Chapter 10
The Social Dilemma of Climate Change: Socio-economic Implications

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Abstract A social dilemma lies behind many environmental problems, such as climate change. Analytically separating temporal aspects from structural aspects of the environmental dilemma prevents wrong conclusions. This article concentrates solely on the structural aspects with different grades of complexity and different grades of ignorance in the dilemma. Dilemmas with sufficient complexity, such as climate change, and/or ignorance of the stakeholders are extremely vulnerable to individual defections. Therefore, governance is an absolute must and institutions are necessary. However, controls and sanctioning are key factors of institutions. Consequently, psychological approaches should not only target the individuals, but integrate in a multidisciplinary programme that focuses on governance tasks with respect to (1) the structural diagnosis of the social dilemma of climate change; (2) didactic instruments and methods that give addressees an insight into these structural problems; (3) the role of governance for the stakeholders on internalizing norms; and (4) the impact of structural knowledge on accepting institutions that help to solve the structural part of the sustainability problem. Psychological research in institutional ergonomics could help to create addressee-friendly governance, where the addressees know about the value and adequacy of certain restrictions for the sake of common welfare and sustainability.

Keywords Climate · Environmental psychology · Governance · Institutional design · Sanctioning · Social dilemma

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Introduction: Climate Change Is Essentially a Social Dilemma

Beyond many environmental problems, there is the structure of a social dilemma. Since Hardin (1968), environmental social dilemmas have been tagged as "the tragedy of the commons", and it is well-known in environmental psychology that many environmental problems are social dilemmas: "The-tragedy-of-the-commons process underlies most problems of environmental pollution, just as it underlies the depletion of most natural resources" (Gardner and Stern 1996). This is especially true for climate change. The globally most challenging social dilemma is "the prevention of dangerous climate change. Reaching the collective target requires individual sacrifice, with benefits to all but no guarantee that others will also contribute" (Milinski et al. 2008). In this quotation, the authors describe very aptly the structure of the social dilemma with respect to climate change, but partially confound it with temporal aspects. This article concentrates on the dilemma and depicts some relevant implications.

Social Dilemmas

The very simplest form of an environmental dilemma is the prisoners' dilemma (cf. Luce and Raiffa 1957). In its classical form, the prisoners' dilemma is presented as follows: Two suspects are arrested by the police. There is a lack of evidence for a conviction. Therefore, the suspects are separated and individually interrogated. In this interrogation, the police offer a deal similar to a leniency. If the interrogated testifies (defects) for the prosecution against the other and the other remains silent (cooperates), the betrayer goes free and the silent accomplice receives the full 10-year sentence. If both remain silent, both prisoners are sentenced mildly for a minor charge. If both betray each other, both of them receive a 5-year sentence. What should the prisoners do? In either case (the other betrays or the other remains silent), betraying is the better choice (dominant strategy). However, if both follow this individual-rational consideration, both are worse off than if each of them had been silent. Betraying on the part of both is a win-win situation. However, this win-win situation is very unstable, because betraying of the other would absolve the prisoner (and lead to a very high sentence for the silent prisoner).

In this very simple social dilemma, there are only two stakeholders (individuals or interest groups) and only two choices to select from. Nevertheless, like all environmental dilemmas, the prisoners' dilemma is a serious conflict between individual rationality and collective reason (Poundstone 1992).

International policies concerning climate change lead to a political Prisoners' Dilemma. Governments have to decide whether or not to take action against climate change. Countries benefit if climate change is prevented, independent of whether they support such policies or not. This free-rider problem is hard to tackle.

Even worse, many environmental dilemmas are much more difficult than the prisoners' dilemma. In the following, I would like to point to three issues that are

mostly relevant with respect to climate warming (1) There is asymmetry in the dilemma; (2) there are more than two stakeholders in the dilemma; (3) there was a long period of blindness about being in the dilemma and it is not clear how blind the addressees are today; (4) besides the dilemma itself, there are complicated time dependencies that make the problem much more complex.

Climate Warming Is an Asymmetric Dilemma

Even this simplest form of an environmental dilemma, with two stakeholders and two options, respectively, can be enriched in complexity by introducing asymmetry. In this case, it is much harder to reach welfare and cooperation. Distributive justice plays a crucial role in conflicts with such asymmetries.

A reason for such asymmetries could be different costs of the consequences of climate warming, such that one nation ends up better off in mutual defection than the other. Data from the lab indicates that in asymmetric prisoners' dilemmas the phases of cooperation are much shorter and long phases of cooperation are extremely rare compared to the symmetric dilemmas (Beckenkamp et al. 2006). Magen (in preparation) assumes that dilemma experiments with unequal endowments reveal the ambiguity of fairness criteria in almost every experiment about asymmetric social dilemmas (see also Magen 2006).

Due to such justice conflicts, there is a special dynamic in asymmetric prisoners' dilemmas. Structural solutions that help to maintain welfare may become necessary. An important approach is to negotiate side payments. Other solutions, such as keeping the situation deliberately opaque with respect to the benefits (such a solution can often be found with respect to payments of employees), are hard to implement in the context of climate warming. Moreover, such an approach may yield the problem of "blind" dilemmas and the veil of ignorance described below. In the context of climate warming, it is also impossible to find good reasons that justify the inequalities in the consequences. Due to the asymmetries, climate warming is a topic where issues about distributive justice are entangled with issues about procedural justice (Ittner and Ohl 2006).

There Are Many Stakeholders in the Dilemma

In most of the environmental dilemmas, there are more than two stakeholders involved. This is especially true for climate warming. Like in the 2-person dilemma, there is a free-rider problem (see also van Lange et al. 1992). Therefore, the game-theoretic equilibrium falls apart from the welfare optimum, and the welfare optimum is unstable because there is always the temptation to defect for each of the stakeholders.

A serious problem is that reciprocal strategies are hard to implement or do not even make sense in N-person dilemmas. Some nations and stakeholders at least try to use reciprocal strategies by imitating what other stakeholders do and, moreover, making some leap of faith in their efforts against climate warming. Underlying this approach that tries to come to mutual cooperation, there is a strategy called "measure for measure" (cf. Beckenkamp 2009). Nevertheless, the efficiency of reciprocal strategies in N-stakeholder dilemmas is much worse than in 2-stakeholder dilemmas. Even worse, communication is also problematic, because with the growing number of participants in the dilemma, communication channels and rules are necessary. The difficult environmental dilemmas such as climate change could probably never be resolved without institutions.

Is Climate Warming Still a Blind Environmental Dilemma?

Traditionally, from a historic point of view, climate warming was also a very difficult environmental dilemma because in contrast to many laboratory experiments with social dilemmas, the stakeholders were not aware about the dilemma they were in. They had only limited information about their own situation, and no information about either the behaviour of others or about the others' measures against climate warming. It is plausible to assume that under such circumstances the stakeholder will learn defection instead of cooperation (cf. Beckenkamp 2009). Nowadays, most of the stakeholders are probably aware of important aspects of the social dilemma, although it is an open question as to how much they really know about it.

At the beginning of the initiation of policies against climate warming, many stakeholders seemed to be blind to the matrix of social interdependencies in which the decisions are made. Stakeholders made decisions without the intention of harming others, although their decisions were freighted with huge negative externalities. If the stakeholders had no insight into the structure of the "game", i.e. the social interdependencies of the decisions with other stakeholders, it seems rather obvious that they could not believe the scientific and political claims that less energy consumption could mean more welfare.

The general global trend in policies to deregulate in many domains and to create "efficient" markets may even have amplified such tendencies to care only about the impact of decisions for oneself. On the other hand, licences for CO_2 emissions are a powerful economic instrument to do away with the external costs of CO_2 waste production. The initiators now have to bear the costs themselves, and the stakeholders who avoid CO_2 waste production can benefit from their efforts. An efficient market means that there are no market failures and therefore no social dilemmas. In such cases, blindness poses no problem. Unfortunately, climate warming is a consequence of inefficient markets, and until now there has been no remedy that abolishes the market failures in sum. Until now, the licences have concerned only parts of the problem.

Temporal Aspects of Climate Warming

Milinski et al. (2008) describe environmental dilemmas not only from a structural aspect, but also with regard to its temporal side, by saying that "substantial emissions reductions are likely to have negative short-term economic effects, but failure to accomplish this reduction may well incur dangerous climate change later, resulting in substantial human, ecological, and economic losses" (Milinski et al. 2008). Although this is undoubtedly true, this temporal aspect should be separated from the structural aspect of the social dilemma. The temporal aspect is independent of social interdependencies and can also be a problem for a single person, as, for instance, in the case of addiction problems. It requires other interventions than the structural dilemma aspect. The temporal implications also need psychological instruments other than the structural implications.

Climate change is an extremely complicated environmental dilemma, because the dilemma structure itself is complex and because the time latencies and nonlinearity of many causal interrelationships are very complicated. It is a political problem with the highest complexity in both the social interrelationships and the natural science foundations. The social dilemma implies a situation of social interdependencies, and it only occurs when there are at least two persons striving for maximal incomes (or minimal efforts). Therefore, climate change is not only a problem that is relevant for natural sciences. Trying to solve the dilemma without a consideration of the social interdependencies must fail. The social dilemma is an essential component of the environmental problem climate change, and this facet of the problem must be well understood and analysed in and of itself.

Implications of the Structural Complexity: Institutions Are Necessary

The success and applicability of reciprocal strategic reactions of stakeholders stands in close dependence to the complexity and structural form of the dilemma. A complex social dilemma such as climate change is extremely vulnerable to defections coming from minorities. In such cases, institutional solutions are necessary to help stabilize mutual cooperation. However, such institutions must not necessarily come from outside or top-down, because historic examples and current cases show that self-governance can be possible (Ostrom 1990). Yet, it should not be overlooked that not only governance from outside but also successful self-governance always includes monitoring and sanctioning – even in small groups governing a common-pool resource. Nevertheless, self-governance may outperform governance from outside, because the efficiency of controls and the adequacy of sanctions are highly dependent on context specificities. Often, nobody knows such specificities better than the addressees of institutions themselves. Nevertheless, in the context of climate change it seems implausible to assume that self-governance alone could be sufficient.

Empirical experiences demonstrated that in complex environmental dilemmas, it is hard to convince the individual of their individual impact on the destruction of their basis of existence. Many environmental studies report long-lasting mediation processes to overcome environmental dilemmas (cf. for instance, Ohl et al. 2008).

Focusing on the structural aspect of the dilemma could lead to new strategies in the mediation process and new tasks in education. People should learn about the question "If everybody knows that we are destroying our environment with heavy energy consumption, why do people continue as they do?" They should learn that is not necessarily the malignance of individuals that leads to this destruction, but also the structure of social interdependencies that may even force part of the people to behave defectively in order to guarantee their own existence and survival. People should learn more about the necessity of institutions that change these structures. Nobody wants to be controlled and sanctioned in cases of defection – an insight into the structural problem, however, can lead to an acceptance of such institutions (Yamagishi 1986).

Potentially, experimental games could help to communicate this issue. The games can illustrate the trap that stakeholders are locked in, and thus accelerate mediation processes. Why not make use of dilemma games about climate warming with the stakeholders themselves – games adapted to their situation that demonstrate that they could achieve a win-win constellation, but that this constellation is extremely vulnerable? This would be a completely new approach in institutional design. Instead of making use of experimental games in order to reveal data in the lab, such games can also be used both for data acquisition (i.e. the diagnosis of social interdependencies) and, after that step, for specific mediation in the dilemma conflict in order to come to a well-integrated institutional design. They could also help to foster the introduction of institutional solutions, and integrate the stakeholders' knowledge in such an approach. This, again, would also lead to more self-governance and less governance top-down in the solution of the dilemma.

Experimental games could also be used for target-oriented data acquisition and lead to a game-theoretic valid model. This approach would take several steps. The first step is the identification of the relevant stakeholders within the environmental dilemma. How many players are there in the game or, accordingly, how many stakeholders are there in parts of the environmental dilemma? The answer to that question provides the relevant stakeholders. Ideally, such studies should be shaped in such a way that the number of different interest stakeholders is small, such that a rather big conflict (as, for instance, climate warming in general) can be partitioned into manageable sub-conflicts. Therefore, instead of integrating the conflict between private energy consumption, transportation and energy production, it would make sense to focus on the transportation conflict and within that, aviation, and to map other conflicts in other games, such that each conflict can be put on its own agenda.

Once the stakeholders of such a manageable conflict have been identified, the second step would be to try to identify the relevant action space of the respective stakeholders; this corresponds to the rows and columns in the examples given before. Then, in the last step, the ranks in the evaluation of the different combinations of

actions for each of the stakeholders should be elevated. This would lead to preference tables that represent the "game" played by the respective stakeholders.

Such preferences could be revealed by requesting the whole combination of actions that can be ranked by the different stakeholders. When the "game" is identified, it can be used in confrontation with the stakeholders in order to check the validity of the diagnostic process. If the "game" fits well, the diagnosis of the environmental problem (which can be an environmental dilemma, but could also have a different, non-dilemma structure) is finished and the same game can be used to illustrate the structural problem beyond the stakeholders. If the game does not fit well, the diagnosis itself should be evaluated with respect to the differences between the answers the stakeholders gave and the denial of the stakeholders with respect to the game that has been identified on the basis of their answers. This could bring up relevant questions that had not yet been posed until that point of data acquisition.

Making use of experimental games in order to come to a valid diagnosis of conflicts is one issue where environmental psychology and experimental economics could tie in with institutional design. However, until now, institutional design has mainly been a topic in political science, law and economic theory. In social conflicts, psychology is mainly used for mediation and strategies of attitude and value change in the addressees.

Psychology could do more, because such a diagnosis could be a solid foundation for the support in interventions. Many environmental problems are complex social dilemmas (Brock and Xepapadeas 2003), and climate change is one of these problems. Such environmental dilemmas need both institutional solutions and insight into and support of such solutions by the addressees. The valid diagnosis of the "game", i.e. a game-theoretic representation of the environmental dilemma that is not denied by the stakeholders with respect to its relevance and validity in relation to their situation, could be used as an illustration for the stakeholders about their strategic situation. Above all, the game can be used to illustrate that the stakeholders could strive for a win-win constellation – however, a win-win situation that is extremely reactive to defections. This raises the question of how to stabilize the win-win constellation, and thus the purpose of institutions can be illustrated, and the games used to discuss and prototypically implement different institutional solutions. The games would illustrate that there is a problem of trust, and that trust in norms could solve a big part of the problems. The instrumental question would be how a trust in norms can be established. In many cases, it would become obvious that institutions play an important role.

Both the diagnosis of the environmental dilemma and the intervention with a preparation of institutional solutions are tasks that fit psychological research goals and applications very well. Therefore, psychology could have a much better impact on institutional design. Beyond doubt, this is an ambitious task. Until now, psychology has mainly been ignored, probably with fatal consequences for the environment, because according to current research in psychology and other disciplines, it can be expected that the success of institutions in solving social dilemmas crucially depends on the addressees' interpretation of the institutions.

This issue is closely connected to the question what role a structural insight into the dilemma plays, which the institution is about to solve. Should the research demonstrate that institution acceptance crucially depends on the insight into the problem the institution is about to solve, then this research would be extremely important. Although psychology is rich in relevant knowledge about how to give addressees insight into environmental problems, it does not yet have much experience about different methods that facilitate insight into environmental social dilemmas. This research could tie into a long tradition in psychological research about social dilemmas (cf. Liebrand et al. 1996).

This leads to a further research issue about the circumstances under which institutions are either seen as an intrusion from outside or as a help in solving a pressing problem. Institutions can only be successful if the latter is true, and psychology can contribute with research and know-how. This research is closely related to psychological research about justice and justice sensitivity (see, for instance, Gollwitzer et al. 2005).

Moreover, research should not only be concerned with improving institutions, but also with changing the impact of institutions on internalized norms. Both injunctive norms and descriptive norms are favourable for solving environmental dilemmas, and descriptive and injunctive norms are in a positive interaction (Thogersen 2008). Institutions probably play an important role in inducing cooperation in environmental dilemmas by modifying the belief that others cooperate (descriptive norm), and by modifying the belief that relevant others expect one to cooperate (injunctive norms). Within the domain of institutional design, psychological research about the role of institutions on the internalization of descriptive and injunctive norms is important. Under normal circumstances, controls and sanctions are usually bad. However, controls and sanctions can also be important to give positive signals on what society expects from the individual and what the individual can expect others to do.

This positive impact of institutions depends on whether the institutions are easy to understand, and whether it is easy to understand what institutions expect in a given situation. In political science, it is well known that institutions that are made to solve environmental social dilemmas – or, to be more specific, common-pool resource problems – have to be transparent, comprehensible and fair. According to Dietz et al. (2003) and Ostrom (1990), this is an essential feature of successful governance. Many of the institutions that are made for governing climate change and to attenuate the expected disasters seem still to be far away from these considerations, both due to the immense complexity of the problem and the lack of understanding as to the necessity of targeting on issues of social sciences.

Conclusion

Like many environmental dilemmas, climate change is extremely complex, even if it is only analysed from the point of view of a social dilemma: there are many stakeholders with asymmetric benefits from solutions against climate change,

and they act in tangled hierarchies. Above this complex structure, with respect to the dilemma, there is also a complicated time trajectory with uncertainty and non-linearity. Nevertheless, the social dilemma problem in climate change also needs solutions of its own. Agreements alone are not sufficient, because due to the dilemma, there are many incentives to defect. Therefore, solving such a complex situation requires institutions with the power to monitor and sanction defections against agreements. The dilemma itself already has tremendous complexity, and therefore, until now, approaches that integrate solutions to handle temporal uncertainty with institutional solutions are far from reach. Instead, due to the temporal uncertainty, the conference in Copenhagen was far from coming to any institutional solution that could handle the social dilemma in climate change.

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