

# **Inquiring about the Dynamics of Institutional Change. Some lessons from the Modernisation of the Mula *huerta* in Murcia, Spain<sup>1</sup>.**

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**ABSTRACT.** Institutions are dynamic entities. This paper focuses on the dynamics of institutional change in an attempt to identify some of the main variables that can affect change. On the one hand, it argues that in the study of these dynamics, both formal and informal institutions do matter. On the other hand, it suggests that multiple factors, having both an endogenous and an exogenous origin can be identified when trying to explain processes of institutional change, and that such factors can account for changes at various levels and scales of the institutional structure. This paper also provides some empirical evidence from the study of the transformation of the Mula *huerta* in Murcia, Spain to illustrate how institutional changes do operate in practice. In this case, the changes introduced to the existing institutions that regulated the property and use of water have led to a deep transformation of the management practices of irrigations and improved the conditions for the sustainability of a common pool resource.

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## **Introduction**

Institutions, once they are created, they tend to stability. Even if this affirmation is widely accepted among scholars interested in the study of institutional change, many of them also support the idea that institutions respond to certain dynamic processes which account for their evolution in time as well as for their real impact in shaping human interactions. As Binger and Hoffman (1989) point out, ‘society is constantly reevaluating the institutional framework in which individuals operate’.

However, when focusing on the dynamics of institutional change several questions arise. (1) *How do we define institutional change?* (2) *Do all institutions follow the same patterns of change? And if, not, in what do they differ?* (3) *Which factors do account for institutional change? And, how do they operate?* (4) *How can evaluate change?*

The following sections will look more in depth into these questions in an attempt to identify some of the main variables that affect the dynamics of institutional change. In the first section, I will give some definitions of the terms that will be used in this paper in order to clarify what we do mean by institutions and institutional change. In the second section, I will focus in the patterns of change that both formal and informal institutions can follow, identifying some of their main features. In the third one, a typology of factors that can account for institutional change will be proposed. The following section will look at how these changes agents may operate from the perspective of the Institutional Analysis and Development framework. After some brief comments of the evaluation of change, the case Study of the transformation of the Mula *huerta* will be presented. The last section includes some concluding thoughts.

### **Institutions and Institutional Change. Some definitions.**

For purposes of this paper I shall use a definition of institutions which include both the formal (regulative structures) and informal (social norms, conventions, customs, traditions, patterns of behavior and activity) rules of the game (North, 1990) which organize and give significance to the social behavior (Scott,1995)<sup>2</sup>.

There are many conceptions of institutions. However, two main ideas are common to many of these accounts. On the one hand, the idea that institutions create a *context* for human decision making and action. In this sense, the institutional context shape individual preferences and affect the distribution of power and resources among them (March and Olsen, 1989; Hall and Taylor, 1996). On the other hand, the idea that institutions act as a *filter* favoring the interests of some actors (or some groups) over others (Immergut, 1998). As Jones (2001) point out, the institutions in which individuals

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<sup>2</sup> I will also use the term ‘institutional arrangement’ or ‘institutional structure’ to refer to the set of institutions that are operating in a particular setting.

find themselves operating elicit behavior by the explicit incentives they provide and by the social understandings they promote.

But neither are institutions the only variable in shaping behavior nor they act in an isolated way. Institutions interact with other exogenous variables and are also influenced by the political, economic, and social context in which they are embedded. In this sense, institutions can act not only as independent variables that shape individual action but also as dependent variables being influenced by structural and contextual factors.

Institutions are, thus, dynamic entities that are subject to change. In what follows I shall use the term ‘institutional change’ to refer to any shift in the rules and enforcement procedures that operate in a certain recurrent situation (*status quo* rules) so that different individual and collective behaviors are constrained or encouraged (Ostrom, 1990; Levi, 1990).

### **The Logics of Change<sup>3</sup>**

In general terms, some important features seem to characterize the patterns of change followed by institutions:

1. Most institutional change has a sequential and incremental nature (Ostrom, 1990; Levi, 1990). In this sense one could say that institutions are not completely destructed to be ‘rebuilt’ again. Although we could find some case which have followed such ‘drastic’ pattern, gradual transformations of the existing institutional arrangements are more likely to occur.
2. There is ‘path dependence’. Current institutions, as well as the evolution they have followed in time constraint the subsequent choices that individuals (or future generations) will consider (Levi, 1990).
3. The great number of cases of repetitive failed attempts to bring about institutional change that have been observed in the field suggest that the patterns of change may not be as simple as a process of ‘trial-and-error learning’ (Jones, 2001). Institutions, as human creations are also fallible and follow more complex patterns of continuous redefinition.
4. Change can occur at various levels of the institutional framework. We can distinguish among changes in the set of rules that regulate individual action at the (*operational level*) from changes that occur within a given set of rules at the deeper levels (*collective choice* and *constitutional levels*) that define how the first set of rules can be changed (see Ostrom, 1990; Ostrom et al 1994; Ostrom, 1999; Ostrom 2002 forthcoming).

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<sup>3</sup> I am referring to the terminology used by Margaret Levi (See Levi, M. 1990). In what follows, I will use the term ‘pattern’ of change as a synonymous.

5. The evolution of the processes of institutional change can not be easily predicted (Hall & Taylor, 1996). The complex interaction among the variables that explain change as well as the feedback from the affected structure can have unintended effects in multiple levels and scales.

### *Formal and informal institutions*

Besides, not all institutional components follow the same pattern of change. Many scholars have showed their concern about the role of informal institutions in explaining the dynamics of institutional change (see North, 1990; 1993; Alston et al., 1996; Powell and Di Maggio, 1991). Besides, some of them have also stressed the challenges that the study of informal institutions put on the neoclassical economic paradigm and the rational choice model. As Eggertsson (1996) points out, 'self-interest and power are important in explaining change but individual behavior cannot be modeled solely in terms of pure self-interest'. Empirical research has uncovered that rational choice models fail to predict outcomes in many 'real' situations individuals face where (1) information is many times incomplete, (2) information processing capabilities of individuals are 'bounded' (Jones, 2001), and (3) internal valuation of outcomes is shaped not only by objective payoffs but by internal values and individuals perception of risk and uncertainty (Ostrom, 2002 forthcoming). On the contrary, individuals follow norms of behavior based on values like trust and fairness (Eggertsson, 1996) and their behavior, as well as the way they construct problems and consider sets of solutions, is also influenced by variables from the institutional, cultural and biophysical context (Ostrom, 2000).

Social and cultural processes, thus, also do matter. When considering the processes of institutional change then, do informal institutions follow the same pattern of change that the formal ones? Or it is otherwise possible to identify a 'logic' of change for informal institutions and a different 'logic' for the formal ones? A deeper consideration of the main dynamic features of informal institutions suggests an affirmative answer to this question. As Young (2000) points out, informal institutions establish a connection between rules, decision making processes and culture in a double perspective:

- (1) *Cognitive*. Informal institutions are learned and internalized as a result of the socialization process creating a set of shared perceptions and understandings among participants (i.e. about the functioning of ecosystems) that guide collective behavior.
- (2) *Normative*. Informal rules are followed because individuals have given them a certain degree of legitimacy. Informal institutions such as social norms, 'especially in a setting where there is communication between the parties, can work as well or nearly as well, at generating cooperation as an externally imposed set of rules and system of monitoring and sanctioning' (Ostrom, 2000)<sup>4</sup>.

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<sup>4</sup> Following a similar argument, Taylor and Singleton (1993) stress that a strong feeling of community membership can act as an efficient social control mechanism among users of a common-pool resource.

In this sense, the development of informal institutions increases the diversity of the institutional arrangements as they increase the variety of tools that individuals can use to face different situations and solve different kind of problems. Informal institutions, in this sense increase the capability of adaptation of individuals to changing, complex and uncertain environments. Informal institutions can develop in response to different situations:

1. *As a means to internalize the formal rules.* The enforcement of formal institutions depends heavily on informal rules (Eggertsson, 1996). In this sense, informal institutions can be developed by individuals to transform the 'rules-in-form' into 'rules-in-use'. According to this process of internalization, participants may interpret the prescribed rules and develop informal channels that take the form of informal agreements, patterns of behavior and activity to adapt the rules to their operational environment. Thus, individuals learn some mechanisms to respond to certain situations which are then internalized and become 'prepared strategies' that are 'activated' when facing the same certain situations.
2. *As a means to compensate a 'mismatch'<sup>5</sup> between the formal rules and the 'real' situations faced by individuals.* As Ostrom (1990) point out, if the cost of changing formal rules is very high, participants may develop their own informal rules (outside formal channels) as well as some mechanisms to enforce them.
3. *As a means to regulating 'new' or 'non-regulated' situations.* Informal rules can also develop when the rules-in-form do not cover all the situations that participants may face at the operational level or when rules-in-form are not known or properly understood. As an important component of property rights, for instance, informal institutions such as traditional practices and codes of behavior can be established in order to coordinate operational activities and interactions among owners or users which are not regulated by the formal rights. They can also be developed in order to solve conflicts among participants when no alternative mechanisms have been established.
4. *As a way of replacing missing regulations at some upper level.* Informal arrangements are not restricted to a particular level of the institutional structure. On the one hand, although informal institutions are more likely to develop at the operational level, they can also develop to coordinate the interaction among actors at deeper levels of the rule configuration (collective-choice or constitutional-choice levels). On the other hand, informal arrangements can also be established among actors operating at different scales (local, regional, national or even international level) (i.e. when there are regulations relating to the management and use of a particular water resource at the national and regional level but not at the river basin level).

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<sup>5</sup> Tolbert and Zucker (1996) use the concept of 'decoupling' to refer to the way institutions respond to disadjustments between the existing formal institutions and those patterns of behavior developed by individuals.

The consideration of all these situations suggests that formal and informal rules must be seen as complementary in creating specific outcomes (Eggertsson, 1996). The design of efficient new formal rules, thus, as well as the changes introduced to them should take into account the existing informal ones and consider the relations that exist between them. A better understanding of the role of informal institutions is, then, needed.

### **Agents and conditions for change.**

Most of the theories of institutional change have identified some factors that act as triggers of the process of change. What differs among the various accounts, though, is the origin of such *change agents*. Some scholars view change as an *endogenous* process driven, responding to struggles for power or to individuals' interests to have an advantage in future situations (Steinmo, S.; Thelen, K. and F. Longstreth, 1992; Levi, 1990).

Alternative explanations of change have mainly focused on *exogenous* triggers, viewing change as a cyclic process driven by external forces. Krasner's (1984) model of 'punctuated equilibrium' has been one of the most influencing in this perspective. According to his model, institutions are embedded in a context of stability which is disturbed only in punctual moments ('crisis') due to changes in the external context. Such crises produce a wave of conflict that lead to a series of changes in the institutional structure.

Institutional dynamics, however, are neither completely internally nor externally driven. Both endogenous and exogenous factors play an important role in explaining the dynamics of institutional change. Institutions, as well as the individuals that create them, are constantly adjusting to their external and internal environment (Jones, 2001; Powell & Di Maggio, 1991). These 'environments' are far from fixed or stable but many times constitute a set of changing 'elements' interacting in complex and uncertain ways. On the other hand, institutional change requires many times from deliberated attempts and resources coming from both 'suppliers and 'demanders' of change. However, change may not always be a choice available to them (Alston, 1996).

A typology of factors that account for institutional change can, thus, be identified according to two main variables: origin and intentionality. (See Table 1.)

**Table 1. Typology of change agents**

<i>Change Agents</i>	<b>Exogenous</b>	<b>Endogenous</b>
<b>Purposive</b>	<p>New policy designs at different scales</p> <p>Changes in the regulative system at upper levels</p>	<p>Initiatives or deliberated attempts in response to a tension or inconsistency between existing conditions and institutions</p> <p>Ideological innovation within the institutional context.</p>
<b>Non purposive</b>	<p>Physical changes</p> <p>Changes in the broad political, social and economic context (technological, demographic, cultural,..)</p>	<p>Internalization of rules, norms, values.</p> <p>Evolution of the internal structure of the institution</p>

On the one hand, *exogenous* changes can be either purposively or non-purposively driven. The former can be a result of the introduction of new policy designs (i.e. new policies relating to the protection and use of a natural resource) or the result of changes in the regulative system and deeper institutional levels (*constitutional or collective choice*) (i.e. passing a new law at the regional or national scale relating to the protection of natural resources; reforming the existing regulative system by introducing new criteria). The latter can result, on the one hand, from physical changes (i.e. changes on the perimeter of the natural resource, climatic conditions (i.e. severe drought periods, floods)). On the other hand, it can also include broad changes in the political, economic and social context in which institutions are embedded (i.e. changes in national or international markets, technological innovation or cultural changes). In this case the effect of change agent would induce a transformation or redefinition of the existing institutional arrangements to adapt to the ‘new’ circumstances.

*Endogenous* changes can also have either a purposively action or not. Individuals react to the constraints imposed by the institutional context in which they are embedded by interpreting the rules, norms and practices included in this context (Salvador, 2000) and by trying to redefine them in a way that best fits to their particular interests or worldviews. Non purposive changes take place as a result of the internalization of rules and norms by individuals and/or as a consequence of the evolution of the institutional structure according to its internal dynamic. However, changes may also come as a result of active attempts from participants to introduce changes in the institutional structure when the evolution of the existing institutions has led to a ‘mismatch’ or a tension between both the individuals’ expectations and the conditions they face, and the operating rules. In this sense, individuals may consider, for instance, that:

- the existing institutional arrangement is not providing the expected (individual and/or collective) outcomes
- their future expectations and interests could not be fulfilled from the existing rules
- the costs (or risk) associated to the maintenance of the operating rules are too high
- the enforcement of the existing rules results to high levels of social conflicts (i.e. distributional asymmetries)
- the maintenance of the existing rules is threatening the sustainability of key resources to the activity of the community

On the other hand, cultural elements<sup>6</sup>—such as new ideologies associated with ‘cultural frameworks’<sup>7</sup> proposing alternative worldviews and ways or organizing action, can also act as an exogenous trigger of change in the sense that they can induce individuals to construct new strategies of action, motivations, ways of organizing experience and evaluating reality, ways of forming social bonds, or shape the existing ones (Swidler, 1986).

*Favorable conditions*

The change agents that operate in each situation may vary and the response of the existing set of institutions to these changes may be specific of a particular setting. Besides, change agents do not operate in an isolated way. Thus, in many cases it is also possible to identify a set of factors (or *favorable conditions*) which although they are not responsible for change they contribute to a great extent to the ‘success’ of deliberated attempts for change made by participants (Bressers, 2001). The main conditions include the following:

- i. *Tradition of cooperation among actors.* Participants have cooperated in the past in order to achieve collective outcomes (i.e. positive examples of institutional change known or experienced by the actors involved, mutual respect and trust in ‘fair play’ of the actors involved)
- ii. *Joint perception of the problem.* There is a common perception among participants that they will be worse-off if the status quo is maintained and that the situation sooner or later will have to be changed somehow (i.e. information

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<sup>6</sup> For purposes of this paper I will use the definition of culture proposed by Swidler (1986) as a ‘tool kit’ (or repertoire) of symbolic vehicles of meaning such as beliefs, symbols, traditional practices, worldviews, norms, patterns of behavior and activity which individuals may use in different situations which provides a set of elements from which individuals construct their ‘strategies of action’ (persistent ways of ordering action through time). In this sense, cultural elements create motivations, ways of organizing experience and evaluating reality, modes of regulating conduct and behavior and ways of forming social bonds. She argues that culture plays an independent causal role because it shapes the capacities from which such strategies of action are constructed.

<sup>7</sup> I shall use the definition of a ‘cultural’ or ‘interpretative framework’ proposed by Goffman (1974) as an interpretative frame that allows individuals to perceive, identify and classify reality phenomena in a way that they become meaningful (Goffman, 1974). Cultural frameworks provide elements that ‘tell’ individuals how to perceive, rationalize, evaluate (morality) and prescribe their relationships with different objects or phenomena (see also Entman, 1993; Williams, 1998; Zald and Useem, 1996).



- symmetry between the actors, a sense of responsibility for the future among participants).
- iii. *Joint future chances.* There is a notion of possible ‘joint’ gains (benefits) from institutional change (so called ‘win-win-situations) among participants (i.e. knowledge bases from respected sources on opportunities stemming from institutional change, information symmetry among participants on these points, a sense of respect for each others’ interests among participants), and their discount rates are relatively low.
  - iv. *Existence of a credible alternative threat.* There is a credible threat from a dominant actor accumulating power and altering the situation if no change is undertaken.(i.e. sufficient imbalance of power favoring a dominant actor to enable unilateral action; information on alternative options to ‘solve’ the problem from the perspective of the dominant’s actor perspective; maintaining the status quo would have more severe consequences or costs for that actors than to others)
  - v. *Institutional interfaces.* There are well functioning institutions at deeper levels that provide fertile ground for attempts of change at lower levels.(i.e. clarity of assigned responsibilities; legal or practical possibilities to protect negotiated compromises from continuous litigation, legal leeway; official policy guidelines to change institutions; provision of resources to lower the costs of undergoing a change).

### **The dynamics of Change: Incorporating change to the IAD framework**

As we argued above, institutional change can be induced by exogenous or endogenous agents. But how do these change agents operate in practice? We will first consider how changes operate at one level of the rule configuration (i.e the operational level in relation to the use of a common-pool resource) and then see how changes can also occur at upper and lower levels of the rule configuration. Figure 2. includes a diagram based on the Institutional Analysis and Development (IAD) framework<sup>8</sup> that illustrates how this process may take place. (See Figure 2. Adapted from Ostrom et al, 1994; Ostrom, 1999; Denzau & North, 2000; Costeja, 2002)

As Ostrom (1990) points out, when considering the possibility of changing the existing institutional arrangement at a particular level, individuals face a main choice; whether to support a change in the status quo rules or not (that is, keep the situation as it is). The consideration of choice, however, is influenced by the effects of both exogenous and endogenous triggers of change. On the one hand, exogenous change agents may directly or indirectly affect the main variables that create the social context in which participants interact. That is, the physical conditions (i.e. due to physical changes in the resource system, severe climatic conditions, changes in the perimeter of the resource or

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<sup>8</sup> (see Ostrom, 1990; Ostrom et al 1994; Ostrom, 1999; Tang, 1992).

availability of new resources), the attributes of the community (i.e. new users, situations of illegal users) and the set of *status quo* rules (changes or rules at deeper levels or scales that affect the operating rules)

Endogenous triggers of change play also an important role in influencing the decision-making process. As a result of endogenous triggers of change, there can be a tension between individuals' expectations and worldviews, and the existing institutional arrangements (i.e. if the existing institutional arrangements have led to the degradation of the resource they depend on causing a threat to their production and/or consumption activities, or if there is a high level of conflict among rival uses of the resource).

Individuals' perceptions and the information available to them about the potential effects of such changes will, thus, inform their choice. Participants may rely on particular mental models (Denzau & North, 2000) to do an assessment of the expected costs and benefits associated with such changes and to consider the anticipated consequences of alternative choices<sup>9</sup>. Their discount rates will also shape the evaluation of costs and benefits associated to a possible change. However, as individuals' information processing capabilities are limited ('bounded') they may try to compensate these limits, either with the feedback they receive from the 'outside world'—that is by using some forms of communication (and other means to receive information)—or by recalling on their experience<sup>10</sup> or others'. Cultural elements (beliefs, worldviews, and social norms) will also shape the choice of adopting new strategies of action or shaping the existing ones.

If the final strategy chosen by the individual is to support change, and if a large enough number of participants (depending on the rule used for collective decision-making) also do so, then a collective effort is likely to be made to bring about a change. The presence of favorable conditions for change will also contribute to the success of the process. The outcomes of the process can also feedback in the action situation and the contextual variables affecting it. On the one hand, outcomes may cause a change in any of the variables that constitute the action situation in ways that shape the patterns of interaction among individuals. On the other hand, outcomes can also have an effect either in the physical conditions of the environment in which individuals are embedded or in the attributes of the group (See Figure 2).

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<sup>9</sup> The way individuals evaluate costs and benefits associated with institutional change depend, on the one hand, on the information available to participants about the benefits that would result from adopting an alternative set of rules and, on the other hand, on the information about the costs of transforming the status quo rules and the costs of monitoring and enforcing the 'new' ones (Ostrom, 1990). Ostrom identifies a great number of variables that can influence such an evaluation. On the one hand, expected benefits may depend, for instance, on the specific proposed rules, the variability of key resources in the future as well as their actual conditions, the market conditions for these resources, among others. On the other hand, the evaluation of costs may be influenced by the available technology, the size and the heterogeneity of interests among participants, the rules that can be used to change the existing ones, among others.

<sup>10</sup> The recent findings of the indirect evolutionary approach consider individuals' experience as one of the situational variables which influence decision making. According to this theory, experience about others' behavior, as well as about own's prior action and the received payoffs is likely to shift initial behavior of individuals in a collective action situation (Guth and Kliemt, 1998).

### *Levels and scales of Change*

As we suggested in the first sections of the paper, institutional change has a multi-level nature. Change can take place at different levels of the institutional structure. Thus, a change in one level can lead to changes at lower or upper levels of the rule configuration. In this sense, we can distinguish between patterns of change which are bottom-up driven from top-down driven ones. (See Figure 1)

➤ *Bottom-up patterns.* Processes of change at the operational level can also induce changes at deeper levels when a larger enough number of participants in a group (or organization) support it or when enough pressure for change is exerted by agents and conditions favoring change. (i.e. clear indicators of degradation of a key resource). If such conditions are present, then, individuals can consider the possibility of a change in the set of assumptions on which operational rules and practices have been based and start a process of changing rules at the collective choice level.

Shifting to the constitutional level, however, can be much more difficult. When envisioning changes at the constitutional level, individuals may have to face several 'barriers'. Some of structural disincentives they may face are the following:

- high costs associated to the process
- rigidity of the *status quo* rules
- lack of resources in the hands of participants to foster their initiatives
- lack of power in the hands of participants to enter the decision-making arenas at the constitutional level
- plurality of conflicting interests among actors

All these factors can 'blind' attempts for change. In this case, change can be 'stuck' at the operational or collective –choice level and rules at deeper level will not be questioned. The main danger is that if rules at deeper levels were the cause of the problems that participants were facing at the operational level, then these problems will remain 'unsolved'. On the other hand, if participants fail to grasp opportunities to bring about change can feel discouraged and fail into the trap of 'accommodation' (Maarleveld & Dangbegnon, 1998).

On the other hand, change can also take place only at the formal level. If formal rules at the operational or collective choice level are changed but 'old' informal rules are deeply rooted among participants, then, individuals will keep showing compliance to the norms that regulate their daily activities despite the changes in the formal arrangements. As North (1990) stresses, 'people identify with old institutions in ways that make them more difficult to change than reformers think'. This 'mismatch' between formal and informal institutions can lead to a situation in which no 'real' change occurs.

➤ *Top-down patterns.* Changes at the constitutional level can also lead to changes at lower levels of the rule configuration (collective choice and operational levels). However, this can also be a slow and troublesome process. Several ‘barriers’ to change can also stop the process at any of its steps:

- lack of efficient mechanisms to enforce changes at the lower levels
- plurality of interests among actors
- rigidity of *status quo* rules

Again, in a top-down process, changes can be ‘stuck’ at the constitutional level without reaching the lower levels or result in a ‘non-real’ change situation if the rules-in-form are not translated into rules-in-use.

As we suggested in the first sections of this paper, change can also have a multi-scale nature. Although for purposes of this paper multilevel changes have only been described occurring at a particular scale it is worth noting that changes can also take place at different scales of governance (local, regional, national, international) and that the consideration of multilevel changes occurring at various scales would place Figure 1. in a complex matrix of links and interactions that would require a deeper analysis.

### **Evaluating change**

The criteria used to evaluate the outcomes of a process of institutional change will depend on the actors that carry out such evaluative effort. On the one hand, from the perspective of an external evaluator, the same criteria we may use to evaluate the performance of an existing institutional arrangement could also be used to evaluate change. The main focus could then be placed on economic (i.e. efficiency), social (i.e. redistribution of benefits) or ecological (i.e. carrying capacity of an ecosystem) issues. On the other hand, if participants are themselves evaluating change, the achieved outcomes of the process will more likely be evaluated in relation to their initial objectives and expected results. Thus, they would probably select the criteria that best adapt to these aims.

The following sections provide some empirical evidence from the case study of the transformation of the Mula *huerta* in Murcia (Spain) to illustrate how institutional changes do operate in practice. In this case, the changes introduced to the existing institutions that regulated the property and use of water have led to a deep transformation of the management practices of irrigations and improved the conditions for the sustainability of a common pool resource.

## The Modernisation of the Mula *huerta* in Murcia (Spain).

### Case Demarcation

*Physical Conditions.* The Mula huerta is a traditional Spanish irrigation system located in the Northwest area of the Murcian region, at the Southeast of Spain. Irrigation consumes most water from the Mula river basin (95% approximately). Traditionally, the main crops in the Mula river basin have been olive, vineyards and cereals. However, as in many areas in the Murcian region, traditional mediterranean crops have been replaced by fruit crops along the second half of the XXth century, mostly apricots, peaches and lemons<sup>11</sup>.

Water resources currently available to the Mula huerta come from both own sources of the basin and concessions. Among the former, are the waters coming from the Mula river<sup>12</sup>, water stored at the La Cierva dam, and groundwaters (El Pradillo and Corral de Comba wells). Among the latter, the Mula huerta two concessions of waters: one coming from the Segura river basin and one coming from the Tajo Segura diversion.

In order to characterise the Mula river basin, three factors must be taken into account: climate conditions, the fragmentation of the land and the traditional division between land and water property:

- (1) Climate conditions at the Mula river basin are semiarid and typical of the Mediterranean basin. In general terms, both inter-annual and intra-annual climate patterns can be identified. There are five-to-eight year wet cycles followed by long dry periods.
- (2) The irrigable lands in the Mula *huerta* cover 2,016 Has and are structured in small holdings (*minifundios*): 86% of farms, out of a total of 1,328 registered lands, have each a surface lower than 2 Has. The fragmentation of land into small holdings has historically been established and is typical in the Murcian region. Land fragmentation, together with the low levels of agrarian associationism, has largely constituted an obstacle for irrigators to transform the historical water regime and improve water distribution infrastructures.
- (3) Finally, the traditional division between land ownership and water ownership has historically generated a system in which land owners have been subordinated by those few having a property title over water, the so-called Lords of Water, who have formed an institution called the *Heredamiento*. The separation between property of water and land took place along the XIVth century in such a way that those having a privileged position could obtain greater benefits by just acquiring water than by buying land. At least since the XVIth century, the Lords of Water had the property of about 95% of the water from the Mula river flowing through the *Acequia Mayor*, which is the main and most antique irrigation

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<sup>11</sup> As it is well known, fruit production needs higher amounts of water and demands are higher in the dry seasons of the year (spring and summertime)

<sup>12</sup> The Mula river is tributary to the Segura river in its right side and is included in the Segura river basin.

channel, while the remaining 5% was reserved to the neighbours. For centuries, the Lords of Water used to sell water in daily auctions and by this they had the control over price of water and the conditions for its distribution, being small land owners subject to the conditions and use rights historically established. The national regulations respected the vested water property and use rights, so that the Lords of Water kept holding the property of waters from Las Fuentes de Mula, at the head of the river, until the late eighties. Since then, a transformation of the water regime has taken place.

*Attributes of the Community.* Land owners of the Mula huerta (irrigators) who have the right to use waters from the La Cierva Dam constituted the Irrigation Community of La Cierva Dam which is the governing body having authority to take collective decisions that apply to all its members. It was created in 1935 but because of the lack of own resources and powers it remained almost paralyzed until 1966, when the first attempt to alter the ‘monopoly’ of the Lords of Water took place. Along the eighties, the Irrigation Community became a central actor of the modernization process. At present, the Irrigation Community is integrated by 1700 irrigators.

*Institutional structure.* The traditional system of land and water property as well as the traditional structure of the huerta (smallholdings) have determined to a great extent the institutional arrangements. Both formal and informal institutions play an important role at the huerta level. Regarding the former, the regulative system at the national level considered water an ordinary real state and water owners had free choice upon waters. This fact allowed them to sell not only the ownership of water but also their use right. A way of transferring this right was by the means of daily auctions as in the Mula huerta case and other villages of the Murcian region (Hellin, 1980). The rules-in-use related to the water regime in the *huerta* of Mula were strongly determined by the irrigation system used by farmers since the Muslims and by a water distribution system based on a vast net of irrigation channels. The core and the origin of the distribution system at the traditional *huerta* was the *Acequia Mayor*, which was the major irrigation channel and had been excavated by the Muslims at the IXth century. Over the *Acequia Mayor* there was a complex distribution net formed by irrigation channels that distributed water to every single *huerta*. All water available was divided into 20 portions (*cuartos*), 19 of which were a private property of the Lords of Water and the portion left could be used by the municipality of Mula and its inhabitants. So the Lords of Water owned the majority of *cuartos* and could transfer the titles of water as it could be done with any other private good. Farmers had to buy the *cuartos* of water in the daily auction. Water was then distributed to them by the *tanda*<sup>13</sup> system, a fixed time period in which water was distributed to the huerta. However, informal rules, such as norms of behaviour and traditional practices among irrigators also played an important role in the distribution of water resources. For instance, during period of severe drought, it was established an “unofficial” auction which began after the official one and in which the waters left were sold to the most desperate irrigators—who needed water in order to save their crops. The competition for the acquisition of water resulted in a high social conflict and in increasing rivalries among irrigators.

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<sup>13</sup> Each *tanda* consisted in 20 days, divided into 4 periods of 5 days each.

### **The Actors in the process**

The main actors in the case are the Irrigation Community and the Heredamiento. The latter was formed by the so-called Lords of Water, a handful of aristocratic families who were the owners of waters. However, other actors have also taken part in the process of institutional change initiated by the Irrigation Community. The main ones are (1) the Regional Ministry of Agriculture in Murcia which developed a pilot project on the modernisation of irrigation in the Murcian region, (2) the Center for Applied Edaphology and Biology on the Segura river basin (CEBAS) which provided the expertise for the elaboration of the Modernisation Plan, and (3) the European Union, which co-financed the implementation of the Plan.

### **Patterns of Interaction and Institutional Evolution**

The evolution of the traditional institutional arrangements (both formal and informal) operating at the huerta level led to a deep crisis of the traditional structure of the huerta. Since then, an important process of institutional change has taken place. Three major periods can be identified in the process of transition from a traditional to a modernized irrigation system.

➤ Along the first period (starting at the beginning of the XXth century and ending in 1966), covering the availability of water in the basin had been limited by the high variations in climate conditions and the property rights regime, the latter of which was controlled by the Lords of Water. They sold portions of the resource in daily auctions and established the rules of access (exclusion of the non-members), and allocation of the resource. Along this period, the Mula huerta specialized in vineyards, olive and cereal because of the low irrigation demands of such crops. Irrigation was only needed once a year in winter or spring, when water could be bought in the daily auction at a lower price. The construction of La Cierva dam in 1931 and the creation of the Irrigation Community (1935) increased farmers' expectations of having increasing water resources. However, severe drought periods resulted in an increasing speculation on water prices. As the property of land and water was separated, many owners sold their lands and kept the property of water.

Along the post-war period the demand of more select products at the national and foreign markets induced a transformation of the traditional huerta that specialized in crops with high water demands, more particularly apricots and citrus. As a result of that, the reserves of the dam progressively decreased and scarcity problems and social conflicts reappeared again. During this period, water from La Cierva dam, although it was administrated by the main river basin administration (*Confederacion Hidrografica del Segura, CHS*) due to its public character, was also sold in auctions. In this sense, there were two types of water and two different bodies in charge of them: the private ones that were owned by the Lords of Water and were acquired in daily auctions and the public ones that were administrated by the SHC and also acquired by farmers in the auction. The main reason to this distinction was that the Heredamiento had also the right of way over the water distribution channels which implied that as all waters had to be distributed by the same

net of channels, the Heredamiento determined the mechanism of distribution. From 1948, the traditional system started to be questioned. Some users started claiming the autonomy of the Irrigation Community from the CHS in relation to the watering out of the La Cierva dam. Several proposals among farmers claiming for a transformation of the traditional system of distributing water represented the first step towards a change in the existing institutions.

➤ In 1966, two major changes in the traditional administrative and distribution system marked the start of a new phase in the development of the regime. On the one hand, the Lords of Water agreed on the transfer of water management to the Irrigation Community and, on the other hand, water auctions were abolished and the *tanda* system of distributing water, which was a 20 day period in which water was distributed, was established. But the following years came with another drought period that resulted in scarcity problems and social conflict. The lack of supply from the Segura river concession, the high price of water and the low efficiency of the irrigation system resulted in the rationing of the available water resources, a premature crop ageing, a decrease in land productivity and a rural exodus. As a result of the search for new water resources by the Irrigation community, in 1981 a well was opened and the concession of 4hm<sup>3</sup> per year from the Tajo-Segura diversion became available. Along the late eighties, the huerta became less and less profitable: crops were rapidly ageing, the traditional irrigation system became more inefficient, the inequalities of water distribution became wider and water prices kept increasing.

➤ Within this context, at the end of the eighties a process of deep transformation of the institutional structure was initiated. This process resulted in the redistribution of property rights and the adoption of a Modernisation Plan. The redistribution of property rights was directly conducted by the Irrigation Community, whereas the Modernisation Plan was elaborated by the regional Ministry of Agriculture in Murcia and the Centre for Applied Edaphology and Biology on the Segura (CEBAS), although it was based on the proposals made by the Irrigation Community.

In 1990 the president of the Irrigation Community started the process of unifying all waters by proposing the Irrigation Community to purchase waters owned by the Heredamiento. This was possible because, in the mid eighties, the Heredamiento had already lost its monopoly on water property rights as public waters coming both from La Cierva dam and the Tajo-Segura diversion were also available. This circumstance, together with the fact that in the mid eighties the Murcian region suffered from a severe drought period—which meant that the Lords of Waters could not get much profit from the almost inexistent flow of La Fuente de Mula— was a powerful reason to persuade the Lords of Water to sell their property rights to the Irrigation Community and allow the redistribution of water property rights. The Irrigation Community assigned a price to each portion of water (the *cuarto*) and established the terms in which it would try to purchase as much *cuartos* as possible with their own financial resources. Nowadays, a very reduced number of *cuartos* are still in the hands of the Lords of Water and the Irrigation Community keeps on negotiating with them in order to purchase the remaining ones. The process of purchasing water is expected to conclude by the end of 2002. Once concluded,



the Irrigation Community intends to publify these waters by registering them in the Water Register of the SHC.

The Modernisation Plan was designed by the Murcian administration and counted with the financial aid of EU funds. The plan has conducted an in-depth transformation of the water distribution system. To do so, the plan first updated the users' census and quantified the total water available and the monthly needs for crops. In order to optimize the distribution and use of water, the plan divided huerta into seven irrigation sectors, each of them receive water through eight interconnected small dams. The dams receive water from the deviation channel at the Mula river, La Cierva dam, El Pradillo and El Corral wells. Apart from that, the Modernisation Plan is innovative as the distribution net is computerized and centralized so that the Irrigation Community receives immediate information about all the operating parameters of the system and can regulate and have a control over it. The water distribution system has also substantially changed, as the *tanda* system has been replaced by a new one based on the 'water quota', which is the minimum quantity of water per hectare available to every user at the beginning of the hydrological year. The quota is calculated at the end of each hydrological year according to the available resources and the foresight of ground waters availability. In order to rationalize the use of water, the Modernisation Plan has given users incentives to replace the traditional flooding system of irrigation by a dropping system. This has had the effect of consuming less quantities of waters. To this respect, water stored in the dams that have not been used revert to the Irrigation Community. Thanks to the computerisation of the distribution and management system, users can elaborate their own Irrigation Programme. To this respect, the Modernisation Plan introduces another innovation consisting of giving each user a Water Saving Book—which is very similar to an ordinary saving book from a bank—in which information about water consumption is registered. The new distribution and management system also allows the transfer of water as the Modernisation Plan has established the figure of a Water Bank operating at the huerta level. Through the Irrigation Communities, users can transfer their waters from one farm, sector or owner to another. They can also transfer water to be used in future situations of water scarcity. Finally, the plan has facilitated the adaptation and transformation of their crops into the flooding system and, through the Irrigation Community, it has created a training program for farmers which was developed at the same time as the Modernisation Plan works (Del Amor et al, 2000). In general terms, the autonomy given to users has resulted in a more efficient use of water, a dilution of social conflict and in increase of number of young farmers having a part time job at the huerta. Nowadays, the Modernisation Plan of Mula is having a demonstration effect for the transformation of other huertas at the Murcia region.

### **An Assessment of change**

The process of institutional change that has taken place at the Mula huerta can be characterized as internally driven. Changes have taken place at two main levels: the operational and the collective choice level. The main actors have initiated actions at the operational level and have also searched for the support and resources of actors at other scales of 'governance' (regional and European level) to introduce changes at the

collective-choice level. As a result a new water management program has been implemented and the rules governing the irrigators' activities were substantially redefined. The following table summarizes the main actions that resulted from such changes.

**Table 2. Main actions at the operational and collective-choice levels**

COLLECTIVE-CHOICE LEVEL	OPERATIONAL-LEVEL
<ul style="list-style-type: none"> <li>- Abolition of the water auctions</li> <li>- Unification of all waters (the Irrigation Community purchases the property titles of water in the hands of the Lords of Water)</li> <li>- Census update (farmers, lands and crops)</li> <li>- Authorisation of huerta studies (water demands of crops, available resources to irrigation, optimum storage capacities and consumption levels)</li> <li>- Authorisation of land expropriation to install the new irrigation system.</li> <li>- Co-design of the Modernisation Plan (Irrigation Community-CEBAS-Regional government)</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Actions of Irrigators</b> <ul style="list-style-type: none"> <li>- Adaptation of crops and lands to the new irrigation system</li> <li>- Adoption of new management practices</li> <li>- Attendance to meetings and conferences about water management strategies in a context of scarcity</li> <li>- Participation in the training program before the implementation of the Modernisation Plan.</li> </ul> </li> <li>➤ <b>Actions of Irrigation Community staff</b> <ul style="list-style-type: none"> <li>- Reporting on dam storage and water resources conditions</li> <li>- Technical Assistance and support to irrigators</li> <li>- Centralised management, control and monitoring of the irrigation system.</li> </ul> </li> </ul>

In parallel to this process of transformation of the formal rules at the operational level, informal rules are also changing. Progressively, irrigators are abandoning the traditional practices and norms of behavior associated to the traditional regime of distributing and using water and learning news ways of organizing individual and collective action.

#### *Change Agents*

The main change agents identified in the Modernisation of the Mula huerta have been not only endogenous but also exogenous. As *endogenous* change agents we can identify:

1. *Local leadership.* The Irrigation community was the actor having the main interests in changing the existing institutional arrangements. It has provided its members as much information as possible about the potential benefits of changing the operational rules and about the costs of maintaining the status quo. It has also provided information about possible alternatives, and has given its members the possibility of visiting settings in other parts of the country where similar modernized irrigation systems had already been implemented.
2. *Problem pressure.* Two main factors account for the intensification of such pressure. On the one hand, the high levels of uncertainty associated to the availability of water resources (severe drought periods) that led to high levels of

social conflict and, on the other hand, the deep crisis of the traditional structure of the Mula huerta that threatened the production activities of all farmers.

The *exogenous* triggers of change have been the following:

3. *Expertise and technical support.* The scientific knowledge and experience of CEBAS staff in developing efficient irrigation systems in arid and semi-arid regions have been a crucial factor in the design and the implementation of the Modernisation Plan. Its technicians have also given support to irrigators in developing their annual irrigation plans.
4. *Initiative of the regional government.* The regional Ministry of Agriculture had a clear predisposition to promote and adopt policies at the regional level that increased the efficiency of the local irrigation systems. According to this aim, it envisioned the Modernisation Plan of the Mula huerta as a pilot plan with a demonstration effect in other areas of the region.

#### *Favorable Conditions*

The main factors that have provided fertile ground to the process of institutional change have been the following:

- (1) *Homogeneity of interests and shared perception of the problem.* The members of the Irrigation Community approved by unanimity the implementation of the Modernisation Plan and initiative of purchasing the property titles to the owners of water. This was so because they perceived that the expected costs and benefits from the change will be equally distributed to all members.
- (2) *Joint future chances.* Participants not only have shared a past; they also share both an interest and a responsibility for the future. In this sense, an institutional change was needed in order to secure the sustainability of the huerta (and the future generations)
- (3) *Existence of a dominant actor.* The Irrigation Community has accumulated sufficient imbalance of influence to involve other actors at various scales of governance—and their resources to lead the process of institutional change.

#### **Evaluating outcomes**

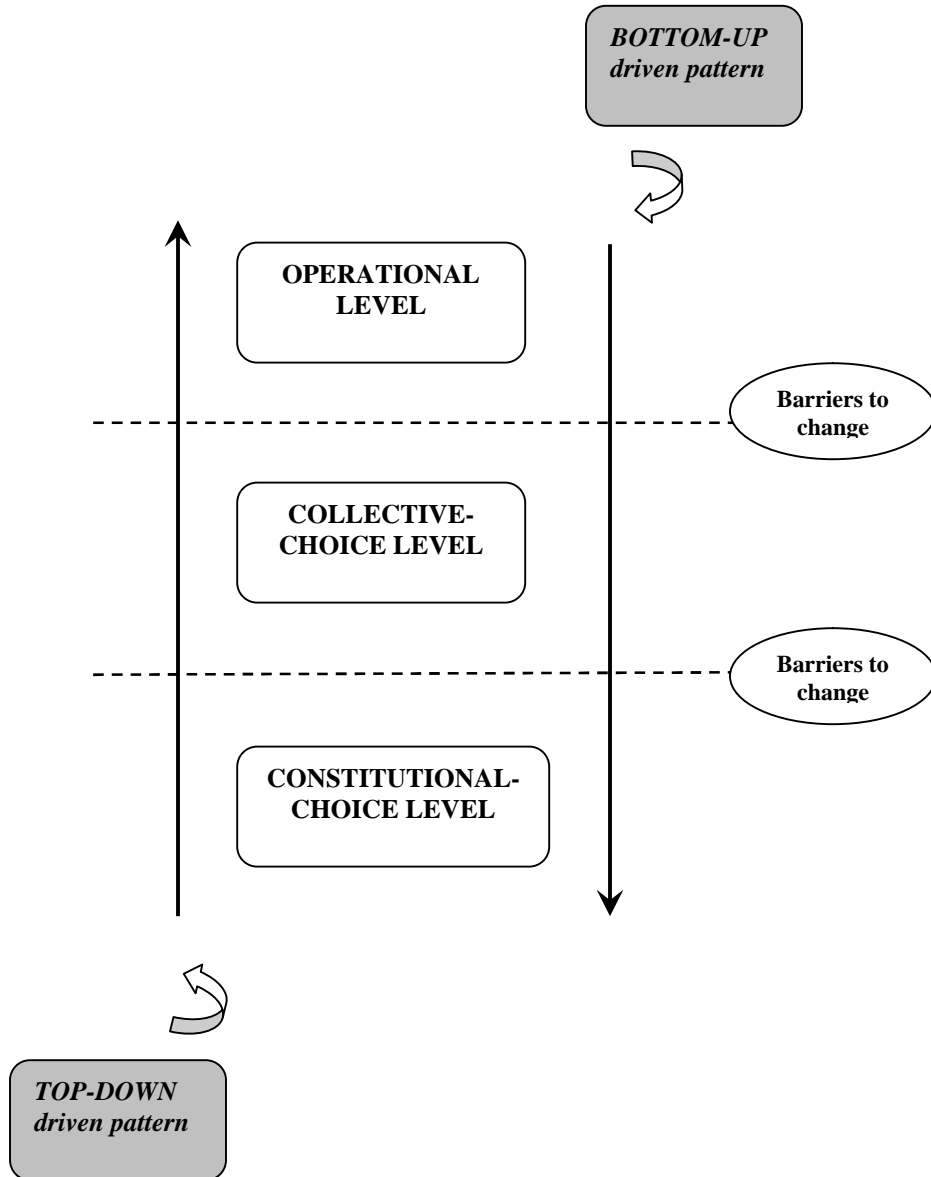
The main outcomes of the process of institutional change have had several economic, ecological and social implications. Regarding the economic aspects, the cost of water for farmers has decreased and the productivity of land has considerably increased. Regarding the sustainability of water resources, there have also been considerable savings in water and energy consumption, as well as a decrease in the water losses. Besides, the Modernisation Plan has established several measures in order not to overexploit the aquifers. Finally, regarding the social aspects, the implementation of the Plan has improved the living quality of farmers and has contributed to stop rural exodus at the Mula huerta by providing incentives to young farmers to stay.

## **Concluding Remarks**

I began the first sections of this paper by stressing that both formal and informal institutions do matter, and that both exogenous and endogenous factors do account when explaining change at different levels of the institutional arrangements. The case of the modernization of the Mula *huerta* in Spain has been used to illustrate some of these points in relation to the management of a common-pool resource.

The complex interaction among the multiple variables that influence the dynamics of change, however, can not be captured from the analysis of a single case. This complexity suggests that the development of more general theories and frameworks for analyzing change faces important challenges. Two of these challenges have been highlighted in his paper. On the one hand, the level of complexity that characterizes the interaction of the multiple variables that influence change operates (simultaneously) at various levels of the rule configuration and various scales of governance requires special attention. On the other hand, a deeper understanding of the role of culture in explaining human behavior is needed in order to explain the relation between formal and informal institutions—and the potential implications of such relation in explaining institutional change.

**FIGURE 1. Levels of Institutional Change**



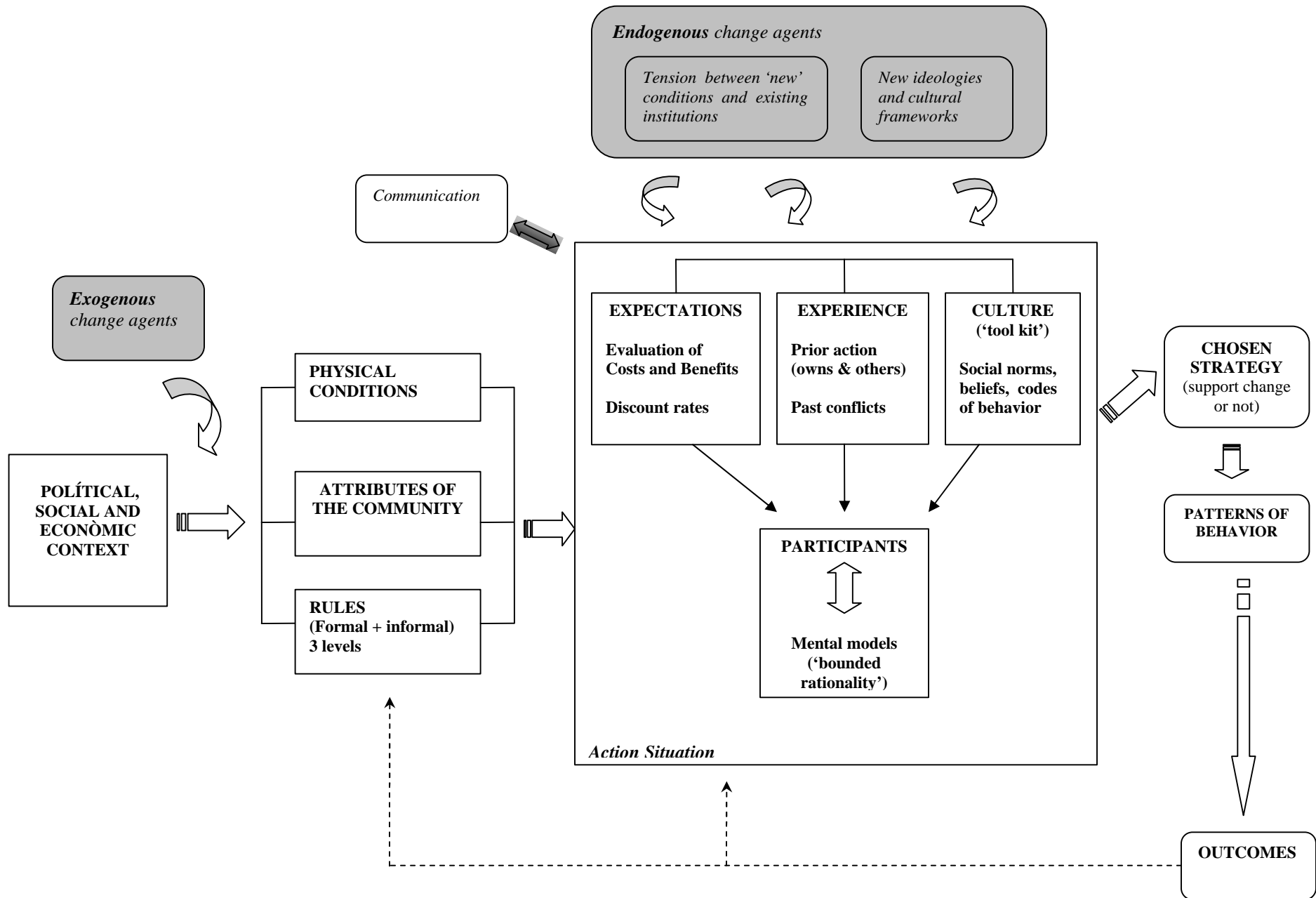


Figure 2. Institutional Change within the IAD framework

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