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”Governing the Commons”
The Evolution of Institutions for Collective Action

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1 Introduction

What do resources like air, water and fish have in common? They do not have an owner, they are not naturally restricted to and for usage. But they can be used by many individuals or institutions. So they get often called common resources or common pool resources. The usage of this resources can be done by different technologies, by different intensity in place and time, and so they can get overused. If this happens, the involved actors face a problem. So in many cases they decide to establish an institution with rules for usage of the resource.

Elinor Ostrom's book "governing the commons" deals with so-called common-pool resources (CPR). Here attention turns not to natural scientific problems but to the governance and management of CPRs, institutions dealing with such resources and their inner structure. Her observation focuses on small-scale CPRs, which are located in one country, have 50 to 15.000 people that are related to it and are heavily dependent on the CPR for economic returns.

With her study she wants to criticize the conventional policy analysis schemes. For this purpose she presents successful and unsuccessful efforts to govern CPRs with the aim to develop a theory for a better understanding of capabilities and limitations of self-governing institutions. One major ambition is the "development of a broader theory of institutional arrangements related to the effective governance and management of common-pool resources."¹ Within this theoretical approach Ostrom wants to determine the factors that influence individuals in CPR situations to organize collective action.

Ostrom mainly gets three central findings out of her work: At first, "neither the state nor the market is uniformly successful in enabling individuals to sustain long-term, productive use of natural resource systems."² At second, collective action increases the returns from the appropriation efforts.³ At third, she gives a list of eight criteria, that she calls the "design principles for long-enduring CPR institutions" (s. Fig. 4).⁴

The following conclusive and interpretive execution of Elinor Ostrom's book "governing the commons" is - after a short presentation of the author Elinor Ostrom - divided in five parts. At first a general framework is presented that states central questions and gives an survey of Elinor Ostrom's method and important terms. The second part deals with the theoretical framework, where basic models of policy analysis and typical policy prescriptions are presented and the CPR situation gets introduced. At third Ostrom's empirical study comes to focus with a short overview over the structure and as an example for her research the *huerta* irrigation institution will be talked about. The fourth section deals with the analysis of institutions, splitted into initial situation, analysis of benefits and costs and evaluation of norms. The final chapter is to give a short overview about the significance and the influence on science, policy and common understanding that derived from Elinor Ostrom's book.

¹ Ostrom, 2007, p. xiv

² p.1

³ p.38

⁴ p.90

2 The Author: Elinor Ostrom



Figure 1: Elinor Ostrom, Source: <http://newsinfo.iu.edu/pub/libs/images/usr/3559.jpg> [08.08.2009]

Elinor Ostrom was born in 1933 in Los Angeles, California, where she studied at the University of California Los Angeles Political Science and received her Ph.D. in 1965. She obtained many awards and honors, was president of the American Political Science Association from 1996 to 1997, is member in many advisory boards and committees, is and was member at 20 editorial boards and got plenty grants and funds for her research. She held several speeches in front of the US congress and senate and supported the actual President of America Barack Obama in his rally.

Today she is Arthur F. Bentley Professor of Political Science at Indiana University, Bloomington, Senior Research Director at the Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, Founding Director at the Center for the Study of Institutional Diversity, Arizona State University, Tempe and Professor (part-time) at the School of Public and Environmental Affairs, Indiana University, Bloomington.

She is one of the most influential scientists in political science, especially in the field of common pool resources. She focuses on socio-ecological phenomena, the sustainable use of resources and most of all how humans decide to establish institutions to deal with common pool resources.

3 General Framework

For a better understanding of Elinor Ostrom's ideas the next sub-chapters will deal with the general framework of the book. The author formulates some questions that lead the reader through the book. And because it is a scientific study, she has an explicit methodology to come to results. Therefore she uses and introduces different terms, e.g. for the explanation of CPRs or the institutions in a CPR context.

3.1 Central Questions

Within the book you can find several questions that are of special importance for the understanding of CPR-situations. These are for example:

- "How can natural resources, which are used by many individuals, best be governed? How is it possible that some individuals organize themselves to govern and manage CPRs and others do not?"
- How do "individuals organize and govern themselves to obtain collective benefits in situations where the temptations to free-ride and to break commitments are substantial"
- What are the "incentives for participants to continue investing time and effort in the governance and management of their own CPRs?"
- What are the "underlying design principles of the institutions" that are successful?
- Which "internal and external factors can impede or enhance the capabilities of individuals to use and govern CPRs?"⁵

3.2 Ostroms Method

To answer this questions Ostrom does not present a new field research or new data. But she determines that many articles in many different scientific fields dealing with CPRs have been published, but there has been almost no synthesis or application of this knowledge, neither in science nor in policy. Thus she develops a system, how to code and analyze those articles. The chosen variables for this purpose are the structure of the resource system, the attributes and behaviors of the appropriators, the rules the appropriators were using, and the outcomes resulting from the behaviors of the appropriators.⁶

The empirical study design consists of five steps.

1. Understanding the structure of the resource itself (size, clarity of boundaries, internal structure).
2. Discovering the flow patterns (predictability, economic circumstances, risks).
3. Ascertaining key attributes of the individuals (quantity, interactions, time horizons etc.).
4. Examining the rules that the individuals have devised.
5. Understanding the process of searching for design principles and the effects on incentives.

Within this scheme Ostrom sees the possibility to answer the presented questions. But in addition she makes presumptions about individuals and the appropriators. In her eyes, "individuals try to solve problems as effectively as they can [... and] have very similar limited capabilities to reason and figure out the structure of complex environments."⁷ Furthermore, individuals "engage in a

⁵ Ostrom, 2007, p.27

⁶ p. xv

⁷ p.25

considerable amount of trial-and-error learning.”⁸ For the appropriators she states, that ”appropriators in CPR situations face a variety of appropriation and provision problems whose structure vary from one setting to another depending on the values of underlying parameters. [...] Appropriators must switch back and forth across arenas and levels of analysis.”⁹ In addition they face many problems that have to be solved.

3.3 Ostroms Terms

As can be seen from the citations above, Ostrom uses different terms and key concepts to illustrate the problem of CPRs and in special the governance and management of them. The following paragraphs will present these terms and lead to a better understanding of the subsequent executions.

3.3.1 Common-pool Resource

The superordinated term for the whole work is the common-pool resource. She defines CPRs as the following: They ”refer to a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use.”¹⁰ So it is important to specify the resource system.

3.3.2 Resource System and Resource Units

Resource Systems have to be seen as a stock that is available for everybody. It is nearly impossible to exclude individuals from the resource system or its improvement. All appropriators take advantage from improvements, no matter if they contribute to the improvement or not.¹¹ The resource system itself consists of resource units.

”Resource units are what individuals appropriate or use from resource systems.”¹² They are not subject to joint use or appropriation and can get overused or exploited.

3.3.3 Appropriation and Appropriator - Provider and Producer

Appropriation is ”the process of withdrawing resource units from a resource system. [...] Those who withdraw such units are called ,appropriators.’”¹³ They consume or use the exploited units for themselves, as input-factors to the production process or for disposal.

Providers are ”those who arrange for the provision of a CPR.”¹⁴ Producers are ”anyone who actually [...] ensure[s] the long-term sustenance of the resource system itself.”¹⁵ So providers and producers have incentives to keep the CPR running.

⁸ p.34

⁹ p.46

¹⁰ p.30

¹¹ p.31

¹² p.30

¹³ ib.

¹⁴ p.31

¹⁵ ib.

3.3.4 Contingent Strategy - Institution

The institution is one of the important aspects in Ostrom's work. She sees herself as an institutionalist, which in fact can be reasoned out by her academic background as political scientist. For institutions contingent strategies are of fundamental relevance. Referring to contingent strategies she states: "A whole class of planned actions that are contingent on conditions in the world."¹⁶ Individuals are using those strategies in a variety of complex and uncertain field-settings. Referring to Popper Ostrom sees actions as non-rational but situational.

The institution, as mentioned above the core-concept of Ostrom's book, is seen as "sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions."¹⁷ So an institution consists in her eyes first of all of these aspects and second of actors or individuals.

4 Theoretical Framework

The first two chapters of the book "governing the commons" deal with different theoretical approaches concerning the commons and the problems of self-organization and self-management in CPR situations. The following paragraphs are not orientated towards the order given in the book but towards different topics. At first we expose basic models of policy analysis. At second we examine current policy prescriptions and have a closer look at Ostrom's given alternatives. Then an overview over the CPR situation follows. Before CPR problems are discussed problems of collective action are examined. The last theoretical step is the analysis of working rules in CPR situations.

4.1 Basic Models of Policy Analysis

In policy analysis Ostrom points out three basic models.

- *The tragedy of the commons*¹⁸: collective goods are in danger to get overused due to individual efforts of the involved people. This model is the most influential one on Ostrom's work, because in every CPR situation this danger is given.
- *The Prisoners dilemma game*¹⁹: individual rationality leads to collective irrationality.
- *The logic of collective action*²⁰; example: a group wants to achieve their highest benefits; rational, self-interested individuals do not seek for a collective benefit; one, who benefits from collective goods has little incentives to contribute voluntarily to the provision of that good; there is always the temptation to free-ride.

¹⁶ p.36

¹⁷ p.51

¹⁸ This idea goes back to Garrett Hardin, who published an article in the journal *science* in 1968

¹⁹ This game is one of the basic games used in game theory, mainly in economic and political science

²⁰ This idea goes back to Mancur Olson, Jr., who published a book called "The Logic of Collective Action: Public Goods and the Theory of Groups" in 1965 and is an influential work on political science

These models are of particular interest because they "capture important aspects of many different problems that occur in diverse settings."²¹ But in Ostroms eyes the constraints that are taken as basis are fixed and therefore too inflexible for theoretical explanations of complex problems. If they get used for scientific explications this will result in metaphorical use of the models, so that e.g. the scientific observation of "the similarity between the many individuals jointly using a resource in a natural setting and the many individuals jointly producing a suboptimal result in the model" will result in policy recommendations that will have an "grim character."²²

4.2 Policy Prescriptions

In current policy prescription Ostrom figures out two major positions. At first the Leviathan - "a coercive force outside their individuals psyches"²³ - is seen as the only way, especially because of the diametric approaches of a private enterprise system on the one hand and socialism on the other hand. In this position the political solution of the tragedy of the commons is seen in a central government with control over CPRs. But this advice is in some ways "based on assumptions concerning accuracy of information, monitoring capabilities, sanctioning reliability, and zero costs of administration."²⁴

At second privatization is seen as the only way for solving the CPR-problems. Here are two ways to privatize. Common resources can be divided and privatized, so that the appropriators play "a game against nature in a smaller terrain, rather than a game against another player in a larger terrain."²⁵ The other possibility is to grant private rights for using the CPR, e.g. in fishery for equipment, usage in time and space, or quantities. This will lead to a still common owned resource system. Both ways will lead to interactions between the appropriators and will hinder them to overuse the CPR because of their own profit incentive. The main problem in privatization is "how to impose private ownership when those currently using a common [are] unwilling to change to a set of private rights to the commons."²⁶

Even if private organizations are generally seen as more efficient than governmental organizations there is no reason that privatizing the ownership of CPRs has to have the same positive result as privatizing for example an airline.²⁷ The assertion that private or centralized institution are 'better' leave many questions unanswered. The results will depend on "the particular options available, the sequencing of those options, the information provided, and the relative rewards and punishments assigned to different sequences of moves."²⁸ So the set of rules used in a particular physical environment have to be aligned to this particular physical environment.

²¹ ib.

²² p.8

²³ p.9

²⁴ p.10

²⁵ p.12

²⁶ ib.

²⁷ p.22

²⁸ p.23

Ostrom sees "that many solutions exist to cope with many different problems, [...] that getting the institutional right is a difficult, time-consuming, conflict-invoking process, [...] that the capacity of individuals to extricate themselves from various types of dilemma situations varies from situation to situation."²⁹ Because of this the possibility to enter and exit the market is important, so it has to be open and free. But that implies an underlying public institution to support the market.

An alternative solution is seen by Ostrom in binding contracts that are worked out by the appropriators themselves, so that they will share equally the usage of resources and the emerging costs. Additionally they need an "private agent to take on the role of enforcer,"³⁰ who searches for methods, that are inherent in the contract, to settle possible differences. The advantage of this system is the monitoring of rules. It will be taken over by the parties themselves and so the enforcer will not come into a principal-agent problem. But disadvantage are the possibility of misinterpretation of the capacities of the CPR, the possible break-down of the monitoring-system and the inability of the enforcer "to enforce ex post, after promising to do so ex ante."³¹ For this policy prescription she cites the fishery in Alanya, Turkey, as an example, where the fishermen set up their own system of rules and so were able to overcome the threat of exploitation (s. Ostrom 2007, p.18 ff.).

4.3 The CPR Situation

The CPR situation occurs when different appropriators (providers and producers) have interests in common-pool resources (resource systems and resource units). The appropriators have to make different and difficult decisions to overcome CPR related problems. Those decisions depend on benefits and costs and therefore have many uncertainties, e.g. lack of knowledge, the structure of the resource system or external effects, such as quantity and timing of rainfall.³² Rules are the possibility to organize and manage these problems. But establishing rules that transform "a situation from one in which individuals act independently to one in which they coordinate activities"³³ is a costly time-consuming undertaking.

4.3.1 Interdependence, Independent Action and Collective Action

The economic success of the appropriators depends on the capability to solve individual and collective problems. Those are especially the time horizon, dependent on expectation of future benefits, and discount rates, dependent on physical and economic security and general norms. In addition, each individual takes the choices of others into account.³⁴

Out of this problems several constraints and moral values for acting are rising. The one and only opportunity to get out of those constraints is another problem in CPR situations: opportunistic behavior.³⁵ But if "there are strong norms against opportunistic behavior, each appropriator will be less wary about the dangers of opportunism."³⁶ Furthermore those norms can be used for re-

²⁹ p.14

³⁰ p.16

³¹ p.18

³² p.33

³³ p.40

³⁴ p.34 f.

³⁵ p.35 f.

³⁶ p..36

duction of costs of monitoring and sanctioning.

But "the physical interdependence does not disappear when effective institutional rules are utilized in governance and management of the CPR. The physical interdependence remains; what changes is the result the appropriators obtain."³⁷ Those results will increase in correlation to the intensity of collective action.

4.3.2 Theories of Collective Action

For the problem of collective action there exist different theories, some of which are discussed by Ostrom. The two following theories of collective action "address how a new institutional arrangement can come about, how credible commitments can be made, and why monitoring must be supplied."³⁸ In both presented theories an individual takes the initiative, whose benefits depend on others. Nonconformity to the established rules gets punished, which implicates a effective monitoring.

The Theory of the Firm

An Entrepreneur negotiates contracts with various participants. The contracts are freely subscribed. The participants get payed for their work by the entrepreneur and he gets the return of the work. The entrepreneur has the goal of highest efficiency and gets any surplus. So he has an incentive for efficient organizing and monitoring.³⁹

The Theory of the State

The state has the monopoly of power and therefor is able to "use coercion as the fundamental mechanism to organize a diversity of human activities that will produce collective benefits."⁴⁰ The ruler is not faced with mechanisms that exert pressure on him. The only risk for him is rebellion.

4.3.3 Three Problems of Collective Action

The problem of supply

Because collective action increases the beneficial outcomes, individuals are motivated to make a set of rules and therefor form an institution. But the problem is which kind of institution is to chose. Two major questions arise: Why are institutions supplied? and: How do individuals supply their own rules? Ostrom solves those questions in reference to Robert Bates with the assertion that "establishing trust and establishing a sense of community are [...] mechanisms for solving the problem of supplying new institutions."⁴¹

The Problem of Credible Commitment

Every situation, in which individuals organize themselves, e.g. in an institution, is based on rules which are based on commitments. The problem is that in some situations some participants of the

³⁷ p.38

³⁸ p.41

³⁹ p.40

⁴⁰ p.41

⁴¹ p.43

institution may increase their benefits in breaking the rules. This insight leads to the assertion that a long-term credible commitment can't be made. So "how does one appropriator credibly commit himself or herself to follow a [...] system when everyone knows that the temptation to break that commitment will be extremely strong in future time periods? [...] How do past commitments bind the appropriators to future sacrifices? [...] How do the other appropriators know that commitments are actually being kept?"⁴² Ostrom rejects the opinion that external coercion could be a solution. She says that motivation for monitoring and sanctioning activities is important. As long as there is no monitoring there won't be credible commitments.⁴³

The Problem of Mutual Monitoring

The problem of mutual monitoring states that individuals will not monitor themselves, even if they set up the rules themselves. This is empirically proved. The biggest problem seen by Ostrom in this context is that "without monitoring, there can be no credible commitment; without credible commitments, there is no reason to propose new rules."⁴⁴ So the most important goal in the establishment of an institution is to ensure the monitoring.

4.3.4 Two Types of CPR Problems

Occurring CPR problems can be divided into two groups: appropriation problems and provision problems.

Appropriation problems occur on three different levels.

- "In an open-access CPR, in which no limit is placed on who can appropriate, [...] rent dissipation is likely to be endemic. No appropriator has any incentive to leave any resource units for other appropriators to harvest."⁴⁵
- "In a limited-access CPR, in which a well-defined group of appropriators must jointly rely on a CPR for access to resource units, the incentives facing the appropriators will depend on the rules [...] (These incentives) will lead them to over-invest in any input factor that is not constrained under current rules."⁴⁶
- Spatial or temporal restricted access CPRs "can reduce risks still further if the rules are well crafted to fit the physical attributes of the resource system. If risks are sufficiently reduced, appropriators can invest in productive enterprises that would not otherwise be economically viable"⁴⁷

⁴² p.44

⁴³ p.44 f.

⁴⁴ p.45

⁴⁵ p.48

⁴⁶ ib.

⁴⁷ ib.

Provision problems can be divided into supply-side problems, supply-side provision problems and demand-side provision problems.

- Supply-side problems are "related to the construction of the resource itself and its maintenance."⁴⁸ Every investment is to be carefully considered. If a group decides for long-term investments, the temptation of free-riding raises. So "the organizing to maintain a system is a challenging task."⁴⁹
- Supply-side provision problems consist mostly of that "less than the optimal effort will be devoted to the construction, and particularly to the maintenance, of the system because of free-riding."⁵⁰ In a CPR situation this is even more complicated because "unless appropriation problems are resolved, the provision problems may prove intractable [...] because resource units are subtractable."⁵¹
- "Demand-side provision problems involve regulating withdrawal rates so that they do not adversely affect the resource itself.[...] The same rules that affect the allocation of this year's resource units will have an impact on the reliability of resource units next year and the years thereafter."⁵²

Similarities between those problems are "the non-separability of one's choice of strategy and the choices made by others, as well as the fact that solving provision problems depends on achieving adequate solutions to appropriation problems."⁵³

4.3.5 Working Rules in CPR Situations

In the CPR context rules can differ from laws and official regulations. Generally spoken, CPR related "rules provide stability of expectations, and efforts to change rules can rapidly reduce that stability."⁵⁴ Ostrom divides this rules into three levels of rules:

- *Operational rules* express the necessity for regulation for day-to-day work and decisions.
- *Collective-choice rules* are used by appropriators, their officials or external authorities in making policies and thereby have an indirect impact on operational rules.
- *Constitutional-choice rules* "affect operational activities and their effects in determining who is eligible and determining the specific rules to be used in crafting the set of collective-choice rules that in turn affect the set of operational rules."⁵⁵

The relationship between those rules and how they are built upon each other is illustrated in the following figure 2.

⁴⁸ p.49

⁴⁹ ib.

⁵⁰ ib.

⁵¹ ib.

⁵² ib.

⁵³ ib. f.

⁵⁴ p.53 f.

⁵⁵ p.52

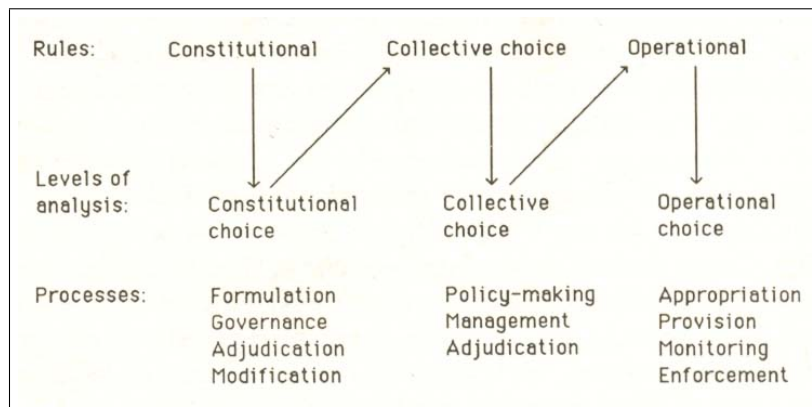


Figure 2: Linkages among rules and levels of analysis, Source: Ostrom, 2007, p.53

If individuals are neither self-governed nor self-organized, the structure of their problems is given to them. At best they can adapt strategies within the boundaries that are given. If the individuals are self-governed and self-organized they are working between the different levels of rules. This leads to tremendous problems in analyzing them.

Ostrom introduces the "arena", "the situation in which a particular type of action occurs."⁵⁶ Every policy-making takes place in such an arena, e.g. for operational-choice rules in the collective-choice arena. "If the appropriators using a CPR cannot change the rules to organize operational choice, then the only arenas for collective choice are external to the CPR appropriators. [...] Several collective-choice arenas affect the set of operational rules actually used by appropriators for making choices about harvesting and investment strategies in a CPR."⁵⁷ In figure 3 the relationships of formal and informal collective-choice arenas and CPR operational rules can be seen.

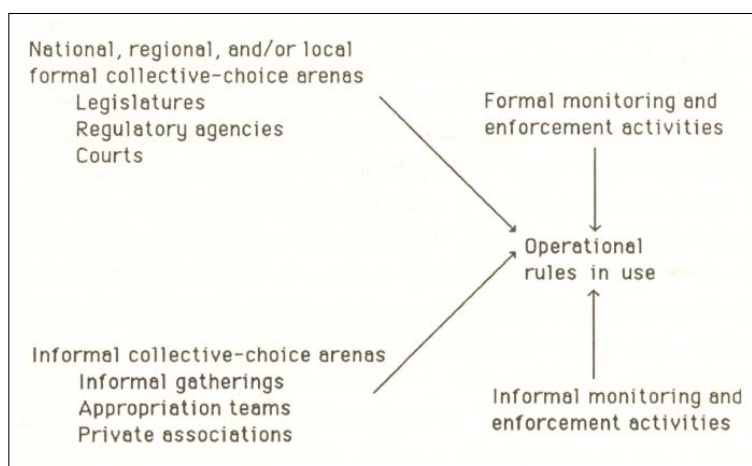


Figure 3: Relationships of formal and informal collective-choice arenas and CPR operational rules, Source: Ostrom, 2007, p.53

⁵⁶ p.54

⁵⁷ p.54

One important aspect for rules and regulations is, that the absence of national, formal laws regulating the appropriation from and provision of a CPR is not equivalent to the absence of effective rules. Local appropriators may develop working rules over the course of time. "Such rules may or may not lead appropriators to manage their resource efficiently and fairly, but they will affect the strategies that appropriators perceive to be available to them and the resulting outcomes."⁵⁸

5 Empirical Study

5.1 Structure

Ostrom's empirical study is divided into three parts. At first she presents long-enduring, self-organized, and self-governed CPRs, each in different situations (communal tenure in high mountain meadows and forests in Switzerland and Japan; irrigation institutions in Spain and the Philippines). The examination of those successful working institutions for collective action leads to eight design principles for long-enduring CPR institutions (s. Fig. 4, p. 13).

The second part deals with changing institutional settings. Therefore, she uses the example of groundwater pumping in the area of Los Angeles, where several single pumping organizations, privately or governmentally organized, formed a set of working rules and created institutional rules, "that forbid, require, or permit some action or outcome."⁵⁹

The third empirical chapter analyzes institutional failures and fragilities, located in Turkey, Sri Lanka, Nova Scotia (each fishery) and California (groundwater basins). The reasons for their failing are seen in nonperformance related to the design principles developed in before.

5.2 Example: The Huerta Irrigation Institutions

To illustrate the relevance of the eight design principles in the following section the *huerta* irrigation institutions in the east of Spain shall be described. The spanish term *huerta* describes irrigation systems that are located near by or around settlements. The climatic situation is regularly frost-free in winter and hot and sunny in the summer. Because of the varying intensity of waterflow the irrigators early decided to build a dam and so had a more or less permanent availability of water. Two or three hearvests per year are possible, mainly potatoes, onions and vegetables. Since 1435 there exist rules concerning access to the water, responsibilities for the maintainance of the irrigation canals, which officials are elected and fines for the breaking of rules are predefined. The access-rights to water are connected with the land tenure. Typical constellations of conflicts are between irrigators, between irrigators and officials or between irrigators located at headwater and irrigators at tailwater. All in all the system is stabel till today. But why is this?

⁵⁸ p.55

⁵⁹ p. 139

1. Clearly defined boundaries
Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself.
 2. Congruence between appropriation and provision rules and local conditions
Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.
 3. Collective-choice arrangements
Most individuals affected by the operational rules can participate in modifying the operational rules.
 4. Monitoring
Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.
 5. Graduated sanctions
Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.
 6. Conflict-resolution mechanisms
Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
 7. Minimal recognition of rights to organize
The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
- For CPRs that are parts of larger systems:*
8. Nested enterprises
Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Figure 4: Design principles illustrated by long-enduring CPR institutions,
Source: Ostrom, 2007, p.90

5.2.1 Clearly Defined Boundaries

*Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself.*⁶⁰

In the *huerta* system all the land in the surrounding of Valencia, ca. 16.000 ha, is included. There are eight main canals. All the appropriators are local farmers. The farmland is strongly fragmented due to hereditary law. So 80 percent of the farmers own less than 1 ha of land. So the system has clearly defined boundaries in participants and space .

⁶⁰ p. 91

5.2.2 Congruence between Appropriation and Provision Rules and Local Conditions

*Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, materials, and/or money.*⁶¹

In the *huerta* irrigation system the method to distribute water is organized by the so called *turno* system. There can be an order in which the single irrigation ditches are connected to the water in the main chanal. In the *turno* system there are three different settings for the process of withdrawing.

1. If there is enough water in the whole system, the withdrawal of water is unlimited
2. If there is a low water situation, the order of withdrawal is unknown to the farmers. In addition the amount of water for the singel farmer is not restricted.
3. If there is an extraordinary drought, system no. 2 is used but with a restricted amount of water.

The low water situation is the one that occures most often. And there is a general agreement not to lavish water. So the appropriation rules are fitted to the provision rules and the local conditions.

5.2.3 Collective-Choice Arrangements and Monitoring

*Most individuals affected by the operational rules can participate in modifying the operational rules.*⁶²

*Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.*⁶³

As can be seen in figure 5 the participation individuals in the *huerta* irrigation system are linked among each other. The irrigators themself are strongly involved in the decisions concerning person-el decisions and the establishment of rules. The syndics, or chief executive, and the ditch-riders, who patrol the chanel and are directly responsible to the syndics, are elected by the irrigators and are themself irrigators at the chanal that they monitor. The executive commitee is responsible for the whole *huerta*. It is composed of syndici.

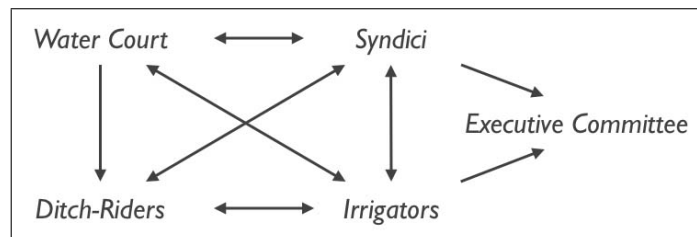


Figure 5: Relation and accountability among actors in the *huerta* irrigation system, Source: own illustration based on Ostrom, 2007, p.74

⁶¹ p. 92

⁶² p. 93

⁶³ p. 94

5.2.4 Graduated Sanctions and Conflict-Resolution Mechanisms

Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.⁶⁴
Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.⁶⁵

Since 1443 the breaking of rules is recorded. Two third of the perpetrators just made one rule infraction. From the left over the half broke twice the rules. So the rate of rule infraction is very low. The system of sanctioning can be called graduated. The harder the contravention of the rules is the higher is the sanction. But the most effective impact is the loss of reputation connected with the breaking of rules, because this leads to humiliation. All in all there were, as mentioned, few incidents, some stealing or palpability. So one can say that the *huerta* irrigation distribution system is efficient and the guards are vigilant.

5.2.5 Minimal Recognition of Rights to Organize

The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.⁶⁶

In the *huerta* irrigation area until today there are no governmental rules concerning the irrigation process. So the irrigators are completely responsible for their own system, what strengthens their impact on the establishment of rules.

5.2.6 Nested Enterprises

Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises⁶⁷

As can be seen from the last explications, in the *huerta* case the layers of decision making are various and the irrigators are involved - either directly or indirectly through election - in every layer. The layers are local, regional and national. At the local layer there are the irrigators and the syndici that are the actors in a smaller area. On the regional layer there is the executive committee that is responsible for higher affairs such as intraregional agreements on the use of water from one river at its head- and downwater. The national level is another layer, but it isn't that important because on this level there are less relevant decisions made that have a direct effect on the irrigation activity.

⁶⁴ ib.

⁶⁵ p. 100

⁶⁶ p. 101

⁶⁷ p. 101

6 Analysing Institutions

Beside the central findings that "neither the state nor the market is uniformly successful in enabling individuals to sustain long-term, productive use of natural resource systems."⁶⁸, that collective action increases the returns from the appropriation efforts.⁶⁹, the list of eight criteria of design principles for long-enduring CPR institutions (s. p. 4) and the collocation of theoretical approaches, Elinor Ostrom sets up a framework for analysis of self-organizing and self-governing CPRs. This framework is illustrated in figure 6.

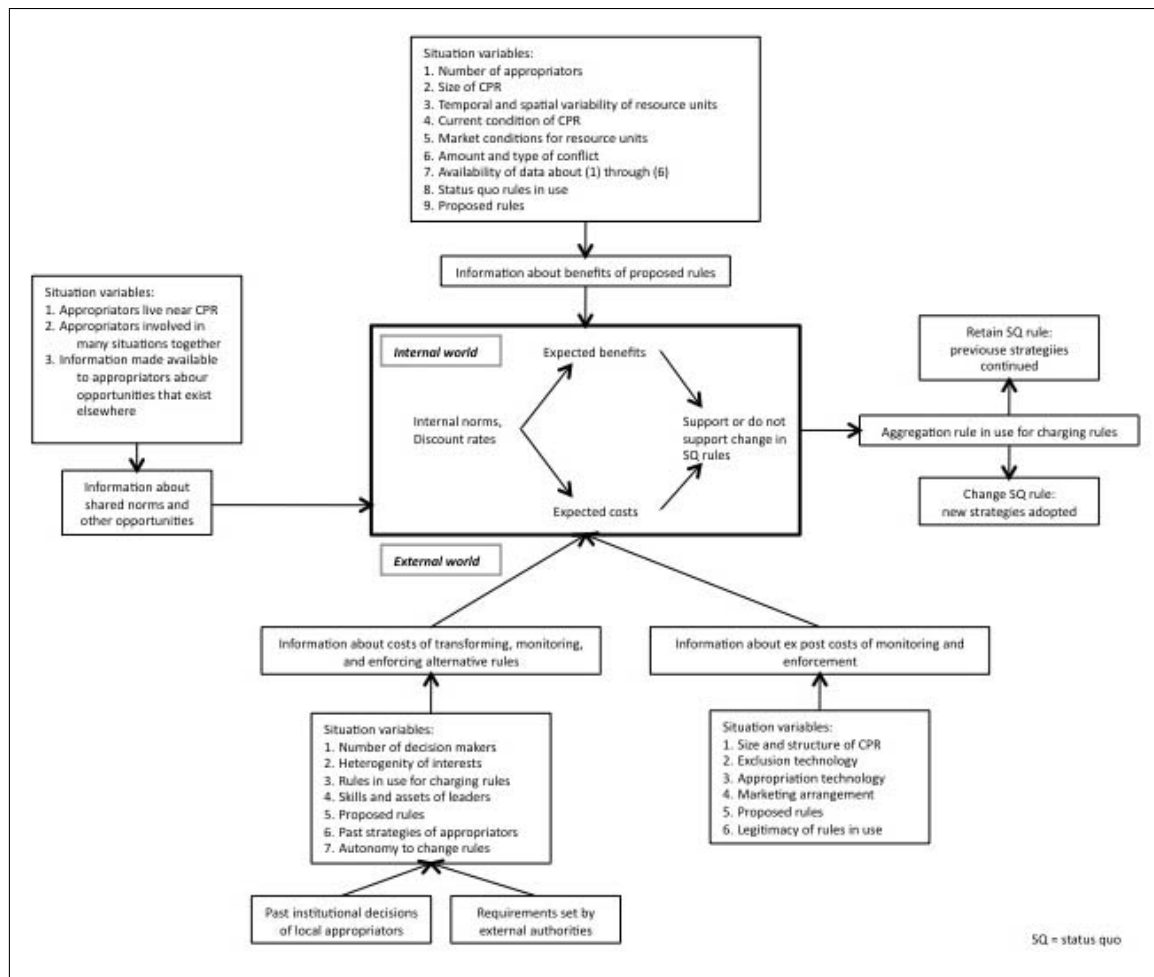


Figure 6: Variables affecting institutional choice, Source: Ostrom, 2007, p.193 ff.

Elinor Ostrom herself calls her framework a "complex array of variables."⁷⁰

⁶⁸ p.1

⁶⁹ p.38

⁷⁰ p. 214

6.1 Initial Situation

The framework mainly consists of two spheres: the internal and the external world of decision. For analysis of CPRs it is necessary to take the position of an individual that faces the question of benefits and costs of a change in rules in the CPR situation. Mainly it has two possibilities, either keep the rules or change it. One major factor are the costs of rule changes, on the one hand ex ante and on the other hand ex post. Monitoring is one requirement to enhance the availability of information, another one is to organize, which increases the degree of available information.

6.2 Analysing Benefits

Concerning the change of rules Ostrom states that every individual faces several questions. How will the value of resources change? How variable is the flow of resources? Which differences in quality will occur? How will the resource system regenerate? Will there be more, same or less conflicts after the change of rules?⁷¹ The answers of these questions will result in an estimation of benefits and within this the involved individuals will estimate, if a change in rules is profitable. To answer those questions the situational variables from figure 7 are needed. The potential benefits depend on three factors:

1. "objective conditions of the CPR,
2. the type of information that the current institutional arrangements generate and make available to individuals, and
3. the rules proposed as alternatives."⁷²

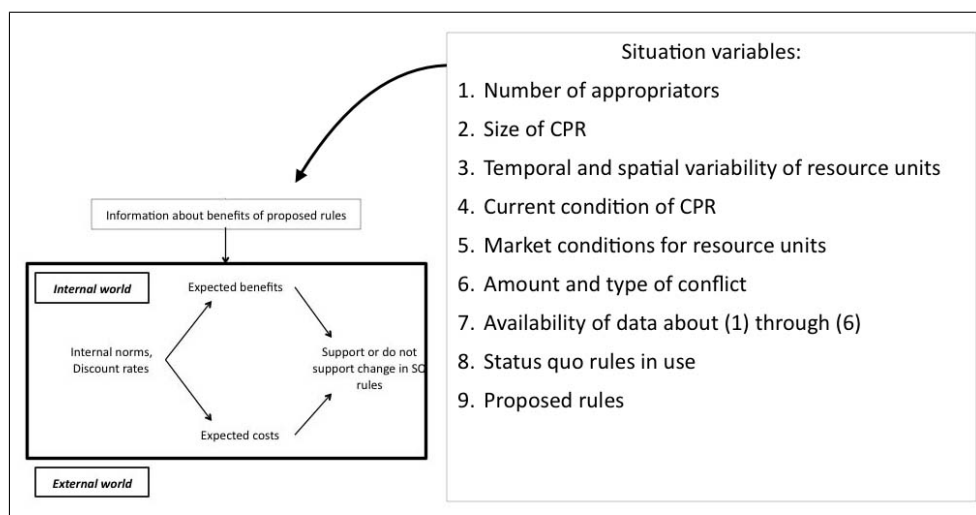


Figure 7: Variables affecting expected benefits, Source: own illustration based on Ostrom, 2007, p. 197

⁷¹ p. 196

⁷² p. 198 f.

6.3 Analysing Costs

Beneath the expected benefits the expected costs of a change in rules is an important point to analyse. There are two different layers for that, at first the ex ante costs of transforming, monitoring, and enforcing alternative rules and at second the ex post costs of monitoring and enforcement. The corresponding situational variables can be seen in figure 8. So mainly the distinction is between ex ante and ex post costs of changing rules.

Transformation costs have to be seen as all the costs of an change of rules. If the appropriators or the involved individuals can profit from a change, the costs of transformation are expected to be lower. Monitoring and enforcement costs occur e.g. for courts, police or detention facilities to enforce rules. The expended resources for those activities could be used else and so must bring a higher benefit than it is expected without monitoring and enforcement.⁷³

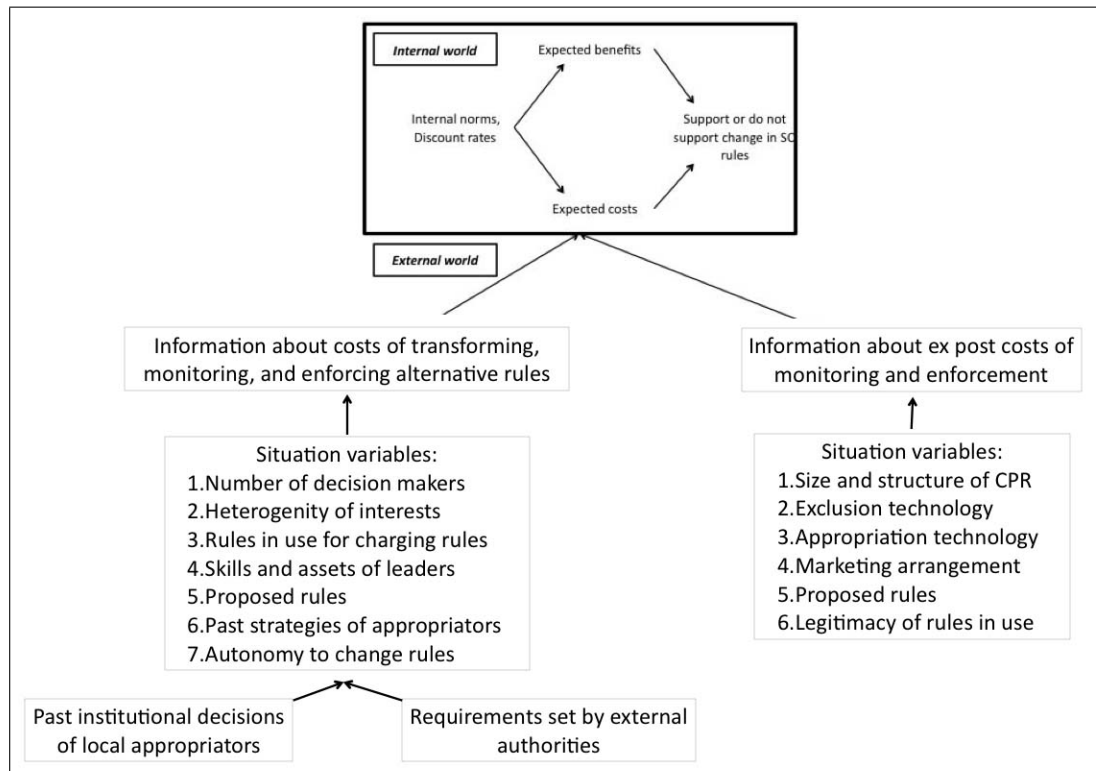


Figure 8: Variables affecting expected costs, Source: own illustration based on Ostrom, 2007, p. 199 ff.

⁷³ p. 198 ff.

6.4 Evaluating Norms

For an complete evaluation of benefits and costs norms have to be looked at, because the weighting of benefits and costs depends on the underlying norms. The understanding of the situational variables - spatial proximity and interaction between the appropriators and information about opportunities elsewhere - strongly affect the informations for the analysis of shared norms and other opportunities. The major finding by Ostrom in this case is that "shared norms can affect discount rates as much as can information about other opportunities."⁷⁴ So for the analysis of benefits and costs of an change in rules norms - as an external world condition - are an important factor for the decision - the internal world action.

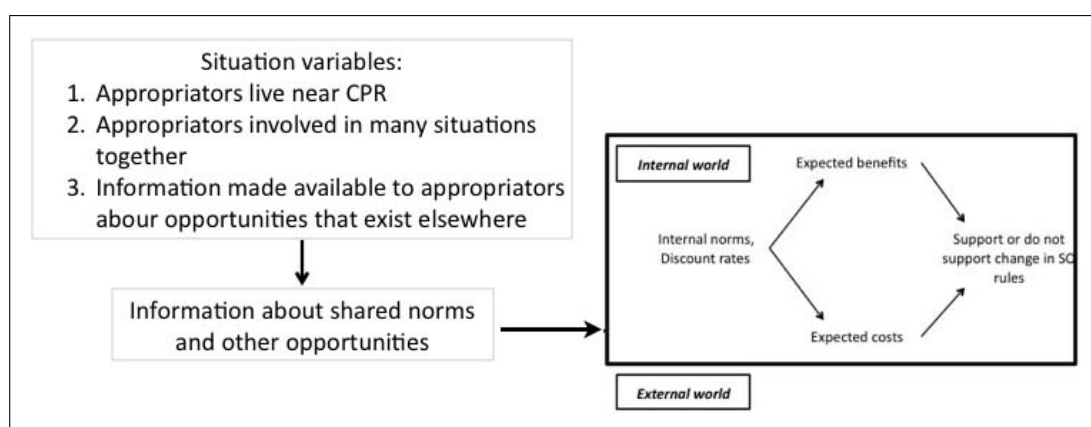


Figure 9: Variables affecting internal norms and discount rates, Source: own illustration based on Ostrom, 2007, p. 206

⁷⁴ p. 206

7 Significance and Influence on Science, Policy and Common Understanding

It is hard to measure how influential a single book can be. Of course, the work of Elinor Ostrom is highly regarded, as mentioned. In science she is one of the most cited experts for common pool resources and in politics her concepts are highly noticed. But this is more her general work than the book presented in before.

Maybe it is better to look back at her major findings in *governing the commons* to estimate her significance and influence. At first she points out that "neither the state nor the market is uniformly successful in enabling individuals to sustain long-term, productive use of natural resource systems."⁷⁵ This is an offending opinion because our political and market system and understanding mainly focuses on those two possibilities. This has the implicit assumption that in smaller contexts the participants should be able and are better in establishing their own rules. Furthermore this perspective includes that no set of rules can work ubiquitously and rules have to be fitted to local conditions. This new layer outside the state or the market system can hardly be found elsewhere, but seems to me as an understanding of the establishment of rules that is helpful, especially for small-scale situations.

At second she states that collective action increases the returns from the appropriation efforts. So not only individual increases of production, as in the models of *economics of scale* or *economics of scope*, but also collective enhancement leads to collective benefits in the CPR context.

At third, she gives the list of eight criteria, that she calls the "design principles for long-enduring CPR institutions" (s. Fig. 1). In fact this is not a list that has to be worked through while establishing an institution for collective action. But it is an analytic perspective on the evolution of such institutions and leads to the framework for analysis. There she points out, which variables in the internal and external world of institutional choice should be examined to understand the process of institutional collective action and changes in rules.

So all in all Elinor Ostrom presents new theoretical approaches for analysing CPR situations and gives us a new perspective on the evolution of institutions for collective action.

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⁷⁵ p. 90