addition, more pollutants, e.g. sulfur, may have an impact on global warming. These uncertainties limit the motivations and potentials to reduce CO2 emissions (e.g. Leroux 2005). It is the "recognition of the proper limits of rational control" (Hayek 1976: 93) that requires us, so Hayek argues, to acknowledge that "it

[9] Hayek (1952/79: 149-50): „Though our civilization is the result of a cumulation of individual knowledge, it is not by the explicit or conscious combination of all this knowledge in any individual brain, but by its embodiment in symbols which we use without understanding them, in habits and institutions, tools and concepts, that man in society is constantly able to profit from a body of knowledge neither he nor any other man completely possesses".

is not in our power to build a desirable society by simply putting together the particular elements that by themselves appear desirable" (Hayek 1973: 56) and, instead, to focus our ambition on the *indirect* strategy "of constructing a suitable legal framework" (Hayek 1948: 22). Such indirect strategy for building a "better society," not by discretionary interventions but by changing the rules on which the system operates (Hayek 1976: 129; 1992: 185), means to provide for general conditions that enable the individuals involved to pursue their own purposes better, individually and collectively, in terms of their own evaluations of things and using their own specific knowledge of relevant circumstances.

Second, constitutional ecological economics advocates a rule-constrained and rule-oriented policy not only because of the knowledge argument that Hayek emphasizes, but also because a discretionary interventionist government is much more vulnerable to rent-seeking than a government that is constrained in its choices by general rules and that is limited in its social and economic policies to reform the rules under which the system operates. Since rent- seeking means that interest groups seek to induce governments to grant them privileged treatment at the expense of others, a democratic policy must fail to operate as "a cooperative enterprise for mutual advantage" to the extent that it is susceptible to rent-seeking, And even though a government committed to sustainable politics by rules will surely not be immune to rent-seeking, it is much more restricted in its ability to grant privileges than a government that is authorized to intervene in the economic process in a discretionary manner, without committing itself "to do the same in all instances where some circumstances defined by a rule are the same" (Hayek 1976: 129).

6 Some Recommendations from Constitutional Ecological Economics[10]

Andreas Renner points out that whenever constitutional economists argue that politics should be more responsive to individual preferences they think about 'informed' voters. Democracy does not mean that people vote – rationally or irrationally – 'ignorant' in the sense that they vote for an environmental policy which they would not go for if they were more well-informed. Following the argumentation of ecological economics, ecological systems are too complex. Therefore, it is hard for 'normal' citizens to form 'informed' preferences. From this it follows that the political decision-making process has to be modeled in a way that promotes the formation of 'informed' (wise, long-term, sustainable) citizens' preferences! Renner lists four policy recommendations for constitutional environmental reform based on this reasoning (cf. Renner 1999: 333-4).

1. *Direct Votes on Environmental Objectives* could promote sustainable development as it would raise the acceptance of environmental policies. In addition, this procedure would reduce interest group influence on the political decision-making process.

2. Implementing *Proxi-Votes for Parents on Behalf of their Children* may help to link present political decisions to the interest of future generations. This proposal is based on the assumption that parents vote in the interest of their children, a very questionable assumption.

[10]Drawn from Renner (1999).

3. Reforming the political decision-making process by implementing *Transparent Advisory Councils and Participatory Networks*. On the one hand government advisory councils should be more transparent and independent than at present to improve the transfer of knowledge from scientists into the political arena. On the other hand participatory networking among different societal groups could promote consensus on controversial issues.

4. *Fostering Institutional Competition*: Decentralizing the political competence leads to a competition of different political and theoretical concepts. Gerken and Renner (1996) suggest an institutional competition that induces a search process in which knowledge about successful concepts is generated. Hannowsky and Renner (1998) e.g. highlight the importance of decentralizing environmental policy in order to promote political innovations. This argument is of special significance to the EU where environmental policy is increasingly centralized. "Whenever externalities prevent lower political entities of solving a problem (global warming, for example) institutional competition has to be framed by a common set of rules; that is new forms of intergovernmental co-operation have to go along with the decentralization of political competence" (Renner 1999: 334).

7 Conclusion

"The proposal to link Ecological and Constitutional Economics is unusual for Ecological Economists and Constitutional Economists" (Renner 1999: 334). Indeed, no more than 10 years ago there were published some very first articles linking constitutional economics to environmental policy.[11] "Often Ecological Economists oppose not only mainstream neoclassical welfare economics but all concepts based on a (normative and/or methodological) individualism such as Constitutional Economics. Besides, not many Constitutional Economists deal with the question of ecological sustainability" (Renner 1999: 334). Bernd Hansjürgens (2006) suspects that it is due to the fact that the leading characters – Walter Eucken, Friedrich August von Hayek and James M. Buchanan – hardly paid any attention to the study of environmental issues.

Linking ecological economics and constitutional economics – arriving at a constitutional ecological economics approach – shows promising results. First, constitutional economics separates the theoretical arguments from ideology. James Buchanan points out that in general a consensus could be reached more easily on the level of rules defining the political decision-making mechanisms rather than on specific environmental issues where we are faced with conflicting interests on the level of action. Behind a "veil of ignorance" (Brennan & Buchanan 1988) people have a strong interest to choose wise, just and sustainable. Constitutional ecological reforms therefore tend to reflect long-term interests e.g. by accounting for future generations. Second, a constitutional ecological economics approach is aware of the problem of limited knowledge as well as rent-seeking. Both issues claim for implementing sustainable policies on the constitutional level rather than on the sub-constitutional level. Proposing institutional reforms by establishing incentives to political leaders to reflect adequately natural scientific knowledge when defining environmental objectives and to allow individuals to build

[11] Without claiming completeness see the contributions of Gerken (1996); Wegner (1998a, 1998b, 1999); Gerken & Renner (1996); Renner & Hinterberger (1998); Renner & Hannovsky (1999); Pahl (2001) and Suchanek (2000).

informed preferences on environmental issues themselves may be a crucial aim within constitutional ecological economics. To sum up:

> *The Constitutional Economics Approach, if applied in a fruitful way, allows to be revealed normative assumptions so that alternative policy proposals can be rationally discussed. Besides, it shows that policy recommendations which limit their normative assumptions to a minimum have a better chance to be implemented than those based on non-commonly shared norms and values (Renner 1999: 336).*

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Institutional Change, Rationalities and Thick Description

Some epistemological and methodological considerations on doing economic empirical research

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Abstract

This paper argues for more abduction as an epistemology and more "thick description" (Geertz) as a method for analysing institutional change. Institutional change is often complex, context dependant, and deals with new phenomena. It is therefore explorative and requires openness. All aspects indicate that deductive, thin reasoning is not appropriate. Abduction combines deductive and inductive reasoning. The latter has been neglected in economics since the Methodenstreit. The paper shows, however, that the research done on institutional change has often effectively been abductive.

In relation to methodology, it is argued that thick description should be used more extensively. Currently, many scholars claim that understanding institutional change necessitates considering multiple rationalities and cognition. Understanding, and not just describing, those aspects empirically requires thick description. The paper uses empirical material for illustration from a current process of institutional change in German forestry.

Introduction

The Methodenstreit had clear winners. For many decades it was obvious, what represents good practice in Economics. Having a winner calmed down many methodological and epistemological discussions, because when the common sense is clear, there is no need to argue for ones own approach (Davis 2006, 13). However, this dominance of one particular approach in economics is over and may only survive in the Bachelor students impression of economics (Colander 2005), as the development of textbooks is lacking behind. The current research being undertaken in economics represents another picture, which is diversified. Heterodox approaches can be found everywhere (Davis 2006). Multiplicities of methods and approaches, which try to elucidate the economic process beyond neoclassical economic man, have become mainstream. However, one particular approach, which used to dominate economics, did not see a great revival. It is the inductive, descriptive, empirical and qualitative approach of the historical school. To a certain degree, this research tradition has

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lived on in the tradition of classical institutionalism, in history, and in anthropology. It is certainly not by accident that this approach has survived in the field of Institutional Economics, institutions being often a complex and qualitative phenomenon by nature (Menard 2001). The paper will argue in favour of strengthening epistemological and methodological approaches in economics, which use inductive approaches on the one hand and thick description on the other, which in turn emphasize empirical and context dependant research.

The inductive approach and thick qualitative description are often closely associated with each other. In this paper I will argue that there is no need for this association and that both approaches could be used independently, and I will separate the epistemological from the methodological argument. As those two aspects are, however, often associated with each other it is important to discuss them in the same paper.

The times of the Methodenstreit are long past (1890s) and its critique has been discussed extensively, so it would be useless to revive the discussion of that time and refer to it at present. The discussion has moved on (even if one gets the impression that we are following a circular process in relation to methodological discussions (Lindenberg 1985, 68; Reinert 2006, 4)). Therefore, I will take the position of those who today favour a context dependant and historically routed research (e.g. Hodgson 2001) and try to make the case, why such an approach will help us largely in our understanding of the economic process.

So far, the literature that argues for thicker and context dependant research on institutions within economics has not provided much empirical content. There are only few exceptions[1]. While this paper is primarily oriented toward a theoretical or a theory of science contribution, the argument is much more strongly underpinned, when the paper makes the use of qualitative data transparent. Thus it will use thick description and root the analysis in a particular empirical context, by referring to a case study. Therefore, in the following paragraph I will deliver some background information about the empirical case used. This will allow the quotes and references in this text to be put into perspective.

The case study examines the institutional change currently under way in the forestry sector in a region of Bavaria/Germany[2]. It does not focus on the formal change taking place on the government level by changing laws. The focus is on decentrally changing institutions. On the one hand, the study looks to the forms and rules for cooperation between forest owners. There the emphasis is on forest associations and how they are currently changing. On the other hand, the interest is on the change of contractual relationships between forest owners and the next step in the production chain, mainly the saw mill industry.

There are a variety of reasons for the changes taking place. These are not the focus of the current paper, but in order to develop a better understanding of the case, several reasons are briefly mentioned. The composition of forest owners is changing substantially. The urbanised forest owner (Schraml 2003), who is not dependant on the economic return of the

[1] See the special issue of JOIE (2006(2)) edited by Marco Janssen on Historical institutional analysis of social ecological systems.

[2] The project is called ZUFO (www.zufo.de) ("future markets in the forest timber chain") My colleague Markus Koch has collected qualitative data for this project (interviews, participant observations, documents). Fieldwork is over and the material has been entered and coded (see Finch (2002) for a description of the coding process) with the help of MAXQDA, a qualitative data analysis software (http://www.maxqda.de/). The qualitative software collaborates with standard statistical software. It therefore allows the use of 'thick description for thin reasoning' (Bates, et al. 1998, 14). It can be used for inductive theory development, but also for deductive hypothesis testing (as far as this goes with qualitative data (Miles and Huberman 1994, 155)).

forest, increases the heterogeneity of forest owners in respect to preferences, size, dependence, etc.. Understanding and preferences towards the environment are changing. Market conditions are changing rapidly and therefore requesting new institutional solutions. The market for timber is becoming increasingly globalised. Harvesting and saw mill technology is changing, becoming more and more dependant on the realisation of economies of scale.

The current changes under way have a substantial influence on the definition of property rights and their distribution. The outcome of the process will have substantial implications on the efficiency (in a broad societal and intergenerational understanding of the term) of the production process. Currently, various service contractors, which are in the hand of the saw mill industry, are entering the logging and forest maintenance markets to enable a constant supply to the huge saw mills, which have made considerable specific investments.

Forest owners, whose last generation would have never trusted anyone else to work in their forest (due to the important principal agent problems involved), are currently considering new forms of forest use with the help of contractors. In other parts of Germany even leasing contracts have emerged, an institutional form completely unknown in Germany until recently.

Small forest owners are only able to make contracts with saw mills when they join together to get the required quantities. These saw mills do not accept any measurement of the timber in the forest by the local state forester, but rather they want to measure it once the transport agent has brought it to the saw mill, where it can be measured and valued automatically. There are so many small changes affecting the institutional setting, that I could not possibly describe them all here. The examples should just give the background for the empirical references provided in the text.

The use of this particular institutional change for illustrative purposes is especially suitable for underpinning the argument that a theory of institutional change often needs empirical context and thick data. On the one hand, it is an institutional change taking place in a market environment (timber market, market for forest services, land market …), and is therefore inherently an economic phenomenon having to be understood with the help of economic theories of institutional change (in the case that this is their rightful name). The theories of institutional change that rely more on efficiency might even claim to be able to explain the considered change (Schlüter 2001; Weimer 1997). On the other hand, the observed institutions govern environmental resources, which are part of a complex social-ecological system (Janssen 2006). Due to the long production cycles, there are many true uncertainties involved[3]. The German forestry sector has a long tradition of developing institutions that allow for a sustainable interaction with this particular eco-system. This tradition not only exists on the formal level with strongly regulated forest laws, but also on a cultural, local level. One would expect that for such a process of institutional change, which is characterised by complexity, the argument for more thick description and context would be of particular strength (Denzau and North 1994; Schlüter 2007).

The paper develops as follows. There are two main sections; the first part looks at the problem from a theory of science perspective. It is divided into two sub-sections. The first sub-section has a purely epistemological focus. The difference between the formerly favoured inductive approach and the currently, by classical institutionalists, favoured abductive approach for doing institutional analysis is clarified. Then, this is put it into perspective with the mainstream deductive approach. The second sub-section combines the epistemological question with a more methodological argument and analyses whether or not

[3] See Schlueter (2006) for longer description of the particular characteristics of this institutional change.

there is a necessary link between deductive reasoning and quantitative methods on the one hand, and inductive and qualitative methods on the other hand.

The second part looks at current theoretical developments, which, to my understanding, indicate that we should pay greater attention to the use of thick description in economic institutional research. The developments considered are the analysis of multiple rationalities and cognition with a special emphasis on the role of culture First the theoretical development is explained and then examples from this particular case are given, which should exemplify what it would mean to more deeply understand those particular factors in an empirical case.

Deduction, Induction, Abduction and Thick Description

Epistemology

Since the Methodenstreit, deduction is, at least rhetorically, by far the most dominating epistemology within economics. Following a set of assumptions, a generally valid theory is developed out of logical reasoning. No empirical input is needed so far, but pure philosophical logic, which provides us with a general model of explanation, which is completely consistent within its model logic. The model, which was hermetically blocked off from reality during its creation, is then exposed to reality and is tested to see if it is able to explain this reality. Within mainstream economics it is assumed that, when modelling the majority of choice processes, we can use a uniform set of behavioural assumptions on which our models are built. Many empirical studies have shown that, depending on the empirical context, we must use different behavioural assumptions to be able to build applicable theories about those situations (see section about multiple rationalities below). Therefore, this makes a certain empirical groundedness of any theory necessary. There is no fruitful theoretical development imaginable, which is not influenced by the reality it is expected to explain. It would otherwise be only be chance that a theory out of an empirical vacuum would fit. Eucken argued, in the aftermath of the Methodenstreit and being squeezed in between the two economic traditions, that if we let economics remain or become purely theoretical, non grounded with empirical data, we might lose our creativity as scientists and the ability to explain new phenomena (Eucken 1965, 34). This kind of argumentation seems to be obvious, at least since Kant, because with a deductive reasoning, which is not fructified by empirical puzzles we observe, one cannot create new knowledge. One is only able to draw logical conclusions, which have been ingrained in the particular model through its assumptions (Finch 2002; Hodgson 1993, 16). Empirical information has an important role to play in the development of our theories. We need to confront the model with new empirical information and try to use this information and our logic to build new and better theories.

What could be said about an inductive economic science? The main criticism against the German historical school was their naive empiricism, coupled with an inductive reasoning. There have been long discussions about whether or not the German historical school was really a-theoretical and whether it relied on a pure empiricism (Hodgson 2001, 27). However, these questions do not seem to be relevant anymore. It seems to be common sense that no knowledge, reasoning, or empirical investigation is possible without any preconceptions existing in the mind of the researcher (Eucken 1965, 37; Glaser and Strauss 1967, 37; Hodgson 1993, 16; Hodgson 2001, 9). Might it be a conception, which is given by defining

words and what they mean, e.g. when we talk about an institution[4], or might it be that those pre-theoretical understandings are necessary to be able to ask any question at all, about any empirical situation. Therefore, pure inductivism is not feasible.

On the other hand, it is also common sense that the reason for doing research is to get an understanding (what would translate into the German word of "Verstehen" so prominent in methodological and epistemological discussions) of a situation and to be able to draw any (general) conclusion out of this data. Therefore, science without theory seems senseless. If we believe in general or context dependant theories is another matter. However, the proponents of inductive research always stress that inductive research is far better suited to understand empirical phenomena, instead of solely being able to explain them, which a pure deductive science is "only" able to deliver. Inductivism without any sort of theorising is neither feasible nor desirable.

Those who followed the historical school, the classical institutionalists, do not favour an inductive approach, but believe that abduction provides a much better description of how we do science and expend our (theoretical) knowledge as scientists or as human being in general (Bromley 2006; Hodgson 1993)[5]. Abduction is often also called the Holmes method (Truzzi 1985). We have already partially backed up theories, on which we built our hypothesis, which is more of a deductive reasoning. However, as reality is complex and never fits into our broad brush theories, which are necessarily abstracting, we become astonished at empirical phenomena, which then in a creative process needs a recombination of our existing theoretical knowledge and the empirical observations (Bromley 2006). The combination then leads to new theory (Hodgson 1993, 16). This method allows us to develop a context dependant theory, which might not be a general theory that is valid over time and space (Ostrom 1998, 16). Classical institutionalists would anyhow see limits of those kinds of general theories (Vatn 2005). This context dependence is more important if we look at institutional change. It is partially explainable by general patterns, which are valid across cultures and time, but the concrete shape of the institutions always depend on the particular circumstances of the historic situation.

The inductive and the deductive approaches still do not seem to be seen as complementary, but as excluding strategies of research (Hodgson 1993, 3) and the dogmatic gaps are rather deep (Bates, et al. 2000, 696). This paper argues that different studies could be placed differently on a continuum between deductive, abductive and inductive research. Concrete research hardly ever reaches either the one or the other theoretically proclaimed extremes, but build both on logical thinking and the incorporation of empirical context dependant material. Therefore, it is best described as an abductive process. In the following section, I would like to show how important the role of stories, thick data, and qualitative description of

[4] Interestingly during the interviews the word "institution" was not used by the researcher (technical terms tried to be avoided). It was used 11 times by the interviewees. It was never used by a forest owner, only managers or administrators used it. The word institution was never used in terms of "rules of the game", but was used as a synonym for what economist would call an organisation. The verb institutionalisation was used once in the sense of "becoming a routine".

[5] Pape (2004) argues that „abduction" as a research strategy is currently en vogue. He argues that the term is often used for conventional research approaches using particularly induction. The term abduction is used to increase the perceived rigour of the research. This seems obvious, if one considers that the death sentence of the old historical school was its reliance on inductivism and empiricism and that those who see themselves as followers of this tradition would always avoid to be associated with this term. However, there is a clear difference in the approach between inductivism and deductivism.

particular empirical material has been for the development of economic theory in general, and for institutional theories in particular. I mainly use examples from theorists associated with New Institutional Economics, as they are more associated with Neoclassical Economics and therefore would stand for a deductive reasoning.

Even if most economists would reject their role as convincing story tellers and would argue that economics is a deductive science, it is impressive, how many important economic theories are emerging within an amalgamation of theoretical reasoning bound within particular empirical cases and where the joining of those two things lead to an emergence of a new theory. When referring to Williamson, who sees it as good part of transaction cost economic's job 'to tell plausible causal stories' (Williamson 1990, 65), Mäki (1993, 24) even argues, that the great majority (90%) of economics is actually (convincing) storytelling, that combines theoretical thoughts with any (or many) qualitative (stories) cases. This is particularly true if we look at institutional economics. Alston (2005, 10), for example, makes this argument in the case of Ronald Coase's theory of the firm, where Coase uses various narratives of cases for analysis and where the insights of those narratives, have lead to a much richer theory.

A similar argument could be made about the main adversary of the historical school Carl Menger, and his theory of money (1871, pp. 250). Obviously, his main interest is developing a general theory of money, and he tells a very convincing story, which seems to be applicable to the emergence of money in the whole world. Nevertheless, he is doing it by referring to thick description of anthropologists about cultures around the world[6]. In general he uses narratives for underpinning his general theory he has developed, yet his general theory seems to be very much emerged out of logic deduction *and* observations about the real world. Phrases like: „ja die *Erfahrung lehrt* [7](emphasis added), dass (yes, *experience* teaches us that" (Menger 1871, 278) indicate that not only deductive reasoning but very much empirical observations have influenced the emergence of his theory of money. Reading Demsetz's (1967/1988) article „Towards a Theory of Property Rights", one gets the impression that developing his theory, he always jumps between theoretical reasoning and the presentation of „fascinating" anthropologic accounts. He uses the anthropological accounts as "convincing evidence" (107). It is unclear whether deductive logic reasoning, or analysis of an empirical situation, was more important for the theory to emerge, but it is obvious that both played an important role.

One of the very obvious examples of institutional analysis where a clear combination of deductive and inductive reasoning exists, and where particularly historical qualitative data, in the sense of case studies, played a huge – in the impression of some too huge a role (see Agrawal 2001)- is the common property research relying on institutionalism (e.g. Baland and Platteau 2000; Bromley 1992; Ostrom 1990). Take the example of Elinor Ostrom's "Governing the Commons". There, she develops first a theory, which is based on deductive reasoning, where she uses property rights theory, collective choice theory and others. These help her to make theoretical suggestions. The theoretical suggestions are mirrored with case study data, which leads to an adoption of the drawn conclusions, a condensation of the hypothesis, getting them more complete and through this the hypothesis is substantiated. This back and forward process between theoretical thoughts and empirical observation –

[6] On page 254 he makes a long explanation about the cognitive surroundings and meanings of the different words of money in different cultures. One gets the impression, being ahead of his time, he considers even shared mental models, and their role for the emergence of a particular type of money.

[7] It does not sound very scientific to base a theoretical conclusion on Erfahrung/experience.

which to my understanding is best described as an abductive process[8] – leads to the development of the 8 design principles, which are too general to be viewed as blueprints for success, but nevertheless have a general validity[9]. This abductivness is probably already disposed in the reasons, why the entire research programme about common property emerged. Hardin's general theory about the tragedy of the commons, was doubted at first due to some, and then to an ever increasing amount of empirical cases, which indicated that there must be something wrong with this theory, something which calls for a rejection, re-adaptation or reformulation of the theory, a paradigmatic shift[10].

The Wrong Association between Quantitative & Deductive and Thick Description & Inductive Research

Quite often there is a clear association made between inductive research and thick description and deductive and quantitative research. This association is of very little help. Obviously, many deductive hypotheses which need to be tested need many cases. Therefore, a research design that relies on quantitative data seems to be more appropriate. However, there are also research questions that take a deductive approach, which cannot be answered just due to the lack of available data, with the help of quantitative data or the number of cases is just too little (Menard 2001, 90). It can also be argued that thick qualitative description can provide another form of empirical evidence than quantitative data could provide, therefore providing a triangulation of the findings (Downward, et al. 2002, 482). A convincing story can certainly be told better (because it can tell you something about he causes and reasons) with the help of qualitative data. The analytic narrative project in particular had the aim to use narratives for deductive reasoning (Bates, et al. 1998).

The project from which I draw some empirical examples in this paper has also started – at least in the project proposal – with a clear theoretical hypothesis, but uses qualitative data for its research. This was due to the particular hypothesis, which needs qualitative data for proofing. The underlying hypothesis was that institutional change within the forestry sector is, in comparison to other processes, strongly influenced by ideologies of the participating actors. The starting point of the project was definitely the later theory(ies) of institutional change by Douglas North (1992). Therefore, it started with the intention to see if North's claim about the role of ideology and thereby mental models for institutional change is right in the case of forestry. This hypothesis was formulated comparing the theoretical characteristics described by Denzau and North (1994) (complexity, low income relevance, infrequent repetition …) with a general observation of the forestry sector[11]. Due to the low

[8] See Johnson (2004), who would contradict me here and who is very strict in putting Ostrom into the box of deductive researchers on common property. He sees a categorical difference in the two traditions (inductive, deductive) in using context specific and historic data, which, in his understanding, leads to an incompatibility of the two approaches. This dogmatic view does not seem to be helpful for overcoming the Great Antinomy.

[9] I am fairly certain that the reason for the success of „Governing the Commons" was that it told a convincing story, and a far more convincing story than the competing one about the „Tragedy of the Commons", which did not seem to fit with the empirical observation. Therefore the explanatory mental model needed to be adopted.

[10] Bromley (2006) explains this as the main reason for change in reasoning.

[11] See Schlüter (2007) for this comparison. The empirical part of this project has now finished and the interviews with 37 actors involved in the process are coded. So far 836 junks of texts are coded, of which 554 relate to theoretical issues, explaining institutional change. Out of those 554 text bits 182 relate to North's ideology, subdivided into 5 codes. Many important texts relate to power issues (in the sense of Knights (1992) theory of

monetary relevance of the forestry sector to the forest owner, it was assumed that competition (e.g. Barzel 1989) and power based (e.g. Knight 1992) approaches are of less importance. After first field visits however, the hypothesis was set that on the level of the forest owner, the relevance of ideology based explanations clearly dominate, but for understanding the behaviour of the managers of forest associations, a power based approach (e.g. that of Jack Knight (1992)) would be necessary (Koch 2006)[12].

Analysing the discourses of the actors involved in the empirical process, one gets the impression that many replicate the deductively developed economic theories. The reasoning of many economic theories is deeply engrained (Fine 1998). That these mental models have been developed purely inductively from one's own experience is rather questionable. It is more likely that they repeat warranted beliefs (Bromley 2006), where actors take rather unquestioned scientific knowledge and mirror it with the reality they observe, adopting it to the particular context. If this leads to a self-fulfilling prophecy is another matter, but those discourses can be used, in a deductive sense, to deliver the "context specific clarifications" (Finch 2002, 222) to elaborate further on those theories (why should in any case those living a particular situation have a worse understanding than those theorising about it) (Finch 2002, 224), and to see how they are understood by the people, whose behaviour should be explained by those theories. Quote one and two below, for example, are a kind of rudimentary economic theory of competition[13]. A managing director of a forest association (3) has a more neoclassical understanding of the process. If the price is lower, than it is obvious what is going to be selected, the invisible hand will do its job. The two following forest owners (4, 5) have a view similar to spontaneous order, evolutionary approaches, the first combining it with a value judgement, which dislikes this selection process and the second, seeing it more as a natural process.

1) **Forest Association Manager**: All in all, it's not a bad thing when the structures can be kept the way they are, that we keep Small, Medium and Large ones, and not just Large ones that eventually destroy all the Small ones. That's always the problem. The resulting competitive situation is probably what was responsible for the price increase.

2) **Forest regulator**: Naturally, it's definitely going to lead to an acceleration of the dying out of medium-sized saw mills, this is clear – it's certainly tough competition. But I mean, then that's the way it is, just like it is elsewhere too. There are some big ones, a few niche providers, a couple of family businesses

distributive bargain 213), which we did not expect, as private forestry in this part of Germany is certainly not important in relation to distribution. Unexpected was the huge importance of trust related issues (122), which is obviously linked to mental models. This simple quantification says nothing about the length of the particular text bits, about their relative importance or about the way in which the interview was conducted. Nevertheless, it gives a first indication of the importance of the various topics.

[12]A more detailed and qualitative analysis of these hypotheses still needs to be done, but a pure quantitative analysis of the coding proves this hypothesis. For the interviews a general schedule was used, which was only moderately altered according to the particular actor interviewed. Summing up all the codings within the interviews of the managers 61 text chunks have been coded as relating to North and 91 relating to Knight. For the forest-owners, 108 have been coded as relating to North and just one relating to Knight. We haven't jet done tests for examining inter-coder reliability, but even admitting the possibility of a strong coder influence these results are robust.

[13]One could distinguish more: quote two represents a structure based understanding of competition, found in old theories of competition. Quote three has a more modern and dynamic understanding of competition.

and the rest. The rest is gone now and so this development is going proceed faster than it would have before. Altogether though, it's clearly keeping the timber demand in this area alive – but how long this is going to last, and to what extent price arrangements and contacts might eventually lead to some kind of Oligopsony, remains to be seen. But it's not going to be easy, because such a plant is there to treat timber, not to not treat timber, so I'm therefore rather confident

3) **Forest Association Manager:** Bad, I say that we want the smalls ones to stay, but we don't have the timber[14], so when the market price is 80 Euros, I can't just tell the one sawyer that because of his significantly higher break even point, he can get it from me for 70 Euros – that just doesn't work. Either he comes through, because he's found some kind of niche, or he's gone. … Because the local carpenter, who always bought the wood from him, he says to the sawyer that he needs to offer his goods for a good price too, so he needs the wood as cheap as possible, it doesn't matter how well they know each other when the wood is more expensive. And the consumer doesn't care, he just wants it cheap.

4) **Forest Owner**: That's how, in principle, the whole economic system works. Whether it's the sawyers or the farmers, it's the same principle. Always more of the bigger ones and the smaller ones disappear, whether that's in agriculture or, like we used to say, „Aunt Emily's Shop", they aren't around anymore. The big discounters built on the green field, and yeah, that's how it is with the sawyers too. Actually, I don't agree with this principle. Neither in agriculture, nor with the discounters, nor with the saw mills, because so much is being realised in one concentrated area and the machines are so optimised, that more and more jobs are disappearing. And with the high unemployment rate, it would actually be much more logical to have better smaller ones with more jobs, instead of a lot of unemployed workers.

5) **Forest Owner**: No, because that's the way it always is. It was already like that 50 years ago. I know, because my father was also affected by it, he was a miller. There used to be a mill in every village, but it's not like that anymore – we can't even imagine it. I think that the small sawmill - the kind you think of in the country, where the farmer brings his logs directly to – it just can't work economically. I also think that there's only one market, maybe even one world market. And timber is simply a commodity. It's clear to me, that it has to be industrialised and profoundly automated. And there's absolutely no reason to make this a bad thing.

I tried to show in the section above that there is no clear advantage for an inductive, deductive or abductive approach within institutional economic research, but that it depends on the particular question or case we are looking at, what type of research method leads to the greatest understanding and cumulation. This section reasoned that there is no necessary link between the epistemological approach and the kind of empirical data used. All this indicates that economics and particularly institutional economics should get more heterodox and aim for a multiplicity of epistemologies and methodologies. However, the second argument I want to make in this paper is not an epistemological but a methodological one. It

[14]The member of the forest association is not obliged to sell her timber to the association. She can also look for better opportunities.

is about the use of history specific, empirical descriptive thick data and its usefulness for analysing institutional change. I want to show its usefulness and want to point out why it is useful to focus on qualitative data and in how far this data can complement other approaches.

Thick Description and Institutional Economics?

Apart from the epistemological reasons I mentioned above, there are reasons relating to theoretical development, which should make us reconsider using more thick description to better understand institutional change. The relevance of multiple rationalities and the importance of cognitive/mental models and culture for institutional change are issues that must be considered. These issues are closely interlinked. If we assume that to understand human choice, which is in the centre of economics, we cannot assume one rationality (e.g. the one of homo oeconomicus) but various rationalities, then it becomes clear that we must open the black box of the individual and understand how an individual comes to a certain choice. This inevitably leads to the issue of cognition. There is no strong agreement on the best means of understanding cognition. Nevertheless, when trying to understand institutional choices, there seems to be a consensus that cognition is shaped on the one hand by our experiences, but on the other hand to a great extent by the culture in which we are embedded.

Rationalities and Thick Description

One of the reasons we should use more thick description, comes from the more and more recognised fact that for many economic decisions, the assumption of an economic rational actor is not sufficient, but different behavioural patterns have to be considered if we want to understand the choice process (Etzioni 1994). Those deviations might be of particular importance if we look at choices regarding institutions on the one hand, and the environment on the other hand. Institutions are normally valid over a long time, they are a priori rules, which should be applied to everybody, they are often complex and it is therefore not obvious to the actor, which kind of institution he or she should favour. From this perspective many actors might not perceive it neither wise nor morally justified to behave like an e.g. transaction cost minimizing agent maximising the own benefit, as assumed in huge parts of new institutional economics.

Uncertainty, and the limits of the calculating capacity of the individual, might make it entirely impossible and not mainly calculation, but instead rule following will guide the decision procedure (see below) (Vanberg 2006). This might be even truer if we look at institutions regulating the environment. The public good character, and the resulting impossibility to use the market in certain areas as an institutional form for its regulation, might indicate that it would be inappropriate to assume the rationality of homo oeconomicus to actors interacting with the environment (Siebenhühner 2001)[15]. Long-term experiences might have shown that it is in the common constitutional interest to apply another rationality.

[15]See various works of Frey (1997; 1997), that show how detrimental it can be to assume, when designing environmental policy, a utility maximising agent. We behave according to the institutional (cultural) context we are in. A policy framework which assumes utility maximising agents will provoke and morally justify a utility maximising behaviour. Moral rules, binding behaviour will be “crowded out” and lead to a welfare loss.

Empirical observations as well as laboratory experiments have shown that we use various rationalities depending on the context we are in (Ostrom 2005b, pp.69). The context is partly determined by the institutional structure in which the particular choice situation takes place[16]. We might be able to use laboratory experiments to find out the general features of situations we need to create, for actors to behave in the one or the other form, so that we know, how to set institutions right, depending on the way of behaviour we want to favour in a particular situation. This might give us important clues on how to design institutions, but these clues need to be validated in the field with the help of detailed analysis of the way the particular actor really behave and how the particular situation can be characterised. It has to be seen, how robust those findings are, and what influence the differences between the laboratory experiments and the reality have (Finch 2002, 222).

Obviously, the more we create, due to institutions, an environment which favours strong competition between the various actors, we can expect them to behave more according to the picture of an individual utility maximising/rational agent (Ostrom 1998, 3). However, real meaning of a rational actor in a particular situation is not that obvious. In a theoretical situation we are able to posit this precisely. We design a situation, where everything can be counted and expressed in monetary terms, like in a game situation, and where behaving rationally is clearly defined. However, in a real life situation the picture is far more diversified. One needs to look in more detail at what particular institutional environment favours which type of behaviour. Usually the literature differentiates between four or five different rationalities (Vatn 2005, 127)[17]. It can be doubted that we are able to press all our different ways of behaviour we can empirically observe in the four or five coherent boxes, but that empirically we find a much more diversified and nuanced picture. Additionally, it is also recognised that usually we do not behave in a particular situation following one pure form of rationality, instead we mix our behaviours, e.g. acting in a market does not mean to behave like rational actor, meaning calculating our own cost and benefits (Etzioni 1994).

Laboratory experiments might give us the possibility to detect the various heuristics in a particular situation, but we might have a problem of induction, only being able to observe the various behaviours. Observing the behaviour only provides us with thin description. We might not be able to understand those behaviours, the reasons behind those behaviours, by just observing the behaviour (Ostrom 2005b, 114). Obviously, many of the heuristics might be used unconsciously, which makes empirical research difficult (Ostrom 1999, 51, 54) and even letting the actors talk about their strategies and behaviours might not lead directly to an understanding of the heuristics. Nevertheless, discussing them with the actors might enable us to slowly get at the reasons behind those strategies and giving us a better understanding about the heuristic. We need, therefore, to take more thick description about the context into account. This even holds true for an experimental setting[18], but it is certainly relevant for an empirical situation.

The heuristics we find when considering thick description of empirical situations might be more applied to a particular situation/context and be less general, such as the heuristics described by Ostrom (2005b, 115) (e.g. “[t]he lexicographic strategy (Fishburn 1974) selects

[16]This creates the problem of infinite regress, that we are not able to say what was first, the institution or the choice (Bromley 1989; Vatn 2005).

[17]See Ostrom (2005b, pp. 114) where she does not describe rationalities, but decision heuristics we use. Relating to Riesenkamp and Hoffrage 2003, 50 she refers to 7 decision heuristics found in a series of experiments.

[18]See the paper from Björn Vollan in this working paper series. The behaviour of the players and what they said after having played the game shows the importance of thick description to understand their behaviour.

the alternative with the highest value on the cue of the highest validity …"). This particular decision heuristic has the additional problem that it might be applicable in an experimental game theory setting, where people make choices about easily measurable outputs. However, in reality most choices do not allow for such simple metric comparisons (Panther and Nutzinger 2004). Nevertheless, to learn more about the decision rules people apply according to the context it is important to investigate the more context specific "rules of thumb" (Ostrom 2005a, 21) for an economic choice within a particular situation, In our case, it was quite clear that for many forest owners, the decision rule about a new institution was bluntly speaking: "I follow the opinion of the manager of the forest association". This is never stated so clearly – who would ever admit such a decision rule, but there are many indications for this. The reasons given for doing it, are in a broader sense, quite rational (Vanberg 1993): its is not worth the effort to do a thorough analysis; the manager knows much more than the small owner does; the experience shows that trusting the manager is worthwhile. [19]

Laboratory experiments can create the general boxes, but they are far from the many times more complex reality and the question can be asked, to what extent we are able to create realistic conditions and gain valuable insights for reality from those experiments (Knight 2000, 21; Loasby 2002, 8)[20]. Many cross cultural comparisons of the same experiments have been made, to see, how far those experiments are still bound to a particular real context, or if they are completely independent of this context (Ostrom 2005b, pp.72). Certain patterns seem to be culturally independent, but others defer very much depending on the culture you are in (e.g. doing game theoretical experiments with students of economics and business administration leads to different results than doing those experiments in between students of theology for example). Therefore, the rationality employed is not only influenced by the immediate institutional setting, such as those given by the instructions of a game, but they are also influenced by the broader and general context and culture[21]. If this is the case, then we need to put more emphasis on context information, which gives us the necessary information about the particular choice situation (Knight and North 1997).

Having myself been socialised for many years by rational economic thinking as a student of economics, coming to a faculty of forestry makes you realise how important different disciplinary cultures are for understanding the choice process of people. Understanding the German, and even more the Bavarian, forest owner decisions is not possible without knowing something about German "Waldgesinnung" (forest ethos) and Germans' particular relation to nature. The forestry sector is certainly a sector where ideology and a sector's culture are particular[22]. However, I would doubt if particular cultures are of less importance in many other sectors.

[19] **Forest owner**: „the manager actually used to be my neighbour, he lived just down the next street – we used to play in the sandbox together. So whenever I need information, that's how I get it."

[20] This statement should not be interpreted as a rejection of laboratory experiments. Laboratory experiments have a crucial role in testing and rejecting theories. They are often the only way to rebuild the assumption made in the theory (Guala 2005). They are a mean to substantially reduce complexity of reality. Simon (2000, 750) claims that detailed empirical research in this field is still rare.

[21] Just imagine the game of pachisi and how differently it is played in various families. One would assume that the rules of the game are clear enough that they favour a behaviour of an individual utility maximising agent. However, real behaviour is much more diversified.

[22] See Pleschberger (1981), who shows the role of ideology and a particular scientific culture for the sub-science "forestry political science". See Detten (2001) who shows the metaphorical and ideological battles between the various groups of foresters.

In the empirical case of the Bavarian forestry sector, we are looking mainly at institutions that are regulating markets. We are looking at organisations and contractual forms, which organise the selling and harvesting of timber. These are all activities, which are taking place in a market environment. Therefore, as the conventional wisdom goes, we should assume that actors behave like homo oeconomicus, at least in a broad interpretation of the term. However, at least when looking at the discourses, and not at the real behaviour, one gets the impression that decisions made on those markets are not driven by maximising one's own utility and optimizing short term costs and benefits, but for all kind of other reasons. It is more a process of argumentation than a process of mechanistic calculation, and in a neoclassical sense rational behaviour (Bromley 2006). The following quotes below show, to what extent it would be wrong to assume just one rationality, and particularly the rationality of homo oeconomicus, which is a utility or pay-off maximising agent.

The following quote is from a managing director of a forest association about his forest owners and how they behave towards a huge saw mill owner (sell or not to sell), who has, according to them, not shown sufficient respect towards the small forest owners:

> ***Forest Association Manager****: "There are very many forest owners who say absolutely no. One of them told me a few weeks ago that he's fed up with them, and that he wouldn't sell them the wood, even if they paid him 5 Euros more for it – he wouldn't sell it to them out of principle. Because farmers are actually to some extent stubborn."*

Many of the forest owners do at least tell that they would be very willing to loose a couple of Euros per cubic meter, if instead they could help the local saw mill industry.

> ***Forest Owner:*** *"… because I agree with the locally routed, I think that it's more reasonable to have several of them, some smaller and medium-sized ones – they don't have to be really small – but I like the medium-sized and small ones better. I could do without a few Euros so that these people could continue to exist."*

Currently, the forest associations and owners of the region are organising a cooperative, which should finance a particular saw for a local saw mill (the main argument for it is to strengthen local mills, against the demon of powerful huge saw mills). The following potential member of this cooperative went on and on in the interview about the negative consequences of being a member of that cooperative. The cons outweighed by large the pros of becoming a member. Therefore, one gets the impression that it is not at all advisable to become a member of this cooperative. He argues that his other colleagues and friends are going to join. In between the lines one can conclude that this is also the reason for him to buy shares. He concludes:

> ***Forest Owner:*** *„Nevertheless, I'm going to become a member of the cooperative, out of principle."*

Two last quotes of forest owners about their „rationality". The second owner was asked what he thinks would be to "act rationally" in a particular situation and if he would do this.

> ***Forest Owner:*** *„Why am I saying that the idea is good? Yes, that is just my opinion, I mean, my opinion is that it's good. The exact reason why, well, at the moment that's a little over my head, but, I mean, I have the feeling that it's good."*

> ***Forest Owner:*** *„The rational thing to do, might be to approve a forest association that is going to make a new owners association – that might be rational. But that's against my instinct.*[23]

Cognition, Culture and Thick Description

The above puts an image on human beings as if we were irrational, making our decisions with the help of beliefs and "half baked theories" (Denzau and North 1994). We do make our decisions with the help of those beliefs[24]. Those beliefs are finally what make us able to act in a complex environment. If we were rational individuals in the sense of neoclassical economics, always calculating all pros and cons, converted into easily commensurable cost and benefits, we would be lost and not be able to make all the required calculations. Apart from this, these calculations would not be possible, due to incommensurability and due to uncertainty (we just need to believe what the possible pay-offs will be). We use and need rules of thumb (Ostrom 2005a, 21). Simon (1992) and others have shown that this ability to act with the help of patterns, rules of behaviour as a homo behaviouralis (Vanberg 1994, 35), substantially increases our possibility to act and is even very rational in terms of resources spent on the decision making process (Vanberg 1993).

Cognition is a broad term and used by various sciences.[25] One dominant interpretation is certainly that of cognitive psychology, where the emphasis is put on the individual and the way it processes the information it receives. Cognition is understood as a physical process explaining how the human brain receives and processes information. This research can contribute significantly to the understanding of the role of cognition in the process of institutional change, but is not in the centre of interest of the institutional economist.

When analysing cognition for the process of institutional change it is important to understand how humans reason, interpret the information they receive, and the filters they use for interpretation. We have to know, on the one hand, something about the "if then" connections people think are relevant in a particular choice situation. They cannot interpret the information directly, as assumed in neoclassical rational actors' model, but they use their half "baked theories" to understand their environment and, therefore, to make a choice. On the other hand, we need to learn something about the values and norms the actors think are relevant in a particular choice situation. The "if then" connections humans use are the mental models used for interpreting the environment. They are the building blocks for the behavioural/choice rules developed (Mantzavinos 2001, 24). Understanding the role of cognition for institutional change then basically means understanding the role of cognitive models. Getting at those cognitive models means having to analyse discourses, what is said and what is thought in a particular decision situation (Downward, et al. 2002, 490).

There are different views on how those mental models are developed. As the role of cognition was emphasised for the first time, which was done by scholars of New Institutional Economics like North (Denzau and North 1994), they began by focusing on the individual

[23] This quote underlines the important role of emotions when making economic decisions (Damasio 2004).

[24] Bromley purposefully uses the word belief, to make clear how insecure this "knowledge" is and in how far it is based on assumptions. Even for scientific knowledge he uses the term "warranted beliefs" (Bromley 2006, 130). Knight and North also use the term "beliefs" (Knight and North 1997, 218).

[25] Knight (2000, 16) differentiates between three schools looking at cognition, each of which place a different amount of importance on the individual or society when trying to understand cognition.

and the experience she makes. Here, human beings are described as inductive learners (Holland, et al. 1986), who are constantly comparing the actual choice situation with patterns stored in the brain. Human beings are, due to this pattern matching procedure, relatively good decision makers in an uncertain environment (Holland 1996, 281). This puts the importance on the individual and the experience she makes.

However, it did not take long to recognize that humans do not build those mental models from scratch, but that they heavily adopt models from others, might it be family, experts, or friends (they are not inductive, but abductive learners (Bromley 2006)). This leads to the recognition that to understand institutional choice, understanding the individual as such does not suffice, but we also need to understand her environment and context in which she is acting. This is something that classical institutionalists have long since adopted, but was not obvious to many scholars at beginning of New Institutional Economics[26].

The main factor analysed to provide context for the building of mental models is the role of culture. The role of culture in influencing institutional change and choice has been increasingly emphasised in the past years. If we look, for example, at the development of Douglas North thoughts over the last 25 years, one gets the impression that the role of culture for the process of institutional change has been more and more recognised (Goldschmidt 2006, 178). Other scientists also put more emphasis on the role of culture for institutional development (Klump 2002)[27]. We can only understand individual choice, if we have understood, how culture "provided the substantive content of individual thoughts" (Knight 2000, 18). This has clear implications on our methodological approach (Goldschmidt 2006, 181; Goldschmidt and Remmele 2005, 465). "To the extent that we accept the arguments that cognitive activity is dependent in a fundamental way on the cultural and institutional context, research on cognition must move beyond the walls of experimentation and pay greater attention to the mechanisms of everyday cognition in social life" (Knight 1997, 696).

Avner Greif (1994), for example, has convincingly shown in his description of the Maghribis and the Genoese that culture plays an important role in determining the development of the institutional setting, making a comparison between the more individualist Genoese and the more collectivist Maghribis. Yet here, we again find two rather broad-brush behavioural assumptions, which are believed to be relevant in the one or the other culture. In many studies on the role of culture for institutional change, those broad-brush categories are analysed (e.g. the role of Orthodoxy in relation to Protestantism is analysed for the success of transition). The usefulness of such studies will not be disputed here. However, in the explorative phase of integrating culture into models of institutional change, we need to understand a particular culture and the possible influence it might have on the choice process. Otherwise we might once again risk the problem of induction mentioned above, delivering thin reasoning. Finding out something about the impacts of culture on our institutional development needs more detailed knowledge about the particular culture, much detailed description, all sorts of historical sources, narratives from people, which give us insights about the culturally engrained patterns of behaviour of this particular group. The data required is a detailed description of people's thoughts and reasoning. We need to understand

[26] E.g. North & Thomas (1973), North (1981) when developing his theory of the state or Barzel (1989).

[27] See Goldschmidt (2006, 181), who argues that Witt, Hodgson, Vanberg – and certainly Hayek – all claim that culture needs to become a central issues within economics, if we want to understand the economic process (and not define economics furthermore by its methodology instead of its subject (Hodgson 2000).

what gives “sufficient reason” for then influencing institutional change into one or the other direction (Bromley 2006).

Reading North, one can get the impression that culture can be seen as a static, exogenous factor, which is not moulded in the interaction with people during a process of institutional change (Goldschmidt 2006, 178)[28]. Therefore, one would conclude that we need particularly historical sources in order to understand the role of culture in the process of institutional change. The importance of historical data, might it be written or oral data is not disputed here. However, the cognitive models, which are relevant for the process of institutional change, are, as indicated above, partly moulded by the engrained culture and partly moulded by the new experiences we make.

We have to consider that many choices about institutional change deal with situations, which have not been regulated before, or which have not been regulated in the way the institutional proposition is made, they are institutional innovations (There has never been, in the experience of the forest owner, such huge saw mills as they now have to deal with. Huge timber service providers never used to exist. The forest was always maintained by the owner, this change requires institutions never seen before). Therefore, it is always a process of uncertainty. It is something we cannot know, and what we have to do is to take our experience and knowledge we have from other situations and try to extend this to the new situation (pattern matching (North 2005, 26)).

Therefore, looking at culture, in the sense of historical data, would not suffice for the understanding of cognition in the process of change. We must find out how the old mental models engrained in our culture are used and adopted for the new situations. Therefore, we access the role of culture for the process of institutional change by analysing the discourses. Seeing how they interpret the new situation with the help of their “old” and newly emerging models. It is the process of abduction that we need to understand, the way people reason (Bromley 2006). The discourses give us the possibility to understand the applied “if then” connections and the values which are fed into the process of cognition.

Listening to the discourses of people involved in the process of change in the forestry sector, clarifies how important those models are in order to understand the process of institutional choice. The quotes 1-5 from the section above, which showed how actors adopted warranted beliefs (Bromley 2006) from science and adopt them for their particular situation, are all “if then” connections from the individuals concerning their reality (if small sawmills die, we might have a problem of competition). They are often inseparably linked to normative positions (it is not fair if competition select the weak saw mills (4) or this is the way how it always has been (5)). Obviously, the model in the actor’s mind determines her choice. Therefore, knowing them is indispensable for the understanding of their institutional choice.

Other example of cognitive models shaping the decision in this particular case are, among others, the following: The forest owners have a positive experience with cooperatives over several generations (mainly in the area of farming). When discussing the legal form for a new business, there is an unquestioned preference for cooperatives. From the perspective of many actors involved, cooperatives are preferred because they are – as one actor, who

[28]One also gets this impression particularly looking at Williamson’s levels of institutions, where culture is changing in period of 1000 years (Williamson 2000). If one considers how quickly trends and views are changing, for example, if we look at the cultural understanding of our environment in Germany, one does not get the impression that those views are static and that mega-trend of a thousand years are shaping our institutional change, but probably very short living joint understandings, cognitive models, of a particular period (Phillimore, et al. 2007).

represents the opinion of many puts it – "the optimal legal form, because the business risk is put on the biggest amount of shoulders one could get." This is coupled with the dominant view that private businesses, particularly if they are big private businesses, have to be mistrusted because their interest is profit maximisation.

> ***Forest Association Manager:*** *„Because that's the way it is with the economy, it's already like that, that everything that's profit orientated pulls everything else over the table whenever possible, or, it's like that with lots of the big companies. I would be careful."*

> ***Forest Association Manager:*** *„The big sawmill has bought this huge forest service provider, it bought the forest operation. Until now the forest operation had been in the forestry sector, which means that the planning that we're doing is sustainability planning, forest planning, sensible planning within the scope of what we've learned and what we understand, and now we have a paradigm shift. The duty of this service provider is supplying the sawmill's lumberyard in the short-term. They go out, they are not interested in the forest or its sustainability, they say supply, away with the wood."*

The following quote gives the reasons this forest owner is not considering signing a service contract with his forest association. The reason he continues to harvest the forest with his family, even if it might not be economical in a narrow sense of the word, is because he wants to teach his children a provisional thinking as his parents taught him. He has to transfer "pedagogical values".

> ***Forest Owner:*** *Yes, I know that something like that exists, but I've never considered it. It might be because I find this relatively small forest still kind of nice. Where you can sort of saw a bit of wood here and there, and take out your firewood. Only doing a really little bit, on a really small scale. We have a wetland in middle with a picturesque little creek that flows through there - we made more of a clearing in that area. So, what was it that I wanted to say - it has a really small recreational value and perhaps, when I go with my boys out into the forest, a somewhat larger pedagogical value. I've been doing that since they were little, we get wood in the summer when it's warm, for the winter when it's cold. Yeah, that kind of provisional thinking, I think you can really learn that in the forest. First you get the wood, then pile it up, then it has to be sawn down again, and finally it's piled up again. All in all it's a huge undertaking, but then we'll burn it here, and we'll be burning the wood that the kids have already had it in their hands three times.*

Conclusions

We need both thick and thin description to advance our knowledge of economic processes. Multiple ways for acquiring knowledge must be used. The use of various epistemologies and methodologies is necessary and fruitful (Downward, et al. 2002, 497; Hodgson 2001, 10). This is not thought of as a unification of those two approaches but as a mutual fructification and complementation (Finch 2002, 215). After the complete defeat of the historical school and a long domination of formal theorizing, it is obvious that any economic research which relies on detailed empirical qualitative data has a difficult stand (Menard 2001, 89). However,

this paper made an argument for using thick description in economics in order to “verstehen” processes of institutional change.

Including a more inductive on the one hand, and a more thick describing qualitative approach on the other, in our analysis would be of great help for the development of institutional economic theory. However, the general nexus which is made between inductive and thick description on the one side, and deductive and quantitative work on the other side, is not at all straight forward and all sorts of combinations of those epistemologies and methods are fruitful. Deduction, abduction and induction can be seen as a continuum, where, depending on the research question, using the one or the other approach might be useful. Particularly when old theories have to be extended with details or new theories need to be developed (Finch 2002, 214), then a move towards induction might be particularly fruitful. This can, but must not, be linked with the more intensive use of thick description. Thick description might be used to underpin our thin reasoning it might give the causal link, enough details for our theories to provide convincing evidence.

Looking at recent theoretical developments within institutional economics, there are reasons, which indicate that we should “switch back” and use more thick description again, particularly for analysing institutional change. Learning more about “various rationalities” needs, apart from experiments, the analysis of discourses of people. We need to understand the reasons (Bromley 2006). This is closely linked to the more and more emphasised role of cognition and mental models for understanding institutional change. If we think theoretically that mental models are of crucial importance for understanding institutional change (e.g.North 2005), then we need to explore and get to know these mental models empirically, we need to listen to actors’ stories. These models are built, on the one hand, by “inductive learners” with the help of experiences they make. On the other hand, these models are influenced by the culture we live in, undoubtedly a thick phenomenon. Those elements call for the use of detailed qualitative thick description to enhance our understanding of institutional change.

The empirical data provided was trying to show how thick description could enhance our understanding of a process of institutional change. It has shown that assuming rational actors in a narrow sense does not make sense, even in a market-based environment, such as the one we were observing. It was shown that to understand economic choice of the actor, we need to know the cognitive models, which are driving this choice process.

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Water Management in Seasonal Floodplains of the Mekong Delta

A case study from four villages in Cambodia and Vietnam

Christine Werthmann*

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List of Abbreviations

ADB	Asian Development Bank
CCK	Chamroen Chiet Khmer Organisation
CNMC	Cambodian National Mekong Committee
DOF	Department of Fisheries
DONRE	Departments of Natural Resources and Environment
FiA	Fisheries Administration
FWUC	Farmer Water User Committee
FWUG	Farmer Water User Group
FWUS	Farmer Water User Sub-group
GDHM	General Department of Hydrology and Meteorology
GDLA	General Department of Land Administration
GMS	Greater Mekong Subregion
IAD	Institutional Analysis and Development
MAFF	Ministry of Agriculture, Fisheries and Forests
MARD	Ministry of Agriculture and Rural Development
MFAIC	Ministry of Foreign Affairs and International Cooperation
MIME	Ministry of Industry, Mines and Energy
MLMUPC	Ministry of Land Management, Urbanization and Construction
MRC	Mekong River Commission
MRD	Ministry of Rural Development
MOC	Ministry of Construction
MoE	Ministry of Environment
MoFi	Ministry of Fisheries
MoFin	Ministry of Finance
MoH	Ministry of Health
MOI	Ministry of Industry
MoNRE	Ministry of Natural Resources and Environment
MOP	Ministry of Planning
MOSTE	Ministry of Science, Technology and Environment
MOT	Ministry of Tourism
MOWRAM	Ministry of Water Resources and Meteorology
MPI	Ministry of Planning and Investment
MPWT	Ministry of Public Works and Transport
NCCD	National Committee for Management of the Decentralization and Deconcentration Reform
NWRC	National Water Resource Council
PRA	Participatory Rural Assessment
PRDC	Provincial Rural Development Committee
PRDS	Provincial Agriculture and Rural Development Service
VNMC	Vietnam National Mekong Committee
WRO	Water Resource Office
WTO	World Trade Organisation
WUG	Water User Group

1 Introduction

A functioning natural resource base plays a significant role for in the livelihoods of the people of Cambodia and Vietnam, as people living in the Lower Mekong Delta relying heavily on rice farming and fishing. Fish products in Cambodia for example represent an estimated 75% of animal protein intake in the diet of a Cambodian, which is globally exceptional (AHMED ET AL. 1998). In Vietnam, the Mekong Delta region accounts for almost half of Vietnam's rice and fish production and thus is also an important source for foreign exports (RATNER 2003). Thus, Cambodia and Vietnam are exceptionally dependent on water resources for irrigation and as fishing grounds.

However, although the Mekong Delta is still a functioning eco-system at this stage, environmentalists fear serious resource degradation in the near future. Resource users in the Mekong Delta face a highly complex situation as the water resources are used in different ways by different people, water crosses communities and national boundaries and additionally, water characteristics change seasonally. Property rights systems on water resources in the Delta are diverse. Water can be a private good, a common good as well as a public good, depending on season and location. Diverse and inter-related use patterns and therefore diverse needs and expectations make the governance of the resources even more complex. E. OSTROM argues, that "neither the state nor the market is uniformly successful in enabling individuals to sustain long-term, productive use of natural resources" (OSTROM 1990, 1).

This is true for Cambodia as well as for Vietnam. The market is not able to prevent resource degradation and even might intensify resource depletion. On the other hand, both governments in Cambodia and Vietnam are still overloaded with resource conservation and are not able to overwhelmingly protect the natural resources in the region. Local users in the Lower Mekong Delta face a situation where landscape and thus tenure rights change according to seasonal changes. Different land laws are in force, *de jure* and *de facto* rights on resources often contradict, property rights are seldom enforceable or not defined at all and significant amounts of natural resources are confronted with open access situations. Furthermore, various groups have access to the resources and use them in various ways at different times, which give the water resource system a multiple use character. As public goods, water resources are shared by different communities. This leaves local resource users in a difficult management situation with a tendency for overuse as excluding potential appropriators or limiting appropriation rights of existing users is difficult and creates a temptation for overusing the resource. Different use patterns emerged over time and although local users face quite similar natural settings, institutional arrangements differ between Vietnam and Cambodia.

This papers aims to assess institutions in water management in the Lower Mekong Delta providing an introduction into the theoretical background on institutional arrangements (Section 2) and an overview about important historical changes in land and water tenure in Vietnam and Cambodia (Section 3). Recent national institutions charged with water management issues will also be presented. Section four then provides an insight into water resource systems in two Cambodian and two Vietnamese villages, where a situational analysis on current water issues was undertaken. Section five presents a summary and conclusions.

2 Theoretical Background

2.1 The institutional framework

Institutions can be defined as “the prescriptions that humans use to organize all forms or repetitive and structured interactions including those within families, neighbourhoods, market, firms, sports leagues, churches, private associations and governments at all scales” (OSTROM 2005, 3). These institutions must be viewed as being dynamic - responding to political transition, changing governance patterns and evolving natural environmental settings. They play a crucial role in sustainable resource management and poverty reduction and the following section will thus focus on property rights, collective action and then take a closer look at what makes institutions in water management unique.

2.2 Property rights

Property rights play an important role in the management of natural resources as they shape incentives for sustainable management through securing access to and claim on the resource. They can be defined as “the capacity to call upon the collective to stand behind one’s claim to a benefit stream" (BROMLEY 1991). Property rights are legally defined and enforceable and describe a relationship between the right holder, others, and a formal or informal institution to back up the claim. Through property rights, restriction of access by other individuals can be secured as the owner has the right to prevent them to exercise the same right on the same property (DEMSETZ 1967).

Property rights may refer to private, public or common rights of a resource. While public property is held by the state, private property is referring to an individual or legal individual such as companies (MEINZEN-DICK/ KNOX 1999). If a community or a group of users define the rules and regulation for the resource use, one speaks about common property rights. Open access to a resource is characterized through a non-restrictive possibility to use the resource, meaning that property rights are not defined at all. Different property rights systems can exist between communities, within communities as well as between and within households. To be effective, property rights need recognition and legitimacy. Governance structures must be in place or established to secure the claim on the rights. Formal property rights often refer to state recognized *de jure* rights, while informal property rights often refer to exercised *de facto* rights within a community or a user group.

Property rights may be a number of different "bundles of rights". In Property Rights Theory one can find a distinction between the right to use an asset, the right to gain an appropriate return from the asset, the right to change the form, the substance and location of the property and the right for alienation or transfer of the property. The distribution of those rights will determine the pattern of the former described relationships between different rights holders. Different bundles will give different incentives for people to act on and respond to other individuals’ actions or external shocks, with absolute power being the bundle that contains all possible rights (BROMLEY 1990, AGRAWAL/ OSTROM 2001). These bundles result in the possibility of overlapping property rights.

Low asset endowments or few property rights and an insecurity of rights reduce the poor's choice set and bear the risk that benefits from investment will not be internalised in future. This shortens the time horizon of users concerning their considerations over investments and returns. This is one main source for natural resource overexploitation and degradation.

Therefore, instruments that guarantee, monitor, sanction and settle disputes have to be in place to set a reliable framework for social and economic activities (MEINZEN-DICK/ KNOX 1999).

2.3 Collective Action

In natural resource management by multiple users and multiple uses, collective action is required to coordinate individuals' activities, to develop rules for resource use, to monitor compliance with the rules and sanction violators, and to mobilize the necessary cash, labour or material resources (MEINZEN-DICK/ KNOX 1999). Collective action can be understood as an action taken by a group of individuals to achieve common interests (MARSHALL 1998). These groups are characterized by a shared interest, engagement in activities to reach objectives and participation of the group members. Usually, rules and decision-making structures are an important part of collective actions (MEINZEN-DICK/ KNOX 1999).

Participation in collective action can be voluntary or obligatory, active and direct or through an organization, permanently institutionalized or *ad hoc*. Formal agreements on collective action are found as well as informal arrangements. Through this form of cooperation, public good and service provision as well as secure access to benefit streams derived from resources can be facilitated. Furthermore, collective action can be a substitute for missing markets or help to overcome barriers to participate. It is an opportunity to provide poor people with an asset. In addition, collective action can increase the access to higher level institutions to request services or protection and bargaining power (DIGREGIO ET AL. 2004). Local collective action arrangements can be instrumental in finding rules and in allocating the resource between different users in a way that is seen as equitable by the users themselves (MEINZEN-DICK/ KNOX 1999)

The ability to engage in collective action is an essential choice, capability and power for poor and other marginalized groups. These co-operations can be applied to address different types of risk, to increase property rights security, to give a political voice to local people, and to reduce conflicts (DIGREGIO ET AL. 2004). Thus, collective action is a means to reduce poverty, but often some of the users may be excluded from the benefits of collective action, because of different social and economic backgrounds. Formal, complete property rights may weaken secondary, informal, temporary rights of way, collection and access. Some groups or individuals might lack time, capital or confidence to participate. Therefore, the recognition of land or long term use rights must be arranged in such a manner that deeply rooted inequality in assets can be overcome, that the power of dominant oligarchy is broken down and to bring scarce resources into the hands of the most productive (MEINZEN-DICK/ KNOX 1999). To understand collective action, it is required to understand group formation, group dynamics and power relations and to examine how decisions are made as to participation, decision making, monitoring, enforcing agreements and resulting distribution of benefits and costs.

Collective action is often characterized through high transaction costs that emerge when people organise themselves and the necessity of a minimum degree of trust. Property rights play a key role for collective action within common property resources as they can reduce the transaction cost of co-operation and offer a secure basis for sustainable management measures within the user group. Likewise, collective action may enable common property resources to be more equitably and sustainably exploited. These institutions can provide stability, but they change over time. Therefore, collective action and property rights can not

be understood as static but must be seen as dynamic. The distribution of rights and the forms of collective action or how they are interpreted and enforced will change over time.

The consequences of poor environmental management tend to be disproportionately borne by the rural poor whose livelihood and health are especially dependent on the goods and services supplied by a functioning local ecosystem. Provision of secure and enforceable property rights is particularly critical to these groups. Insecurity often results in overexploitation and degradation of natural resources, while secure property rights, can create incentives to build assets and to invest in sustainable resource management for the future.

The poor, landless and other marginalized groups are also most dependent on common property and open access resources. Collective action is often the only possibility for these groups to gain access to such resources as well as other public goods and services. The enforcement of rules regarding the access and sustainable use of common pool resources is facilitated through coordination and regulation in collective action structures. Although the most dependent on collective action marginalized groups are most likely to be excluded from it because of a lack of time and confidence associated with their poor human capital and inferior status with respect to underlying power structures.

2.4 Institutional arrangements and water resources

Water is of existential importance for human life and water rights are an issue of ongoing debate, conflict, negotiation and regulation at the international, interstate, and the national and regional levels (SPIERTZ 2000). Water is used for different purposes, e.g. for electricity generation, watering animals, gardening, transport and especially fishing and irrigation. Extensive irrigation systems have been built all over the world, where water users attempted to improve water use. However, irrigation systems often fail to meet expectations and water is not delivered equitably and not used efficiently. Yields are not as high as anticipated, economic returns do not justify the levels of investment made, and the irrigation infrastructure for irrigated land is often not sustainable (BRUNS/ MEINZEN-DICK 2000).

Attention to water rights has lagged behind attention to tenure of land resources. Water as a mobile resource, is difficult to examine in terms of property rights and institutional arrangements and water rights can be described as “fluid”, as opposed to ‘static’. Water often crosses not only community border, but national borders and rights attached to land and water change with flood levels. Water rights include formal rights embodied in official titles, permits, seasonal irrigation schedules, less formal rights based on customary patterns, and rights implicit in social norms and local practices. While formal laws are important, they frequently fail to coincide with people's own perceptions of water rights and the ways water is managed at the local level (BRUNS/ MEINZEN-DICK 2000).

In the Mekong areas of Cambodia and Vietnam, water builds a core resource for food production, human health, local livelihoods and well being as well as the functioning of the ecosystem as a whole. Because of their large scale irrigation systems, fisheries and floodplains areas cannot be managed at the individual or household level. In fact, the Mekong river basin faces an open access situation during flood season. During flood season, fishing is the main activity besides deep water rice cultivation. During the dry season, the resource is individually used for field irrigation. As the resources become increasingly scarce, strategies need to be devised that will minimize conflicts for water resources among different users and put forth enduring solutions that respond to the interests of multiple users, particularly those whose livelihoods depend on the utilization of the natural resources.

This makes collective action necessary, but difficult to organize (OSTROM 1992). Water management and irrigation systems require long-time horizons and extensive coordination among farmers. Negotiated approaches are essential to equitable and efficient allocation of water. The institutions through which water rights are negotiated have critical influence on the possibility of generating equitable and efficient solutions to conflicts or increasing confusion, rigidity, inefficiency and inequity (BRUNS/ MEINZEN-DICK 2000).

The people living in the Greater Mekong area draw upon a range of strategies for claiming and obtaining water. Government law on different levels, religious and customary laws, development projects rules, and unwritten local norms may all address who receives water, from which resource and for what purpose. Therefore, concepts of legal pluralism are required to emphasize that multiple legal and normative frameworks coexist (BRUNS/ MEINZEN-DICK 2000).

In recognizing legal pluralism, it is required to understand the local perspective of those who use water, their daily experiences, the meanings through which they conceive water and rights, and the options they have available for acquiring water and defending their access to this vital resource. The systems of water rights are overlapping and different rules may apply at different places and times, or may be appealed by different parties (BRUNS/ MEINZEN-DICK 2000). Local customary, community-based water rights and organizations for water management must be recognized (SPIERTZ 2000). The concept of legal pluralism aims to explore these different conceptualizations of water and water rights, the functions of water as natural resource, and the variety of forms of legal status attached to water. All these are essential preconditions for any effort to understand or improve water management. It is required to explore the relationships between the various legal orders, the types of interests and the social relationships and practices involving resources in local contexts of social interaction (SPIERTZ 2000).

In order to give consideration to the legal pluralism one can find in the Greater Mekong area it is necessary to understand underlying conditions, which determine the property rights in place and influence collective action in the region. Therefore, historical patterns on resource management, traditional rights and political regulations concerning changing property rights systems and patterns of collective action must be taken into consideration for Cambodia as well as for Vietnam.

3 Cambodia and Vietnam- Legal Pluralism

3.1 Regional institutions for water management

The Mekong River Commission (MRC) is an international institution charged with the regional cooperation to manage the Mekong River. With the Paris Convention (1954) a Provisional Mekong Committee was created, through which Vietnam, Laos and Cambodia agreed to ensure free navigation on the river. The Mekong Committee created in 1957 then also included Thailand. From 1978 till 1995, the committee continued to work without Cambodian participation and in 1995 the four lower user countries created the Mekong River Commission (MRC). Although the Mekong River is shared by six countries, namely China, Burma, Laos, Thailand, Cambodia and Vietnam, not all countries are fully represented in the MRC. China and Burma only hold observer status.

Another important international institution in regard to the water management in the region is the Greater Mekong Subregion (GMS), a program initiated by the Asian Development Bank (ADB) in 1991. Being the only institutions representing all six user countries, it can be described as the most important forum for challenging economic development assistance for regional projects (RATNER 2003). The GMS focuses on infrastructure and regional power projects, trading agreements as well as water resources management (GMS 2007).

International organisations and researchers have focused attention on improving the coordination of water management between the six countries. However, there is still a lack of cohesion and cooperation between all user countries as well as a lack of civil society inclusion. Until now, the MRC and the GMS proved to be biased against large-scale engineering schemes (RATNER 2003) and less focused on local resource user needs in the Mekong countries. Furthermore, international conflicts appeared between upstream and downstream users, because decisions on resource developments had trans-boundary effects. A lot of projects focusing on economic developments like dams for electricity production are in place or planned. These projects change the nature of the resource and have severe impacts on the livelihood of the direct users. The focus on economic development in the region also sidelines social and environmental factors and impacts of large infrastructure projects on rural livelihoods are not being overwhelmingly assessed so far.

Within this regional framework, all user countries do have their own policies and laws for the management of water resources in their respective countries. Evidently, historical developments influence these national land and water tenure regulations. Institutional arrangements in water and land management in both countries changed several times during the last decades and are still in development.

3.2 Cambodian Water Management Institutions

In Cambodia, as a country in transition to a market economy, the official data available about land and water resources rights is insufficient and resource rights are not well identified and catalogued. The country wide land titling and land valuation system is not yet established and rural areas in particular lack data about common property issues. Broad based analyses will be necessary to understand by whom and how the resources in rural areas are used and more applied research is advisable to better understand the complex livelihood strategies of the poor and the key role of land (KIRK 2004).

Cambodia is an overwhelmingly rural society and agriculture production still dominates the economy (VAN ACKER 1999). Eighty percent of the total population is employed in agriculture and 40.1 percent of the rural population is classified as poor (KIRK 2004). Almost 85% of Cambodians are locked in quasi-subsistence agricultural activities, with little change in agricultural techniques in the last decades (VAN ACKER 1999). Access to land constitutes the principal access to livelihood and with it the right to subsistence, but the poorest half of the Cambodian population has access to only about 10% of the cultivable land and 40% of all rural households own 0.5 ha or even less (KIRK 2004). More than 70 to 80 percent of the rural population has access to agricultural land, but only 1 percent has a legal title to it (BOREAK 2000). Furthermore, the growth of the agricultural sector is slow due to limitations of irrigation systems, poor infrastructure and ineffective policies (KUYLY 2002).

Cambodian history has strongly influenced land and water tenure issues and collective action arrangements in the country. The country has undergone successive waves of tenure

modernisation, complete collectivisation, and re-privatisation and is still overcoming the long record of political conflict and with it a long history of changing conditions in rural economy.

Since the French protectorate, people in Cambodia experienced several water and land tenure changes, including times where land was private property, but also complete collectivisation and forced labour. Traditionally, land in Cambodia belonged to the sovereign and the household appropriated what was needed for subsistence (VAN ACKER 1999). During the French protectorate (1863-1953) the Cambodian Civil Code of 1920 introduced a national cadastre system and a general registration of land. In 1908, the French also introduced a commercial fishing lot system, where vast areas of the Tonle Sap and the Mekong area became concessionaries and thus restricted access for local users. The privatisation of the traditional collective land ended with the Cambodian independence in 1953. With the launching of the "Buddhist Socialism" in the mid-1960s a time of state socialism started. During this period, thousands of Cambodians were resettled and land was forcibly redistributed. With the Khmer Rouge regime (1975-1979), all private property was abolished and all property records were systematically destroyed. The entire population was forced out of cities and villages and reduced to slave labour for large-scale public projects and collective work-brigades (VAN ACKER 1999). The Vietnamese Invasion in early 1979 ended the Khmer Rouge rule, but collectivisation of property lasted. However, the so-called "Krom Samaki" appeared in a less forbidding form and different levels of private property were allowed. Only in 1989, the government abolished collectivisation completely and reintroduced private ownership (VAN ACKER 1999). Today, national policy aims to register land titles for local users, but until now only a few villages in the south-western part of Cambodia hold private land titles.

The SEILA program (KINGDOM OF CAMBODIA 2001), initiated in 1996 was established under the government overall reform program in order to strengthen local institutions and to support the decentralisation process. In line with SEILA, Commune Councils were established with first elections held in 2002 and technical as well as financial resources were transferred to all government levels. The SEILA program ended in 2006 and activities carried out by SEILA are now under the mandate of the National Committee for Management of the Decentralization and Deconcentration Reform (NCDD) (SEILA 2007).

Today, several national institutions are in charge of water management in Cambodia. The Cambodian National Mekong Committee (CNMC) is responsible for the assistance and advice of the Royal Government of Cambodia in all matters relating to the formulation of water policy, strategy, management, preservation, investigation, planning, restoration and the development of the water and other related natural resources of the Mekong River Basin (CNMC 2007). The following Ministries are members in the CNMC and thus in charge of different water management issues:

- the Ministry of Public Works and Transport (MPWT)
- the Ministry of Water Resources and Meteorology (MOWRAM)
- the Ministry of Environment (MoE)
- the Ministry of Agriculture, Fisheries and Forests (MAFF)
- Ministry of Foreign Affairs and International Cooperation (MFAIC)
- the Ministry of Industry, Mines and Energy (MIME)

- the Ministry of Planning (MOP)
- the Ministry of Land Management, Urbanization and Construction (MLMUPC)
- the Ministry of Rural Development (MRD)
- the Ministry of Tourism (MOT).

At lower government levels there are provincial governments, municipalities and development committees responsible for water related policies, regulations, implementation and monitoring (MOWRAM 2001).

The MAFF as the key institution responsible for land reforms, agricultural sector reforms and the overall management of natural resources in the agricultural sector, is represented on a provincial level through Provincial Departments of Agriculture, Forestry and Fisheries (MAFF, 2007). The MRD, responsible for decentralisation as well as rural development, including local water use, is also represented on a provincial level in the Provincial Rural Development Committees (PRDC) (MRD 2007).

The commercial fishing lot system was reintroduced after the Khmer Rouge regime and lots have since then been allocated by auction every two years. Resistance from local communities started in 2000, criticising the system, whereby the best fishing areas are not accessible due to the commercial lots. Thus in 2000, a series of decrees reallocated 56% of the former lots to the communities in order to enable communities to access these areas for small-scale fishing activities. “Community Fisheries” are now being established all over the country, in order enable local communities to sustainably manage their resources. However, water resources are now open access as the strictly regulated access to the water resources through the fishing lot has now been removed. The state as well as the communities could not fill the management gap that the private sector actually offered through the lot system (RATNER 2006). Since the release of the fishing lot system the use of illegal fishing gears and fishing activities has increased sharply (DOF 2001).

From 1999 onwards, the Cambodian government, through the Ministry of Water Resources and Meteorology, also introduced a system of Farmer Water User Communities (FWUC) on a communal level, including Farmer Water User Groups (FWUG) and Farmer Water User Sub-Groups (FWUS) on village levels. The objective of this change is to ensure an effective functioning and management of irrigation schemes in a sustainable manner and to contribute to reducing government expenses on maintenance and management of the irrigation schemes (MOWRAM 1999).

The FWUC are governed by a Community Committee elected by the community members, and is responsible for the enforcement of the community by-law as defined by the Ministry of Water Resources and Meteorology, the operation and maintenance of the irrigation scheme, conflict resolution and financial management. Furthermore, it is in charge of the establishment of FWUGs and FWUSs on village levels. The FWUGs are then responsible for the implementation of the communities’ work programs and the coordination between group members (MOWRAM 1999). Although the FWUGs have been established country-wide, the functioning of these institutions still does not meet expectation. Meetings are not held on a regular basis and co-operation between different User Groups and Sub-Groups is not existent, although these groups partly share responsibility for the same resources. FWUSs have not been established in all villages and decentralized financial as well as technical support is so far not implemented in this new system.

Although the Cambodian government is aware of the fact that an integrated policy for water management is needed and because several institutions on different levels are involved in water management and the legal framework is until now not able to provide an efficient, effective and sustainable management in the Mekong Delta. Overlapping responsibilities between the Ministries, a lack of financial and technical support to local levels, a lack of accountability to local users and a lack of transfer of decision power to local users still provoke unsustainable use of water resources in Cambodia.

3.2.1 Situational analysis in Cambodia

A situational analysis was undertaken in four villages in Cambodia during September 2006 and March 2007 in order to understand resource use patterns, to identify primary and secondary stakeholder and to examine difficulties associated with the water resource. In addition to secondary data analysis and literature review, Participatory Rural Assessment (PRA) was applied in all four villages. PRA is a method that facilitates community participation in examining issues of resource management, problem solving and decision making (IFAD, ANGOC AND IIR 2001). In different group sessions, villages are invited to participate in different activities, such as the drawing of community maps, the creation of timelines recounting significant events in the community or preference ranking techniques which encourage the open discussion of questions that arise. This allows both the researcher and the participant to better understand actual resource use patterns and other related issues, to identify primary and secondary stakeholders and to examine difficulties associated with the natural resource. The PRA undertaken within this research included the following tools: resource mapping, social mapping, seasonal calendars, and time lines, transect walks, wealth ranking and semi-structured interviews. Information collected through a socio-economic baseline survey which was undertaken in all villages is presented in this paper, too. Thus, a combination of qualitative and quantitative methods was applied.

Research in Cambodia was conducted in two villages. *Thnal Kaeng*, located west of Phnom Penh in Prey Veng province, Mesang District, Svay Chrum commune, and *Pom Eith*, located in the south-western part of Cambodia in Takeo province, Kiri Vong District, Prey Ampok commune. Both villages are not far from the other two research villages on the Vietnamese territory and thus natural conditions are quite similar in all four research villages, although divided by a national border.

3.2.2 Two reservoirs in the Mekong Delta

Both villages are located next to large reservoirs, built during the Khmer Rouge era. Both reservoirs are important water sources for rice fields inside the reservoir and for fields outside the reservoir being connected to through a canal system. Furthermore, they are used for fishing during the whole year and for all other household activities including bathing, soaking animals, drinking water, washing, waste disposal, and sanitation. Both reservoirs are fed through rain waters and through the Mekong River which rises soon after the rainy season begins in May/June.

Boeng Khei Reservoir in *Thnal Kaeng* village is 900 m wide and 2800 m long. Two upstream canals allow water in-flow for further storage. Three sluices connect the reservoir with downstream canals. All land south of the reservoir is fed by the two canals heading south. Since 2006, two newly built sluices regulate the water flow for *Thnal Kaeng* and thus also influence water levels in the downstream Potamoun reservoir. The reservoir is accessed by nine different villages from two communes for irrigation purposes. However, about six

different communes and more than 700 households have access to the reservoir and use it as fishing ground. *Thnal Kaeng* village, with a total of 93 households, can be considered as the main user, while the village builds a strip settlement along the reservoir and villagers have land holdings within the reservoir. The village itself consists of 98 households and was part of an earlier NGO based rural development project (Care Cambodia).

Figure 1: Boeng Khei Reservoir, Thnal Kaeng village

Pom Eith village, with 133 households, has access to the Tunloub reservoir, which is in the southern-west part of a larger system of a four reservoirs north of the village and encloses a total of 2196.50 ha. On the eastern side the reservoir borders the national road No.2, which separates the paddy fields lying west of the road from the direct use of the reservoir. The land of these farmers is connected to the reservoir through two sluices. There are another five sluices for water regulation around the reservoir, all renovated in 2004. Altogether there are 21 villages in six communes and two districts using the water from the reservoir. This gives a total user number of up to 2394 households. All land owned by the farmers in *Pom Eith* lies within the reservoir.

Figure 2: Boeng Khei Reservoir, Thnal Kaeng village

3.2.3 Water Management in Thnal Kaeng and Pom Eith

In *Thnal Kaeng* no cadastral survey was undertaken until now and people have no secure property rights of their land holdings. Legally, all agricultural land in the reservoir is state property and belongs to the Cambodian government and only paddy fields outside the dyke are privately owned (without land titles). People have held use rights on the agricultural land in the reservoir for many years, but are aware that the government can claim the land back at any time. As the reservoir usually holds water for the whole year, it is recognised as a public good, where everybody can have access to during the whole year.

In 1973, the Khmer Rouge forced the villagers of *Pom Eith* out of the village and people lived next to the mountains nearby. In 1975, the villagers and new households moved back to the village. After the Khmer Rouge, under which land was collectivized, the village experienced another expropriation in 1983/84, where land became public property again. In 1989, government then abolished collectivization and redistributed land to private owners. In 2006, a cadastral survey was undertaken in *Pom Eith*, thus it is one of the first villages that were able to register officially their private land titles. Villagers report that land disputes that occurred during the process of land registration are now completely solved.

As stated above, from 1999 onwards, the Cambodian government established Farmer Water User Committees (FWUCs) on a commune level, which are responsible for water

management issues in their communes. The villages in the commune are represented in the FWUC through two to four village members, which were selected by the villagers. Both villages are represented in the FWUCs in their respective communes. The FWUC in Svay Chrum commune (*Thnal Kaeng* village) represents approximately 770 HH. There is a FWUC in the Prey Ampok commune (*Pom Eith* village) as well as a Water Resource Office (WRO) on district level, which is the deciding entity for water management in *Pom Eith* village.

However, the planned WUGs were not established by the government until now and there is thus no official water user representation at the village level. In Thnal Kaeng, CARE Cambodia established a Water User Group (WUG) lead by the village head and the six Krom[1] leaders as members. This WUG was established in the course of renovation and building efforts CARE Cambodia undertook in 2006 and is now responsible for monitoring and maintenance of dykes and sluices.

In both villages, water is used according to daily needs and respective requests from villagers. Thus, villagers must address their water needs for irrigation to the FWUC, the FWUC will inform the responsible village chief to operate the sluices according to its order. This procedure is the same for all villagers that have land connected to the reservoir.

There are rules and regulations concerning the use of the water resource according to national policy. Thus, there are restrictions on the type of fishing gear, whereby electrical fishing gears as well as fine mesh nets are not allowed to be used. Furthermore, there is a restriction on the size of gill nets, seine nets and arrow shaped trap nets. There are no rules concerning the amount of fish that can be taken from the reservoir and no time or fishing area restrictions. Everybody, including non-community members, is allowed to use the reservoir for their purposes, including fishing.

People are informed about new rules through the Commune Fisheries Office and the police. There are no written rules and regulations, but village meetings, where the advantages of rules and the penalties are explained to the villagers. During these meetings the use of legal fishing gears is also explained. These meetings are held once or twice a month. Villagers are not involved in any decision making about rules and regulations, they are only informed by the fisheries officer and the police.

The Commune Fishery Office and the police are responsible for monitoring, exposing and fining the use of illegal fishing gears. Thus, the village heads do not have legal authority to fine the offenders, but they report their observations to the commune head and the police. Because of the size of the water resource offenders are seldom caught and villagers report that the use of illegal fishing gears can be regularly observed. In both reservoirs there are no regular monitoring efforts of water quality, fish abundance or the use of illegal fishing gears. The police officer in *Thnal Kaeng* reports that there are a lot of people using illegal fishing gears, but that he alone is not able to prevent illegal fishing and fining all offenders. Additionally, he is responsible for all sorts of crime prevention; fishing is only one part of his responsibility.

The two reservoirs do not possess clearly defined boundaries and although the Cambodian government established FWUCs in order to improve local water management, water allocation still remains arbitrary. Not all water users of the same water resource are represented in the same institution and there is no inter-commune coordination between the different FWUCs, although the water resources in Cambodia are most often shared between

[1] A Krom is an administrative entity underneath the village level. All villages in Cambodia are further divided into several Kroms with each having his own Krom leader

communes (WERTHMANN 2007). Additionally, the intended FWUGs and FWUSs are until now not established on village levels, leaving the direct users in a state of powerless under-representation concerning water management decisions.

There are no institutions concerning the access to fishing grounds and the coordination of local fishermen. Besides the national restrictions on the type of fishing gears, there are no regulations on the amount of fish, the location or the time spend fishing and breeding areas are not protected. There are no written documents informing the villagers about existing rules and regulations, but is spread informally by word of mouth. Villagers in *Pom Eith* reported that they feel confused and even threatened by the penalties they are informed about. The monitoring, exposing and fining of the use of illegal fishing gears through the Commune Fishery Office and the police must be considered as ineffective as villagers report regular illegal fishing practices. Usually, people are aware of the number and people who use illegal fishing gear, but face difficulties to convict the offenders due to a lack of presence of responsible staff as well as due to a fear of revenge (WERTHMANN 2007).

In Cambodia, people are still uncertain whether their claims on property are secure, because the conflict settlement is still an ongoing process and different sources of land law are in force. Additionally, the social base in Cambodia is still fragile and makes collective action a serious challenge. Institutional structure is still underdeveloped due to the long era of military regime and corruption and power structures characterize the people's life instead of the legal system. Collective action projects can be considered as a new model for Cambodia as people are used to working on an individual household basis rather than in groups or even on a community basis. During the Khmer Rouge regime, Cambodians were forced to work collectively, but were never able to appropriate a benefit from this collective work (WERTHMANN 2007). Incentives for collective action were never created and the institutional basis supporting collective action is still fragile and not transparent. In fact, people have to cope with the open access situation concerning their water resources as existing rules and regulations are not legally enforced. Open access resources, weak higher level institutional support, fragile social structures within the villages and ineffective monitoring of rules can be seen as a serious challenge for the emergence of collective action.

3.3 Vietnamese Water Management Institutions

In Vietnam, two thirds of the workforce is engaged in agriculture activities and agriculture accounts for nearly a quarter of Gross Domestic Product (GDP). Since the 1980s, Vietnam has progressively moved toward a market economy.

The history of Vietnam is punctuated by three important dates. In 1954 Vietnam became independent from the French and was divided into two parts (North and South). In 1975, the Vietnam War ended with the reunification of North and South. In 1986, economic reforms started and Vietnam has since then moved towards a market-oriented economy (Do/ Iyer 2005).

Vietnam also faced several tenure changes in the recent history and people experienced collectivisation efforts or often only held user rights to the natural resources.

Since the Geneva Accord of 1954, Vietnam was a French protectorate and most farmlands were either owned by French plantation owners or by Vietnamese landlords and were characterized by highly unequal distribution. After independence in 1954, the land was divided into two parts (North and South). In the North, land was redistributed to farmers. In the 1950s, Communist ideology gained strength and land began to be collectivized. In the

South, during the same period, political conflicts influenced land institutions. Although land collectivization began in the Mekong Delta, farmers there resisted collectivization and farmers who participated did so over a much shorter period. Farming continued to be rather individually than collectively (DO/ IYER 2005).

In 1975, the "Vietnam war" ended with the reunification of North and South and ten years later in 1986, the program "Doi Moi" was announced by the government and the movement towards market economy began. Production and consumption subsidies were eliminated and the economy started to open up to trade (DO/ IYER 2005). In the agricultural sector, the implementation of the land law's Resolution 10 of 1988 (SOCIALIST REPUBLIC OF VIETNAM 1988) was the most important step towards a market-based agricultural economy, because land use rights were granted to households. However, land remained state property (RAVALLION/ VAN DE WALLE 2003). In the Mekong region, the Resolution 10 stipulated that farmers should be assigned the land they owned prior to 1975 which generated disagreements between farmers and former landlords.

The new land law in 1993 attempted to foster free transactions in land-use rights and gave the power to households to exchange, transfer, and lease, inherit and mortgage their land-use rights. Furthermore, the land law extended the lease term to fifteen years for annual crop land and thirty to fifty years for perennial crop land, depending on the crop cultivated (DO/ IYER 2005). In 2001, land allocation was being brought to completion. Today, most land in Vietnam is private property and people hold private property rights of their farm lands. However, water resources are considered as public goods and remain under the management of the Vietnamese state (SOCIALIST REPUBLIC OF VIETNAM 1993).

The Government of Vietnam is still engaged in a reorganisation of the institutional framework concerning water management. One important step in this direction was the adoption of the Law on Water Resources in 1998. Together with the Law on Land and the Law on Environmental Protection is provides the comprehensive basis for natural resource management in Vietnam. Based on this law the National Water Resource Council was established and functions as an advisor to the Ministry of Natural Resources and Environment and other ministries concerned with water resources (NWRC 2006).

However, until now, Vietnam does not have an overall action plan concerning their water resources. Management of water is still based on action plans of sub-sectors (NWRC 2007).

Institutions involved in water management and fisheries are

- Vietnam National Mekong Committee (VNMC), responsible to assist the Prime Minister in directing, managing all corporation activities with the Mekong River Commission and to develop, use and protect the water resources
- Ministry of Agriculture and Rural Development (MARD), responsible for irrigation, flood prevention and rural water supply.
- Ministry of Natural Resources and Environment (MoNRE), responsible for water resource management (including issuance of water extraction licenses and water discharge permissions, water supply to meet demands of the national economic sectors)
- Ministry of Planning and Investment (MPI), responsible for allocation of resources between sectors
- Ministry of Finance (MoFin), responsible for fund allocation between the institutions

- Ministry of Construction (MOC), charged with urban water supply and drainage
- Ministry of Industry (MOI), responsible for hydropower generation projects
- Ministry of Science, Technology and Environment (MOSTE), responsible for the regulation of water quality standards, ensuring compliance with environmental standards and investigating environmental issues
- Ministry of Health (MOH), responsible for water quality (drinking water standards and regulation)
- and the Ministry of Transportation (MOT), responsible for river channels and water transportation

Furthermore, the General Department of Land Administration (GDLA) and the General Department of Hydrology and Meteorology (GDHM) are involved in water management. On a provincial level, water management is undertaken by the Departments of Natural Resources and Environment (DONREs) as well as through the Provincial Agriculture and Rural Development Service (PRDSs). On a village level, Farmer Associations, established by the government are involved in irrigation water related management.

The Vietnamese government created a system of institutions on different governance levels in order to increase the likelihood of effective water management. However, lower level institutions still lack experiences, financial support and technical advice in water related policies and development projects. Local users find themselves underrepresented on higher levels and are not included in decision making process, even when these affect their livelihood. However, an important step for a more sustainable management of land and water was the allocation of private land titles in 2001.

3.3.1 Situational analysis in Vietnam

In Vietnam, research is conducted in two villages, also in the Mekong Delta. *E2* is located in Can Tho province, in Vinh Thanh district, Thanh Thang commune. *Thruong Phu B* is also located in Can Tho province, Co Do district, Thoi Lai commune.

3.3.2 The canals in the Vietnamese Delta

Figure 3: Irrigated rice fields in E2 village

Both villages use water from canals, drawing water from the Bassac River. These canals both hold water for the whole year, with water levels changing seasonally. Water is used for irrigation, fishing, washing, doing the dishes, irrigate gardens, transport (commercially as well as private), for sanitation and waste disposal, as well as a market places (floating markets).

In *E2*, the flood season starts at the beginning of September and water levels in the canal start rising with a peak level of approximately 1.6 m in October. The water is used for gravity irrigation during this time and pumped into the fields for irrigation during December and August. The canal was built by the government in 1954 and is now used for

all household means. The water in the channel is mainly used for irrigation and fishing, although transportation also plays a key role. Some villagers (approximately one third) also use the canal as a drinking water source of drinking water, whereby the rest of the village gets drinking water from a drinking water company.

The water resource for people living in *Thruong Phu B* is a river called “O Mon”, which is also fed by the Bassac River. The flood starts in September and reaches a peak in October/November, where the water in the river is approximately 5 m deep. In January/February the flood reaches its lowest level at 3 m in the river. The river is used for gravity irrigation and pumped irrigation between March and June. As it holds water the whole year, it is a crucial resource for the livelihoods.

Figure 4: Canal in Thruong Phu B village

The use of pesticides, fertilizer and insecticides is common in both villages and the villagers are aware that this harms the fish population and the water quality. Villagers are not aware of any water quality measure. In *Thruong Phu B*, villagers report a decrease in wild fish catch, which is explained by an increase in population. However, from 2000 onwards, the government allowed the import of the golden apple snail, which spread very fast and destroyed the rice yield. This led the farmers to use chemicals to reduce the spread, which then also affected the fish. The fish population decreased dramatically until 2004. In 2004, a new chemical against the snails was used and it did not affect the fish and there has since been a slight increase in fish production sufficient to meet the needs of the whole village.

3.3.3 Water management E2 and Thruong Phu B

Water in both villages is used according to the daily needs of the community and sluices are opened according to private decisions for irrigation. In *E2*, more than 100 small private sluices connect the paddy fields with the canal and are used for individual private water release. These small sluices were built by the individual farmers themselves and farmers access the water whenever they are in need of water for irrigation. There are no collective decisions about when and how to irrigate.

In *Thruong Phu B*, farmers report that water pumping into the fields is done on the basis of individual decisions, without any common considerations. However, before the next rice crop can be sewn water needs to be pumped out of the fields and as this must be done by all farmers at the same time. This is to ensure, that in the case of disease affection, combat becomes easier and is not exacerbate through different status of the crop. Thus, the government announces a certain time frame within which the water must be pumped out entirely. This is a local regulation from the Communal Agricultural Division and farmers are not included in this decision. They report that they need to follow the instructions, because in case of not compliance they fear a lack of financial or other government support in future.

In both villages, a problem associated with the water resources is that farmers which are not close to the water resource (canal or river) are excluded from fresh water for field irrigation. These “landlocked” farmers can enclose their fields with a small dyke, if they do not want water to flow into their field from a neighbouring field. However, these farmers can only access water, when their neighbour with access to a sluice is willing to open it. But still, water is flowing through the other fields first and only then into their fields and thus has lower

quality. Landlocked land is cheaper than the land close to the water resource and that is why villagers consider this to be fair.

In Vietnam in comparison to Cambodia, people do hold legal private property rights to their lands and transfer of land is regulated through the willing buyer- willing seller principle. Only water resources like canals, rivers and reservoirs are considered to be a public good and remain under the management of the government. Thus, the canals in the two villages are an open access resource during the whole year and everybody can use them for any purpose at any time. The access rights to the paddy fields change with the season. The fields are private land during dry season, but become common property during wet season. At this time, the fields can be accessed by everybody, even by other communities, for fishing purposes. Villagers do not consider this as an open access situation or a change in property rights, because legally they still have the right to deny access to their land. However, this is not common to deny anyone access to fields for fishing purposes. Conflicts about water resources are not reported, even in times where there was a lack of fish for daily subsistence.

Rules concerning the water in the villages are based on national law and only refer to illegal fishing gears, which include electric fishing gears as well as small mesh nets. Seasonally, there are no restrictions; fishing is allowed during the whole year and any part of the water body, including private fields, flooded then. The police officer, employed by the commune is responsible for the monitoring of illegal fishing gear use. In case of not accordance with the law (using illegal fishing gears) the gears will be taken away and fines can be imposed by the police officer. They range from 200.000 VND to 500.000 VND (16.000 VND = 1 US$). However, the amount of the fine depends on the goodwill of the police officer.

There are only a few people breaking the rules, the police officer in *Thruong Phu B* reports. During flood season it is more common that somebody is breaking the rules (approximately once a week the police officer catches someone using illegal gears). He considers himself as very strict, “he must follow the law and take away the fishing gear” (pers. comment police officer *Thruong Phu B*). However, as they all know each other, villagers will not betray their neighbours when they see somebody using illegal gears.

Rules and regulations established by the government as well as sanctions in the case of non compliance are spread by word of mouth, on the television and on the radio. Villagers are not involved in decision making about rules and all laws concerning fisheries are made by the government. Villagers think this is a good solution, because “only the government can make good laws” (villager in *Thruong Phu B*). The national rules are considered to lessen conflict between the farmers and they are considered as important, because it will ensure that there is enough fish for the next generation, too.

In both villages maintenance of the canals is officially in the hands of the governments. However, villagers also report, that there is no monitoring about the status of the canal, dams or dykes or of water quality and fish abundance. It is the villagers that need to address renovation wishes to the government. After inspection and decision from the government, renovation might be organised by the government, whereby villagers contribute money and labour. In *Thruong Phu B*, the government invests in making the canals deeper and renovates them approximately every 10 years. Villagers report that it is an unsatisfactory process as the government decisions to renovate take a long time. For the small canals the villagers of *Thruong Phu B* are responsible for maintenance and they have to organise renovation themselves, including financial contribution from the people living around the small channels. However, the government encourages them to renovate these small channels, which takes place approximately every 5 years.

4 Conclusions

Today, the Vietnamese floodplains are intensively managed under extensive flood protection and irrigation works, while flood waters in the Cambodian sites are largely un-regulated and collective action as well as participation in water related policies are low. The communities in Cambodia and Vietnam only established formal water management institutions recently and until now water is used on an individual basis without regard for the collective nature of water use. Communities still try to cope with inner-community management and the prevention of illegal fishing activities.

Although many development projects in Vietnam and Cambodia focus on the enhancement of collective action and a better local coordination of local water management, there is still a lack of institutional support from other government levels as experienced by farmers in the research villages. Financial, technical and institutional support, according to the principle of subsidarity, still needs to develop in order to facilitate community-based aquaculture in the region. The facilitation of community-based approaches in Cambodia might be an even more serious challenge. So far, local users in Cambodia are not involved in decision making about the water resources at all and they are lacking long-term support from higher level institutions in supporting their needs like water quality management or flood protection. Furthermore, legal property rights are still not awarded in most parts of Cambodia. Rules and regulations as well as monitoring/sanctions systems are rarely monitored and inefficient, because local users are not involved in either decision making or monitoring.

Local resource users will not be able to manage the cross-boundary water resource sustainable without being embedded in a reliable institutional framework that does not only coordinate different needs in different communities, but that also give local users the opportunity to have say in decision-making and represent local needs on national, regional and international levels. Although, first step to an integrated inter-community coordination, which includes all water users are taken, they are still far from being effective. In Cambodia as well as in Vietnam, the relatively recent de-collectivization of agriculture will provide a challenge to the introduction of more democratic forms of collective management.

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Acceptable regulations to reduce resource extraction with heterogeneous costs♥

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Abstract

We examine the short term impact of regulatory instruments to reduce common- pool resource extraction when its users (e.g. fishermen) have heterogeneous costs. The regulation must be acceptable in the sense that every user must be better-off with the regulation than under free access. We provide necessary and sufficient conditions for the implementation of targeted conservation. In our set up, a fee and subsidy scheme and transferable quotas dominate non-transferable quotas because they (i) achieve higher conservation, (ii) minimize total extraction cost, (iii) yield higher profits. Yet non-transferable quotas reduce inequality among users.

Key Words: common pool resource, fishery, regulation, quota.
JEL codes: Q20, Q22, Q28.

1 Introduction

Since at least Gordon (1954) and Hardin (1968), it is well known that the open access extraction of natural resources such as fisheries leads to over-exploitation. Efficiency can be improved under regulated extraction. Consistently, the fishing industry has been lately extensively regulated worldwide. Several regulation tools have been used to reduce over-fishing, including vessel buy-backs, access rights, fishing restrictions and quotas. Those regulations have an heterogeneous impact on the fisherman's welfare. Although some might improve their situation compared to open access, other might lose, thereby opposing strong resistance to regulations. Regulations also change the distribution of the welfare. Despite being welfare improving for the fishing industry as a whole, regulated extraction might be rejected by some fishermen and, therefore, be difficult to pass. The feasibility of a particular regulation should take into account its acceptability by the fishery industry, driven by the fishermen's welfare.

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This paper investigates the short term impact of regulations in a fishery previously extracted under free-access. We are concerned by the “acceptability" of new fishing regulations by the fishermen. Our first requirement is that the regulation is Pareto efficient, i.e. welfare improving to all fishermen. If it does, the regulation is likely unanimously accepted. We examine the performance of the regulation instruments in reducing resource extraction under this unanimous acceptability constraint. How far the regulation can go in reducing resource extraction without hurting fishermen? Another dimension of acceptability which is fairness. Fishermen might oppose a regulation that exacerbates inequalities. We thus also discuss the fairness property of the regulation instruments.

More precisely, we compare the performance of three regulatory instruments in four features: lowering resource extraction, increasing efficiency, improving profits and reducing inequality. The first instrument is an access fee to the resource and a subsidy (a paiement not to fish) for those who exit from the fishing industry, e.g. a boat buy-back. It is referred as the fee and subsidy (FS) scheme. It must be budget-balanced, i.e. the subsidies must be entirely financed by the fees collected. It is equivalent in our framework to a tax on catch. The second instrument is an individual, uniform and non-transferable quota (IQ). It imposes restrictions or quotas on inputs (e.g. fishing days, net or vessel size) or output (catch). The third instrument allows the fishermen to exchange their quotas (on input or output) in a competitive market. It is referred as the individual transferable quota (ITQ) scheme.

The FS, IQ and ITQ regulations are common worldwide (Hannesson, 2004; Bjorndal, 1998; Hartwick, 1998). For instance, in the Bering Sea, National Marine Services proposes a crab fishery boat buy-back and landing fees to reduce the crab decline. The buy-backs[1] are financed by a loan to be repaid over 30 years by catch landing fees of crab fishermen who remain in the fishery. There exists different types of quota. Inputs restrictions such as vessel size, maximal season length, net size and fishing techniques can be seen as individual and non-transferable quotas on inputs. Individual and non-transferable quotas on output are also common. For instance, the United Kingdom divides its allowable catch as fixed by the European Union among groups of fishermen through individual quotas (GAO 2004). Individual and transferable quotas are more and more popular worldwide, especially in New Zealand, Australia, Canada and United States. Documented examples can be found in Hannesson (2004).

To asses the acceptability of the above regulations in a simple model, we employ the following modeling strategy. First, since we focus on the short term impact of the new extraction regime, we rely on static model à la Gordon, thereby abstracting for dynamic considerations such as the evolution of the fishing stock. Over-fishing is inefficient at the short run (i.e. the current fishing season) because reduces the return of fishermen's investment in fishing effort. Second, to capture the efficiency gain of market-based regulations and to be able to analyze inequality, we need some heterogeneity in the fishermen's population. We introduce heterogeneous but constant marginal cost of fishing. These marginal costs are private information. As in Gordon's model, under free access, fishermen enter the resource so long as their profit is positive. Fishermen return's exceed their opportunity cost except for the threshold fisherman who gets exactly his opportunity cost. Therefore, under the fear of losing this profit, they might be reluctant regulations.

The goal of a regulation is to reduce the total fishing effort to a targeted level under the unanimous acceptability constraint which requires Pareto improvement on free access. We provide necessary and sufficient conditions for the implementation of a targeted fishing effort under the unanimous acceptability constraint for the three regulation instruments. We show that, in our framework, FSs and ITQs are equivalent since they yield the same outcome in equilibrium. These conditions imply that the two market-based instruments (FS and ITQ) implement at least the same fishing effort than IQ but can reduce it further. Furthermore, the

[1] Fishermen remaining in the Bering Sea crab fishing industry pay back the 97.4 million of dollar loan with a fee on crab landings; source: National Oceanic and Atmospheric administration.

same targeted fishing effort yields higher equilibrium profits to fishermen when implemented by FSs or ITQs. It also leads to lowest total extraction costs. Indeed, the market-based instruments select the more efficient fishermen who use all their capacity to fish. The less efficient fishermen accept the boat buy-back (under FS) or sell all their quotas (under ITQs). In contrast, if quotas are non-transferable (under IQs), all fishermen still fish but with reduced efforts.

Although the market-based instruments tend to dominate IQs regarding efficiency, they have two fairness drawbacks. First, by rewarding some agents from not fishing (through the vessel buy-backs or the quotas sold) the market-based regulations assign part of the welfare to non-fishermen. These outsiders benefit from the fishing industry's welfare without contributing to it. Even worse, they experience the highest welfare improvement from free access. In contrast, under IQs, the welfare is entirely distributed to fishermen. Second, the FS and ITQ schemes do not change the distribution of welfare among fishermen while IQs reduce inequality. Indeed, under IQs, the fishing effort reduction is spread equally among fishermen. Inequality is reduced further with more stringent quotas. The paper is related to two strands of literature in economics: the theoretical approach of common-pool resource extraction and the economic impact of fishery regulations.

The standard common-pool resource economic literature examines the emergence and the enforcement of endogenous extraction rules. Users play a common-pool resource game in which they might voluntarily refrain extraction and eventually punish those who do not (Ostrom 1990[2]). Burton (2003) studies the problem of rules enforcement and explores how sanctions affect heterogeneous fishermen within a community using limited entry and uniform quotas. In contrast here we consider exogenous and fully enforced regulations imposed on non-cooperative users. We examine the voluntary adherence to those rules by selfish users who fully comply to them. In particular, we investigate how far the regulator can go in reducing extraction without hurting the users.

Several papers have examined the welfare and distributional impact of privatizing a common-pool resource (Scott, 1955, Weitzman, 1974, De Meza and Gould, 1987, Jensen and Vestergaard, 2003, Baland and Francois, 2005, Ambec and Hotte, 2006). In particular, Weitzman (1974) argues that workers can be worse off because they are paid the marginal product instead of the average product. Instead we focus on regulations as new extraction regimes. The extraction rate might differ from the one implemented under private property. Here the aggregate effort target is fixed exogenously. It is a target selected by the regulator. Moreover, the regulation does not deprive the agents from extracting the resource, although it restricts extraction.

In the economics of fishery, several papers compare fishery regulations but with a different focus. First, Androkovich and Stollery (1991) and Weitzman (2002) deal with homogeneous fishermen who face uncertainty in estimated to stock fish size and/or in the demand for fish. They argue that price-based instruments such as landing fees are more efficient than quantity-based ones such as individual quotas. With deterministic fish stock and demand but with heterogenous fishermen as assumed here, those two regulations are equivalent as long as quotas are transferable.

Second, Clark, Munro and Sumaila (2005) study the impact of buy-back subsidies on fisheries previously extracted under open-access in a dynamic framework. They highlights that fishermen's anticipation of future buy-backs might lead to overcapacity. They suggest the implementation of “incentive adjusting approaches to management". We assume here that fishermen do not anticipate the buy-back regulation which avoids the overcapacity problem.

[2] See also Sethi and Sommanathan (1996) for an evolutionary approach, Baland and Platteau (2003) for a review. Dayton-Johnson and Bardhan (2002) analyze the impact of harvest inequality on overall levels of harvest.

Lastly, in their study of the Texas shrimp industry, Johnson and Libecap (1982) discuss how heterogeneity in fish skills affects regulation acceptability. They highlight that *"without side payments (...), uniform quotas could leave more productive fishermen worse off than under common property conditions"*. Consistently, in our model, under IQs, the binding unanimous acceptability condition is for the more efficient fishermen. Johnson and Libecap also suggest that egalitarian pressure favor uniform quotas. We rationalize this claim by showing than IQs distribute the welfare more fairly.

The paper is organized as follows. In Section 2 we present the model and describe the free access extraction framework. Next we consider successively the three regulatory instruments: an access fee with a subsidy for exiting the fishing industry (Section 3), individual quotas (Section 4) and individual and transferable quotas (Section 5). Section 6 compares the performances of the three instruments. Section 7 concludes the paper.

2 The model

A community of individuals are extracting a natural resource from a common pool. Typical examples of such common-pool natural resources include fisheries, forests for timber or fuel-wood, hunting grounds and pastures. For the sake of simplicity, the common-pool resource will be called the fishery" and the extractors the „fishermen". Yet the model encompasses for other common-pool resources.

Each fisherman selects a fishing effort x. For every fishing effort, a fisherman obtains the average product of extraction $\Phi(X)$ where X represents the total fisherman effort of the community. The average product is assumed decreasing with fishing effort, i.e., $\Phi' < 0$. Fishermen are endowed with the same effort capacity $\overline{x}$. Importantly, they differ by their cost of fishing. A fishermen is labelled by his constant marginal cost of fishing effort c. It is private information. It might include direct fishing costs such as wages, the annual cost of a vessel, gasoline, and so forth, as well as the opportunity cost of spending this time and money in fishing. It might also capture differences in fishing skills (i.e. to obtain a same "fishing effort" some fishermen need to spend more inputs). There is a continuum of fishermen (of mass 1) with costs $c \in [\underline{c}, \overline{c}]$ (with $0 < \underline{c} < \overline{c}$) distributed according to the cumulative $G(c)$ and density $g(c)$. The price of the resource is normalized to 1. When investing x units of fishing effort, the fisherman c obtains $\pi(c) = x(\Phi(X) - c)$ from the fishery[3].

e first consider the benchmark free-access (FA) extraction framework. In our setup, it is easy to show that, under free access, there exists a threshold cost c^{FA} such that fishermen with lower cost fish up to their capacity $\overline{x}$ while the others do not fish at all. For a given equilibrium fishing effort X^{FA}, a fisherman obtains the average product $\Phi(X^{FA})$ per unit of effort. He fishes so long as his benefit exceeds his marginal cost c. Denote c^{FA} the fishermen whose marginal cost equals the free-access average product, i.e,

$$c^{FA} = \Phi(X^{FA}) \qquad (1)$$

All fishermen with c lower than c^{FA} obtain more than their marginal cost per unit of effort. They fish up to their capacity $\overline{x}$. Fishermen whose cost is higher than c^{FA} lose for each unit of

[3] If c is an opportunity cost, gains on fishery are $x\Phi(X)$, and the remaining units $\overline{x}$ -x are invested in an outside activity which yields ($\overline{x}$ -x)c to fishermen c.

effort. They do not fish. We therefore do not call them fishermen anymore but simply "agents"[4]. The total fishing effort under FA is thus:

$$X^{FA} = \int_{\underline{c}}^{c^{FA}} \bar{x} dG(c) = \bar{x} G(c^{FA}) \qquad (2)$$

The Figure 1 below illustrates the FA equilibrium

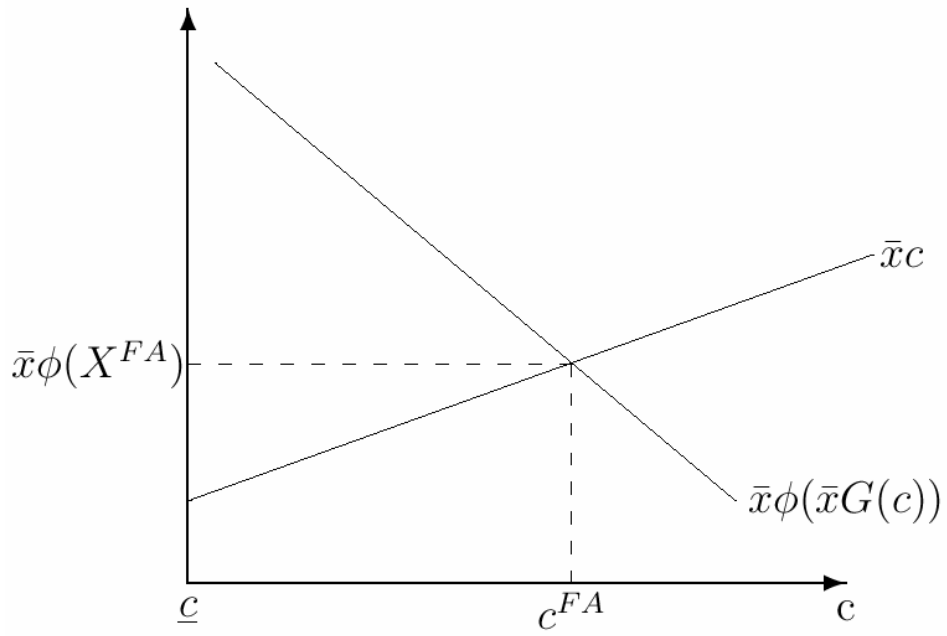

Figure 1 Extraction under free access

The downward sloping curve $\bar{x}\,\Phi(\bar{x}\,G(c))$ represents the benefit from fishing $\bar{x}$ units of efforts when fishermen with cost up to c fish at their maximal capacity. The upward sloping curve is total cost of the fisherman c when exerting effort $\bar{x}$. The threshold fisherman under FA c^{FA} makes zero profit from fishing (see condition (1)), meaning that his benefit $\bar{x}\,\Phi(X^{FA})$ is equal to his cost of fishing $\bar{x}\,c^{FA}$. It is therefore defined where the above two lines cross. Each fisherman $c < c^{FA}$ makes a strictly positive profit equals to the distance between his benefit at the equilibrium $\bar{x}\,\Phi(X^{FA})$ (the dotted line) and his total cost $\bar{x}\,c$ on the upward sloping curve. Fisherman *c*'s profit under open-access for every $c \le c^{FA}$ is thus:

$$\pi^{FA}(c) = \bar{x}\left[\Phi(X^{FA}) - c\right] \qquad (3)$$

The FA regime is inefficient because fishermen extract the resource up to equalize the marginal cost to the average product instead of the marginal product. This is the well- known

[4] In the rest of the paper we call "fishermen" those whose costs are lower than c^{FA}, i.e., who fish under-free access. The other agents obtain their payoff with their alternative activity $\underline{x}$ c.

over-exploitation result of open access extraction of natural resources. Fishing effort must be reduced to restore or, at least, increase efficiency. This is indeed the goal of regulations.

In the next three sections, we examine the performance of regulations in implementing a targeted fishing effort $X < X^{FA}$ under the unanimous acceptability constraint. The targeted fishing effort could be the one that maximizes the fishing industry's welfare at the short run. But this first-best fishing effort might not be unanimously acceptable. Moreover, if the fishing stock exhibits some externalities outside the fishing industry, for instance for its biodiversity value, it might be optimal to reduce the fishing effort further. The question is: how far can we go in reducing fishing effort without hurting fishermen?

To answer this question, we consider successively three regulatory instruments: a fee and subsidy scheme (FS) in Section 3, individual quotas (IQs) in Section 4, and individual transferable quotas (ITQs) in Section 5.

3 Fee and Subsidy

The first regulatory instrument is an access fee τ and a subsidy σ for those who accept to quit the fishing industry. Only active fishermen in the free-access regime can apply for the subsidy. It can take the form of boat buy-backs or unemployment and reconversion benefits. The fee and the subsidy are the same for all fishermen.[5] The FS scheme must be budget balanced in the sense that all subsidies must be enterally financed by the fees collected.

The FS regulation rises the cost of fishing by τ and the benefit from not fishing by σ. Fisherman *c*'s profit with a fishing effort $x > 0$ is thus $x[\Phi(X) - c] - \tau$ and σ if $x = 0$. As under free-access, the fishermen whose cost is lower than a threshold level fish up to their capacity while those with a cost higher do not fish. The threshold cost denoted $\overline{c}$ depends on both τ and σ. It is defined by:

$$\bar{x}\left[\Phi(X) - \bar{c}\right] - \tau = \sigma \tag{4}$$

The threshold fisherman $\overline{c}$ is indifferent between fishing or not. He obtains the same profit while fishing (left-hand side of (4)) or not fishing (right-hand side of (4)). The total fishing effort obtained under this regulation is:

$$X = \int_{\underline{c}}^{\bar{c}} \bar{x} dG(c) = \bar{x} G(\bar{c}). \tag{5}$$

Combining (4) with (5) lead the following incentive-compatibility constraint:

$$\bar{x}\left[\Phi(\bar{x}G(\bar{c})) - \bar{c}\right] - \tau = \sigma \tag{6}$$

The scheme (τ; σ) implements the threshold fisherman $\overline{c}$ that satisfies (6). All fishermen with $c < \overline{c}$ fish up to their capacity $\overline{x}$.

The FS scheme (τ; σ) increases the cost of fishing by $\tau + \sigma$. Indeed fisherman *c* has to pay τ but also renounce to the subsidy σ if he fishes. Therefore his cost of fishing $\underline{x}$ unit of effort is now $\underline{x}\, c + \tau + \sigma$. It is represented in Figure 2 below.

[5] It would be more efficient to define an access fee and a subsidy contingently on c. However, it is not feasible here because c is private information.

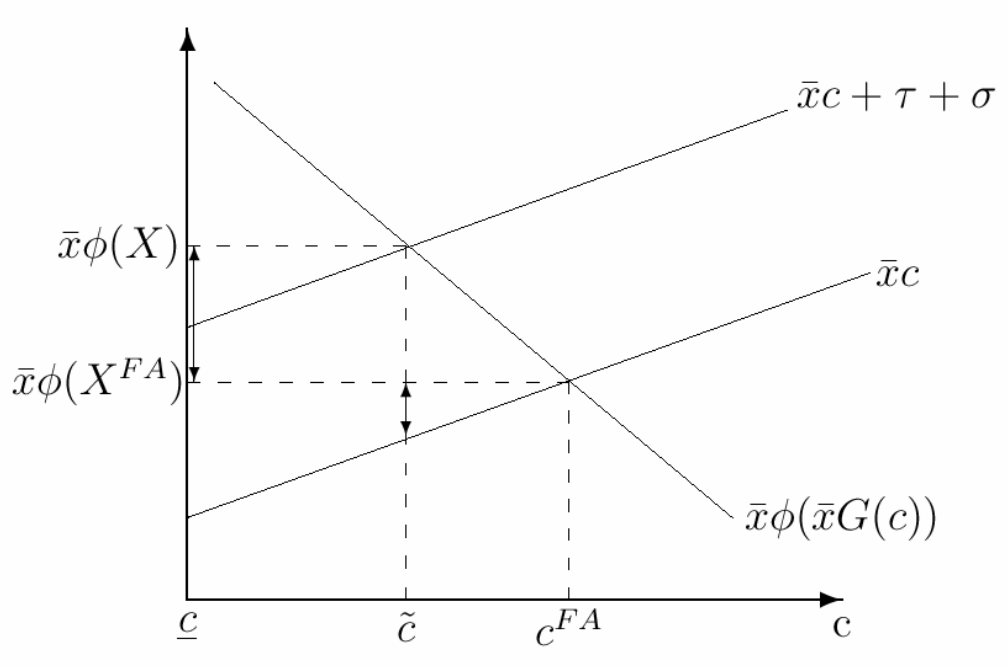

Figure 2: Extraction with an access fee and subsidy scheme.

The regulation (τ; σ) moves upward the fishermen's cost of $\bar{x}$ units of effort. The fisherman $\bar{c}$ who is indifferent between fishing or not is defined where the new cost curve $\bar{x}\, c + \tau + \sigma$ crosses the benefit curve $\bar{x}\, \Phi(\bar{x}\, G(c))$. The fishing effort implemented is $X = \bar{x}\, G(\bar{c})$. Each fishermen with $c < \bar{c}$ fish and make a strictly positive profit which is equal to the distance between the equilibrium benefit $\bar{x}\, \Phi(X)$ and his total cost $\bar{x}\, c + \tau$. Those with $c > \bar{c}$ obtain the subsidy σ.

Now the FS scheme (τ; σ) must satisfy the following budget balanced constraint:

$$\tau G(\bar{c}) \geq \sigma(G(c^{FA}) - G(\bar{c})). \qquad (7)$$

Combining the incentive constraint (4) with the budget balance (7) leads to:

$$\tau = \bar{x}\left[\Phi(X) - \bar{c}\left(1 - \frac{G(\bar{c})}{G(c^{FA})}\right)\right], \qquad (8)$$

$$\sigma = \bar{x}\left[\Phi(X) - \bar{c}\right]\frac{G(\bar{c})}{G(c^{FA})} \qquad (9)$$

The incentive constraint (4) forces $\tau + \sigma$ to be equal to the threshold fisherman's profit $\bar{x}$ [$\Phi(X)$ - $\bar{c}$]. The budget balance constraint determines which share of this profit will be paid as a fee τ by fishermen, the rest being received as a subsidy σ. The relative share or fee and subsidy depends on the ratio of remaining fishermen under the new regime $\frac{G(\bar{c})}{G(c^{FA})}$. As this ratio decreases, more people must be subsided which requires to levee more funds with a higher fee. With extra funds, i.e. if the budget-balancing is relaxed, the same target effort X

can be obtained with a lower fee and/ or a higher subsidy while $\tau + \sigma$ being unchanged to satisfy the incentive constraint.

To sum up, a budget-balanced access-fee and subsidy scheme that implements a total fishing effort X yields equilibrium profits to each fisherman $c \leq \overline{c}$,

$$\pi^{FS}(c) = \bar{x}\left[\Phi(X) - c\right] - \bar{x}\left[\Phi(X) - \bar{c}\right]\left(1 - \frac{G(\bar{c})}{G(c^{FA})}\right) \tag{10}$$

and to each fisherman with $c \geq \overline{c}$,

$$\pi^{FS}(c) = \bar{x}\left[\Phi(X) - \bar{c}\right]\frac{G(\bar{c})}{G(c^{FA})} \tag{11}$$

where threshold fisherman is defined by the unique cost $\overline{c}$ such that $\overline{x}\ G(\overline{c}) = X$.

We now compare those profits with the ones under free access to asses the acceptability of the scheme ($\tau; \sigma$). We want the regulation to be accepted by all fishermen. It must be such that everybody (those who still fish and those who leave this activity) are better off under the regulation regime FS than under FA. Formally, the following acceptability constraint must hold for every fisherman $c \leq c^{FA}$:

$$\pi^{FS}(c) = \max\{\bar{x}[\Phi(X) - c] - \tau, \sigma\} \geq \pi^{FA}(c) \tag{12}$$

Combining (3), (4), (12) and (7) lead to:

$$\frac{\bar{x}[\Phi(X^{FA}) - \bar{c}]}{\bar{x}[\Phi(X) - \bar{c}]} \leq \frac{X}{X^{FA}} \tag{13}$$

An acceptable FS scheme implements any effort level X that satisfies inequality (13) where $\overline{c}$ is defined in (4). Basically, the threshold fisherman $\overline{c}$ should obtain a ratio of profit improvement (left-hand side in (13)) not higher than the relative reduction in fishing effort (right-hand side in (13)).

It turns out that (13) is also a sufficient condition for a targeted fishing effort X to be implemented with a FS scheme. It is easy to show that if (13) holds then ($\tau; \sigma$) defined above is acceptable and incentive-compatible by fishermen (i.e. satisfy conditions (4) and (12)). We thus established the following necessary and sufficient condition for the implementation of X by an acceptable FS scheme.

> ***Proposition 1*** *An acceptable fee and subsidy scheme implements a fishing effort X if andonly if*

$$\frac{\bar{x}[\Phi(X^{FA}) - \bar{c}]}{\bar{x}[\Phi(X) - \bar{c}]} \leq \frac{X}{X^{FA`}}$$

with $\overline{c}$ such that $\overline{x}\ G(\overline{c}) = X$.

Before moving to quotas, it is worth to mention that the access fee policy is equivalent to a tax rate on fishing effort or on catch at the equilibrium in our model. The same reduction of fishing effort with the same profits can be obtained with a tax rate $\frac{\tau}{\bar{x}}$ on each unit of input x

(e.g. labor, fishing supply, gasoline,...) or a tax $\frac{\tau}{\bar{x}\Phi(X)}$ on catch or output $x\Phi(X)$ instead of an access fee τ[6]. We now examine an alternative regulatory instrument to reduce fishing effort: individual quotas.

4 Individual Quotas

Consider first an uniform individual and non-transferable quota (IQ) on fishing effort. Fishermen are allowed to only $\hat{x}$ units of fishing effort with $\hat{x} < \bar{x}$. Example of such regulations include fishing season restrictions, specific gears or size of vessels. It only applies to fishermen active under FA, i.e., those with $c < c^{FA}$[7].

The IQ regime has two impacts. First, it restricts entry to fishermen $c \leq c^{FA}$. Second, it reduces the individual effort capacity to $\hat{x}$. As before, fishermen fish up to their allowed capacity now $\hat{x}$. The total fishing effort implemented is:

$$X = \int_{\underline{c}}^{c^{FA}} \hat{x} dG(c) = \hat{x} G(c^{FA}),$$

which is obviously lower than under free access. Therefore the average product is higher, i.e., $\Phi(X) > \Phi(X^{FA})$. Hence implementing a fishing effort X under IQs requires to assign to every fishermen the following quota level:

$$\hat{x} = \frac{X}{G(c^{FA})} \tag{14}$$

The equilibrium profit of a fisherman c is:

$$\pi^{IQ}(c) = \frac{X}{G(c^{FA})}\left[\Phi(X) - c\right] \tag{15}$$

As before, we want the regulation to be acceptable by all. An individual quota level $\hat{x}$ is acceptable by fisherman c if his profit is not lower than under FA, formally if:

$$\hat{x}[\Phi(X) - c] \geq \bar{x}[\Phi(X^{FA}) - c]$$

The above *acceptability condition* of IQ must be satisfied for every fisherman. It can be rewritten as,

$$c(\bar{x} - \hat{x}) \geq \bar{x}\Phi(X^{FA}) - \hat{x}\Phi(X) \tag{16}$$

for every $c \leq c^{FA}$. The right-hand term in (16) is the variation of harvest or total revenue. Its sign is ambiguous. Although fishermen experience an increase of harvest per unit of effort (i.e. Φ increases), since the effort level is lower, total harvest and, therefore, total revenue (i.e. $x\Phi$) might decrease. If revenues increase or remain equal, i.e. if the right-hand term in

[6] This equivalence is mostly due to our assumption of constant marginal cost which provide with incentives to use full effort capacity with per input or per output tax rates once the fisherman has decided to renounce to the subsidy.

[7] If everybody can fish up to the quota, since the average product becomes higher than c^{FA}, then some fishermen with $c > c^{FA}$ will fish under the IQ regime. Therefore a higher fishing effort reduction can be achieved by assigning quotas only to the active fishermen under FA.

(16) is positive or nul, then the acceptability condition holds for every fisherman. If they decrease, i.e. if the right-hand term in (16) is strictly negative, then acceptability might be a problem. In that case, some fishermen might lose under the regulation. Indeed the left-hand term in (16) is the total cost saved by reducing fishing effort. It is lower for fishermen with low cost of fishing effort. For IQ to be accepted by all fishermen, it should be accepted for the ones with lower fishing cost $\underline{c}$. Formally, a necessary and sufficient condition for the acceptability condition (16) to hold for every fishermen is that it holds for fishermen $\underline{c}$, i.e.,

$$\frac{\Phi(X^{FA}) - \underline{c}}{\Phi(X) - \underline{c}} \leq \frac{\hat{x}}{\bar{x}}$$

Using (2) and (14), straightforward computation shows that the above inequality is equivalent than the one obtain the next proposition.

Proposition 2 *A non-transferable quota implements a fishing effort X if and only if*

$$\frac{\bar{x}[\Phi(X^{FA}) - \underline{c}]}{\bar{x}[\Phi(X) - \underline{c}]} \leq \frac{X}{X^{FA}}$$

Proposition 2 establishes that *X* can be implemented with IQs if the profit improvement of the most efficient fisherman $\underline{c}$ (left-hand side) is lower or equal to the decrease in aggregate effort (right hand side). The IQ regulation is illustrated in Figure 3 below.

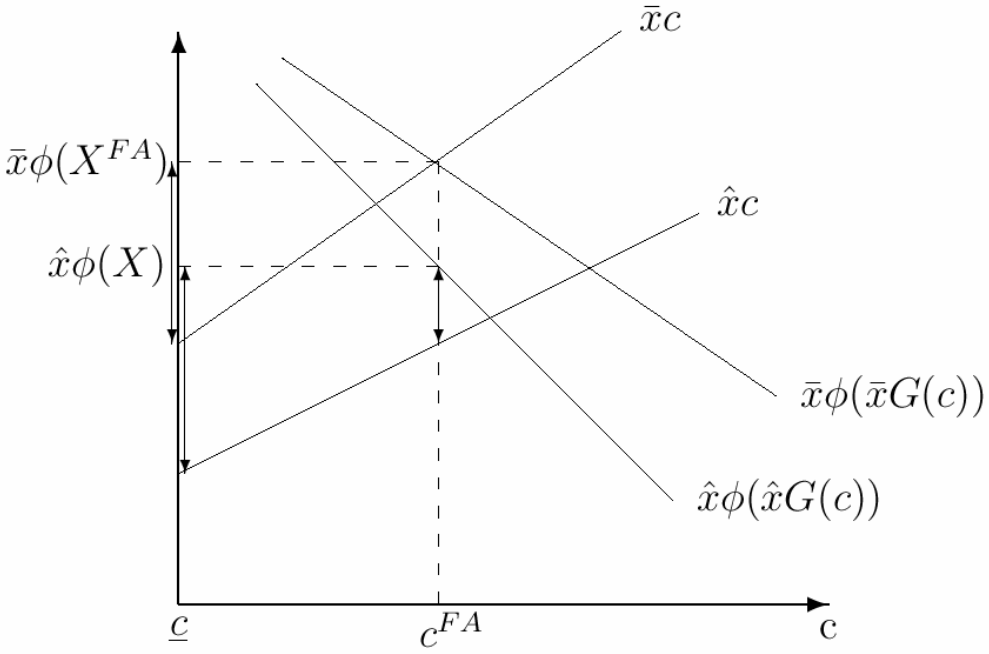

Figure3: Regulation with IQ

The downward sloping curves represent the total product under free access (using full capacity $\bar{x}$) and under IQs (using all effort quota $\hat{x}$) if fishermen up to *c*. Here we consider the worse case for fishermen whereby the total product is always lower under IQs. The upward slopping curves are total costs. All fishermen with costs up to c^{FA} exhaust their quotas to fish. Every fisherman *c* earns a strictly positive profit which is equal to the distance between the equilibrium total product or revenue $\hat{x}\,\Phi(X)$ and his total cost $\hat{x}\,c$. Yet his profit has not necessarily improved compared to the free access regime. Recall that a fisherman

c's free access profit is the distance between the free access revenue $x\Phi(X^{FA})$ and the total cost $\overline{x}$ c. Here IQs reduce revenues but also total costs. Although the reduction of revenue is identical for every fishermen, the reduction of total costs is heterogeneous. Those with higher cost per unit of effort experience a higher reduction of total cost and, therefore, a higher increase of profit. In particular the fishermen with highest cost c^{FA} obtains the highest increase of profit, represented by the right-hand double arrow in Figure 3[8]. On the other hand, the fishermen with lowest cost $\underline{c}$ (the more "efficient") gets the lowest increase of profit. Indeed in Figure 3 this increase is almost nil because the profits under FA and under IQs (the size of the two left-hand double arrows) are almost the same. In other worlds, the acceptability constraint (17) is binding here. This difference of total cost (and thus profit) among fishermen is due to the difference of slopes of the two total cost curves which increases with lower quotas $\hat{x}$. By reducing the slope of the total cost curve, IQs tend to "homogenize" fishermen's total costs.

Before moving to transferable quotas, note that, in our framework, the individual quota can equivalently be defined on individual catch or revenue. A upper bound on harvest $\overline{\Phi} = \hat{x}\Phi(X)$ provides to every fisherman with incentives to exhaust their quota, thereby exerting fishing effort $\hat{x}$ at the equilibrium.

5 Individual and Transferable Quotas

Consider the following individual and transferable quota (ITQ) scheme. As in the preceding section, each fisherman $c \leq c^{FA}$ is assigned an individual level of quotas on effort $\hat{x}$. But now quotas can be exchanged in a competitive quota market at a price p. The total quota level distributed is $X = \hat{x}\, G(c^{FA})$.

Each fisherman compares the return of one unit of quota in the fishery with its value on the market. By using himself the quota to fish, a fisherman c obtains $\Phi(X) - c$. On the other hand, he gets p by selling this unit on the market. Therefore a fisherman c prefers to sell (respectively buy) a quota if $\Phi(X) - c < p$ (respectively $\Phi(X) - c > p$). At the market equilibrium p, there exists $\overline{c} = \Phi(X) - p$ such that all fishermen $c \leq \overline{c}$ buy quotas up to their capacity $\overline{x}$, while the others $c \geq \overline{c}$ sell all their quotas and stop fishing. The market clearing condition determines $\overline{c}$ such that $X = \overline{x}\, G(\overline{c})$. The equilibrium price is thus $p = \Phi(X) - \overline{c}$ which is the return of a quota in the fishery for threshold fisherman $\overline{c}$. The profit of a fisherman c with ITQ depends on wether he sells or buys quotas. A fishermen with cost $c \leq \overline{c}$ buys $\overline{x} - \hat{x}$ units of quota to fish under with all his capacity $\overline{x}$. His profit is therefore $\overline{x}\,[\Phi(X) - c] - p(\overline{x} - \hat{x})$. His marginal cost is c for the first units of effort up to his quota endowment $\hat{x}$ and $c + p = c + \Phi(X) - \overline{c}$ beyond.[9] Those with $c \geq c^{FA}$ sell all their quotas at price $p = \Phi(X) - \overline{c}$ and thus obtain $p\hat{x} = (\Phi(X) - \overline{c})\hat{x}$ which is the threshold fisherman's profit from fishing (gross of transactions in the quota market).

Now, to implement a fishing effort X, the $\hat{x}$ quotas assigned to the $G(c^{FA})$ fishermen must satisfy $\hat{x}\, G(c^{FA}) = X$ which, combined the market clearing condition $\hat{x}\, G(\overline{c}) = X$ yields:

[8] Remember that fishermen c^{FA} make zero profit under free access so that their increase of profit is simply their profit under the IQ regime.

[9] The last equality is due to the market equilibrium condition $p = \Phi(X) - \underline{c}$.

$$\frac{\hat{x}}{\bar{x}} = \frac{G(\bar{c})}{G(c^{FA})}$$

Using the above relationship it is straightforward to write fishermen's profit as in (10) and (11), which formally shows that $\Pi^{FS}(c) = \Pi^{ITQ}(c)$ for every fishermen *c*. Therefore, the ITQ and FS regime assign same equilibrium profits to the fishermen for any targeted fishing effort $X < X^{FA}$. Hence, from the point of view of the profit maximizing fishermen and the regulator, the two regulatory instruments are equivalent. We referee both instruments as the “market-based" instruments. In the next section, we compare the market-based instruments with IQs.

6 Comparison of regulations

6.1 Efficiency

The market-based instruments perform better than IQs under three measures of efficiency: (i) acceptable reduction of effort, (ii) total surplus, (iii) individual profits.

First, since the acceptability condition on the implemented fishing effort is more stringent in Proposition 2 than in Proposition 1, the FS and ITQ instruments allow to reduce extraction at least as much than IQs without reducing the fishermen's welfare. Furthermore, some fishing efforts can be implemented under the acceptability constraints under FSs and ITQs but not under IQs as shown by the mean of an example in the appendix.

Second, the market-based instruments exclude the less efficient fishermen while the IQ regime keeps all fishermen with a reduced activity. Doing so, the market-based instruments minimize the total cost of fishing. All regimes yield the same total return $X\Phi(X)$ but the total cost of fishing under IQs is higher than under FSs (and ITQs) $\int_{\underline{c}}^{c^{FA}} \hat{x} c dG(c) > \int_{\underline{c}}^{\bar{c}} \bar{x} c dG(c)$

Therefore the total surplus of the fishing activity, as measured by the sum of fishermen's profit, is higher with the market-based instruments than under IQs. Third, for a same targeted fishing effort *X*, the market-based instruments yield strictly higher profits to almost all fishermen than IQs. Indeed the ITQs would yield same profits as IQs if no quotas were exchanged. Yet as long as costs are heterogeneous, some transactions occur which strictly improve the parties'welfare. Fishermen who exchange quotas are strictly better-off doing so which imply that their profit is strictly higher under ITQs than under IQs. Only the threshold fisherman $\bar{c}$ who is indifferent between selling and buying quotas, and therefore might decide not to exchange quotas, has same profit under both regimes. Indeed, combining (5), (11) and (15) show $\pi^{ITQ}(\bar{c}) = \pi^{IQ}(\bar{c}) = \pi^{FS}(\bar{c})$. But all other fishermen $c \neq \bar{c}$, we have $\pi^{FS}(\bar{c}) = \pi^{ITQ}(\bar{c}) > \pi^{IQ}(\bar{c})$. Hence the market-based instruments are both Pareto improving on the IQ regime in addition to be (at least weakly) more efficient in reducing fishing effort under the acceptability constraint. We now examine the distribution of welfare from the fishing activity.

6.2 Equity

The Figure 4 below represents the distributions of profits extracted from the fishery under each regime.

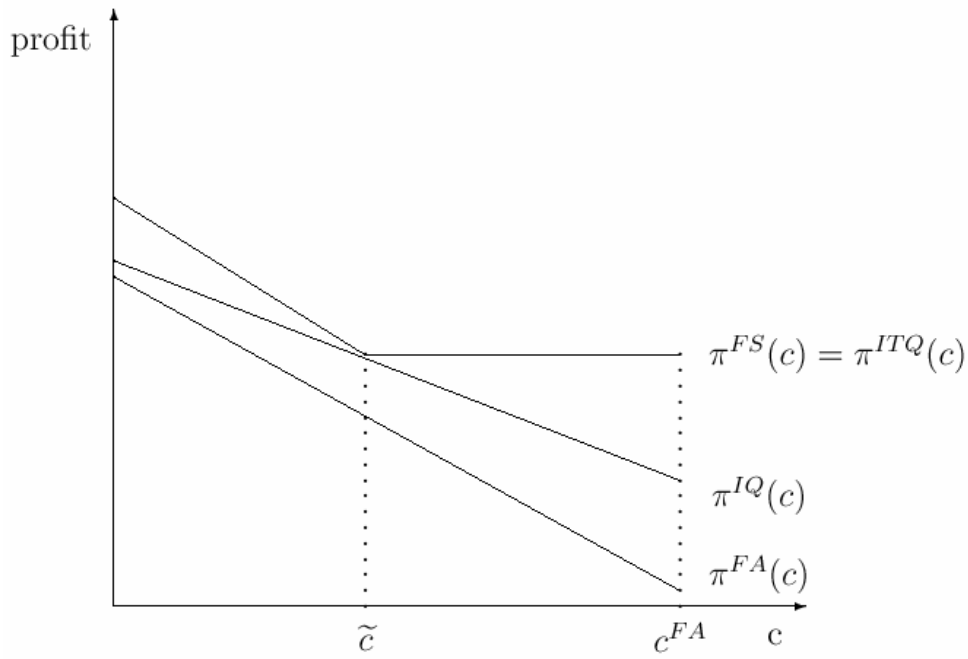

Figure 4: Distribution of profits from the fishery

The three curves are the profit levels $\pi(c)$ for every fisherman c under FA (the lower line), IQs (the middle line), FSs or ITQs (the upper kinked curve[10].). The equation of these curves are formally defined in (3), (15), and (10)-(11) respectively.

Our first concern is the distributional impact of imposing a regulation on the resource previously extracted under FA. Introducing the IQ regime clearly reduces inequality among fishermen as the slope of the profit line $\pi^{IQ}(c)$ is always lower than the slope of the profit line $\pi^{FA}(c)$. On the other hand, since the slope of the two profit curves $\pi^{FS}(c) = \pi^{ITQ}(c)$ and $\pi^{FA}(c)$ are equal for every $c \leq \overline{c}$, the market-based instruments FS and ITQ actually yield same distribution of welfare among fishermen under both regimes than under FA, although individual welfare is higher.[11] A second fairness issue is that the welfare created by the fishing industry might goes into outsiders'pocket. Under IQs, all welfare is shared among fishermen.[12] It is therefore consistent with the principle that only those who contribute to the wealth should have a share of it. Under FSs and ITQs, a share of this wealth is assigned to former fishermen through the subsidy or the quotas sold. Since those agents are not involved anymore in the fishing activity, they do not contribute to the fishing industry's welfare. They are rewarded from fishing, therefore, not contributing to wealth.

The inequality among fishermen with IQs decreases as the regulation becomes more stringent. Indeed, a further reduction of the fishing effort implemented X with IQs, which requires to lower the number of individual quotas $\hat{x}$, reduces the slope of the profit line π^{IQ}

[10]Recall that both regimes FS and ITQ yield same equilibrium profits

[11]If c is an opportunity cost, the non-fishermen under the FS and ITQ regimes obtain same payoffs from the fishery (i.e.the subsidy or the receipt from marketing quotas) but inequality among them remain the same than under FA since their welfare also include their benefit from working full time on their outside option, formally $c \perp x$.

[12]We abstract from the consumers', suppliers' and retailers'welfare since those stakeholders are absent in our model.

(c) for $c \leq \overline{c}$. On the other hand, the same reduction of X with market-based regulations does not change the slope of $\pi^{FS}(c)$ and $\pi^{ITQ}(c)$ on the same range of c, and there inequality among fishermen is unchanged. Yet it does increase the share of the welfare assigned to non- fishermen. Indeed, under FS, reducing X further requires an increase of both the access fee τ and the buy-back subsidy σ to exclude more fishermen. Formally, the threshold fisherman in Figure 4 moves left. Although it might increase of the total product $X\Phi(X)$, this reduction of fishing effort benefits mostly to those who exit the fishery who obtain a higher subsidy σ. Under ITQs, reducing the total number of quotas X leads to a higher equilibrium price in the quota market to the benefit of the quota sellers who do not fish at all. They obtain a higher return from selling their quota in addition to saving their costs and/or obtaining the return from their outside option c.

Compared to the free access benchmark, the fishermen who benefit the most from the market-based regulation are those who give up fishing. This is partly due to the fact that, since they quit the fishery, they save their costs or obtain their outside option return c which are the highest. A fairness concern with the market-based regulations is not only that some people get a benefit from the fishing activity without fishing but also that these people have the highest increase of benefit. In contrast, with IQs, the welfare improvement, although more modest, is more equally spread among the two group of fishermen: those with $c \leq \overline{c}$ and the other.

6.3 Requiring less than unanimity

Now what happens if the fishing effort X implemented is reduced below what is acceptable by all fishermen? Who might lose with the new regulation? As the fishing effort X decreases below what is Pareto efficient, the first to experience loss of welfare compared to free access are all the fishermen who still fish under the new regime. With the market-based instruments FS and ITQ, only those who exit the fishery gain, all the remaining fishermen (whose cost c are the lowest) loose. Under IQs, the firsts to experience a loss of welfare compared to free access are the low cost fishermen while the high cost fishermen might still be better-off (in particular fihermen c^{FA}). Nevertheless since the variation of profit line under IQs is always below the one under FSs or ITQs, more agents lose with the same reduction of fishing effort below what is acceptable. This implies that less people would support the same reduction of fishing effort under IQs than under market-based regulations FS or ITQ instruments. Yet those people are not fishermen anymore under FSs and ITQs. Note that if the reduction of fishing exerts positive externalities on the economy outside the fishermen community (e.g. because the impact of fishing on tourism or the biodiversity value of the fishery) then a subsidy to the fishing industry might be justified. By relaxing the budget balance constraint of the FS scheme, it might helps the fishing reduction to be acceptable by fishermen.

7 Conclusion

Common-pool resources such as fisheries are regulated to reduce extraction. We compare the performance of three regulatory instruments, an access fee and buy-back subsidy scheme (FS), individual quotas (IQs) and individual and transferable quotas (ITQs), in reducing extraction under the “acceptability constraint" which requires that fishermen are not worse-off than under free-access.

An important assumption of our model is that fishermen have heterogenous fishing costs. It is therefore more efficient that the extraction effort is carried out by the low cost fishermen. This is made possible by the equivalent market-based regulatory instruments which are FS and ITQ instruments. Instead under IQs all fishermen fish with reduced capacity, thereby leading to higher total extraction cost. Quota transferability increases both total and individual welfare. We show that it expands the set of extraction rates that can be implemented under

the acceptability constraint. On the other hand, forbidding quota transferability reduces inequality among fishermen. It also avoids to transfer part of the welfare to people who do not contribute to it. These two fairness properties might explain why IQs are widely used to regulate fisheries despite being less efficient.

The model examines on a short term analysis several regulation instruments when a reduction of the extraction effort of a natural resource is desired. In order to understand the impact of instruments on the viability of the resource, a long term model of the type presented in this paper is required. For instance, one could introduce a stock of natural resource and its natural regeneration rate in our framework. We might then analyze the transition path from the free access regime to targeted, efficiently-regulated exploitation (i.e. a first-best sustainable steady state). An other investigation matter in such long term analysis would be the examination whether fishermen are allowed to exit/ enter the extraction activities from one period to the other when acceptable market based instruments are implemented.

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What reciprocity? – The impact of culture and socio-political background on trust games in Namibia and South Africa

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Abstract

This paper reports on unexpected results from trust games in southern Namibia (Karas) and northern South Africa (Namaqualand). I argue, that in Namibia where experimental trust is high but reciprocity is almost not exhibited that people in the experiment apply their available knowledge, believes and past experiences that relates to the norm of generalized reciprocity. In South Africa trust is extremely low. I argue that people rely too much on (biased) information regarding the likelihood that past events involved untrustworthy behaviour. Prominent examples related to untrustworthiness are more easily memorized and thus overestimated. I further analyse socio-demographic variables, motives for trust and questions on stated generalized trust. Experimental trust and stated trust differ widely. Regression results suggest that social distance, market integration and helping motives influence experimental trust while economic investment motives play a minor role.

Introduction

Cross-cultural experiments carried out in the field combined with ethnographic research have gathered immense evidence on behavioural variability among different cultural groups. However, what is the underlying factor for the different results? Explanations do not fully synthesize the observed variability and explain some puzzling or contradictory findings. Proposed solutions to synthesize findings range from assuming bounded rational actors with limited cognitive abilities that apply heuristics in their decision-making (Gigerenzer and Selten, 2001; Kahneman, 2003) or social preferences of individuals inducing equitable outcomes (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Less ambitious is the overarching claiming that difference is due to influence of social norms, values and attitudes which depend on the cultural background of decision makers (Henrich et al., 2001; Cardenas and Carpenter, 2005). In this study I will focus on the historical and socio-political background of two related peoples from Southern Africa to explain a rather unusual outcome of a series of trust games. The result from the cross-cultural experiment explains a deep-rooted behavioural variability in the societies that matches current real world behaviour, is comprehensible in a historical context, is supported by post game data as well as by the data of a prior social capital survey.

The paper explores three different research questions. First of all it seeks to understand the form of reciprocity prevalent in the region of South Africa and Namibia. Second, statistical analyses are used to test for the influence of individual and group characteristics as well as questions on stated trust on experimental trust and trustworthiness. Lastly, it will be discussed how differences between the two neighbouring regions can be explained with their cultural and socio-political background and with the availability heuristic.

Literature Review

A prominent experiment used in the study covering 15 small-scale societies is the ultimatum game. Here, two people must share a sum of money (say, $10); Person A gets to propose a share to be given to another, anonymous, person B. Person B can only accept or decline. If he rejects, both get nothing. The game is played only once and confidentiality is maintained. The expected rational choice would be a $9.99/$0.01 split. But in fact typical offers in past laboratory experiments with a student population from Person A are between 42 and 48 per cent. These findings and other laboratory studies led to the formation of economic theories for altruism, fairness, and reciprocity or inequality aversion to form a realistic model of the *homo oeconomicus*. However, in the field experiments the offers in the ultimatum game ranged between 25 to 57 per cent (Henrich et al., 2004, p. 19) and even, hyper-fair offers of

over 50% were reported as the mean behaviour in Lamalera, Indonesia that cannot be explained with the emerging theories of economic preferences. Interestingly, Lamalera is a community of whale hunters where the economy depends on the cooperation of large groups of non-relatives. Henrich et al. (2004, p. 39) explain that *"In real life, when a Lamalera whaling crew returns with a whale or other large catch, a specially designated person meticulously divides the prey into predesignated parts allocated to the harpooner, crew members, and others participating in the hunt, as well as the sailmaker, members of the hunters' corporate group, and other community members (who make no direct contribution to the hunt)"*. While this behaviour could be treated as an outlier that should not be put much too weight on these hyper-fair offers also occurred in two New Guinea groups (the Au and Gnau). But here offers above 50% were rejected applying a costly norm of negative reciprocity although there is seemingly no need to "punish" the first mover. This puzzling finding only makes sense in the ethnographic context of many New Guinea societies (Tracer, 2003; 2004). Tracer argues that the rejection of generous offers is similar to the gift giving found in Au and Gnau villages, and throughout Melanesia. In these groups, accepting even unsolicited gifts implies a strong obligation to reciprocate at some future time. Not reciprocated gifts accumulate, and place the receiver of the gift in a subordinate status. The gift giver may demand repayment at anytime inducing an immediate obligation by the receiver to return the gift according to the givers' agenda. As a result, extremely great gifts will often be rejected due to the anxiety about the commitment to reciprocate.

The present case study of trust games in Namibia and South Africa follows the proposition of "ecological rationality" by Todd and Gigerenzer (2000) and adapted from Vernon Smith (2003) to highlight the importance of context and evolved norms in human choice as opposed to "constructivist rationality" based on logic or optimization. According to Smith ecological rationality describes a *"...undesigned ecological system that emerges out of cultural and biological evolutionary processes: homegrown principles of action, norms, traditions, and 'morality'. Ecological rationality uses reason -rational reconstruction- to examine the behaviour of individuals based on their experience and folk knowledge, who are 'naïve' in their ability to apply constructivist tools to the decisions they make;"* (Smith, 2003, p.469). Thus, the notion of ecological rationality means that the correctness of a decision strategy depends on characteristics of the environment in which it is tested. Decisions are often guided by heuristics. Hence laboratory experiments of the trust game and related one shot games performed with student population of industrialized countries do not necessarily posses external validity for different cultures and population pools as they might apply different heuristics based on their prior experience with similar situations. Consequently, external validity of a laboratory experiment is likely to be diverse according to the field setting and the experimenter has to answer the question "what do people bring into the game?" (Cardenas and Ostrom 2004).

The trust game or investment game which is underlying this study is adapted from the seminal article of Berg et al. (1995). The game is played by pairs of two players, both endowed with $10. The game has two stages. In stage 1 the first mover decides how much of his endowment to pass to an anonymous second mover. All money passed is increased by a multiplicative factor 3. In stage 2 the second mover then decides how much to return to the first mover. The game theoretical prediction for the first mover is to send nothing unless he trusts the second mover while it is predicted for the second mover to return nothing. In this anonymous, one-shot setting only social history about the use of trust within a group is common information (not reputation, learning or punishment threats); social history focuses on the internalization of social norms as no other information is available to the participants. Cox and Deck (2005, p.634) showed in a series of experiments that a low social distance among players in the trust game induces reciprocal motives. Thus, in small communities were social distance is low and frequent interactions have been taken place social history is high and the trust game reveals individual's predisposition towards trust to their community members. A good synthesis of findings from the trust game is provided in Camerer (2003). The most general finding among university students and in the field is that a large proportion of first movers invest about half their endowments (except in Kenya where investment level is

25%). Second movers tend to repay the level of trust or slightly below indicating, that trust does not quite pay.

Bohnet and Croson (2004) review article on the determinants of trust and reciprocity in a special edition of the journal of experimental economics. Carpenter et al. (2004) analyze trust games from Vietnam and Thailand and find many demographic and associational factors that vary with individual behaviour. However, the correlations often differ significantly between the two countries. Carpenter et al. (2004, p.538) conclude that *"these differences are likely due to cultural and political-economic influences on local cooperation."* Greig and Bohnet (2005) review a set of trust experiments and distinguish specific cultural behaviour related to the norm of reciprocity. They conclude that in the western industrialized world the norm of conditional reciprocity is the standard behaviour meaning that with increasing money invested by the first mover the amounts returned by the second mover increases. In developing countries however, the decisive norm of reciprocity is mostly balanced. Indicating that the amount returned will equal the money invested no matter how much was invested. Thus, trust as an investment does not pay. These might explain the strong impact of 'social capital' on institutional performance and economic development with national level data (Knack and Keefer, 1997; Fukuyama, 2001). Further indications of different forms of reciprocity are presented by Holm and Danielson (2007). They mention that there is no evidence for a reciprocity mechanism among Tanzanian subjects. The higher amount Tanzanian students receive, the smaller share they send back (ibid, p.507). The hypothesis of cultural and socio-political influence in trust games was also supported by the experiments of Barr (2003). Barr compared traditional villages with recently resettled villages in Zimbabwe and found evidence, that resettled villages exhibit less trust but that some players makes high investment despite the low level of expected trustworthiness. While one could argue, that in resettled communities; beliefs about other people behaviour are not settled yet, Barr (2003, p.627) argues that this behaviour relates to the desire of people to build a community.

Low levels of trust have economic drawbacks for a specific region. Transaction costs are higher, contract enforcement is difficult and less local public goods are provided. One remaining issue is how trust experiments do fit into the literature on generalized trust or cultural values[13]. Uslaner (2006) explains that generalized trusters are people who believe in a common core of values that is integrative to minorities and have a willingness to do good deeds which leads to less corruption and finally to more social welfare of a group. Due to the internalized norms hypothesis with social history as main source of information to the participants in the trust game, it seems similarly possible to measure the amount of trust in a community or even a larger society with the trust experiment. Though, trust experiments should deliver similar results to those of 'social capital' and especially questions on stated generalized trust. However, stated trust varies substantially from experimental trust (Glaeser et al., 2000). In a subsequent study Gächter et al. (2004) found for a large sample with student and non-student population that stated generalized trust does not influence behaviour in a public good experiment while other questions do. Also, Johansson Stenman et al. (2006) find evidence that stated trust does not correlate with experimental behaviour in Bangladesh and Maluccio and Haddad (2002) only find little evidence, that measures of associational social capital are correlated to experimental results in South Africa. Finally, Holm and Danielson (2007) find differences for survey questions on trust between the Swedish and Tanzanian student population. In Tanzania standardized survey questions on generalized trust and a trust index are even negatively correlated with experimental results of reciprocity. This study further investigates the relationship of experimental trust and reciprocity and its relation to survey questions on local 'social capital'.

[13] Similarly unclear is the relation between experimental behaviour and cultural attributes. The meta-study of Oosterbeek et al. (2004) find that the differences in Ultimatum game responses cannot be attributed to various cultural traits -- for instance, the cultural classifications obtained from IBM employees in 50 different countries (Hofstede, 1991) or the World Value Survey from 65 countries (Inglehart, 2000) are built on.

Lastly, socio-demographic information can account for trust and trustworthiness. Especially when investigating an area with high poverty and inequality, one could assume that absolute and relative measures of wealth and income could be influencing the decision-making of individuals. People with low income will not take the risk to trust their partner. Trust can be related to risk aversion and so income rich people and male persons are thus exhibiting more trust (Schechter, 2006). Johansson Stenman (2006) or Greig and Bohnet (2005) also find positive correlations between income and trust and reciprocity. Haile et al. (2006) study an interesting setting where participants have full information on income and race of their partner in the trust game. They find for South African students, that low income subjects from both racial groups invest significantly less in partnerships with the high income subjects of the other racial group. Income alone however does not suffice for discrimination. Croson and Buchan (1999) or Croson and Gneezy (2005) find no indication of substantial differences between men and women playing the trust game wit university students in the industrialized world. However, Greig and Bohnet (2005) and Barr (2003) find that female subjects are exhibiting less trust but more reciprocity. Greig and Bohnet argue, that this is due to the higher demand for cash by Kenyan women as supporters of the family while Barr (2003) reports that women in Zimbabwe were reluctant to send to men as men would obviously reinvest their earnings in beer. Lastly, Sutter and Kocher (2003) provide evidence that trust in anonymous partners increases almost linearly from early childhood to early adulthood, but stays constant afterwards. Reciprocity prevails in all age groups, although its degree also seems to increase with age (Sutter and Kocher, 2003).

This study tries to explain different forms of reciprocity as well as different trust levels among two closely related regions in a series of trust games. In the South African Namaqualand measured trust was extremely low but reciprocity high while in the bordering Namibian Karas region trust was high but reciprocity among participants was almost not practiced. The low level of trust in South Africa, the low degree of reciprocity in Namibia and the difference between both countries are at first sight contradictory results. I will explain that these results can only be understood in the context of the historically grown Nama culture that has been practised in Namaqualand of South Africa and is still today practised in southern Namibia. In Nama society and in other societies where generalised reciprocity is practiced as the dominant exchange mechanism not immediately returning a gift symbolizes high trust which partly explains Namibian behaviour. I will further argue how the disruption of the coloured communities in South Africa by external interventions and corrupt local elites led to the disappearance of the cultural identity and the norm of generalised reciprocity which consequently led to the nowadays observed situation with very little trust among the South African Namaqualanders. Until recently, the people in the Namaqualand had to overcome several challenges of the apartheid administration and were continuously confronted with the challenging worldview of the modernized western world. Their effort to reciprocate and do hyper-fair counter offers is similar to Barr's (2003) interpretation as their wish to build a functioning community.

Framework to elicit forms of reciprocity

The investment or trust game is a one-shot game played by pairs of subjects. In the game by Berg et al. (1995) an investor and a trustee both have an endowment z. The investor can keep or invest his endowment. Assume the investor invests X and keeps z-X. The investment of X earns a return, at a rate (1+r), and becomes (1+r) X. X is multiplied by r>1 by the experimenter to capture the efficiency increasing potential of this transaction. Usually r is equal to 2 inducing the experimenter to triple the amounts sent. The other player the trustee must decide how to share the new amount z + (1+r) X with the investor. Suppose the trustee returns Y and keeps z + (1+r) X - Y the total payoff of the investor is z-X+Y and the payoff of the trustee is z + (1+r) X – Y. The usual prediction is by assuming selfish money-maximizing preferences and common knowledge of rationality that returns Y*=0 and trust X*=0, which precludes any trustworthiness and reciprocity. X is commonly referred to as "trust", while Y/X

measures “trustworthiness” (trustworthiness is precluded when first movers send zero). The relationship between X and Y/X determines the form of reciprocity.

Usually, anthropologist distinguishes between generalized, balanced and negative reciprocity Sahlin (1972). Following Greig and Bohnet (2005) three important norms of reciprocity can be distinguished with the trust game. A second mover is said to behave according to a norm of conditional reciprocity if trustworthiness increases with trust – i.e., if the return ratio Y/X is increasing in X; $\frac{\delta Y / X}{\delta X} > 0$. A second mover is said to behave according to a norm of negative reciprocity if trustworthiness decreases with higher amount sent X. Thus, $\frac{\delta Y / X}{\delta X} < 0$. The negative relationship may result if temptation decreases norm compliance or when second movers punish first movers for their willingness to take risk and be generous. A second mover is said to behave according to a norm of balanced reciprocity if trustworthiness does not vary with trust, i.e., if the return ratio Y/X=1 for all values of X. Lastly one could add the case of no reciprocity where Y/X=0 for all values of X. However, generalized reciprocity where those who give goods do not expect any returns from the recipient at any definite time in the future, cannot be directly deduced from the behaviour of player 1 or player 2. It requires the analysis of further motives from both participants. In generalized reciprocity the act of returning a gift is exhibited at a later point when the experiment has already ended and not necessary by the same person who offered the gift. Furthermore, in generalized reciprocity it is especially a sign of trust not to reciprocate immediately and thereby signalling the wish to start a social relation with that person.

The test between negative, balanced and conditional reciprocity can be done with a reduced linear regression function of player 2:

$Y/X=b_0+b_1X+e$

The coefficient b_1 should have a positive sign for the norm of conditional reciprocity and a negative sign for negative reciprocity. Balanced reciprocity leads to $b_1=0$. Further information the participants could observe was the group size the distribution of age and gender within the group and if one assumes that villagers have good knowledge on their fellow villagers the distribution of income and wealth etc. could also be observed. within the group. These effects can be captured with adding group average of the demographic variables into the regression. Assuming, that individual decisions also depend on the characteristics of the person the literature suggests that gender, age, income, amount of siblings, membership in organizations, participation in collective action and amount of time lived in the same village are likely to have an impact on trust and reciprocity in the experimental literature. Besides a rudimentary regression model and a complete regression model I also present the results of a best fit regression model where variables were stepwise eliminated according to the overall explanatory power of the regression[14].

Experimental protocol

In my version of the game I followed the instructions from the trust game protocol of the National Science Foundation project “The Roots of Human Sociality”[15] . Each player’s initial

[14] Elimination of variables was tested block wise using the Wald test.

[15] http://www.hss.caltech.edu/media/roots/docs/Trust-Game-Script.pdf

endowment was 8 South African Rand and the play was conducted with 2 Rand coins only[16]. The first player had to choose X, where X = {0, 2, 4, 6, 8}. The choose of X defines the subgame of the second mover where she chooses Y = {0, 2, 4, 6, 8, 10, … 32}. This game was played in 10 sessions in 8 different villages. The invitation to participate was spread both through written notices at the local shops as well as through mouth to mouth propaganda. Upon arrival participants agreed upon taking part in a game where they could earn some money as well as to fill in the survey forms.

Participants needed to be above 18 years of age and each household could send only 2 players to the game. There were between 8 and 15 pairs per session. The allocation of pairs and roles was assigned randomly by drawing a closed envelope with the player number (e.g. B87 or A5). It was made clear that the number should be kept private and that the pairs were allocated randomly. Thus A5 would not be paired with B5[17]. Furthermore, it was made clear that people were paired with someone from their own village. 56 per cent of the participants were female the mean age was 33 years and the average education level was 8 years of schooling.

The experiments were all pretested and run in Afrikaans. The instructions were read aloud by the same native speaker in all villages to all participants. Different examples were visualized on a white board. Questions could be asked in public or in private and answered according to the protocol. By drawing an envelope each player got their respective group and player number. Players were then separated into different rooms with one overseer for each group to avoid collusion among players. Then, the players of group A first were called one-by-one to the experimenter where they got a short reminder on their role in the game and could eventually ask further questions[18]. The money was then put in front of the person and he or she decided how much to keep respectively to send. Player from Group B was shown a separate pile of the money that an anonymous player in Group A sent and how this amount got tripled. After the experiment participants were asked to complete a questionnaire.

Study area

The Karas Region in Namibia is 162 348 square kilometres in size and is very sparsely populated. It only supports a population of 69 677 people; more than half of these people live in communal areas of the Namaland, Karasburg and Warmbad (Figure 1). The population density in the Namaland is 0,2 people per square kilometre and the lowest in the country. Altogether there are 1235 households in the Namaland (National Planning Commission, 2001) making a total population of 5800 people. The communal area of Berseba consists of 500 households and Tses of 350. However, the towns Berseba and Tses are much smaller (Table 8). Many people live in small settlements of 2-10 households scattered inside the Namaland. Due to this fragmented settlement structure the game could only be played in three villages with 70 participants.

The Namaqualand in South Africa at the border to the Namibian Karas region consists of the municipalities of Kamiesberg, Nama-Khoi, Richtersveld, and Khai-Ma, and comprises about 48 000 square kilometres with 70 000 inhabitants. Approximately 30 000 people live in the six former “rural reserves” or “coloured reserves” of Richtersveld, Steinkopf, Concordia, Komaggas, Pella, and Leliefontein (Figure 1). The trust games were played in the former Leliefontein reserve of the Kamiesberg municipality. From the 10 759 people in the

[16] Average earnings of 10,5 Rand (std.dev 5,4) are equal to one third of a day’s casual work. The endowment of 8 Rand was worth one and a half US $. Namibian Dollar and South African Rand have the same exchange rate and South African Rand are also a valid currency in Namibia.

[17] During pretesting it was found, that this announcement was necessary to guarantee the anonymity of the players after the game.

[18] To increase privacy, the local Afrikaans speaking translator did not observe the decision-making process.

Kamiesberg municipality approximately half of the inhabitants live in the former Leliefontein reserve. The population density is with 2,2 people per square kilometre extremely low for South Africa but higher than in southern Namibia. The recruiting was therefore easier and the experiment was played in 5 different villages with 148 participants. A detailed statistics of the villages as well as its representativity according to the census is presented in table 8. Especially in Namibia the experiment was mainly played with a younger population that have lower income but higher education.

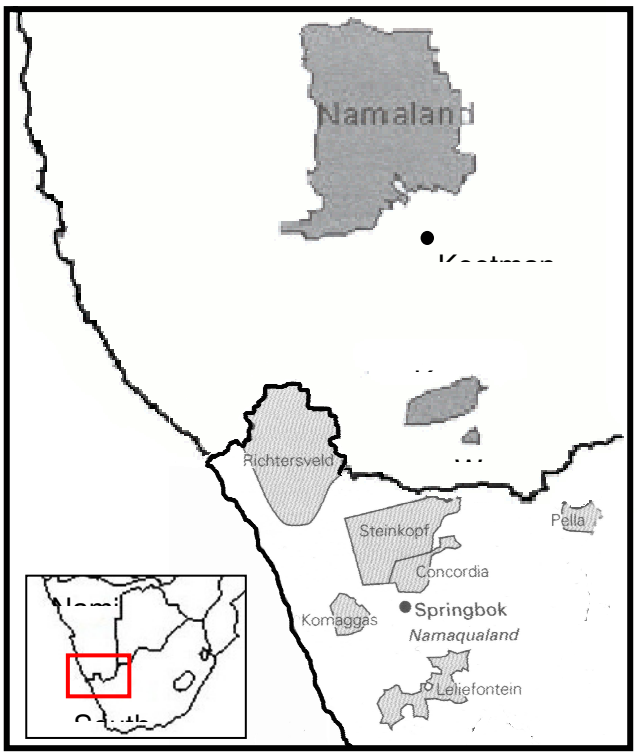

Figure 1: Communal areas in Namibia and South Africa. communal area of Berseba and Tses lies within the Karas district of Namibia. The communal area of Leliefontein is part of the Kamiesberg municipality within the Northern Cape Province.

Nowadays both rural areas lag behind the development of their countries. Namibia and South Africa are countries with huge distributional discrepancies with Gini coefficients above 0,6 (ECA, 2004). Especially the rural areas of the former homelands in South Africa and Namibia are facing similar challenges of poverty and overexploitation of the natural resources that is most likely related to a lack of alternative income opportunities. This further gives rise for plenty of closely related social problems like alcoholism and drug abuse.

Results

Trust and Trustworthiness

The distributions of amount sent are shown in figure 2. In South Africa the average amount sent was 1,6 ZAR which is 21% of their initial endowment. In Namibia the average amount sent was 3,2 ZAR which is 41% of their initial endowment. The differences of the means

between the two regions are significant at the one per cent level (Z=-3,439; p<.01)[19]. The mode is also different. In South Africa the mode is identical to Nash prediction of sending nothing. In Namibia the mode is to send 25% of the endowment (Figure 2). Moreover, Namaqualand in South Africa scores as the region with the lowest trust worldwide. Usually fractions sent range from 40% to 60% in field or laboratory experiments.

Trustworthiness can be measured as the proportion returned Y of the amount received after the amount sent is tripled X*3. The initial endowment is not added. The average proportion returned in South Africa was 37% (std. dev.=0.38) while the corresponding proportion in Namibia was 8% (std. dev.=0.14). Testing for differences in the means yields again significant results (Z=-3,439; p<.01). The return ratio Y/X for those who received positive amounts from the first mover which is similarly indicating trustworthiness was 1,08 (std. dev. 1,1) in South Africa and 0,25 (std. dev. 0,4) in Namibia. A return ratio of 1,5 induces equal sharing of the investment gain, a ratio of 3 indicates, that the second player sent all the profit back to the first player. A return ratio of 1 indicates the norm of "balanced" or pure reciprocity meaning that player one got on average the same amount returned as they sent away. This was the mode behaviour in South Africa (Figure 3). A return ratio below one indicates that first players were making losses from trusting their community members. A return ratio of 0 indicates "no reciprocity". This is with 70% the dominating outcome in Namibia (Figure 3). The regression results for Namibia and South Africa (Figure 4) show an insignificant (negative) relation between return ratio and amount sent which indicates that neither "negative reciprocity" nor "conditional reciprocity" applies.

The unusual results of both Namibian reciprocating behaviour and South African trust behaviour is highlighted in a comparison with already reported results from trust games (Figure 5) as reviewed by Cardenas and Carpenter (2005)[20]. In an environment with little social distance where people frequently interact with each other, one can assume the locally practiced social norm to be one of common knowledge. Therefore, all trust games have strong correlations between amount sent and returned. Trust can be viewed as the expectation that the partner will reciprocate. However, "no reciprocity" and "negative reciprocity" characterize a very untrustworthy environment in which everybody is trying to gain as much as she can and taking advantage of others that should go hand in hand with low trust. If not it contradicts the findings of the correlations between trust and reciprocity. Trusting people in a society with no trust would not be a long-term equilibrium. Therefore, the explanation with "no reciprocity" is only partially satisfactory as it does not explain the high amount sent in Namibia. The question then is why do people send their endowment in an untrustworthy environment where people usually do not return gifts and favours or behave selfish? Interestingly, after the game was played in Namibia I could observe several times how groups of players discussed their earnings and eventually somebody who lost her investment was given her money back by those who had obtained a high earning. This post-game behaviour indicates that reciprocity in Namibia although not practiced in the game is a common feature. I argue in the discussion, that there exists evidence that the trust game behaviour in southern Namibia can be explained with a strong norm of "generalized reciprocity" which is typical for a relation-based society as the Nama culture rather than with "no reciprocity".

In South Africa the norm of reciprocity is clearly balanced and trust is low. Figure 4 corresponds to the regression result indicating, that reciprocating behaviour is mostly balanced, leaving the sender not worse or better off than before. There are even some hyper-fair offers from the second mover with a return ratio above 3. Thus, some people wanted to "reward" the first mover for being generous. Also, in some cases people insisted of

[19] If not stated otherwise the tests were performed with the Mann-Whitney test.

[20] That fraction returned is higher than fraction sent is possible like in South Africa where most player sent 2 Rand (25% of their endowment of 8 Rand) and the second player returned 2 Rand (33% of the received money X*3=6 Rand).

sending money back to the first mover although she did not send anything. Asking them for their reason people stated they wanted to show their partner how to behave in a fair way[21]. Thus the motives behind the experimental behaviour might help explaining trust and reciprocity.

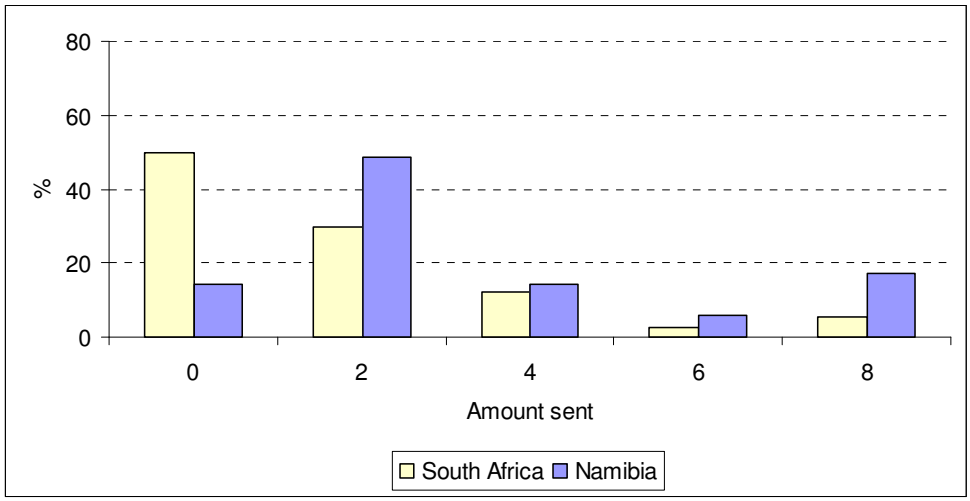

Figure 2: Distribution of percentage sent in South Africa (Namaqualand) and Namibia (Karas).

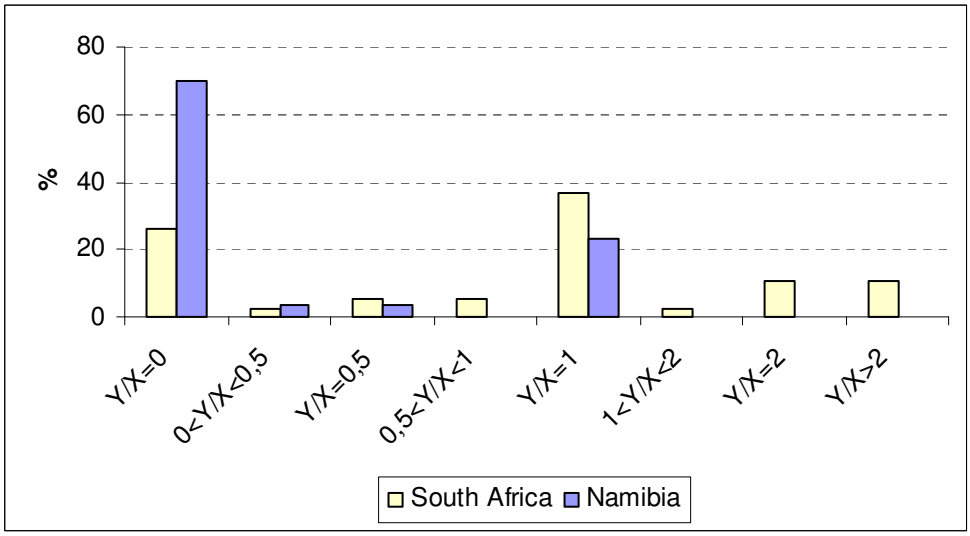

Figure 3: Responses by second mover Y/X (return ratio)

[21] To exclude the possibility of misunderstandings concerning the experimental procedure I re-explained the one-shot interaction.

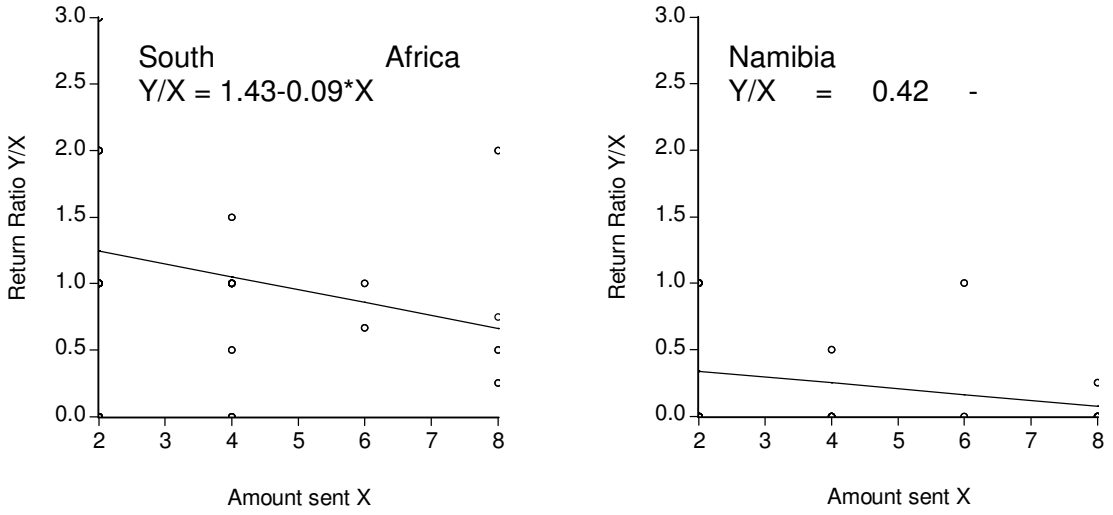

Figure 4: South Africa: R^2=0,02; p-value of beta=0,31. Namibia: R^2=0,06; p-value of beta=0.18

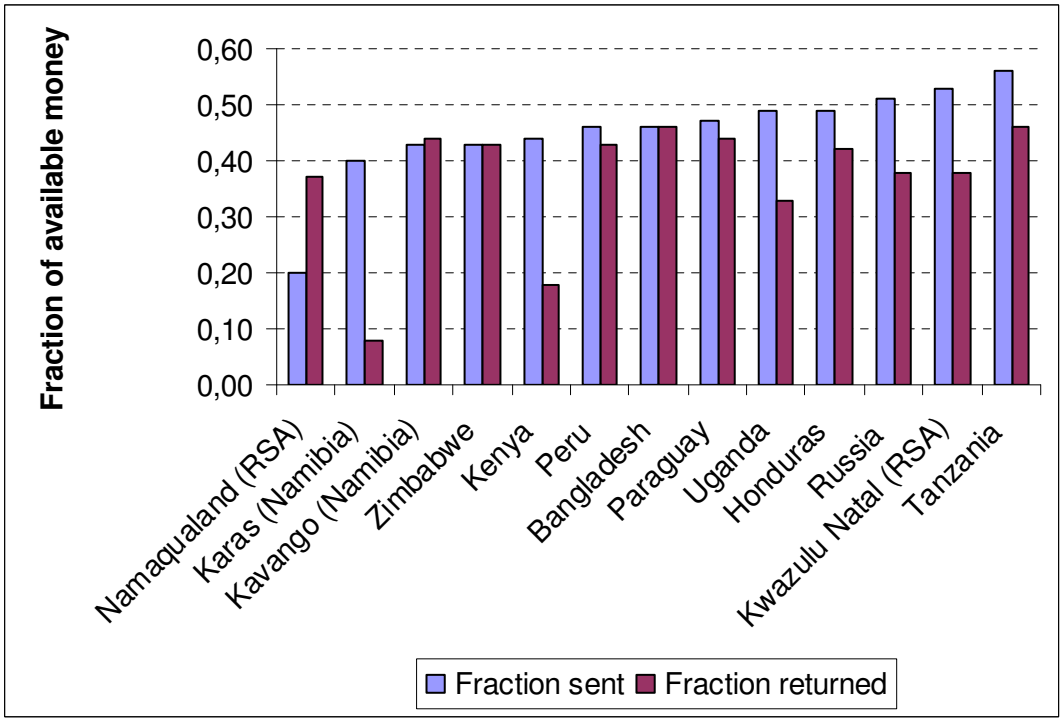

Figure 5: Trust game results with non-student population: Trust levels reported in African countries are generally between 40 and 50 percent (Cardenas and Carpenter, 2005); Trust game results from northern Namibia (Kavango n=98) are from Michael Pröpper's unpublished work. Own research (Namaqualand n=140; Karas n=78).

Motives of trust and reciprocity

Besides in depths interviews with some participants after the game, participants were asked to fill in a post game questionnaire containing general question on trust,[22] their habits of lending money, and to state their motives for sending money during the experiment. Neither generalized trust nor the fact how much people were lending money in real life or were the victim of a crime in the last month's yielded significant results for trust in South Africa or Namibia. Stated generalized trust of the participants does not explain behaviour in the trust game (Table 1 and Table 2). Regression analyses show that the measure of stated trust and the lending of money yielded only significant results for the return ratio in South Africa (Table 7). People that frequently lend their money also had a higher return ratio. A general disposition towards trust induced less reciprocity in the experiment. Either the data is biased after the experiment or the survey questions cover different aspects of trust and reciprocity

The motives for sending were asked with similar questions as used by the study of Johansson Stenman et al. (2006) in rural Bangladesh. The motives include fairness, helping, religion, and profit maximizing. In Bangladesh, most first mover sent money because they feared the punishment either during or after this life for not being generous. In South Africa this item and the helping item was also significant in explaining first movers sending decisions (Table 1). However, fairness and helping were most frequently stated both in Namibia and South Africa. Thus, religious believes and motives of fairness and helping seem to activate trust much more than do calculative aspects. The economic argument 'I believe I will gain from sending money' plays especially in Namibia no role for sending behaviour. It was only stated by 19% of participants. Interestingly, this supports the idea of "generalized reciprocity" in Namibia which is defined as act of giving without expecting anything returned. Motives of fairness and helping were much more often named to influence the sending decision. Concerning the return ratio; in Namibia no one sent the money back because the partner might need the money more than they do (Table 2). Thus, the second movers are not influenced by a helping motive. In the generalized norm of reciprocity one helps when someone asks for it.

Besides the data captured after the experiment I performed a social capital survey in 2004 with household heads in the same area where the experiments were run in 2006. The assessment of social capital was done with 215 structured interviews on household level and semi-structured interviews with community members and committee members in over 20 villages of the Namaqualand (n=151) and 5 of the Karas region (n=64) in Namibia. Table 3 presents the descriptive results on survey questions of trust and reciprocity for South Africa and Namibia. First of all general trust as asked in the world value survey is lower in the survey from 2004 performed with household heads (23%) than it was when asked after the experiments (49%)[23]. The high percentage of 49 seems indeed to point towards a biased result. The higher value in the post experiment questionnaire could be due to the bias of having played an experiment where people might justify their untrustworthy behaviour by stating to have high trust themselves. Gächter et al. (2004) find for a Russian subject pool that while measures for generalized trust do not explain contribution to a public good experiment another question from the World Value Survey on free-riding when unobserved was highly significant. The same item was also asked in 2004 in Namibia and South Africa. The item on free-riding was answered in Namibia and South Africa contrarily to the high degree of trust with a high degree of suspicion or fear of free-riding in the area. 90% of all respondents stated, that people tend to be dishonest when they are not monitored – or

[22] From World Value Survey: "Generally speaking, do you believe that most people can be trusted, or can't you be too careful in dealing with people?"

[23] In South Africa there is a strong decline in general trust (1990: 26%; 1994:17%; 2001: 11%). As a comparison: The United States have 35% and Germany 30%. Sweden is among the highest with over 60% (source: www.worldvaluessurvey.org).

anonymous as in the trust experiment[24]. The item on other people trustworthiness matches the low experimental results of trustworthiness in the region very well indicating, that trustworthiness can be assessed easier in general questions than trust.

However; differences in stated generalized trust and trustworthiness do not explain the different behaviour in the trust experiment between the two regions. The higher trust in the Namibian experiment correlates with a higher degree of trust in local institutions and more trust in lending money to friends as well as having a stronger kin-based society. The reason that there is more reciprocity in South Africa is supported with the higher degree of reciprocity among neighbours to help each other and the larger amount of friends. Thus, the results from the earlier household survey on social capital are supporting the findings of the experiment much better than the post experiment questions on generalized stated trust.

	South Africa	P	Namibia	p
	% yes		% yes	
T1: In general do you think people can be trusted	45%	.48	57%	.20
T2: How regular did you lend money to one of your friends last year		.92		.57
Once a year or less often than a month	42%		20%	
Once a month	18%		31%	
Once a week or more often	6%		19%	
T3: Have you been the victim of a crime in the last 12 months	8%	.18	14%	.09*
M1: It would be unfair not to send anything	53%	.29	53%	.30
M2: The receiver probably needs the money more than I do	53%	.08*	50%	.35
M3: I will get punished, either during lifetime or afterwards, if I am not generous to others.	15%	.02**	23%	.26
M4: I believe I will gain from sending money away	53%	.97	19%	.22

*Table 1: Survey questions on trust (RSA: n=74; Nam: n=35) as well as motives for sending of those having sent positive amounts (RSA: n=38; Nam: n=30) for South Africa and Namibia. P-values of Mann-Whitney test are used to elicit whether item has a significant impact on the amount sent in the trust game for the specific country. (**= sig. at 5% level; *=sig. at 10% level)*

	South Africa	P	Namibia	P
	% yes		% yes	
T1: In general do you think people can be trusted	48%	.23	55%	.50
T2: How regular did you lend money to one of your friends last year		.72		.85
Once a year or less often than a month	56%		63%	
Once a month	12%		22%	
Once a week or more often	22%		15%	

[24] The World Value Survey equivalent is “Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?” In 2001 61% of South African thought people would take advantage on them. In the US the figure is 37%.

T3: Have you been the victim of a crime in the last 12 months	12%	.89	37%	1.0
M1: It would be unfair not to send anything	60%	.98	83%	.12
M2: The receiver needs the money more than I do	64%	.70	0%	.06*
M3: I will get punished, either during lifetime or afterwards, if I am not generous to others.	82%	.69	16%	.78

Table 2: Survey questions on trust (RSA: n=74; Nam: n=35) as well as motives for sending of those having received positive amounts and sent positive amounts back (RSA: n=28; Nam: n=9) for South Africa and Namibia. P-values of Mann-Whitney test are used to elicit whether item has a significant impact on the return ratio in the trust game for the specific country (RSA: n=38; Nam: n=30). (=sig. at 10% level)*

	South Africa % yes or mean	Namibia % yes or mean	p-value
In general do you think people can be trusted?	22%	26%	,55
If people in your community are not monitored tend they to be dishonest?	89%	96%	,11
How many people in your community do you trust?			,08*
Nobody	5%	10%	
Just a few	66%	74%	
Many or most	18%	16%	
Do people trust each other with lending of money?	45%	43%	,82
You urgently need to go to the hospital. Could someone take care of your children while you are away?	82%	90%	,15
How much do you trust your village committees (5=very much)	1,5	2,6	,00***
How much do you trust the church (5=very much)	3,1	3,4	,05**
Besides your household. How many family members live 10 minutes away from you?			,05**
Nobody	52%	28%	
1-2	7%	25%	
3-4	22%	28%	
5 and more	18%	18%	
How many good friends do you have?	5,0	4,0	,04**
How many friends would you give a loan?	2,8	3,6	,63
Did you do a favour to a neighbour the last 3 month?	80%	71%	,15
Did a neighbour do a favour to you in the last 3 month?	73%	52%	,00***

*Table 3: Results from social capital survey 2004 performed in the same communities. P-value to identify significant country effects. (***=sig. at 1% level; **=sig. at 5% level; *=sig. at 10% level)*

Reduced regression models

Table 4 shows the reduced regression model for trust and trustworthiness (return ratio). Due to the difficulties of recruitment in Namibia and the frequent zero amounts sent in South Africa the regression model covers the data sets of both countries. The dummy variable controlling for the country effect is highly significant for both trust and return ratio and explains a large amount of the variations. This again underlines the different behaviour of the two groups. Furthermore, the change in the sign implies that Namibians were more trusting and less reciprocating. The other significant impacts on trust are education and wealth of the family as well as group size, village size and village inequality. The other significant results for reciprocity are also wealth, Methodist religious conviction, amount of livestock owned as well as gender composition and age of the group. Thus, an individual's decision is guided by wealth constellations as well as the observed characteristics of the group and the village.

The reduced model has three highly significant groups of variables that correspond to major findings from the trust game literature. First, with decreasing group size, and thus lower social distance, people trust more. The group sizes varied from 16 to 30 players. In a group of 16 the expectation of having a free-rider as a partner decreases. Second, people that live far away from the district capital or a bigger town that are thus less integrated into market exchange, exhibit less trusting behaviour. The observation of higher market integration leading to more trust has been made by Ockenfels and Weimann (1999) or Henrich et al. (2004) who find high correlations between trust and their index of market integration for 15 small scale communities around the world. The influence of market integration is further emphasized by the fact that farmers trust less and educated people trust more. Market integration is likely to increase education and decrease the likelihood of being a farmer in the rural areas[25]. Third, inequality as measured by a higher gini-coefficient for the village (not the session) leads to more trust as well as higher wealth of the player. The motive of wealthy players was less to expect a profit from their investment but merely a redistribution motive to help their community members or to be generous. As stated in the post game question, people that sent more were wealthy people that stated that 'the receiver probably needs the money more than I do' or that 'one has to be generous during lifetime'. The altruist motive is wide spread and deep rooted through the missionary work especially in the Namaqualand. The church was the only authority that is entirely trusted during apartheid regime and still is today[26]. Though, increasing inequality in the commons is not directly decreasing trust among villagers. However the role of wealth remains ambiguous as it is negatively affecting trustworthiness.

Concerning trustworthiness it is worth noting, that neither social distance, market integration nor altruism seems to have any effects. The group variables affecting reciprocal behaviour are gender, age and wealth of a group. A group with more female players and younger players was likely to reciprocate more. Indicating that men trust more but women are more trustworthy[27]. The highly significant variable of stronger reciprocity in younger groups combined with the significant results of less reciprocity for members of the traditional Methodist church and for people with higher wealth points towards other mechanisms behind reciprocity. Moreover, it is interesting to see that wealth changed the sign in the regression for trustworthiness. When wealthy people have the opportunity to give they will do so. When wealthy people have the opportunity to take they will do so even more.

[25] Maybe education also fosters a common sense to send the money away as the best solution for everybody.

[26] See also Table 3 from Social Capital Survey and trust in institutions.

[27] This relation is robust over several models although not significant.

	Trust	Trust
Country	1.58*** (0.47)	3.32*** (0.57)
Wealth		0,0005* (0.0001)
Wealth Gini coefficient		6.45** (3.28)
Education		0.17** (0.06)
Farmer		-1.21* (0.70)
Group size		-0.19*** (0.05)
Village size		-2.54*** (0.56)
Constant	0.09 (0,67)	-0.01 (2.09)
Observations	108	108
R2	0,09	0,35
Adj. R2	0,08	0,30
F-Test	10,87*** (0,000)	7,69*** (0,000)

	Return Ratio Y/X	Return Ratio Y/X
Country	-0,85*** (0,22)	-0.85*** (0.14)
Wealth		-0,0003** (0,0001)
Group wealth		-0,0001 (0,0001)
Methodist		-0.14* (0.07)
Committee Membership		0.10 (0.06)
Amount Livestock		0.001* (0.000)
Group age		-0.06*** (0.01)
Group Male		-0.65*** (0.22)
Constant	1,96*** (0,33)	3.05*** (0.60)
Observations	67	67
R2	0,18	0.50
Adj. R2	0,17	0.43
F-Test	15,00*** (0,000)	7.3*** (0,000)

Table 4: Reduced regression results for trust and trustworthiness.

Discussion

General trust as stated in the survey from 2004 or after the experiment was higher in the Namaqualand and southern Namibia than reported in the World Value Survey for South Africa. But, stated trustworthiness in the survey from 2004 is much lower in the region than in South Africa. Similarly, southern Namibia has high trust but no trustworthiness in the experiment. As mentioned earlier this observation is following the norm of generalised or delayed reciprocity that is inherent to Nama culture. Today the Karas region is the home of the Nama people the largest remaining Khoi group. In former times, the Namaqualand was similarly inhabited by traditional Nama tribes that practiced their nomadic lifestyle.

Trust and generalized reciprocity among the Khoi and the Nama

The norm of generalized reciprocity arose as a security and risk mitigation mechanism among the Khoi villages and clans. Whenever the herd of cattle of a village became too big and too difficult to herd together the headman decided to separate the families. Though, several villages made up a clan and members lived in villages of up to twenty households. As the rainfall in the area is very erratic and spatially uneven distributed resources are not always and everywhere available. Though, access to resources is unpredictable and risk

mitigation mechanisms to sustain the herds and the families are of outmost importance. Members of the same clan shared a grazing territory while members of unrelated clans had to ask the ruling headman for permission to use the local resources. Several mechanisms like the visiting arrangements among households and clans arose that became the basis for the reciprocal society. Families from other clans visited each other often or stayed in a village of an unrelated clan or exchanged gifts. Ties of reciprocity were strengthened even more when a gift was not repaid right away. It shows that trust exists between the exchange partners and that the parties acquired a sense for "fair exchange" over time (Johnson and Earle 1987, pp.7). The exchange was also institutionalised as marriages had to be arranged between different clans. This improved the relations between the clans and the evolved regional networks granted a secure access to grazing resources. Though, the network enabled clans in lean years and times of need to ask a well-disposed clan for access to their camp or territory. These visiting arrangements helped the Khoi to sustain larger populations of people and cattle over the years. Also, the hunting created the need for an exchange-based group larger than the nuclear family. As food could not be stored the successful hunter shared the kill in the village. This exchange was socialized through generalized reciprocity as well (ibid, pp.50) though everybody got a share of the meat which also mitigated the risk from the unpredictable hunting.

Today, reciprocity among the Nama in Namibia still serves more aims than simply the immediate exchange of goods. It is used as a security mechanism of helping people in need or creating and maintaining social relationships. According to the anthropologist Klocke-Daffa (1999) generalised reciprocity today is the dominant exchange system of the Nama culture. It is based on a network with a constant flow of people and goods between households which supplies a comprehensive form of security plus a sense of ethnic identity. Though, Nama people that receive the money from the experimenter as a sender and have a strong traditional norm feel an obligation to send the money away and to build up a relation with their partner. For player 2 having strong norms of generalised reciprocity as well the immediate return of the gift would be a sign of little trust. It is a sign of trust in a society with generalized reciprocity to keep the gift. Only when the first player demands a compensation for the gift the second player has an obligation to reciprocate. However, any interaction that would build up a relationship after the first exchange is not possible in the trust experiment the norm of "generalized reciprocity" leads to the presented results where the actual norm of generalized reciprocity was practiced after the experiment when disappointed first mover asked for compensation.

Different historical developments in Namibia and South Africa

Originally, people in the Namaqualand and in southern Namibia were KhoiKhoi herders that share the same cultural tradition. Two thousand years ago the Khoi groups divided at the mouth of the Orange River which is today the border between South Africa and Namibia. The 'great Namaqua' migrated up north into Namibia while the 'little Namaqua' turned south as far as to the Olifants River and settled in the Namaqualand of South Africa.

When the first European settlers arrived in the Namaqualand at 1730 the Khoi exchanged goods and granted them permission to use their land. Later the settler alienated the Khoi from their land and gradually undermined their society. Around 1800 the first observed cultural change among the Khoi was the adoption of the Dutch language (Boonzaier, 1996, pp.101)[28]. Movement and break up of groups also accelerated. Some families moved north to Namibia[29] others stayed in the area where they got 'Tickets of occupations' granted from the

[28] In Namibia the Namas prefer to communicate in Nama albeit they speak Afrikaans or English. In Namaqualand only some old people in the Richtersveld still know how to speak Nama.

[29] After about 1780, increasing competition from the whites lead to the migration of a number of Bastard families to Rehoboth or Orlam people to the Nama region. The Orlams already adopted some Dutch culture and the

British crown around mission stations that later became the 'coloured rural reserves'. The Leliefontein reserve got their ticket in 1854. The reduction of the land base and the denial of migratory movements of the herds led to increasing poverty among the Khoi. At the mid of the 19th century mining in the Namaqualand began and offered income possibilities for the Khoi. They provided the mines with wood resources or started working in the mines and supplied their families in the reserves with money. The circulating of money and the loss of their land replaced the traditional lifestyle of bartering and pastoralism among the Khoi who had stayed in South Africa and made the norm of generalized reciprocity obsolete. The Khoi either settled in the 'coloured reserves' of the Namaqualand or crossed the border to Namibia where they had to arrange themselves with other Nama tribes. Mostly due to its remoteness and inaccessibility European settlers did not arrive in Namibia (Omer-Cooper, 1994, pp.3). Albeit some interference from colonial and apartheid state into the internal organisation, the communal land of Berseba was managed by captaincy and largely maintained its self-government until independence in 1990[30]. Thus, the Namas in Namibia still today have a strong orientation at traditional norms. The South African Namaqualanders however; were faced with challenging worldviews through stronger western influence. External intervention, land dispossession and maladministration in the Namaqualand have turned the general reciprocal norms to a situation with low trust. As the two regions are quite similar in terms of livelihood strategies, socio-economic characteristics and ecology the history of the two peoples has taken distinct developments that explain some of the different behaviour and may account for the huge country effect in the regression.

(Mal-) administration of the reserves in the Namaqualand and the decline of trust

The coloured rural areas act 24 from 1963 gave power to the Minister of Coloured Affairs to mandate and control a local management board consisting of the most influential coloured people in the reserves. Although the management board was called autonomous; decisions had to be approved by the superiors and the power and duties were unrealistic in relation to its resources. Until 1988 only 13% of the population 'the burgers' in the reserves were accorded full citizen status with voting rights and rights to stand for office on the board (Westaway, 1994, pp.8; Boonzaier et al., 1996, pp.129). Though, elected board members were typically elder farmers who lacked formal schooling and the relevant skills for administration. Therefore, services were not fulfilled and the infrastructure was of poor quality and the water points too small in relation to the number of livestock (Couch and Pendleton, 1998, pp.12). Westaway (1994, pp.13) further mentions multiple corruption scandals in her report on the administration of the Namaqualand. According to her interviewees people who got elected to the council changed their behaviour because they started to work in a corrupt and inefficient structure of the management board.

With the Rural Areas Act 1 of 1979 the Minister had the power to reorganize the communal system which has been distinguished as inferior to commercial farming systems and a cause for rural poverty. As a consequence, in 1984 the apartheid administration together with the management board undertook an attempt to privatise communal land in order to boost a commercially farming coloured middle class. The establishment of the 47 fenced off

Afrikaans as their language and settled in the Berseba and Bethanie area, which forms nowadays large part of the Namaland. Before the northward migrations by the Orlams from the end of the 18th century, the indigenous Nama communities in southern Namibia lived in well-organised and self-sufficient societies, as attested to by the first missionaries sent by the London Missionary and Wesleyan Societies (Omer-Cooper, 1994, p.24).

[30] Only at the beginning of this century the Nama rebelled against the German intruders. After their defeat, the Germans confined them to so-called temporary reserves. After the First World War, when the mandate to govern Namibia was given to South Africa, the boundaries of these reserves were taken over and accepted by South Africa.

'economic units' on the commons worsened the skewed distribution of access to land and wealth in the commons. In Leliefontein, the wealthier farmers could afford to lease 30 of the 47 units, while only 17 units were set aside for communal use of 230 farmers. Many small farmers had to sell their animals or move to the proximity of towns to free the space for the neediest subsistence farmers. Also the use of fuel wood from the commons was forbidden which further devastated people's livelihoods. Besides, the economic impact, the inhabitants of the reserves became divided. The supporters of the privatisation were the holders of the units who of course were also board members or closely related to board members. The remaining population fought against the privatisation and together with an NGO's the case was put forward to the Supreme Court where it was overruled in 1988. However, Cousins (1996, pp.11) summarizes, that "the struggle over property rights has left a legacy of factional division and bitterness within the reserves". The communities are especially faced with the clashing worldviews of traditional farming practices versus imitating individualized commercial farming practices that have been presented to them as being superior to their traditional farming practice.

From the times of the board system a lot of money was granted for development projects but never reached its initially designated purpose. The autonomous, intransparent and undemocratic nature of the board was recklessly exploited by its members. The corruption scandals of board members that were sufficiently well founded even forced the House of Representatives to appoint commissions of inquiry and the resignations of board members. As a countermeasure against the influence of the board; villagers began to form their own committees. In Paulshoek one village of the Leliefontein area people started in 1988 to withhold their taxes from the board and instead transferred it to a new formed village committee. The low payment morale lasts until today although the board was abolished with independence in 1994. After an intermediate phase governed by a Transitional Council consisting of both members of the old Management Board and new community organisations, the administration is since 1998 fulfilled by a council representing different wards and a Municipality. With new development projects coming into the area the formation of sectoral committees in the villages is popular. The fear among the people that their leaders are still corrupt and withhold money is widely believed. In the survey on Social Capital 2004 there was an interesting correlation between an high amount of committees in a village and low levels of trust and reciprocity (Vollan, 2006, unpublished). This might be explained by an availability heuristic that induces people to overemphasize the likelihood of a corrupt committee based on how easily people remember major events. It seems as if many citizens of Namaqualand do not believe that their fellow citizens will adhere to rules and behave trustworthy once they are in power. Consequently, participants in the experiment do not trust their anonymous partner and give them power of their endowment in the trust experiment. Distrust is a consequence of corrupt local institutions. According to Ensminger (2002, pp.13) one could say[31] that when it pays to be untrustworthy, there is generally more of it, and thus the probability that an individual will find himself in an exchange situation with an untrustworthy person goes up. If this is common knowledge among citizens less trust is exhibited. According to this view, local institutions in the Namaqualand do still not punish untrustworthy behaviour as much as they should in order to establish trust.

Conclusion

The system of exchange in Nama culture is complex, continuous in time and does not end abruptly as in the experiment after stage two with no chance of asking the gift back. Nama people are also not used to anonymous settings. Therefore, the experiment with these interesting results of high trust and low direct reciprocity should rather be interpreted as an

[31] The original citation is: *"when untrustworthy behaviour does not pay, there is generally less of it, and thus the probability that an individual will find himself in an exchange with an untrustworthy person goes down"*

intact and widely practised culture instead of concluding that participants have no reciprocity at all. This claim was supported by describing key elements of the Nama social organization as well as the reported motives of no expected monetary return from sending and the anecdotal observations that people exchanged money after the experiment. Interpreting experiments detached from the context might eventually lead to misleading conclusions. People are likely to use the same heuristics in experiments as they use in their daily lives. These heuristics depend on the knowledge, beliefs and past experiences of people which make additional qualitative studies indispensable (Heintz, 2005). External validity is thus restrictive but the use of field experiments offers an interesting method to explore site specific relations of culture, behaviour and institutions. Variations of experimental results across different sites do not say much about other-regarding preferences as the interpretation of the experimental task involves a cognitive act where people use ecological rather than constructivist rationality to process the information.

Questions on generalized trust did not correlate with experimental trust measures while it seems that the interpretation of trustworthiness is more likely to correlate with 'social capital'. However, the interpretation of the regression results for experimental trust allows drawing some implications for the mechanisms through which trust and trustworthiness could be re-established (i.e. social distance and market integration). In general people have an innate desire for personal exchange even in impersonal and anonymous settings (Mc Cabe, 2005, pp.260). This seems especially true for the Nama in Namibia. The move from personal to impersonal exchange in a common-pool resource experiment lead to the crowding-out effect of group co-operation (Vollan, forthcoming). If one aims to alleviate problems with local institutions that arise due to the lack of direct reciprocity one should think of alternative institutions and organisations where people meet more frequently. This does not alter the norm of generalized reciprocity but with decreasing social distance the possibility to reciprocate and to trust is increased. Increasing market integration will augment transactions based on direct reciprocity which might replace generalized reciprocity in future. Lastly, in South Africa it seems more important to re-establish trust in local institutions and local leaders. In a related experiment on the use of a common-pool resource (ibid) the majority of villagers from the commons of Namaqualand (50%) choose communication as their preferred institution among three possible rules to solve a co-operation problem. Not only does this contrast the Namibian sample were people preferred a pareto-superior rule that granted the participants an extra reward; it moreover points towards a wish to build trust and reinforce social norms that was also portrayed by comments of participants in the experiment who made hyper-fair return offers. In a society mainly based on informal institutions communication is the channel where rules and norms are enforced. Contrasting, their preferred institution in the common-pool resource experiment players from the Namaqualand performed most co-operatively when they had external law enforcement. The general interpretation from trust games that weak performance can be interpreted with weak local institutions is supported. Punishing corrupt or free-riding behaviour might re-establish trust. It needs accountable, democratic and transparent institutions.

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Appendix

Dependent variable: Amount sent X						
	South Africa	Namibia	South Africa	Namibia	South Africa	Namibia
Male	0,80 (0,54)	-0,02 (0,98)	0,62 (0,58)	-1,36 (1,56)	1,59** (0,72)	-2,35 (2,30)
Siblings	0,06 (0,11)	0,19 (0,16)	0,03 (0,11)	0,04 (0,19)	0,03 (0,16)	0,06 (0,28)
Age	-0,03 (0,01)	-0,13 (0,10)	-0,00 (0,02)	0,05 (0,20)	0,03 (0,03)	0,75 (0,56)
Lived in village	-1,11 (0,81)	-0,11 (1,61)	-0,93 (0,90)	-3,19 (2,95)	-0,96 (1,18)	-12,78 (7,42)
Married			0,62 (0,67)	2,70 (2,70)	0,65 (0,82)	-4,88 (8,90)
Education			0,22* (0,11)	0,28 (0,26)	0,37** (0,16)	-0,38 (0,39)
Committee Membership			0,94 (0,67)	-0,52 (1,93)	1,03 (0,76)	-7,66 (9,35)
Days Collective Action			-0,000 (,000)	0,000 (,000)	-0,008* (0,004)	0,04 (0,01)
Religious participation			-0,39 (0,25)	0,62 (0,66)	0,05 (0,27)	4,23 (2,01)
Methodist			0,10 (0,62)	0,15 (1,45)	0,11 (0,64)	11,38 (11,90)
Farmer			-1,33 (0,84)	0,42 (2,54)	-3,22*** (1,08)	-11,53 (6,03)
Food house ratio			-2,03 (3,68)	-0,67 (4,10)	-3,08 (4,43)	4,25 (6,37)
Wealth diversity			-0,71** (0,29)	0,22 (0,59)	-0,77** (0,33)	3,30 (1,65)
Wealth			0,000 (,000)	-0,000 (,000)	,000** (,000)	,000 (,000)
Income			0,000* (,000)	0,000 (,000)	0,000 (,000)	0,001 (,000)

Group size			-0,07 (0,08)	-0,49 (0,70)	-0,13 (0,10)	-1,61 (1,14)
Income Gini coefficient			-6,68*** (2,50)	16,57 (114,8)	-6,52** (3,05)	118,9 (175,4)
Victim of crime					1,10 (1,10)	-6,71 (2,50)
Lending Money					0,15 (0,28)	-2,33 (0,90)
Stated Trust					-0,21 (0,67)	4,95 (-50,12)
Constant	2,05 (1,32)	5,4* (2,75)	6,51** (3,20)	2,17 (55,26)	4,32 (3,92)	-50,12 (90,47)
Observations	74	34	74	34	49	22
R^2	0,05	0,10	0,35	0,49	0,67	0,97
Adj. R^2	0,00	0,00	0,16	0,00	0,43	0,54

Table 5: Determinants of the 'amount sent X' for South Africa, Namibia and the combined sample. OLS regressions.

Dependent variable: Return Ratio Y/X						
	South Africa	Namibia	South Africa	Namibia	South Africa	Namibia
Amount sent (X)	-0,10 (0,10)	-0,04 (0,03)	-0,15 (0,14)	-0,02 (0,09)	0,61* (0,07)	
Male	-0,38 (0,43)	0,05 (0,21)	0,11 (0,86)	0,10 (0,03)	2,50* (0,33)	
Siblings	-0,001 (0,08)	-0,02 (0,02)	-0,03 (0,12)	-0,00 (0,04)	0,24 (0,05)	
Age	-0,007 (0,01)	0,009 (0,01)	-0,01 (0,02)	0,02 (0,02)	0,00 (0,00)	
Lived in village	-0,85 (0,66)	0,09 (0,29)	-0,72 (0,83)	-0,04 (0,51)	3,11** (0,22)	
Married			-0,25 (0,66)	0,63 (1,23)	-4,3** (0,24)	
Education			-0,00 (0,12)	-0,02 (0,10)	0,44** (0,02)	
Committee Membership			0,47 (0,68)	0,08 (0,42)	2,59* (0,37)	
Days Collective Action			0,00 (0,00)	0,00 (0,00)	-0,01* (0,00)	
Religious participation			0,037 (0,35)	-0,07 (0,08)	0,43 (0,13)	
Methodist			-0,26 (0,73)	-0,65 (0,44)	-3,93** (0,22)	

Farmer			-0,28 (1,03)	-0,03 (0,37)	-4,4* (0,40)	
Food house ratio			-0,99 (2,52)	-1,31 (1,74)	0,74 (1,43)	
Wealth diversity			0,40 (0,30)	-0,06 (0,10)	-0,82* (0,12)	
Wealth			-,000 (,000)	,000 (,000)	-,000 (,000)	
Income			0,000 (,000)	-0,000 (,000)	0,000** (,000)	
Group size			-0,08 (0,09)	-0,09 (0,20)	0,039 (0,02)	
Income Gini coefficient			-1,83 (3,37)	19,78 (36,12)	13,19** (0,74)	
Victim of crime					-0,02 (0,75)	
Lending Money					0,76** (0,06)	
Stated Trust					-2,37** (0,13)	
Constant	2,56* (1,30)	0,24 (0,41)	5,06 (4,23)	-8,92 (17,08)	-14,08* (1,38)	
Observations	37	30	37	30	23	Too small n
R^2	0,09	0,11	0,32	0,63	0,99	
Adj, R^2	0,00	0,00	0,00	0,00	0,98	

Table 6: Determinants of the 'return ratio Y/X' for South Africa, Namibia and the combined sample. OLS regressions.

	Amount sent X				Return Ratio Y/X			
A offer X					-0,08 (0,05)	-0,10 (0,07)	-0,03 (0,07)	-0,09 (0,10)
Male	0,74 (0,48)	0,93* (0,53)	-0,37 (0,52)	1,82*** (0,67)	-0,32 (0,25)	-0,25 (0,28)	-0,00 (0,33)	-0,64 (0,43)
Siblings	0,16* (0,09)	0,11 (0,09)	-0,06 (0,08)	0,05 (0,12)	-0,03 (0,03)	-0,01 (0,05)	-0,03 (0,04)	-0,09 (0,08)
Age	-0,02 (0,01)	-0,02 (0,02)	0,02 (0,02)	-0,02 (0,03)	0,01 (0,01)	0,01 (0,01)	0,010 (0,01)	-0,03 (0,02)
Lived in village	-1,14 (0,73)	-1,12 (0,83)	-0,63 (0,75)	-2,36** (1,12)	-0,11 (0,38)	-0,28 (0,44)	-0,08 (0,40)	-0,21 (0,58)
Education		0,14 (0,10)	0,30*** (0,09)	0,03 (0,13)		0,02 (0,05)	0,04 (0,05)	0,03 (0,09)

Wealth		,000 (,000)	,000 (,000)	,000* (,000)		-,000 (,000)	-,000 (,000)	-,000 (,000)
Income		0,000 (,000)	0,000 (,000)	0,000 (,000)		-0,000 (,000)	-0,000 (,000)	0,000 (,000)
Religious participation		0,15 (0,20)	-0,051 (0,20)	0,43* (0,23)		-0,03 (0,08)	0,03 (0,07)	-0,10 (0,13)
Group size		-0,10* (0,06)	-0,43** (0,17)	-0,17** (0,07)		-0,02 (0,03)	6,01 (4,6)	0,03 (0,04)
Income Gini coefficient		-5,24** (2,59)	-11,71 (8,79)	-5,07 (3,22)		-1,68 (2,14)	136,4 (115,9)	3,51 (3,05)
Married		0,05 (0,68)	-0,09 (0,58)	-0,49 (0,87)		0,11 (0,39)	0,25 (0,38)	-0,22 (0,67)
Farmer		-1,59* (0,81)	-1,03 (0,70)	-3,19** (1,14)		-0,40 (0,45)	0,25 (0,43)	-1,51** (0,69)
Food house ratio		-0,36 (0,86)	-1,76 (1,82)	-1,45 (2,33)		-0,85 (1,39)	-0,33 (1,18)	0,25 (2,78)
Methodist		-0,81 (0,51)	0,82 (0,61)	-1,01 (0,65)		-0,07 (0,34)	-0,29 (0,41)	-0,61 (0,53)
Wealth diversity		-0,26 (0,29)	-0,33* (0,19)	-0,42 (0,26)		0,12 (0,12)	0,07 (0,12)	0,03 (0,19)
Committee Membership		0,84 (0,64)	0,71 (0,55)	1,18 (0,74)		0,34 (0,37)	0,03 (0,34)	1,34** (0,55)
Days Collective Action		0,000 (,000)	0,00 (0,00)	-0,003 (0,005)		0,00 (0,00)	0,00 (0,00)	0,00 (0,00)
Wealth Gini coefficient			8,43 (8,10)				-215,4 (172,5)	
Group wealth			-0,00 (0,00)				0,02 (0,02)	
Group Male			-5,92 (6,01)				-18,31 (16,19)	
Group Age			-1,27*** (0,46)				10,86 (9,78)	
Group lived in village			190,19** (87,33)				1917,8 (1596,6)	
Group income			0,01** (0,00)				-0,14 (0,12)	
Victim of crime				0,92 (0,93)				-0,82 (0,62)
Lending Money				0,41 (0,24)				0,08 (0,16)
Stated Trust				-0,12 (0,61)				-1,19** (0,42)
Country			21,59* (11,67)				-35,32 (27,65)	

Constant	2,75** (1,10)	7,35*** (2,54)	-172,74** (87,69)	10,2*** (3,15)	1,16* (0,65)	2,26 (2,17)	-1410,2 (1195,4)	1,09 (3,40)
Observations	108	108	108	71	67	67	67	49
R^2	0,08	0,23	0,52	0,43	0,12	0,23	0,54	0,59
Adj, R^2	0,05	0,09	0,38	0,21	0,05	0,00	0,25	0,17

Table 7 : OLS Regression results for total sample.

		Official Census Data					Trust game 2006				Social Capital Survey 2004			
		Pop.	age	edu.	income	% wage	n	age	edu.	income	n	age	edu.	income
Kharkams	RSA	1291	28	8	2518		40	35	10	596	15	51	6	1138
Paulshoek	RSA	497	31	6	901		42	36	8	523	19	42	7	935
Spoegrivier	RSA	460	29	6	1187		26	30	9	314	13	48	6	1047
Soebatsfontein	RSA	246	29	5	1428		22	41	5	660	35	46	5	1268
Tweerivier	RSA	207	29	7	753		18	40	9	770	12	43	5	765
Berseba	Nam	535	27	5	n.a.	30%	20	26	10	276	14	41	10	n.a.
Tses	Nam	904	27	5	n.a.	36%	30	26	10	469	n.a.	n.a.	n.a.	n.a.
Tseiblaagte	Nam				n.a.		20	20	9	453	n.a.	n.a.	n.a.	n.a.

Table 8: Comparison of official census data with the sample for the trust game and the social capital survey. Income in Census data only for employed persons.

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