Central, Individual, or Collective Control?

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Natural Resource Management

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Abstract

In this article, natural resource management is conceptualized as a social dilemma, a conflict between the short-term self-interest of users and the long-term collective interest of the user community. A self-interest versus community perspective is offered to explain individuals' decision-making in resource dilemmas. The self-interest model assumes that users seek to maximize their personal benefits regardless of the collective implications. To foster sustainable use, it is necessary to restrict people's access to the resource, either through controlling the resource centrally (centralization) or by creating a system of individual access (individualization). The alternative community model suggests that communities can foster self-restraint among users provided that they feel attached to their community. These two perspectives and their implications for natural resource management are systematically compared using findings from research on water conservation.

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Social Dilemma Strategies for Natural Resource Management

A major challenge for society in the 21st century is how to cope with a growing misfit between the demand for and availability of scarce natural resources, such as energy, food, land and water (OECD, 1998). Unless some drastic innovations occur in how societies across the world manage these resources, the call of the recent Rio Earth Summit for a sustainable resource use may be based more on hope than a sense of realism.

Environmental experts agree that drastic policies are necessary to prevent serious resource shortages, and that they should include activities to promote long-term conservation (World Resources Institute, 2000). This is not an easy task, however, because there is an inherent conflict between the needs and desires of individuals and those of their community or society. Whereas individuals want to conveniently use resources, such as water, energy, and space, communities are better off when individuals exercise some restraint. This conflict of interests is generally known as a social dilemma, and, more specifically, as a commons or resource dilemma (Van Vugt, Snyder, Tyler, & Biel, 2000).

In the present article I will first introduce the theory of social dilemmas and apply this theory to the problem of natural resource management. I will then discuss two different psychological perspectives on managing natural resource conflicts, both of which emerge from the social dilemma framework. Following a model of self-interest, solutions to resource dilemmas must be sought in changing the structural features of the dilemma. This can be done either by regulating resource access via a central authority (centralization) or by creating a system of individual access (individualization). These two strategies are generally recommended by policy analysts, but not always for the right reasons. An alternative community perspective

is offered, which suggests that communities are able to foster self-regulation among users to the extent that the community plays an important role in their lives.

In this article, the self-interest versus community perspective will be systematically compared in terms of their assumptions and implications for natural resource conservation. I will apply these models to the problem of domestic water conservation, which I have been studying over the past few years. Water conservation is regarded as one of the biggest challenges for the welfare of communities worldwide (World Resources Institute, 2000). Because water resources are frequently managed locally (Schlager, this issue), it is quite suitable for contrasting the self-interest and community perspectives. Yet, although water management undoubtedly has some unique properties, the conclusions of this article may be extended to other natural resource problems of a social dilemma nature, for example the depletion of energy, fish, land, and forestry (Van Vugt et al., 2000).

Conservation as Natural Resource Dilemma: Theory and Assumptions

The main assumption underlying my research is that the reward structure of conservation resembles that of a resource dilemma. This dilemma was first described by Garrett Hardin in his classic analysis of the Tragedy of the Commons (1968), in which a number of herdsmen share a common pasturage (the commons) where they can graze their cattle. The tragedy starts when one herdsman realizes that by increasing his stock by just one animal, he can provide his family with more meat. Because the costs of his action are shared by all herdsmen, the consequences will be futile, so he argues. However, at some point in time, every one of the herdsmen realizes this, and sooner or later the commons gets overcrowded. The final result is systematic overgrazing, erosion of the pasture, and ultimately the loss of the commons as a resource for the entire community. This end is inevitable according to Hardin (p.1244): "Each man is locked into a system that compels him to increase his herd without limit – in a world that is limited. Ruin is the destination toward which all

men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all."

The problem described by Hardin represents just one type of a class of social problems in which individual and collective interests clash, and for which no obvious solution is possible. Other well-known types of social dilemmas include the prisoner's dilemma and the public goods dilemma. Each of these problems is formally defined by two properties (Dawes, 1980): (i) Each individual receives a higher personal outcome for a non-cooperative decision no matter what the other people in the community do; (ii) The entire community is better off if all or most individuals cooperate rather than act selfishly.

Take the example of water conservation. It is highly attractive for residents of a community to use water at their convenience. Indeed, most of us would want to have the freedom to wash our cars, use our dishwashers or sprinkle our gardens whenever we feel like it or believe it is necessary. Yet, when water reserves are limited, for example due to a drought, it can be dangerous for people to act in accordance with their narrow self-interest. Such conditions demand restraint from users to prevent the resource from collapsing. At the same time, however, it is tempting for people to "harvest" as much as they can before the resource dries out.

Theoretical Perspectives on Managing Resource Dilemmas

How can communities across the world ensure that local resources, like water, fish, energy, and land are used in a sustainable way? To answer this, we must analyze the behavioral decision-making process in resource dilemmas. Over the past decades, much research has been devoted to studying behavior in social dilemmas, both in social psychology and other social science disciplines (economics, political and environmental science, sociology). This is not the place to provide an exhaustive review of this literature. There are excellent review texts available elsewhere (Foddy

et al., 1999; Komorita & Parks, 1994; Liebrand, Messick, & Wilke, 1992; Schroeder, 1995; Van Vugt et al., 2000).

There are essentially two different perspectives on the origins of cooperation in resource dilemmas, the self-interest versus community perspective (Tyler & Dawes, 1993; Van Vugt & De Cremer, 1999). The self-interest model asserts that resource users are driven by their short-term self-interest. They will try to increase their consumption regardless of the social and environmental consequences. This perspective is advocated by game theory and other rational theories that have long influenced our thinking about social dilemmas (Luce & Raiffa, 1957; Thibaut & Kelley, 1959). It is epitomized in the work of well-known philosophers like Aristotle, Thomas Hobbes (Leviathan) and Adam Smith as well as in Hardin's (1968) contemporary analysis of the commons tragedy.

But is a tragedy inevitable? In Hardin's example, will the herdsmen really allow their common pasturage to be destroyed in the pursuit of narrow self-interest or are they able to devise long-term solutions to use the land in a more sustainable way so that everyone benefits in the long run? There is substantial evidence against the self-interest model from applied and experimental social dilemma research, showing that users do restrain themselves in consuming valuable resources. There are numerous case reports of communities all over the world which have been found to successfully manage common water, fishing, and agriculture resources for many centuries (Ostrom, 1990; Schlager, 2000). These findings converge with evidence from experimental social dilemma research which show that restraint is common when users manage a collective resource simulated in a laboratory environment (Messick et al., 1983; Samuelson et al., 1984; Wilke, 1991).

These lines of research (and many others) suggest that users are sensitive to other aspects of the decision situation than self-interest. From the social-psychological literature stems a set of complimentary motives, which can be

summarized as belongingness and identity needs (Baumeister & Leary, 1995; Tajfel & Turner, 1986). It is believed that human beings have a basic desire to develop and foster meaningful social relationships and, via this, build up a shared social identity. When these needs are unfulfilled, for example when people are forced to leave a social group, our mental and physical well-being suffers (Baumeister & Leary, 1995). The importance of these social needs, which possibly stem from an evolutionary adaptive preference for living in groups (Caporeal et al., 1989), may help to understand why cooperation emerges relatively easily and spontaneously between people who live in the same community.

Note that cooperation within a community is not the same as altruism. During a resource crisis, some residents may show restraint out of a genuine concern with the welfare of other people to whom they feel connected. Yet it is equally possible that they cooperate because they feel the social pressure to conform. Or, they cooperate because they wish to gain some respect within the community. Regardless of the underlying motives for cooperation, I believe that this community model offers quite a different perspective on natural resource management than the self-interest model.

Centralization as Solution to Resource Dilemmas

Following the self-interest model efficient resource management can only be achieved by changing the interdependence structure underlying the dilemma so that it becomes in people's self-interest to conserve. There are two generic structural strategies to achieve this, either by increasing central control over a resource (centralization) or by increasing individual control (individualization).

Centralization is basically a political solution as it involves taking away, or drastically limiting, the freedom of users and replace the open access resource with a central authority who regulates access. The implementation of a central authority is what theorists, like Hobbes and Hardin, perceived to be the only viable strategy to cope with resource dilemmas. In the extreme, the authority (or group leader within a

small group) completely controls resource access, and divides the resource between users. These autocratic authority regimes are quite rare in reality, and only emerge when there is an acute disaster, like a war. In resource crises authorities often choose to increase their control over a resource when it is collectively desired. For example, in a study on a water shortage in the US it was found that citizens were willing to empower local water authorities to enforce restraint when they perceived the shortage to be severe (Tyler & Degoey, 1995).

Regulating access to a resource through a central authority can be effective in dealing with resource problems because it effectively solves the dilemma. Yet, there are two important drawbacks associated with the centralization of resource control. First, users do not like to give up their freedom in the commons to an authority who completely regulates resource access. This can be concluded from the results of laboratory research on resource dilemmas. Although an autocratic authority is generally more acceptable to users if there is an acute resource crisis (Messick et al., 1983), the support is not overwhelming. It makes a difference what users perceive to be the cause of the crisis (Samuelson, 1991). When the cause of a water shortage is attributed to the greed of other users, people are less accepting of a central authority than when they believe the shortage has a non-human cause, such as a climate change. In the first case individuals either do not believe that an authority system can actually stop selfish people from overusing the resource or they fear that the authority is corrupt and exploitative.

Furthermore, when given the choice between different authority systems, users have a general dislike for an autocratic authority. They much rather prefer to be led by an elected, democratic authority that allows group members to exercise some control over the decision-making process (Van Vugt & De Cremer, 1999). In addition, adopting a central authority has been found to be very unpopular when group members also have the choice of creating rules amongst themselves, like an equal

division rule or a majority rule to prevent overuse (Rutte & Wilke, 1985; Samuelson, 1993).

A second reason why central solutions to resource dilemmas may not be successful is that they are not very efficient (Ostrom, 1990). It is inconceivable that a central authority can control the resource supplies within a community, especially a large community, without relying on an extensive surveillance system. Hence, it requires a huge operation to ensure that all community members cooperate and that they do not "steal" from each other (Bell et al., 1989). Finally, a central authority may lack the local knowledge to adequately monitor the state of a resource and devise optimal rules for use and distribution of the resource. These arguments are summarized in Table 1.

Individualization as Solution to Resource Dilemmas

The self-interest model suggests an alternative method for regulating resource access in communities, that is, through the creation of anonymous rule systems for resource use. To produce the desired effects, these rules must increase the personal rewards associated with conservation so that it becomes in people's self-interest to cooperate. Because these rule systems affect the decision structure for individuals, while leaving their personal freedom largely intact, they effectively individualize access to the resource.

There are various regulatory rules possible. Probably the most extreme division rule is to divide the resource into equal parts and allocate each part to an individual user. This solution is commonly referred to as privatization (Ostrom, 1990; Samuelson, 1993). It effectively solves the dilemma because, in theory, individuals can only affect their own outcomes, not those of others. Privatization may work with some resources, such as land. For example, to avoid the Tragedy of the Commons each herdsmen receives a piece of land to graze their flock, which they fence off and guard against tress passers.

However, privatization is virtually impossible with resources that have no definable boundaries, and it is therefore less clear who exactly has the right to use them. The best examples are fish, water, energy, and air. To control such resources other rule systems have been introduced. The most common regulatory system to cope with resource dilemmas is via sanctioning systems (Tenbrunsel & Messick, 1999; Yamagishi, 1986). These systems operate on the basis of simple reinforcement schemes, whereby behavior is measured and, based on the outcome, a particular reinforcement is applied (Eisenberger, 1992). For example, excessive use may be punished. Punishments are usually monetary fines, but they can be physical as well, for example, when users are excluded from consuming a shared community resource (Kerr, 1999).

Sanctioning systems have been found to work well in dealing with cooperative problems in social dilemmas simulated in the laboratory. For example, Yamagishi (1988) found that the overall cooperation level in groups with a sanctioning system – in which the least contributing member received a monetary fine -- was almost 50% higher than in groups without such system. Yet, in applied research in organizations, the effects of punishments, for example, to promote cooperative behavior in the work place has been found to be fairly small (Tyler, this issue).

Compared to the adoption of a central authority system, rule systems have some important advantages. First, rules are neutral and impersonal and they are therefore more likely to be acceptable for users than a single authority figure (Rutte & Wilke, 1985). Furthermore, users probably assign greater legitimacy to rules than to authorities, and rules are therefore less likely to be exploited. Rule systems thus require generally less monitoring and surveillance than an authority system would. Moreover, in rule systems users will monitor each other to ensure everyone complies to the rules. For example, after the privatization of the commons each of the herdsmen will have an incentive to defend their private land against intruders.

Yet, a main problem with the introduction of rule systems, such as privatization and sanctioning, is that it may change the way individuals perceive resource problems within their community. Rather than perceiving them as a collective problem, individual users may start to perceive them as individual problems (Tenbrunsel & Messick, 1999). If users are willing and able to pay the penalties they incur for overusing a resource, why should they show any restraint? Hence, if the resource is treated as a private, economic good people may be unwilling to show restraint when they are asked to do so, for example in a crisis. This is the major drawback of individualizing. These arguments are summarized in Table 1.

A Community Perspective on Resource Management: Collectivization

An alternative framework for developing solutions to resource dilemmas is the community model. According to this perspective, communities are able to foster self-restraint among users as long as the community provides individuals with a sense of identity and belonging. When these needs are fulfilled, users will start to take a longer term perspective on their relationships with others and they will cooperate rather than compete with each other for scarce resources. Hence, following this model there will be no need to intervene in the incentive structure of the dilemma. Rather, interventions should focus on developing and strengthening community ties.

According to social-psychological theories of identity (Hogg & Abrams, 1988; Tajfel & Turner, 1986), people derive part of their self-worth and esteem from the groups and communities that they belong to. An indicator of the psychological relevance of a community is the strength with which people identify with their community. A strong sense of community identity facilitates cooperation between individuals and brings their values and goals closer to those of the community they are part of.

Experimental research has shown the powerful effects of a shared community identity. For example, stressing a common fate between a group of unrelated

individuals in the lab fosters their cooperation in social dilemmas (Brewer & Kramer, 1986; De Cremer & Van Vugt, 1999; Kramer & Brewer, 1984). Similarly, cooperation in a prisoner's dilemma game increases dramatically if individuals are allowed to communicate with each other (Dawes, McTavish, & Shaklee, 1977) and are accountable to each other for their actions (Jerdee & Rosen, 1974). Finally, even the salience of a trivial common feature between a group of strangers can produce spontaneous ingroup cooperation (Ellemers et al., 1993). These findings suggest that a shared community identity enables group members to organize themselves quickly and efficiently in solving collective problems.

There may be several reasons for this. First, a strong community identity could transform an individual's self-interest to an overarching community interest, thus blurring the boundaries between personal and collective welfare (De Cremer & Van Vugt, 1999). Hence, people start to believe that what is good for their community is also good for them. Second, a shared identity increases the trust that users have in other members of their community. Among high community identifiers there will be an expectation of reciprocity, which is an essential condition for cooperation. When people make an effort to conserve they will expect others in their community not to free-ride on their efforts (Kramer & Brewer, 1984). Finally, identification with the community could enhance feelings of pride in the community. Because people want their community to compare favorably to other communities in managing local resources they are keen to show restraint (Tyler, 2000; Tyler & Degoey, 1995).

It has been relatively easy to manipulate an individuals' social identity within artificially created groups in the laboratory. In real-world groups, however, this may not be so straightforward. For a strong community identification to develop there must presumably be a set of structural conditions present within a community. In her case studies of community resource management projects, Elinor Ostrom (1990)

observed four different conditions conducive to successful resource management: 1. local resource dependence; 2. availability of knowledge about the resource; 3. appropriate rules and procedures (i.e., for exclusion of outsiders and fair distributions), and 4. the presence of a community. Regarding the latter, she found that small, stable, homogenous communities with a dense network of social relationships generally performed better in managing local resources than did larger, more anonymous and transient communities. These structural factors, as well as others, may form the basis of a strong sense of local community identity. These arguments are summarized in Table 1.

Comparing the Self-interest and Community Models of Resource Management

How can we reconcile this community perspective on resource management with the seemingly opposite view that self-interest is the driving force in resource dilemmas? Rather than one of these models being right, it may be that both perspectives have some predictive value but in different situations. In situations in which community members have developed a strong attachment to their community, resources can be managed successfully via the self-regulating activities of community members. Members of these communities perceive the importance of the resource for the quality of life within their community and they will therefore engage in voluntary restraint when necessary. Furthermore, regular interactions between community members ensure that they can coordinate their actions smoothly and correct each other if needed. In other words, there is sufficient social capital (Sullivan et al., this issue) in such communities to manage resource dilemmas.

This may not be true in weakly tied communities. Members of communities that lack a sense of shared identity are more focused on their personal outcomes. They are not interested in exercising voluntary restraint to help the community, because they attach little value to their community membership. Furthermore, they may have little trust in other people's cooperation. To deal with resource dilemmas in

such communities, it may therefore be necessary to develop interventions which appeal directly to individual's narrow self-interest.

One structural solution is the adoption of a central authority that regulates members' access to the local community resource. Yet, it may be quite difficult in a weakly tied community to reach consensus between members about who should be given the authority role and how much control they should have over the rest of the community (Van Vugt & De Cremer, 1999). When there is not much trust in each other how can anyone trust anybody to lead the community (i.e., the so-called "quis custodiet ipsos custodes" or "who guards the guards"-paradox)? Under these circumstances it is more likely that members decide for managing the resource via interventions that individualize resource access, for example by creating impersonal rules and sanctioning systems. Accordingly, following the self-interest model it seems that an individualistic strategy is the most viable strategy to promote conservation when members of communities identify only weakly with their community.

In the following sections, I will present research on the interaction between the self-interest and community perspectives on resource conservation. I will examine how social-psychological processes shape the effectiveness of an individualistic strategy to promote resource conservation, the metering of domestic water use.

Water Metering as an Individualistic Strategy to Foster Water Conservation

Domestic metering can be seen as an attempt to individualize resource use, because it establishes a direct link between the consumption of a resource and the financial costs. The more users consume of a particular resource, like electricity, gas or water the more they have to pay. Users without meters pay a flat tariff which is independent of their consumption level (although the tariff size is usually determined by standard household features, like household size or property value). In most developed countries, metering is considered to be an appropriate and acceptable structural intervention to foster efficient resource use. Gas and electricity meters are

standard equipment in almost every Western household, except in settings where it is physically impossible or economically inefficient. In dorms and apartment blocks, for example, there is often a central metering system and users share the costs of gas and electricity between each other, which poses a social dilemma (Van Vugt, 2001).

Unlike with gas and electricity, there are some significant differences between Western countries in the availability of water meters. Water metering is compulsory in most countries within Europe except for the United Kingdom and Ireland. In the UK just over ten percent of households are currently equipped with a water meter (OFWAT, 1996). Traditionally, UK households pay a fixed tariff for their water. Although one might think that there is enough annual rainfall in the UK to cater for the needs of everyone, recent evidence contradicts this popular belief. A few years ago, in the summer of 1995, the UK faced one of its most severe water shortages of the past century, due to long periods of hot weather combined with minimal rainfall (OFWAT, 1996). Local authorities and water companies urged the population to use less water, and in various places bans were introduced on the use of garden hoses and sprinklers.

The Impact of Individual Metering in a Resource Shortage

How did users respond to this resource crisis? Were people willing to show self-restraint, and were there any differences between metered and unmetered residents in their responses to the crisis? These were the main questions we tried to address in a first study (Van Vugt & Samuelson, 1999). Adopting a social dilemma framework, we expected that individualization would have an overall beneficial effect on water conservation during the crisis. The argument was fairly straightforward. Following a self-interest model, users are more tempted to consume from a resource the scarcer the resource gets (Kramer et al., 1986). Yet, with a water meter people's temptation to use more is moderated by an anticipated increase in financial costs.

Hence, water meters should be particularly effective in reducing use when it is in people's self-interest to use more, that is, when they experience a severe shortage.

To test this idea, we administered 120 questionnaires at the end of the shortage period in September 1995 to residents in Southern England, 60 in a community without water meters (unmetered sample) and 60 in a community with meters (metered sample). This latter community had been part of a metering trial in the late 1980s and households were still on a metered tariff. A convenience sample was drawn from people attending supermarkets within these two communities on various days of the week.

Seventy-six complete surveys were returned (63.3%), 40 from residents in the unmetered community and 36 from the metered community. There were no systematic differences between the samples in terms of social-demographic make-up. The questionnaire contained various sections. First, several questions concerned the perceived severity of the shortage (e.g., "The water shortage had an important impact on me and the other members of my household"). This was followed by a question regarding the financial costs of water use ("During the shortage I remained reluctant to "splash out" because of the fear for a large bill"). Thereafter, we measured people's trust in other community members ("I think that other people were using too much water" "I felt it was unfair that my household was asked to use water wisely, while other members of my community did not"). We also presented ten statements referring to people's conservation behaviors during the shortage (e.g., "During the shortage I took fewer baths or reduced the amount of water in the bath" "I only used the washing machine when I had a full load"; "I washed my car less than usual"). These were combined into a single conservation score.

Using a hierarchical regression approach, we first regressed the aggregated conservation measure onto various demographic variables (age, gender, household size), but none of these variables had a significant impact. In a second analysis we regressed the conservation measure onto the meter-variable, the perceived severity of

the shortage and the combination of these factors.[1] Following a self-interest model, we anticipated that users from the metered community would show greater personal restraint than residents from the unmetered community when they perceived the shortage to be severe. Together, the entire model accounted for 30% of the variance in individual conservation scores. Results revealed a strong effect of perceived severity on conservation (beta = 0.47), but this was qualified by the meter-variable (0.44). It turned out that to the extent that the shortage was perceived to be more severe, people reported greater conservation but only when their water use was metered. In the unmetered group people were showing less restraint when they thought the shortage was severe.

The same pattern was revealed in the monthly water consumption records of the two communities. When we plotted the growth figure of water use in 1995, the year of the shortage, compared to the previous year, we found that the growth rates were not equivalent between the two communities. As expected, in the unmetered community there was a sharp increase in water consumption during the shortage period (12.3%), whereas this was less pronounced in the metered community (6.8%).

What were the psychological mechanisms behind the obtained differences between users in the metered and unmetered communities? In the metered community the temptation to consume more water during the shortage was overridden by a concern about financial costs. When we compared the correlation coefficients between the conservation index and the concern with financial costs we found a moderately positive link between conservation and costs in the metered community (.18), but no link in the unmetered community (.01). For unmetered residents conservation was influenced by perceptions about what other people in their community did. We compared for both groups the correlation between trust and conservation and found a stronger positive link between trust and conservation in the unmetered group (.48) than the metered group (.21).

From this study several conclusions can be drawn. In support of the self-interest model, we can conclude that water metering is a beneficial individualistic strategy to foster restraint when communities face an acute resource shortage. Furthermore, without the financial incentives, the conservation efforts of users in the unmetered community seem to be more strongly related to trust in others. This suggests that community factors play at least some role in explaining decision-making in resource dilemmas.

Community Identity and Resource Conservation

We conducted a second study to examine if resource conservation could be predicted by the strength of people's identification with their local community (Van Vugt, 2001). Anticipating a trade-off between self-interest and community interest, we predicted that water metering would be effective in promoting conservation for users that have a weak community identity. They would be guided by their self-interest. Users with a strong community identity, however, would have an intrinsic motivation to conserve and should therefore be less sensitive to financial incentives.

This hypothesis was tested in a study conducted in one community in Southern England. All households had a water meter in this community, and the majority were charged for the amount of water they used (metered sample), while a minority were charged according to a fixed tariff (unmetered sample). All properties were meter read during a nine months interval (March to November 1997). During this interval a short questionnaire was also sent to each household. Two-hundred and seventy-eight questionnaires were returned (47.2%), 203 from metered households, and 75 from unmetered households.

The survey addressed various topics, including three questions regarding the strength of community identification ("I feel strongly attached to the community I live in" "There are many people in my community whom I think of as good friends" "I often talk about my community as being a great place to live"). A single community

identification-scale was construed with an acceptable reliability and a median split was performed on the sample to create a group of low versus high community identifiers.

We analyzed the monthly consumption data, whereby the nine months interval was regrouped into three seasons: Spring (March through June), Summer (July through September) and Fall (October, November). We predicted that community identification would affect water use for the unmetered group only, and particularly during the summer season in which resources were relatively shorter. Controlling for differences in household size, the results revealed that water use was overall lower in the metered group (10.05 [x 1000 liters]) than in the unmetered group (16.58). This is in accordance with a self-interest model. This effect was influenced by members' community identification, however. There was no difference between low (9.60) and high community identifiers (10.50) in the metered group. Yet, in the unmetered group low community identifiers (19.11) consumed significantly more than high identifiers (14.04).

These differences were particularly strong in the Summer season, during which low community identifiers (21.93) used much more water than high community identifiers (14.64). Differences were also found between low and high community identifiers in the Spring period (19.45 vs. 14.39). In the Fall, however, there were no systematic variations between low and high community identifiers (15.96 and 13.10).

These findings support the conclusion derived from the first study that an individualistic strategy like water metering is a beneficial method for community resource management. An individualistic strategy, however, is necessary only when users do not identify with their community. As we have seen, members who identify strongly with their community are not sensitive to financial incentives. They will show personal restraint when resources are relatively short regardless of whether it is

in their self-interest or not. These findings suggest an interplay between self-interest and community interests in tackling resource management problems.

Conclusions and Implications

Inspired by the social dilemma framework I proposed three different strategies for natural resource management, centralistic, individualistic, and collectivistic strategies. The first two types of interventions emanate from a self-interest model of social dilemmas which assumes that individuals' use of common resources is dictated by narrow self-interested motives. An alternative community model was offered to explain why user communities sometimes engage in collective restraint to manage a communal resource. Users may show restraint if their community is important to their psychological well-being, which is evidenced by a strong sense of community identification. I hypothesized that a strong community identity would undermine the effect of centralistic and individualistic strategies to manage common resources.

Research on domestic water conservation showed the anticipated trade-off between individualistic and collectivistic strategies. First, we found that an individualistic strategy in the form of water metering was quite effective in moderating the demands for water during an acute resource crisis. The success of this strategy can be explained by a greater concern with the financial costs of overusing the resource. In the absence of water meters, however, residents' conservation efforts were more strongly linked to their trust in the cooperation of others in their community. Complementing these findings, we showed in a further study that metering was effective but only for users who identified weakly with their community. Strong community identifiers showed restraint regardless of whether their use was being metered, thus regardless of the financial consequences.

In combination with findings from the experimental social dilemma literature (Komorita & Parks, 1994; Van Vugt et al., 2000) and research on common pool resources (Gardner & Stern, 1996; Ostrom, 1990), our results indicate that the self-

interest and community models are complimentary in explaining cooperation in resource dilemmas. Community concerns restrict users in pursuing their immediate self-interest, thereby protecting the long-term interests of the broader community. Furthermore, these community concerns are activated by a strong psychological identification with the community, which was measured with a relatively simple three-item survey-instrument.

To get an idea of the psychological underpinnings of the community identity concept, it may be helpful to analyze the content of the survey items: Feelings of attachment to the community, taking pride in the community, and having friends within the community. Attachment is an affective measure of identity as it reveals a sense of belonging (Baumeister & Leary, 1995), whereas pride is more a cognitive judgment about the status of the community within the larger society (Tyler & Smith, 1998). Finally, having friends within in the community is a behavioral manifestation of community identity because it conveys the quality of interactions between community members.

Community identification processes may be rooted in more structural conditions within the community. For example, the size and stability of a community, the homogeneity of the population, the presence of norms, rules, and procedures may facilitate the development of a shared community identity. If community identity is indeed influenced by these distal factors, and future research should investigate this, this could have implications for community resource management. Experts agree that the globalization of economies may lead to a breakdown of traditional communities, due to an increased population mobility. As communities become more open and heterogeneous, it may be difficult for people to develop a local community identity. Perhaps for this reason, at least in the Western world policy makers prefer to adopt individualistic strategies to foster efficient resource management (e.g., metering, privatization, taxation).

Our research findings provide some justification for this approach. When a community does not fulfill members' identity and belonging needs then conservation becomes purely a matter of self-interest ("What can I get out of it?"). Accordingly, conservation strategies must appeal to this motive in order to be effective. I have suggested two different ways to achieve this, either by regulating access via a central authority or, if this is not acceptable, via the individualization of a shared resource. A possible drawback of this strategy, however, is that it eroded any intrinsic motivation to save a valuable common resource within a community (Deci & Ryan, 1975). By individualizing access, users may perceive the resource as an economic rather than social dilemma (Tenbrunsel & Messick, 1999). This is a dangerous development especially in emergency situations, such as shortages, in which extra voluntary efforts are needed from citizens. For this reason, it is relevant to further the study of community identity processes in order to develop interventions that foster the ties between members of communities in increasingly open societies.

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Footnotes

1. Before entering the severity variable into the equation the scores were centered to control for multicollinearity between independent and dependent variables (Aiken & West, 1991).

Table 1. A Social Dilemma Framework for Natural Resource Management

Model	Dominant behavior	Motive to conserve	Strategy	Psychological conditions for success	Structural conditions for success
Self-interest	unrestrained use	self-interest, material rewards and punishment	centralistic (central authority)	legitimacy of authority, willingness to empower authority	presence of surveillance system
			individualistic (rule systems, privatization)	concern about material outcomes, lack of trust in others	dividable resource, clear resource boundaries, technology
Community	conservation	belonging and identity needs	collectivistic	identification with community, trust, pride	small, stable and homogenous community, impermeable boundaries