E. Ostrom's SES Framework to Understand the Factors of Successful and Unsuccessful Situation in the SES: A meta-analysis of community forests in Mexico

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ABSTRACT:

The social-ecological systems are inherently complex and their destruction is highly due to a limited understanding of the processes that lead to their improvements in or deterioration. In an effort to respond to this problem, E. Ostrom and colleagues associated with the Workshop in Political Theory and Policy Analysis at Indiana University developed a Social-Ecological System (SES) framework. however, even if the importance of SES framework to enhance the sustainability of complex social-ecological systems is highly accepted, its implication to understand the functionality of the SESs which may leads to successful or unsuccessful situations is still lacking. In this paper, referring to the context of decomposability of complex systems, and using E. Ostrom SES framework theory and a meta-analysis of 31 case studies of community forests in Mexico, the importance of using this framework in the course of explaining variable interactions and configurations to achieve desired system outcomes is explained.

Keywords: Social-Ecological System; Successful and Unsuccessful SES; E. Ostrom SES Framework; Meta-Analysis of the Case Studies.

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The problem of the misuse or destruction of the Social Ecological Systems like community forests is highly due to the limited knowledge of the processes that lead to the improvement in or deterioration of SES (Ostrom 2009). This is because, the SESs are inherently complex (Anderies, Janssen & Ostrom 2004). Without an accurate method to carry out the analysis of the problems related to the use of them, there should be imposition of the simple solutions or blue print solutions as it was in the case of the assumptions of the model of G. Hardin, 1968 which are irrelevant to the complex problems like those of the SESs. This paper investigates how the sustainability of the Social-Ecological Systems (SES) like the community forests can be maintained through understanding the functionality of the SES. in this context, the E. Ostrom´s SES framework has developed and recently gained interest of researchers in the governance of the Common-Pool Resources (Hill et al. 2015). This is because, it helps accumulation of required scientific knowledge from different disciplines for sustainable complex SESs in which CPRs are embedded in (McGinnis & Ostrom 2014). This theoretical concern is explored by a diagnostic analysis into SES framework. The empirical research was done by using the meta-analysis of community forests of Mexico as a case study, and this has been chosen based on the fact that it has got governance issues related to inter-community collective action as a key link in multi-scale governance (Bray, Duran and Molina-Gonzalez 2012), and consequently a conservation through community approach was highly recommended as an urgent measure (Merino, 2007). The use of a meta-analysis of case studies is highly important because it is a multi-method approach (Poteete, Janssen & Ostrom 2012) and its advantage of considering both quantitative and qualitative data help advancement in diagnostically analysis into SES framework. This work is organized as follows; description of E. Ostrom Social-Ecological System Framework, cased-based meta-analysis, variable interaction and configurations, methodology, results, and conclusion.

THE SOCIAL-ECOLOGICAL SYSTEM

SES can be defined as "social systems in which some of the interdependent relationships among humans are mediated through interactions with biophysical and non-human biological units." (Ostrom & Cox 2010). This definition put more emphasis on the possibility of change in human behavior towards the ecological system depending on its state of conditions.

Social systems are thought of as interdependent systems of organisms. Thus, both social and ecological systems contain units that interact interdependently and each may contain interactive subsystems as well. The term-SES is used to refer to the subset of social systems in which some of the interdependent relationships among humans are mediated through interactions with biophysical and non-human biological units" (Anderies, Janssen & Ostrom 2004).

The SESs are complex systems (Ostrom, Janseen, & Poteete 2012). This is because of the interactions of the social and ecological systems. This can be viewed into two perspectives. The first perspective is that the ecological system is composed with ecological units or ecological resources. These are CPRs characterized by the difficult but not impossible to exclude potential users and the substractability of resource units. Hence, as far as the SESs are complex, unless there are no robust institutions to govern the incentives and actions of the SESs' users, there should be a problem of free-ride which read to resource system destruction (Anderies, Janssen & Ostrom 2003). The second perspective is that social system is complex in terms of that it involves many interrelated action arenas of users and providers of the public infrastructures. Hence, if there are no robust institutions to regulate the interactions in these action arenas, the outcomes from the SES use may be undesired.

Both perspectives contain the same idea of that SESs function into complex dynamic systems of variable interactions and formation of patterns of interactions which determine the outcomes for the real world. The SES outcomes are subject to spatially and timely changes. The state of changes can either be improvement or destruction. All depends on the configuration of set of variables of a SES to another. Thus, a SES framework is necessary to help understanding those processes that may lead to the improvement in or destruction of the SESs.

E. OSTROM'S SOCIAL-ECOLOGICAL SYSTEM FRAMEWORK

The E. Ostrom's SES framework is delivered and closely related to Institutional analysis development framework (McGinnis & Ostrom 2014). It was developed as a response to a criticism of that the later framework was not paying sufficient attention to ecological and larger socio-economic contexts and to the multiple levels and social–ecological complexity in which common-pool resources management takes place (Thiel, Adamseged & Baake 2015). Thus, E. Ostrom and colleagues associated with the Workshop in Political Theory and Policy Analysis at Indiana University had to shift to a new framework in order to be able to study impact of human behavior towards the ecosystem in the course of sustainable governance. The SES framework is a meta-theoretical framework and it attempts to identify the universal elements that characterize any theory relevant to the phenomena of the study, hence, Social Ecological System is considered as a conceptual map, and it also identifies basic working parts and critical relationships among those elements. In this view, SES is considered as a decomposable system. SES as a meta-theoretical concept, it often draws confusion with theory and model concepts (Ostrom 2011). We cannot talk about a framework concept only without talking about a theory and model concepts in the Social-Ecological System conceptual analysis whereas sometimes are erroneously used interchangeably.

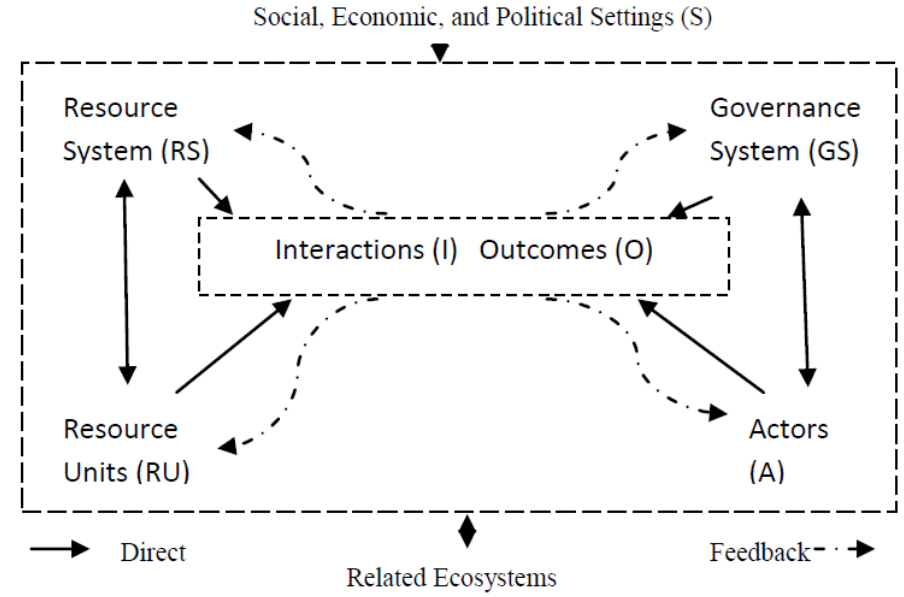
The development and use of theories help diagnosis into the framework, and enable the analyst to specify which elements of a framework are particularly relevant to particular questions and to make general working assumptions about the shape and strength of these elements. Theories make assumptions that are necessary for an analyst to diagnose as specific phenomenon, explain its processes, and predict outcomes. Multiple theories are usually compatible with one framework. In the case of community forests governance, theories help identifying core variables to be included in the analysis, and making assumptions about variable interactions and configurations among case studies. In contrast, the development and use of models involve making precise assumptions about a limited set of variables and parameters to derive precise predictions about the results of combining these variables using a particular theory. Multiple models are compatible with most theories. A model of meta-analyses of case studies is highly recommended for Social-Ecological System analysis due to its flexible analytical method.

A diagnostically analysis into SES framework is built on three aspects of decomposable complex system which are; the conceptual partitioning of variables into classes and subclasses, the existence of relatively separable subsystems that are independent of each other in the accomplishment of many functions and development but eventually affect each other's performance, and complex systems are greater than the sum of their parts. Based on these aspects, SES framework is composed of four "first-level core subsystems," namely: (i) a resource system, (ii) resource units, (iii) a governance system, and (iv) users, and they affect each other as well as linked social, economic, and political settings and related ecosystems. These subsystems contain a set of variables which are also set of "second-level" variables of the SES and they constitute a basis in the SES analysis (Ostrom 2007). As far as a view of SES in the two faces of opposite directions is concerned, each part of the framework is autonomous agent of the whole system and though interactions with other variables or individual parts, dynamically evolves to form changing configurations in the system. The decomposition of SES framework is given in the Figure 01 of its conceptual map.

The Figure 01 focuses on how a Resource System, Resource Units, Governance System, and Actors embedded in larger or smaller Social, Economic, and Political Settings and Related Ecosystems might affect interactions and outcomes within action situation (Ostrom 2011, Ostrom 2007). They are said to be subsystems or variables of the first level of the whole system. These subsystems are further decomposed into second level or second-tier independent variables, and they help diagnosing the causal patterns that affect outcomes. A list of these variables is found in the table below. In this view, SES framework is considered as a whole. Whereas, its subsystems and their sets of variables are its parts on

the first order and second order respectively. As far as diagnosis into SES is concerned, the view in the face turned towards the lower levels where SES parts on the first order and second order are considered as autonomous whole is expressed.

Figure 01. A Figure of a Multitier Framework for Analyzing a Social-Ecological System



Source: Ostrom 2007.

However, in the view of the face turned upward, that of a dependent part, a variable is taken as a unit part of the SES, in this case, it is considered as autonomous whole where its variability depends on its inner characteristics and its interactions with other variables within SES. As parts of a system, these variables interact and form patterns of interactions to determine overall outcome of the system, and any change in formed patterns of interactions may affect positively or negatively the system outcome (Ostrom 2007). Hence, the system is not only considered as a sum of its parts, but also the interactions among its parts in dependent phenomena and this helps tackling emergency of complexity which a critical concern in the management of the common pool resource system (VanWey, Ostrom & Meretsky 2005). The view of the SES framework as a decomposable system into component variables and how the interactions of those variables into a system of combination and recombination constitute a panorama of identifying that the processes that lead to improvement in or deterioration of the SESs are their functionality which is also in function of the institutional settings in place. Here it is important to note that all depends on the quality of the diagnostic analysis within SES framework.

The diagnosis into SES within two faces looking in opposite directions; the face turned toward the lower levels, that of an autonomous whole, and the one turned upward, that of a dependent part are very important in the course of explaining how variable interactions and configuration into

patterns of interaction affect desired system outcomes. It is also a basis of further methods to determine variable interactions and patterns of interactions affect outcomes. This is a case of Social-Ecological System Meta-Analysis Database (SESMAD) method as it is explained later.

Table 01. Second-Tier Variables in Framework for Analyzing an SES

Social, Economic, and Political Settings (S)	
S1-Economic development. S2-Demographic trends. S3-Political stability. S4-Government settlement policies. S5-Market availability.	
Resource System (RS)	**Governance System (GS)**
RS1-Sector (e.g., water, forests, pasture, fish)	GS1- Government organizations
RS2- Clarity of system boundaries	GS2- Non-government organizations
RS3- Size of resource system	GS3- Network structure
RS4- Human-constructed facilities	GS4- Property-rights systems
RS5- Productivity of system	GS5- Operational rules
RS6- Equilibrium properties	GS6- Collective-choice rules
RS7- Predictability of system dynamics	GS7- Constitutional rules
RS8- Storage characteristics	GS8-Monitoring & sanctioning process
RS9- Location	
Resource Units (RU)	**Users (U)**
RU1- Resource unit mobility	U1- Number of users
RU2- Growth or replacement rate	U2- Socioeconomic attributes of users
RU3- Interaction among resource units	RU3- History of use
RU4- Economic value	U4- Location
RU5- Size	U5- Leadership/entrepreneurship
RU6- Distinctive markings	U6- Norms/social capital
RU7- Spatial & temporal distribution	U7- Knowledge of SES/mental models
	U8- Dependence on resource
	U9-Technology used
Interactions (I)? Outcomes (O)	
I1- Harvesting levels of diverse users	O1- Social performance measures (e.g., efficiency, equity, accountability)
I2- Information sharing among users	O2- Ecological performance measures (e.g., overharvested, resilience, diversity)
I3- Deliberation processes	O3- Externalities to other SESs
I4- Conflicts among users	
I5- Investment activities	
I6- Lobbying activities	
Related Ecosystems (ECO)	
ECO1-Climate patterns. ECO2-Pollution patterns. ECO3-Flows into and out of focal SES.	

Source: Ostrom 2007.

The above table shows, SES framework according to E. Ostrom 2007 and it contains 42 variables which have been increased to 175 variables due to its further development and its interest in

research field (SESMAD 2014). It is based on the interactions of these variables in terms of configurations that the complex functionality of the SESs is understood. In order to understand how the same processes within different cases can lead to different results, either as improvement in o destruction of resource systems, a cased-based meta-analysis is used.

CASED-BASED META-ANALYSIS

A meta-analysis is a technique used to make a synthesis of research analysis. Until now, it may be divided into two categories; a statistical meta-analysis and cased-based meta-analysis. The former is normal and too widely applied technique and it attempts to aggregate across systems. By this technique, data are pooled on the same phenomenon gathered in multiple studies in order to test effect sizes, and informal literature reviews which summarize and compare the findings of multiple studies. Statistical meta-analysis is a powerful technique, yet it can only be used when data gathered in multiple studies address the same questions using the same or similar techniques (Harrison 2011). However, studies of SESs rarely have these required characteristics. Informal literature reviews, meanwhile, can provide a meaningful comparison, but are inherently non-systematic. Thus, a meta-analysis of case studies is a suitable method.

Meta-analyses of case studies combine the rigor of formal statistical meta-analysis with some of the flexibility of a literature review, hence it is suitable for qualitative analysis. They do not require that the case studies to be conducted in an identical fashion in order to produce comparable data, but instead rely on standard coding protocols utilizing nominal, ordinal, interval and qualitative variable definitions to create a database which uses existing information to compare across cases (Cox 2013). In this case, Social Ecological Mata-analysis Database (SESMAD) is used as a method of analysis, and two cases are described in to understand the complexity of processes that leads to successful and unsuccessful situations. these cases are:

i) **Scaling up from the grassroots and the top down: the impacts of multi-level governance on community forestry in Durango, Mexico.**

This case consists of analysis of the local-level impacts of cross-scale linkages in Mexican community forestry by evaluating the operation of four inter-community forest associations (FAs). The information on this case focuses on two inter-related issues: (01) the services that each association provides to their member communities and how they impact forest management and the development of communities' forestry enterprises, and (02) the differences in services and impacts between top-down and bottom-up FAs. The findings show that FAs, as a form of cross-scale linkage, can be crucial

for the provision of services, goods and infrastructure related to the protection and enhancement of community forests, the economic development of community enterprises, and the political representation of these communities. At the same time, the study finds important differences between top-down and bottom-up FAs, while pointing to some of the disadvantages of each type of linkage.

ii) Social deterioration and environmental degradation of four woodland regions in Guerrero state, Mexico.

The study of this case analyzes the distinct factors and conditions which have contributed to the alarming deterioration of forest resources in the four regions of Guerrero State with temperate forests: la Sierra de la Costa Grande, el Filo Mayor de la Sierra, la Sierra de la Costa Chica and la Montaña de Guerrero.

METHODOLOGY

The methodology of this research consists of both theoretical and empirical analyses. The theoretical analysis consists with description of the complexity of the SESs in the context of the decomposable system within dependent and interdependent variables, whose interactions determine the outcomes. The empirical analysis applies the SES meta-analysis method (SESMAD) to study how variable interactions and formation of patterns of interactions affect the outcomes.

SESMAD is an internationally collaborative meta-analysis project that builds on previous seminally synthetic work on small scale common-pool resource systems conducted at the Workshop in Political Theory and Policy Analysis at Indiana University, and it was applied to 31 case studies of the community forests in Mexico for a period of 2000 to 2014. This goes hand in hand with what F. V. Laerhoven says that generally, the study of community forest governance relies heavily on case-study materials (Laerhoven 2010) and also reflects Ostrom methodology of case studies to identify similarities and differences (Ostrom 1990).

The meta-analysis of the case studies method allows using qualitative and quantitative data in order to get accurate information from the sample of case studies. 61 out of 175 variables which characterize the SES of the common-pool resources have been systematically chosen from SESMAD. The idea of selecting 61 variables is based on the criteria of how much they are implicated in the characterization of community forests governance performance.

Based on the SESMAD method, the variables used in this paper, are classified as:

i) Variable type which comprises; 14 variables are binary, 15 variables are categorical variables, 01 variable is interval variable, 28 variables are ordinal variables, and 03 variables are text.

ii) Variable Component Type: This type of classification allows getting types of variable component such as; environmental common, natural pollutant resource unit, and natural resource system which are the components of resource system, actors, governance system and formal system which form governance system as a unique component. This is because, as far as the case studies of community forests in Mexico are concern, it is identified that there is no big difference in environmental common and natural resource system, and natural pollutant resource unit and natural resource unit. Hence, in this research four components or subsystems (resource system with 23% of variables, resource unit system, governance system with 15% of variables, and actors with 62% of variables) are considered. In order to know how they influence the outcomes of the community forests, it is needed to identify how far are represented in the interactions and outcomes process, this is given by viewing how variable are distributed in the attached component.

iii) Variable attached component. The variables are attached to either case component or component-interaction. Thus, in this work, 70% of variables are in component interaction and meaning the high viability and reliability on the information got for analysis and the existence of diversity in the outcomes resulting from various possible patterns of interactions.

iv) Theme: spatial, outcomes, institutions, context, enforcement, incentives, heterogeneity, basic, external, leadership, technology, social capital, biophysical, knowledge and uncertainty. The most predominant themes concerned with the variables in this research work are institutions, incentives and outcomes.

Each variable is integrated into one of the four components or subsystems of the SES framework, and it can only play a role of characterizing a subsystem component or/and goes further to be part of interactions or outcomes from the whole SES (SESMAD 2014). Thus, the outcomes result from variables interactions and their patterns of interactions. Any change within that configuration affect the SES outcomes.

RESULTS

Based on the impact of each variable behavior in interactions has on the outcomes of the Social-Ecological System, the meta-analysis of the case studies determines that there are two categories of variables: variables which constantly affect the SES outcomes and variables which differentially affect the outcomes of the SES.

The variables of the first category are variables which indicate that there some common characteristics shared in all case studies. This proves what E. Ostrom 2007 says that one of the errors of the policy analyst of the commons is to think that a case is unique. Thu, the identification of these common characteristics through the meta-analysis removes that ambiguity. The common characteristics are explained by: i) the variables which are constant in all cases of the analysis, and these are: Common actions (extraction, monitoring, conflict resolution, rule-making, sanctioning, trading, consumption). The actions are currently extended and acted under management plan by large group size, with rights of access, use, exclusion, management, and alienation. The proportionality of these rights is not identified, and according to SESMAD project, a lack of proportionality of rights implies lack of motivation to contribute to the successful governance of the common resources, thus for example in this research there is no habit of self-sanctions. But, even if there are no self-sanctions, community forests are governed to the extent to which conflicts are solved, ii) the variable of the scales of resource markets was not identified in all case studies, and this negatively affects the control and decision making on benefits from the use of the resources, iii) the variable of Policy instrument and rights granting was not also identified. Policy instruments structure the behavior and incentives that members of an actor group face. In turns, these incentives and behaviors play a key role in affecting commons outcomes. Initial granting of rights is widely considered to influence the use of those rights. Rights granting processes that are viewed as more fair or legitimate may be more likely to be respected. Rights granting processes that are based on current or past uses may grandfather in historical practices, incentivizing increases in pollution or resource extraction levels, but may also protect vulnerable populations, iv) through the special extent variable, it has been identified that all cases are larger systems. Larger-scale commons are generally more difficult to manage because of the increased likelihood of negative externalities between distinct actor groups, and v) the variables such as boundary fuzz, costs/ benefits, costs of exit, ecosystem service markets, external recognition, flexible rights, governance scale, incentive type, leadership, markets, overcapitalization, rights proportionality, roads, accessibility, external recognition, and physical boundaries, Black markets, size and traditional knowledge have got zero variance and their contribution to success among case studies is unexplained. These variables generate common characteristics within the case studies and are considered to have neutral behavior in the

patterns of interactions and on results or common behavior in the patterns of interactions and on outcomes. Using the descriptive statistics, they are characterized by the variance which is equal to zero.

The second category of variance which differentially affect the case studies, are critical variables to be based on in the analysis of the factors that lead to successful and failed conditions in the case studies. This is in the context of what R. Ostrom says that the cases are different, hence the blue print solutions are not convenient by policy analysts. According to the meta-analysis results, these are variables with variance greater than zero. These variables are the ones used in this work to the complexity embedded into the functionality of the SESs. This analysis bases on their performance within case studies taking in account that they are successful or unsuccessful cases studies. The resume of their performance is given in the following table:

Table 02. Variable performance

Variable	Total points of successful cases	Total points of unsuccessful cases	General total
Boundary clarity	26	32	**58**
Economic dependence	17	28	**45**
Interest heterogeneity	11	29	**40**
Cultural dependence	20	18	**38**
Monitoring technology	12	13	**25**
Perverse incentives	8	10	**18**
Regulating services conditions	8	10	**18**
Regulating services use	9	9	**18**
Commons boundary negotiability	10	7	**17**
commons political participation	17	-2	**15**
regulating services effect	12	3	**15**
Collective action	18	-4	**14**
Trust of the group users	11	1	**12**
Past collaboration	9	0	**9**
Biodiversity trend	14	-6	**8**
Trust in governance system	9	-2	**7**
Leadership accountability	9	-3	**6**
Commons political power	10	-5	**5**
Leadership authority	6	-5	**1**
Effect	10	-14	**-4**
Self-Monitoring	4	-8	**-4**
Economic heterogeneity	-4	-1	**-5**
Cultural heterogeneity	-6	-2	**-8**
Total	**240**	**108**	**348**
Average	**10.43478**	**4.695652**	**15.13043**

Source: Proper design according to the concept of Ostrom 2007 & SESMAD 2014.

From the above table, bold and italic variables are the ones by which their behaviors in the patterns of interactions and configurations determine successful and unsuccessful situations. These variables are divided into two groups; variables which have high performance in successful case studies and low performance in unsuccessful case studies, and these are: commons boundary negotiability, commons political participation, regulating services effect, collective action, trust (governance system), past collaboration, biodiversity trend, trust (Actors), leadership accountability, commons political power, leadership authority, effect, self-monitoring, and the variables which are lowest in successful cases and low in unsuccessful cases, and these are economic heterogeneity and cultural heterogeneity. This is because an increase in scoring points in these variable negatively affect the outcomes whereas a decrease in their scoring points positively affects the outcomes.

The case studies as Social-Ecological Systems function in the complex systems. However, even if in the course of trying to understand this complexity, the theoretical analysis showed that SESs are decomposable systems into subsystems, and the dependent interdependent variables whose interactions determine the realized outcomes, this concept can be applied to the case studies in order to identify the factors underlying in the successful and unsuccessful situations. it is in this context that two case studies are comparatively used. As we have in the methodology, these are: Scaling up from the grassroots and the top down: the impacts of multi-level governance on community forestry in Durango, Mexico, and Social deterioration and environmental degradation of four woodland regions in Guerrero state, Mexico.

The data coded from the impacts of multi-level governance on community forestry in Durango, Mexico case study shows that, the resource system and resource units characterized by biodiversity trend which are in mixed effect, resource market value which is in mixed effect, with inexistence of the black markets, and small size, with governance system characterized by lack of multiple levels, and medium trust, with the actor group characterized by existence of boundary fuzz, high collective action, high commons boundary negotiability, high commons political participation, low commons political power, high dependent to culture, inexistence of the cultural heterogeneity, low economic dependence, inexistence of the economic heterogeneity, no real effect, existence of flexible rights, inexistence of interest heterogeneity, mixed effect of accountable leadership, unidentified of leadership authority, without overcapitalization, low past collaboration, existence of mixed effect of the regulation services effect, without self-monitoring, high transaction costs, and mixed effect of the trust among actors of the resource system. The interactions of these variables lead to successful situation

with the outcomes of: mixed effect in biodiversity trends, Mixed effect in regulating services condition, high collective action, confident effect, mixed regulating services, and mixed regulating services use.

Whereas in the social deterioration and environmental degradation of four woodland regions in Guerrero state, Mexico case study shows that, the resource system and resource units characterized by biodiversity trend which are in worsened effect, not identified resource market value, with existence of the black markets, and large size, with governance system characterized by existence of multiple levels, and medium trust, with the actor group characterized by existence of rigid boundary, low collective action, low commons boundary negotiability, low commons political participation, low commons political power, not identified dependence to culture, not identified cultural heterogeneity, very economic dependence, medium economic heterogeneity, negative effect, inexistence of flexible rights, high interest heterogeneity, low accountable leadership, low leadership authority, not identified overcapitalization, low past collaboration, not identified regulation services effect, without self-monitoring, high transaction costs, and low trust among actors of the resource system. The interactions of these variables lead to unsuccessful situation with the outcomes worsened biodiversity trends, unidentified regulating services condition, low collective action, no confident effect, not identified regulating services, and not identified regulating services use.

CONCLUSIONS

The SES framework is highly important in the analysis of the processes that lead to improvement in or destruction of the SESs. It provides a conceptual description of the SESs as decomposable systems which helps to identify a set of variables whose interactions leads to successful or unsuccessful situation. This is very important to the policy analyst because it is a fundamental to variables configurations for achieving the desired outcomes through the institutional settings. The meta-analysis of the case studies not only helps to identify the impact of each variable in the interaction situation and the resulting outcomes, but also helps to understand the complexity in the functionality of the SESs, by showing that each case in the environmental commons is not unique and that as far as the SESs are complex, the blue print solutions are inefficient.

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Estrutura SES de E. Ostrom para entender os fatores de situações bem-sucedidas e mal sucedidas no SES: Uma meta-análise de florestas comunitárias no México

RESUMO:

Os sistemas sócio-ecológicos são intrinsecamente complexos e a sua destruição é geralmente atribuída a uma compreensão limitada dos processos que levam à sua melhoria ou deterioração. Em um esforço para responder a esse problema, E. Ostrom e colegas associados com o Workshop em Teoria Política e Análise de Políticas da Universidade de Indiana desenvolveram uma estrutura de Sistema Sócio-Ecológico (SES). Entretanto, mesmo se a importância da estrutura SES para melhorar a sustentabilidade de sistemas sociais e ecológicos complexos for altamente aceita, a implicação no entendimento das funcionalidades do SESs que pode levar a situações bem-sucedidas ou mal sucedidas ainda é uma lacuna. Neste artigo, referindo-se ao contexto de decomposibilidade de sistemas complexos e utilizando a teoria de estrutura SES de E. Ostrom e uma meta-análise de 31 estudos de caso de florestas comunitárias no México, a importância de usar essa estrutura no intuito de explicar as interações e configurações variáveis para alcançar resultados desejados do sistema será explicada.

Palavras-Chave: Sistema Sócio Ecológico; SES Bem e Mal Sucedidas; Estrutura SES de E. Ostrom; Meta-Análise de Estudos de Caso.