

Irreversible social change

Citation for published version (APA):

Pols, A. J. K., & Romijn, H. A. (2014). Irreversible social change. In G. Collste, & L. Reuter (Eds.), *Proceedings of the 50th Societas Ethica Annual Conference, 22-24 August, 2013, Soesterberg, The Netherlands* (pp. 79-99). Linköping University Electronic Press.

Document status and date:

Published: 01/01/2014

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.

Irreversible Social Change

A.J.K. Pols

Section of Philosophy & Ethics, School of Innovation Sciences, Eindhoven University of Technology, Eindhoven, The Netherlands

H.A. Romijn

Section of Technology, Innovation & Society, School of Innovation Sciences, Eindhoven University of Technology, Eindhoven, The Netherlands

Abstract

In this paper we evaluate how irreversible social change should be evaluated from an ethical perspective. First, we analyse the notion of irreversibility in general terms. We define a general notion of what makes a change irreversible, drawing on discussions in ecology and economics. This notion is relational in the sense, that it claims that a change can only be irreversible for a certain party. Second, we examine ways to evaluate irreversible changes, drawing on discussions from both ethics, particularly the Capability Approach, and economics, particularly Cost-Benefit Analysis and the Safe Minimum Standard. Insights from the field of development studies are also woven into the discussion. Third, we investigate why (adverse) social changes tend to be systematically undervalued in decision making by private actors and policy makers, and argue for applying the Safe Minimum Standard as a decision rule for dealing with irreversible social changes. Finally, we show how our framework can be applied by evaluating the land acquisition process of biofuel producers in Tanzania.

Keywords: irreversibility; socio-economic systems; Safe Minimum Standard; Habermas; biofuels

1. Introduction

In discussions on the environment and global climate change, a special place is often reserved for changes that are considered to be *irreversible*, such as species extinction or the melting of the Greenland ice sheet. Such changes are considered to be ethically problematic if those changes lead to harm because of their structural nature. Though conceptions of irreversibility differ, they generally require that a change has a long duration, is impossible (or extremely costly) to revoke, and destroys or impairs something that cannot be substituted (Verbruggen 2013). Any harm caused by an irreversible change can thus be considered to be permanent. This has led to incorporation of the notion of irreversibility in some versions of the Precautionary Principle, for example, the explication in the 1992 UN Rio Declaration:

‘In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.’ (Principle 15)

It is noteworthy that, while the 1992 UN Rio conference was on the topic of environment and development, the irreversible damage alluded to in this principle is only applied to environmental degradation resulting from human action. Indeed, the concept has mostly (and successfully) been applied with regard to changes in the *environment* (Adger et al. 2009), yet there seems to be no good reason for not applying it to changes that could damage or hamper *development* as well, e.g. social changes such as degradation or destruction of social or cultural institutions. It could be even argued that society and environment are intertwined to such a degree, as suggested by the literature on socio-ecological systems (Berkes et al., 2001) that this distinction is artificial and should be abandoned.

However, even if we maintain the distinction, there are at least two good reasons for applying the concept of irreversibility to social changes. First, irreversible environmental damages are considered problematic or harmful at least partly because they can threaten the availability of ecosystem services that are needed for human well-being. Irrespective of whether we regard social and environmental systems as distinct or not, they tend to be tightly coupled (Marten, 2001), especially in the case of the rural poor who are strongly dependent on local ecosystem services for their livelihoods (Barbier, 2005, 2012; Aggarwal, 2006).

Irreversible environmental damages do not necessarily induce irreversible social damages, e.g. depending on whether adaptation is possible (Walker et al., 2006). However, adaptation always requires effort and energy. In some situations the requirements may exceed the capacities and resources that local populations can harness. An account of what constitutes irreversible social damages and when they are likely to occur could thus help in the ethical evaluation of irreversible environmental damages, at least from an anthropocentric perspective.¹

Second, many cultural and social institutions are valuable for, if not constitutive of, individual and group identity and self-realization. In addition, their structural degradation can in turn lead to further adverse impacts on the environment, for instance when mounting pressure on vital local livelihood resources causes the breakdown of cooperative local arrangements for resource maintenance that prevent structural overexploitation of the commons (e.g., Ostrom 2000). In this way, interactive ripple effects between the human and ecological parts of systems can greatly amplify the initial impact from, say, the introduction

¹ This is in addition to, rather than in the place of, any ethical reasons connected to the intrinsic value of natural entities or processes that could be lost or degraded in the change (McShane 2007; 2012).

of a new technology or a human intervention, giving rise to vicious cycles that can induce the systems to transgress their ability to cope (Barbier 2012).

At the same time, even structural damages to those social institutions cannot be quantified easily and thus are often not taken into account when performing risk assessments or cost-benefit analyses of policy measures (Adger et al., 2009). Attempts by economists to assign prices to so-called non-market values of (socio-)environmental systems (e.g., Costanza et al 1998) capture this problem only imperfectly, since ‘not everything that is of value can be valued’ (Bergius 2012). This applies especially to so-called ‘non-use values’ associated with the functioning of an organism, such as protection against natural hazards, beautiful views, the sound of flowing water, or spiritual or religious associations with (aspects of) the natural environment (van der Horst and Vermeulen 2011).

This is where ethical reasoning can make a contribution. A first step towards remedying the situation would be to investigate the notion of irreversibility and what it means for a change in social institutions to constitute an irreversible harm. This can help explicating these changes and increase awareness about their importance, allowing for a more inclusive evaluation. Our research question in this paper is thus: *How should we evaluate irreversible social changes from an ethical perspective?*

We address this question in the following way. In section two, we examine what an irreversible change *is*, as conceived of in the literature on ecology and ecological economics. Building on these conceptions, we define a *relational* notion of irreversibility in social changes, which assumes that a change is always (ir)reversible *for an actor* (which may include an institution or natural system). In section three, we examine proposals on *how to value* irreversible changes from ethics, such as the Precautionary Principle, and from (evolutionary) economics, such as the Safe Minimum Standard. We spell out the various ways in which irreversible changes may be ethically relevant, and to which degree this necessitates going beyond traditional consequentialist analyses in ethics and cost-benefit analyses in economics. In section four we develop our theoretical framework on what irreversible changes are, and how they should be valued, in the social world. We use Habermas’s account of ‘colonisation of the lifeworld’ to both explain why social changes are systematically undervalued in policy-making and suggest possible remedies, also drawing on complementary insights from the field of development studies. In section five, finally, we test our framework on a case study of biofuel developments in Tanzania. Following the publication of the EU’s 2009 Renewable Energy Directive (EU RED; EC 2009) and its ambitious renewable energy target for the transport sector, various projects based on different business models were set up in many tropical countries, including Tanzania, in order to produce biofuels for export to Europe. Although their adverse social risks and impacts have been subject to review (e.g., van der Horst and Vermeulen 2011; Hodbod and Tomei 2013), the issue of irreversibility has remained implicit. We examine how these activities have impacted a.o. land ownership and smallholder farming practices; whether there are (potential) irreversible social impacts from these changes; whether these have been adequately considered by the initiators of the change; and try to give recommendations based on our framework.

2. What is an irreversible change?

Irreversibility can be defined in a number of potentially valid ways, though irreversible changes are generally acknowledged to give rise to *long-lasting effects*; are *difficult to undo* / have *high revoking costs*; and lead to the loss of substances or processes that are *difficult to substitute*. Rather than tackling the concept(s) head-on, we will start by listing four conditions that our definition should adhere to in order to achieve the purposes of this paper.

First, the definition should be meaningful. That is, it should not yield a situation in which all changes are irreversible, e.g. because each change takes time, and the flow of time can

never be reversed (at least, not in our experience). Nor should our definition yield a situation in which no change is irreversible, e.g. because the effects of each change can in principle be undone, given enough time, energy and resources (cf. Humphrey 2001). Similarly, it should be able to deal with the fact that making a certain choice necessarily precludes making other choices at that moment, some of which would likely have beneficial effects. In economic terms, we could say that each act of choosing involves making opportunity costs, the costs incurred by losing the opportunity to do something else. For example, sending my children to school will likely (irreversibly) benefit them, but at the same time, deny them other benefits, such as those they would have gained by playing or sports during school hours.

Second, the definition should be relevant for informing policy. The notion of irreversibility in environmental changes has been useful in informing UN policy through the Precautionary Principle. Similarly, the notion of irreversibility in social changes should at least be able to apply to practical cases and have the potential to play a role in policy-making.

Third, the definition should apply to those cases where the change is a clear departure from the status quo. The notion of irreversibility is often applied to (eco)systems that have a relatively stable mode of functioning, that can be disrupted by some outside influence (Verbruggen 2013). This stable status quo is a prerequisite for an irreversible change to be morally relevant due to its irreversibility. For example, if the last tigers are about to kill the last antelopes, and killing the tigers would be your only way to save the antelopes, then irreversible changes will occur whether you act or not, and irreversibility thus cannot give you a reason to prefer one course of action over the other.

Fourth, the definition should acknowledge that people value different things in different ways. There are many ways of valuing things, such as intrinsically, for the sake of itself, and instrumentally, as a means to achieve some valuable end (McShane 2012). Definitions of irreversibility that focus solely on system functions, such as Verbruggen's (2013) are in danger of overlooking changes to entities that are valued intrinsically, and where authenticity is very important, such as holy places, particular species or areas of cultural or historic value, etc. While we should avoid a definition that acknowledges each entity as unique and its demise as irreversible (and thus, one that will be meaningless in practice), the destruction of, say, the Eiffel Tower or the demise of the Javan rhinoceros could be considered irreversible because of the particular nature of those entities. Even if the Eiffel Tower were rebuilt or another great herbivore were to fill in the gap in the Javan ecosystem, unique artefacts or species can still be valued in themselves, and thus considered 'unsubstitutable'.

Taking these conditions into account, we propose a notion of irreversible change that is fundamentally *relational*. That is, whether a change is reversible or not depends fundamentally on the capacities, values and resources of those affected. This has the advantage of anchoring notions such as 'last long' and 'difficult to undo' to a concrete perspective. For example, a change such as a new law coming into effect can be considered irreversible from an individual point of view, but not from the point of view of the government. Also, it allows us to make a distinction between the party that *initiates* the change and the one that *is affected by* the change, and thus, whether considerations of justice or paternalism come into play. Note that for irreversible changes in general, both the initiating and the affected parties can be natural events or processes as well as humans. While we aim to give a general definition of irreversible changes, however, our paper focuses on irreversible social changes, where both the initiating and the affected parties are human.

We propose the following definition:

"A change is *irreversible* for a party *X* if and only if the effects of the change can be expected to last for *X*'s lifetime or longer; if *X* does not have and is unable to acquire the capacities and resources to undo the effects of the change; and if the effects include the destruction or termination of something that *X* has reason to consider to be non-

substitutable; or the creation of something that X has reason to consider to have no functional equivalent.”

We briefly elaborate on this definition. First, the party X can range from a single individual to the whole of humanity. Indeed, the latter seems to be the party implicitly assumed in literature on irreversible ecological changes: while the extinction of a species or the melting of the Greenland ice sheet can be considered perfectly reversible processes, given unlimited time and resources, they are irreversible from humanity’s point of view. We can distinguish here between changes that are *universally* and *locally* irreversible: we consider a change to be *universally* irreversible if X can include all of humanity, that is, the change cannot be reversed meaningfully even if all of humanity were to attempt it. Examples include the melting of the Greenland ice sheet, or a language dying out when its last speaker passes away. We consider a change to be locally irreversible if it is irreversible for some subset of humanity (say, a local tribe or community) but not for all of humanity. Examples include local or regional environmental disturbances such as large-scale deforestation, or the drying up of large water resources due to structural drawdown for cultivation of crops requiring too much irrigation. These changes cannot be resolved locally but could be addressed by a coordinated international effort. Other examples include most legal changes, e.g. anti-gay laws that change the situation of a nation’s LGBT community for the worse, but that this community cannot itself repeal. Though such laws might be repealed by the government at some later time, as long as they do not have an explicit expiration date, policy-makers should evaluate them as they would other permanent changes: a locally irreversible change is still irreversible, *all other things remaining equal*.

Second, the choice of X ’s lifetime for the duration reflects the importance of perspective: the handing out of 99-year land lease contracts by the government of Tanzania to foreign investors (Sulle and Nelson, 2009) - see section 5 -, may not constitute an irreversible change for the country, but it can certainly be considered irreversible for the affected smallholder farmers.

Third, whether something is substitutable depends on two factors. The first is how the entity is valued: if it is valued intrinsically, as itself, it can be considered to be unique or to have a strict identity (e.g. the Eiffel Tower). In that case, the entity is considered non-substitutable. If it is valued instrumentally, as means to an end, its substitutability depends on the availability of alternative means to reach the end. Note that substitutability does not equal compensatability: Humphrey (2001) gives the example of a bread that may compensate me for the loss of a glass of water, yet is not a substitute.

Fourth, while irreversible changes are usually considered in the context of *destruction* (species, entire ecosystems, the Greenland ice sheet), they can also take the form of *creation*. For example, the creation of nuclear waste or the coming into effect of a law that promotes injustice can be considered a change that introduces an irreversible harm.

An irreversible change does not have to constitute a harm. Indeed, an irreversible change may well be a structural improvement, such as education, or it may be a ‘mixed bag’, where it has both beneficial and harmful effects, or the effects are valued differently by different affected parties - the effects of a 99-year land lease may be valued quite differently by the investor and the smallholder farmers using the land; or by those who get hired to work on a new plantation and those who merely get evicted from their ancestral homes without being offered a job. We define an irreversible harm as follows:

“An irreversible change is also an irreversible *harm* for a party X if and only if that party has reason to consider one or more effects of the change harmful.”

This definition is quite broad, in the sense that even a ‘mixed bag’-change is considered harmful under this definition. However, note that unlike the Precautionary Principle, this

definition does not yet forbid irreversible harms. It is set up rather broadly so as to ‘flag’ those changes that need further ethical attention. How to evaluate irreversible changes and harms is a question in itself which we address in the next section.

3. How should we value irreversible changes?

An irreversible harm has one obvious aspect in common with a reversible harm; that it is a harm. The primary ethical difference is that an irreversible harm permanently closes off *options for action* for a party, thereby limiting the ways in which a party can flourish - or survive.² This can occur because of an external change, such as loss of resources, land or unique entities, or the introduction of an innovation into a natural environment where it can go out of control, such as a genetically modified organism (van Merkerk and van Lente, 2005); or it can occur because of internal changes, such as reduction of capacities or capabilities, or death. This is not a strict distinction, nor does it need to be so: especially the more complex socio-ecological systems are, the fuzzier the boundary becomes between system and environment. In addition, many changes affect both. For example, education on sustainable soil management can improve both the capacity of a community to care for its soil and thereby, the variety and quality of their agricultural options. Generally, however, both ethical and economic methods of valuation have focused on either of one side.

While ethics tends to evaluate *actions* rather than *sets of options for action*, some work has been done in this area. The normative side of the capability approach has elaborated on the capabilities that allow people to do and be what they have reason to value (e.g. Sen 1992; Nussbaum 2006; Robeyns 2011). In the philosophy of technology, Illies and Meijers (2009) have called sets of possible actions ‘action schemes’, and argue that we have both the responsibility to perform morally right actions and bring morally right action schemes into existence. Illies and Meijers offer no criteria, though, for judging whether a given action scheme is morally better or worse than another. Intuitively, one could think that having more options for action available is always better, but this does not have to be true (Peterson and Spahn 2011). An example of this can be found in the debate on human enhancement, where it has been argued that cognitive enhancement (increasing our cognitive capacities) without corresponding moral enhancement could worsen rather than relieve current societal problems (Persson and Savulescu 2008; Pols and Houkes 2011). Similarly, in the philosophy of technology Jonas (1984) has argued that technology has enabled us to make drastic and far-reaching changes, the consequences of which we cannot adequately foresee, let alone control. According to Jonas, this has given us an unprecedented responsibility to develop our capacities to anticipate and evaluate the possible (negative) effects of those changes. Also, the extension of an action scheme may be morally better for some affected parties and worse for others. For example, expensive moral enhancements may make those who undergo them ‘better’ persons, while at the same time promoting inequality and disadvantaging the poor who cannot afford them.

An important ethical consequence of irreversible harms is that they often leave people and communities worse off in their capacity to resist, adapt to, or mitigate the effects of further irreversible changes due to loss of *resilience*: the human capacity to reverse harms and recover from them. If some harm irreversibly damages this capacity for resilience, the affected party will be less able to reverse or recover from further harms on their own, increasing the likelihood of further losses of resilience, and so on. This notion carries special significance at the level of social groups. Norton (2005, ch. 3) explicitly argues that our goal

² Though our paper is human-centered, this definition of irreversible harm is not necessarily anthropocentric: as long as one can define survival and flourishing for an animal, a species or an ecosystem, and can argue that it has intrinsic value (or should be valued intrinsically), one can argue that it can suffer irreversible harm.

should not be the long-term survival of *humans*, but rather that of *cultural communities*. According to Norton, cultural and social institutions are vital for maintaining and updating knowledge about how to live within the limits of the land, and how to adapt to changing circumstances. Thus, a structural degradation of the resilience of a cultural community may not only be problematic in itself, but also for the long-term survival of humans as a species.

In cases where the initiator of the change is another party than those most harmed by the irreversible change, this can lead to situations of *structural injustice* (Young 2004; 2006). Young defines this in the following way: ‘Structural injustice exists when social processes put large categories of persons under a systematic threat of domination or deprivation of the means to develop and exercise their capacities, at the same time as these processes enable others to dominate or have a wide range of opportunities for developing and exercising their capacities’ (2006, p. 114). Structural injustices are particularly hard to rectify, as those parties who have most to gain by changing the system have no capacities to do so, while those who do have these capacities have the strongest incentives to maintain the system.

This concern is echoed strongly in literature from the domain of development studies, where researchers have made widespread observations that the production and reproduction of poverty over long periods of time is closely connected to processes of adverse incorporation and/or social marginalisation. Some writers go so far as to say that there are causal relations running from the latter to the former, and claim that the existence of this causality is key to understanding how certain groups or individuals are kept poor even in contexts characterised by economic growth and accumulation (Smith, 2007; Hickey and du Toit, 2007). Yet, no explicit notion of irreversibility has been used in this discourse, so it has also not been singled out for reflection. The same can be said about a currently popular discourse in the field of disaster management that emphasizes the need to address risk of loss of resilience of people and communities after experiencing major shocks. In an attempt to make sense of that field, Manyena (2006) lists twelve distinct definitions, which reveal disagreement even over whether the notion of resilience refers to processes or outcomes.

Perhaps most relevant for the purpose of this paper is the interpretation of resilience as the ability of communities to maintain their core values or assets through addressing non-core elements of their existence. Manyena gives an example of the substitution of drought-resistant crops for more rain-dependent crops such as maize. In this interpretation, resilience thus refers to a system’s ability to alter non-essential attributes—to adapt in order to keep functioning (Manyena, 2006). This shows a resemblance to the earlier-mentioned human capabilities approach developed by Sen, Nussbaum and others.³

Valuation of irreversible changes has received more explicit attention in economics, especially for treating them inadequately. Cost-Benefit Analysis (CBA), the often-used consequentialist way of valuing interventions, has been criticised for not being able to deal adequately with complexity and uncertainty (Verbruggen 2013). One especially problematic assumption is that every value can be converted to monetary value; that, while not everything may be substitutable, everything is compensatable. However, a significant section of the public is unwilling to put a price tag on e.g. parts of the natural environment (Spash 1997; Conant 2012). One prominent disagreement over values and valuation relates to the practice of discounting project costs and benefits expected in the future. This becomes highly problematic when the welfare of future generations needs to be weighed in, for example, when climate change impacts or biodiversity loss are at stake. However, some economists still argue that choosing a zero discount rate would result in too much early investment in low-

³ The application of the notion of resilience to disaster management is itself an interesting example of drawing inspiration from other disciplines, a.o. ecology (see also the discussion about the Safe Minimum Standard further below).

return climate measures, as compared to when one would employ a positive market interest rate (for a review of the controversy, see NOU 2012).

Another valuation problem arises when there is a very small probability of a disaster scenario. In the standard CBA technique, this would have a negligible effect on a project's net present value estimation, since this is derived as the average of the various possible scenario outcomes weighed by their probabilities. Given the huge impact of the destruction, if it does occur, one could argue instead in favour of a decision strategy where the loss of the worst case scenario is minimised. This is especially important in cases when the party at risk is different from the party that will receive the intervention's benefits (cf. Hansson 2003).

The concept of Safe Minimum Standard of Conservation ("SMS") was introduced into CBA to address this issue. Resembling the maximin strategy in decision theory, the SMS is a rule to value changes in 'flow resources with a critical zone' (Ciriacy-Wantrup 1968): resources that are renewable unless depleted beyond a certain threshold, after which degradation or destruction becomes irreversible. Bishop (1978) gives the example of animal species that can survive unless their population drops below a certain number of individuals, after which extinction is inevitable. A similar example could be a deteriorating ecosystem that gradually loses resilience until a certain threshold is passed, after which it suddenly and drastically shifts into a new equilibrium (Scheffer et al. 2001). This, in turn, can lead to an irreversible reduction in the amount and quality of services the ecosystem can provide. Though Bishop focuses on natural resources, there seems to be no reason why the SMS could not be extended to social and cultural resources, provided they can also be classified as flow resources with a critical zone. One can think of socio-environmental systems that would be just as susceptible to equilibrium changes as the ecosystems they depend on, or cultural or knowledge institutions that can only function with a steady input of effort and/or resources.

The simplest formulation of Bishop's (1978) SMS states that a proposed project should not be implemented if the cost to society is so high that the estimated costs of preservation (labelled B) would exceed the expected economic benefits from the project, exclusive of its environmental effects (denoted A); in other words his minimum requirement is that $A - B > 0$. A careful valuation of A and B is of course important.

Bishop then goes one step further by arguing that the decision rule should also consider potential irreversible loss of environmental capital that is not yet considered valuable at the time of assessment, but that could become valuable at some point in the future (C), and taking account of the probability of this loss occurring (y). For example, a plant might turn out to be a source of medicine, or a bug might turn out to be valuable as a sustainable means for pest control. This leads to $A - B > yC$. However, since y is unknown, yC cannot be estimated. Therefore Bishop proposed that public decision makers may set a threshold value (X) to represent yC. This X is thus taken to represent what society considers an acceptable cost of preserving those environmental goods that are irreversibly threatened by a project, which is dependent on ethical as well as economic values. Consequently, the decision-making rule becomes that a project should not be implemented unless $A - B > X$.

However, "...safe minimum standards will not in itself tell us what is an optimal or appropriate level of ambition, and these approaches therefore necessitate specific trade-offs in each individual case ." (NOU 2012: 119). Incidentally, this observation equally refers to the UN's Precautionary Principle mentioned earlier. NOU (2012) puts considerable emphasis on the need to engage in thorough investigations of y, in order to try to reduce the uncertainties regarding the probability of diastereous outcomes, and on clearly defining the crucial knowledge gaps in approaching the value of y. Moreover, since knowledge gaps can sometimes be reduced through more fact finding, economists tell us that there is in such situations a positive value attached to the postponement of go/no-go decisions concerning

investment projects. This is known as a(n) (quasi-) option value in economics (Claude 1974; Arrow and Fischer 1974; Fischer and Krutilla 1974).

Alternatively, Van der Sluijs and Turkenburg (2006) argue that in dealing with extremely complex systems, such as the climate system, uncertainty reduction might only work to a limited degree. They rather argue that we should increase the resilience of ecosystems, reducing the likelihood of irreversible degradation. This is in line with Manyena's (2006) emphasis on promoting resilience in disaster management, and the focus in the Capability Approach on enhancing human capabilities as being of prime moral importance. Van der Sluijs and Turkenburg argue that ecosystems' resilience can be increased by implementing robust measures – measures that are expected to be beneficial over a wide range of possible outcomes, thus limiting the need for uncertainty reduction.

4. Irreversible social change in theory

4.1 Colonisation of the lifeworld

In this section we go into why there is a need to value irreversible social changes and how this valuing can be done. Reaching back to our earlier definition, we propose a procedure for dealing with irreversible changes that should be followed as soon as certain criteria are met. In section five we use this procedure to evaluate a concrete case study regarding land acquisition for biofuel plantations in Tanzania.

In section three we have established why irreversible changes are ethically relevant. In practice, however, cultural and social changes and the experienced world in general are 'systematically undervalued' (Adger et al. 2009, p. 349) by current policy evaluation mechanisms; qualitative changes are difficult to capture using quantitative methods. This observation has also been made by the German sociologist and philosopher Habermas (1987), who offers the following general explanation of this systematic undervaluation. According to Habermas, the everyday social world or *lifeworld* is characterised by *communicative* action, where agents cooperate on the basis of shared understanding, communicating about common goals and values / reasons to achieve those goals. *Systems*, in contrast, are characterised by *strategic* action, where participants try to achieve their individual goals by using the system. Prime examples are free markets (that facilitate individual maximisation of profits) or bureaucracies (that facilitate maximisation of institutional power). Systems in themselves are not problematic: indeed, they can be very good at fulfilling their intended function. However, they can become pathological if they 'colonise the lifeworld', that is, if they incorporate more and more parts of the lifeworld and evaluate it according to its own standards, e.g. when they require small social organisations to be profitable or to be formally institutionalised. Another example of this could be the EU requirement that imported biofuels should be certified as being sustainable since Dec 2010, as laid down in its Directive 2009/28/EC, articles 17, 18 and 19⁴. In practice this has favoured the generally less sustainable plantations over decentralised or smallholder production. This is rather ironic, given that smallholders are de facto operating according to the asked-for sustainability principles, but lack the financial and organisational capacity to prove it (Romijn et al. 2013; Van Eijk et al. in press).

This colonisation of the lifeworld entails a switch from communicative action to strategic action, where communication about goals, values and reasons is either adapted into the system, e.g. by various methods to convert non-monetary values to monetary values, or marginalised. Though Habermas does not explicitly connect this colonisation of the lifeworld to globalisation, the (physical) distance and power inequalities involved in globalisation can easily worsen the effects of this colonisation (cf. Mol 2007). For example, it has been shown

⁴ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0028:EN:NOT>

that essential features of systems that are designed within the context of one region tend to get transplanted to other areas without due regard for, and awareness of differences in local conditions, giving rise to misfits between system and local reality. The phenomenon has been identified as a major cause of failure in North-South technology transfer projects (e.g., Stewart, 1977). Physical distance makes it more difficult to communicate effectively and monitor and control the effects of one's actions, while power inequalities remove incentives to go for communicative rather than strategic actions. Cultural and social institutions are especially at risk here because they tend to be less tangible and changes to them are less easy to measure quantitatively than e.g. physical or ecological changes (Adger et al. 2009).

As a way to counter this colonisation of the lifeworld, Habermas proposes strengthening democratic institutions and practices where citizens can actively deliberate - and thus, engage in communicative action - about public issues, including systems, their boundaries and their place in society. This does not imply that Habermas believes democratic practice could take full control of a complex and globalised society, but he does claim that it can influence and (de)legitimise policies and particular social processes (Habermas 1996, Ch. 8; Bohman and Rehg 2011).

Highly similar ideas find expression in the literature about industrialisation and development, agricultural innovation, and organisational/managerial capacity building in the South. Here, researchers and practitioners alike have widely advocated policies and strategies that are reminiscent of the capability approach discussed earlier: namely, to foster the strengthening of local human skills and knowledge for selecting, operating, maintaining and adapting innovations designed outside their local domain, in order to reduce the risks of misfit and to ensure that local people gain or maintain some degree of local control over the nature and direction of externally-driven change processes that affect them. Iterative social interaction is seen to be a particularly fruitful mechanism of such learning, with an especially important role envisaged for (potential) local innovation users (e.g., UNDP 2000; Lall 1992; Hall et al. 2012; Bond and Hulme 1999). In this way of thinking one can also see that democratisation and iterative social interaction may be regarded, among other things, as means to increase social resilience; the capacity of human systems to adapt to (major) change while being able to safeguard the functioning of their core functionalities.

4.2 Extending the Safe Minimum Standard

In the last sections we have encountered two strategies that could be used to deal with irreversible social harms. The first was derived from Habermas' work and various development-studies approaches, all of whom focus on social changes and colonisation of the lifeworld in general and propose strengthening democratic (innovation) practices and capacities for constituting and implementing such practices as a remedy. While this would certainly be a welcome development, there are at least two reasons to build in extra protection for vulnerable parties. The first is the severity of the harm arising from its possible irreversibility; the second is the more practical problem that the processes of stakeholder selection for and involvement in policy discussions often are hardly just or fair. This holds especially in developing countries and/or where the initiator is a foreign investor, and the facilitator is a powerful government some of whose bureaucrats and politicians pursue private interests.

The second strategy to deal with irreversible social harms was the Safe Minimum Standard, developed to deal with irreversible ecological changes, particularly, species extinction (Bishop 1978). The Safe Minimum Standard said that we should avoid irreversible harms unless the social costs are unacceptably large. Given the fact that social institutions can be valuable as instruments and as themselves, and given the fact that they are systematically undervalued by the classical tools of policy analysis (Adger et al. 2009), we argue that the

Safe Minimum Standard can - and should - be applied to social changes as well. This standard could be formulated as a decision-rule for policy-makers who consider whether to implement policies with irreversible effects:

Safe Minimum Standard for Social Change (SMS-SC): “If a party *X* proposes a policy that is anticipated to lead to irreversible social harms for one or more stakeholders, then that policy should not be implemented unless the costs to society to which those stakeholders belong is deemed to be unacceptably large by that society.”

The remainder of this section will elaborate on and support the SMS-SC. The word ‘anticipate’ is used here to indicate that this principle only applies in cases of relative certainty with regard to the harms; in cases of fundamental uncertainty rather than situations of risk, other principles, such as the Precautionary Principle, may apply.

Theoretically, a straight-out prohibition is not so different from the decision process that would result in Habermas’ ideal speech situation. Presumably, if stakeholders were to deliberate in a rational process with no power differences, they would also reject any policy that would inflict irreversible social harms on them, unless this were the only case in which an even worse harm could be avoided. In practice, though, ‘merely’ having a process for stakeholder involvement might not always lead to a just or even an acceptable outcome for those stakeholders, as the Sun biofuels case illustrates (cf. Greenwood 2007). The SMS-SC is therefore meant as the strongest possible protection for those stakeholders who have legitimate and urgent claims, but not the power to adequately back them up during the decision-making process (Van Buren 2001).⁵

The wary reader will no doubt have noted that this protection still depends on the willingness and ability of the policy-maker to implement the SMS-SC and make sure it is upheld. However, given the ethical severity of irreversible harms, the SMS-SC would often be supported by such high-level policy instruments as the Universal Declaration of Human Rights, the UN Millennium Development Goals, and more specifically by the UN Final draft of the guiding principles on extreme poverty and human rights, which states that ‘No policy, in any area, should exacerbate poverty or have a disproportionate negative impact on persons living in poverty.’⁶ In other words, in practice the SMS-SC is more a specification of already accepted high-level policy principles than a fundamentally new proposal.

A question one might have at this point is: how can we determine objectively whether a socio-cultural change, irreversible or not, actually constitutes a harm? The short answer is that we can’t. This is because the notion of what constitutes a ‘harm’ may itself differ between stakeholders (cf. Boons and Mendoza 2010). Defining an ‘objective’ notion of harm runs the risk of propagating the system’s colonisation of the lifeworld again, where the lifeworld has to adhere to the demands of the system in proving harm or be marginalised, for example with respect to land acquisition in the global biofuel trade (Silva-Castañeda 2012). As Norton (2005) argues, policy discussions should not only be about goals, but also about values and indicators. Stakeholders should be able to bring their own notions of harm into the discussion, though these notions can and should be open to discussion as well.

⁵ Van Buren’s claim that the most vulnerable stakeholders should be the focus of discussion resembles the ‘*primum non nocere* / first, do no harm’ principle in medical ethics, that demands the strongest possible protection for the most vulnerable stakeholder, the patient. Rawls (1971) similarly argues that, if people were to reason from the original position, where they would be ignorant of their place in society, they would naturally maximise the situation of the most vulnerable stakeholder by adopting the maximin rule in the distribution of primary goods.

⁶ Foundational principle A 17.

http://www.ohchr.org/Documents/HRBodies/HRCouncil/RegularSession/Session21/A-HRC-21-39_en.pdf. Accessed 14 November 2013.

One possible criticism of the SMS-SC is that it, in its current form, offers little action guidance. It tells us what policy-makers may *not* do, but not what they should do instead. We offer two suggestions here. Our first suggestion would be to focus on strategies that prevent the SMS-SC from being applicable. That is, whenever a policy would lead to irreversible social harms, that policy should be amended in order to not bring about harm, or, if that is impossible, to make the harm reversible. In practice, this would often mean addressing one of irreversibility's three components: long duration, high revoking costs or substitutability. Our second suggestion would be to explicitly take the (quasi-)option value of waiting and reducing uncertainty into account, both with regard to whether a change will be irreversible, as well as with regard to whether a change will constitute a harm. While there can be value in 'being the first' and loss in 'missing the boat', threats of possible irreversible harms should lead to an implementation of the Precautionary Principle, which in this case may well entail a combination of uncertainty reduction, implementing robust precautions and a wait-and-see approach to determine whether a new development has the potential to truly contribute to sustainable development or will be a short-lived hype. Anticipation and responsiveness might be hallmarks of responsible innovation (Stilgoe et al. 2013), but sometimes postponing innovation might actually be the more responsible option.

5. Irreversible social change in practice

This section hones in on an important recent phenomenon, the establishment of large biofuels projects by foreign actors in poor developing countries, with the objective to grow biomass for western energy markets. Through many of these investments, local rural populations have been (at risk of being) dispossessed from their land and resources on which they depend for their livelihoods. Although biofuel-induced 'land grabbing' lately has been subject to intense scrutiny (e.g. Matondi et al. 2011; Cotula et al. 2009), the question to what extent its consequences constitute irreversible impacts in the social domain have not been addressed explicitly as such. Our first objective is, then, to identify those social changes that could be considered socially irreversible for the concerned actors in this context, and to answer the question to what extent our framework is capable of identifying their ethically problematic aspects. We focus on Tanzania, a country in sub-Saharan Africa where several such projects were initiated in the early years of the 21st century. We will round off by raising suggestions for possible recommendations for action based on our ethics-based framework.

Modern-day land grabbing is being facilitated by a constellation of factors which can be analysed well with Habermas' conception of the colonisation of the life world. In particular, a continued persistence of the neo-liberal economic paradigm in world economic affairs has contributed to a widespread belief in the benefits of a development model for poor countries premised on western private-sector driven investments for the purpose of building exports to western markets. In this climate there is also a big role for the world's powerful international institutions, notably the World Bank and the World Trade Organisation, who try to promote unimpeded transnational investment and trade through ensuring that host governments observe "good governance" principles. In practice, "good governance" is not an ideologically neutral concept. Under its banner, frugal governmental involvement with the affairs of the private business sector has been widely pushed, among other things through making the continued reception of international aid and debt relief conditional upon host governments' cooperation with respect to the adherence to these principles (Cotula et al. 2009).

In this climate, investments in biofuels in poor countries began to be promoted in the early years of the 21st century as a 'package solution to energy security, environmental protection and rural development' (Widengård, 2011, p. 51); in other words as "win-wins", in which both the investing company, and the host country *with its people* would reap benefits

(Bergius 2012, emphasis added). Another, older strong development paradigm can also still be seen to influence important actors on the world biofuel scene: that of development-as-modernisation. In this paradigm, development is conceived as a top-down process initiated by elites, with its benefits gradually spreading downwards and outwards until the entire society has been enfolded into it.

It should therefore hardly be considered surprising that risks of social harms from biofuel projects initially remained substantially out of focus: It was essentially defined away as a non-existent scenario in the minds of leading development and business actors. Initially, the weight of regulation was on private sector facilitation through creating transparent frameworks and minimizing bureaucratic obstacles in order to maximise the possibilities for “win-win” outcomes (Bergius, 2012). Some actors undoubtedly did possess relevant awareness but preferred to pursue their own short-term corporate interests by seeking out the room for manoeuvre afforded by the prevailing economic environment, until such time when actual evidence of social harms began to accumulate before the public eye.

The investors that came to Tanzania entered a country with approximately 4 million peasant families, among whom poverty and malnutrition are high. Farming and nomadic herding are the principal economic activities (WWF, 2009; van Eijck et al. in press). Most rural households tend to diversify their livelihood sources in order to decrease their vulnerability in case of crop failure or irregular weather conditions. Products from common property resources are highly important in this scheme of things. A World Bank report estimates that between 25% and 50% of local people’s ‘income’ comes from such non-marketed resources (World Bank 2008).

In Kisarawe district, which was targeted by Sun Biofuels UK, marginal agriculture on poor-quality land was the main livelihood source for about 80% of the population consisting of approximately 3000 households. Much of this area was already in a degraded state because of the proximity of Tanzania’s huge port city, Dar es Salaam, which generates an enormous demand for cooking charcoal – the major source of forest clearance. Local communities had great difficulties trying to manage their local natural resources (WWF, 2009). Sun Biofuels negotiated a land lease for cultivation of close to 2000 ha *Jatropha*, an oilseed shrub.

Subsequent research among local villagers has noted many harms from this development that cannot be reversed: Worst of all, Sun destroyed a local swamp that was a crucial water source for local people during dry months. After the establishment of the plantation they now have to walk up to 10 km (previously a 15-30 minutes’ distance) for their basic water needs, which has adversely affected their agricultural productivity and their quality of life more generally (Bergius, 2012). Wages earned from plantation work proved so low that the money is insufficient to buy the provisions that were previously self-produced through subsistence activities. It proved impossible to combine a full-time wage job on the plantation with own-account farming (Kitabu, 2012), but people could not revert back to the old situation due to the loss of the land and water resources.

Monetary compensation paid by Sun was grossly deficient. Valuation practices were aimed at minimising compensation values, and illiterate villagers also had insufficient knowledge about their land rights and could not negotiate adequately. There was also considerable pressure put by a local MP, while Sun misrepresented prospective benefits and played down risks, to the point where strategic “divide and rule” tactics involving the populations from different villages in the area were used to coerce villages into agreeing to the proposals (Bergius, 2012).

Compensation was also promised (verbally) in the form of improved public infrastructure such as a better equipped maternity clinic. While in themselves beneficial, the services provided by these human capital assets are obviously no direct substitutes for ecosystem services derived from land-based activities that are crucial for maintaining food security of

local people, like beekeeping, charcoal making, hunting, and medicinal and food plants gathering (World Bank 2008; Msuya et al. 2010). Moreover, the promises never materialised.

Sun also included an ancient ancestral graveyard site into its plantation, and subsequently forbade public access to it. According to ethnographic local research by Bergius (2012), graveyards are always placed in the common village land, and related practices are deeply embedded in traditional culture and beliefs. The site in question was often frequented by local people. Some years later the access constraint was eased, but only with considerable effort from locally-operating NGOs and helped by wide public journalistic exposure of the problem.

The second investor in focus is Bioshape from the Netherlands. In contrast to Sun, this investor targeted a remote coastal area (Kilwa) with plenty of so-called “unused” land. It planned to establish a jatropha plantation of 81,000 ha. In the first instance it convinced local villagers to give up approximately 34,500 ha of their village land. According to both the villagers and the company, the land was not in current use by the local population, and thus left them with sufficient resources for their day-to-day farming needs. However, some time after the land lease took effect, problems began to be reported (WWF, 2009; Sulle and Nelson, 2009; Chachage and Baha 2010; Valentino 2011), drawing attention to loss of hunting grounds due to clear felling of forest. The Bioshape business plan leaked out, which was found to include an estimate of 200,000 and 800,000 cubic metres of valuable hardwood harvesting potential on its concession, worth 50-150 million dollars (Valentino, 2011.). Those grounds were reported to be used by the local people for firewood gathering, charcoal making, medicinal plant gathering, etc., all of which were important for people’s caloric intake or their broader livelihood. Poverty in the region is high; 30% of people are reported to be either chronically food insecure, or highly vulnerable to food insecurity (van Eijck et al. in press).

Bioshape did not engage in direct arm twisting of the local people, but it somehow managed to get its compulsory Environmental Impact Assessment officially approved by putting the name of a reputable scientist on its cover, without this individual’s involvement in the study (Valentino, 2011). Also, its permissions to start clear-felling were issued by a Minister who did not have the jurisdiction to do so (he was later removed from office, after the discovery of a raft of other scandals).⁷ Community members did not receive adequate compensation for the reduction in commons access, thus, they could not compensate for the loss of those resources in other ways (Chachage and Baha 2010; van Eijck et al. in press.).

The compensation paid by Bioshape was a mere US\$ 12 per ha for a 99-year lease period. Moreover, the arrangement entailed the permanent loss of all land rights for the villagers, since the land would revert to the central government after that. When they were negotiating, the villagers were not aware of that fact (Valentino, 2011). To make matters worse, the local District government later creamed off 60% of the compensation amount (which however, they had no legal right to do). This could happen because the money was being transferred from the company to the villagers through their offices (Ibid 2011). Some village communities both in Kisarawe and in Kilwa say that none of the agreed-upon compensation money ever reached them. Others did not even know what to do with their claim forms, and never received any money because they did not file any claims (Bergius, 2012). And just like in the case of Sun, there were also verbal promises of upgraded public infrastructure, which did not materialise.

Villagers also pointed out that, to the extent the plantations had brought “mixed bags of goods and harms”, the benefits were short term in nature whereas the bads are enduring (Kitabu, 2012). As it turned out, the benefits proved highly vulnerable to the vagaries of the global economic system that suffered a big implosion in 2008. In that same year both

⁷ Personal information obtained by Romijn during field trip in Tanzania, 2012.

plantation firms withdrew due to bankruptcy induced by disappointing harvests, crashing world oil prices, and inability to attract fresh finance from risk-averse banks. This left the villagers high and dry, without their new wage jobs, without their former land resources, and without the maternity clinic, school, improved road, or water well they had been promised (Carrington, 2011; Eijck et al. in press). In both cases, the transfer of land rights has been permanent; no legal procedure exists for a reversal. So far, strenuous efforts by Tanzanian lands rights NGOs to address this problem have been to no avail, so we see good reason to speak of irreversibility here.

The loss of vital land resources is bound to affect the livelihood opportunities of future generations even worse than the current one. Tanzania's population is growing fast, while climate change effects and structural over-utilisation are steadily reducing land productivity. These trends are not confined to Tanzania either. Land pressures are steadily increasing as a result of these factors throughout much of Sub-saharan Africa (von Braun et al. 2013). When projects like those of Bioshape and Sun are allowed to add to this already heavily stressed environment, crucial tipping points could be reached, inducing structural loss of social resilience: we should expect the uprooting of local communities in search of survival, aggravating rural-urban migration and destitution in urban slums, and to the break up of traditional ways of family and community life.

When we compare Kilwa to Kisarawe, the latter case shows the least resilience: The starting point was a community already under severe stress due to a degraded ecological system. Its chances of recovering from the Sun experience and its ability to adapt to the new situation in a way in which their core social and spiritual values are preserved are dim. But also in the case of Kilwa, the consequences should not be underestimated due to the very large land area involved, and the severe poverty of the local people.

In both cases, the lessons from Bishop's Safe Minimum Standard and the theory of option values have relevance because of the scale of the envisaged projects and the fragility of the socio-economic systems in which they were introduced: First, there would have been value in the government giving out substantially shorter lease periods (a measure that Tanzania in fact implemented in 2012); legally requiring the companies' to draw up an exit strategy detailing compensation in case of financial trouble, thus mitigating potential harms (van Eijck et al. in press); and requiring them to correct unforeseen negative effects from the lease such as re-allowing villagers to access those parts of the leased land considered non-substitutable, such as neighbourhood water points and ancestral grave sites. Even better, the government could have insisted on arrangements in which local people retain their land rights and share in the benefits from the plantation as co-owners; and mandating that maintenance of adequate food supply and water access for local communities become essential parts of such investment deals (van Eijck et al. in press). A strict land zoning strategy and upper ceilings on the size of the leased land could also help to some extent (these two measures are in fact currently being implemented in Tanzania). All these strategies could remove or mitigate potential irreversible harms and thus, could prevent the SMS-SC from coming into effect.

Following option value theory, there also would have been value in postponing full-scale implementation. Instead, one could have opted for a more cautious, gradual and flexible approach, which could have generated lessons and thus afforded space for course-corrections along the way. Such a gradual approach should be grounded in more deliberative, democratic project organisation and management principles, so that collective learning by all concerned stakeholders can be allowed to happen through iterative social interactions in the spirit of Habermas and development studies researchers such as Hall et al. and Bond and Hulme. At the same time, we should not be naive in advocating more communicative over strategic action without caution. As observed by Borrás Jr & Franco (2010, p. 31), a decentralized negotiation process may even aggravate problems for the rural poor, because it is in the rural

communities that the political and economic power of the dominant classes and groups are most entrenched. Communities are not homogeneous groups. Indeed, the strengthening of ‘democratic’ practices in this context is as vulnerable to being colonised by the system as any other social practice, and needs to be given flesh or risk being hollowed out as well.

6. Conclusions

In this paper we have investigated the notion of an irreversible change and its ethical significance. We have argued that irreversible harms can be ethically problematic for several reasons, most importantly that they reduce the options for action open to a party, which may include foreclosure of opportunities for flourishing and survival as well as for responding and adapting to further detrimental changes (i.e. a loss of resilience). We have investigated economic methods for evaluating irreversible changes, most notably Cost-Benefit Analysis and the Safe Minimum Standard, and used Habermas’s theory on colonisation of the lifeworld to explain why social harms are systematically undervalued. Finally, we have extended the Safe Minimum Standard to be able to evaluate irreversible social harm and formulated recommendations for policy-makers on how to deal with threats of irreversible harm. The application to the case of Tanzanian biofuel projects brings out that our framework is indeed useful for pointing up problematic social irreversibilities, as well as the key forces that produce them, and can also suggest a range of ways of countering them.

As suggestion for further research and action, we suggest that the most pressing issue identified in this paper is that social harms are systematically undervalued, especially at the time when investments are being considered or just starting off. This was also clearly illustrated in the Tanzanian biofuel story – the vantage point of the government and the investors who are supposed to weigh these effects is too dramatically different from the perspective of the local people. As one Tanzanian journalist put it, “It is hard for most people in the industrialised world to imagine the level of desperation that many Tanzanians experience” (Mutch, 2010). In such complex situations, coupled with a dominant neo-liberal mindset and institutional set-up, there are plenty of opportunities for Young’s *structural injustice* to develop and become deeply entrenched. The consequences thereof became clearly manifest in the unequal negotiation positions and the ability of powerful players to twist the system to its benefit.

One possible way in which the undervaluation issue can be tackled is to further develop the notion of socio-ecological systems. If this notion were to replace or accompany the classical notion of ecosystems in e.g. environmental sciences, the methodological toolkit of this field might be adapted and applied to measuring and valuing social changes as well, especially those caused by environmental changes and vice versa. This could also inspire further relevant development in Cost-Benefit Analysis, by for instance increasing the realism of ex-ante project impact assessments through improved valuation.

There is however, also a limit on what such economic approaches can achieve. Their focus on monetary valuation and compensation reflects the tendency of the increasing commodification of natural resources within a neoliberal framework. This tendency, and the underlying value system that promote it, should be viewed with a healthy dose of caution. As the Tanzanian case study shows, not only are people in rural areas vulnerable because they are constrained in how they can make use of this (little) money in a relatively undeveloped rural economy reliant on subsistence land use, but economic approaches also fail to recognize the social, spiritual and political significance of the land that they depend on, and that sustains them in so many ways (Sulle & Nelson, 2009).

Another way in which social harms could be made more salient is by further investigation into the ethical relevance of maintaining sufficient options for action available, and how this could be achieved through ‘robust policies’. While the Capability Approach currently is

particularly good in pointing up salient issues, it could benefit from connecting further with human ecology literature and the incorporation of notions such as resilience and irreversibility. Especially now that the UN has the Millennium Development Goals high on its agenda, identifying and valuing those changes that could constitute irreversible social harms, and thus work directly and structurally against sustainable development, is part of a much-needed political and scientific discussion.

Acknowledgements

This work is part of the MVI research programme ‘Biofuels: sustainable innovation or gold rush?’, which is financed by the Netherlands Organisation for Scientific Research (NWO).

References

- Adger, W.N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D.R., Naess, L.O., Wolf, J. and Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic change* 93: 335-354.
- Aggarwal, R.M. (2006). Globalization, local ecosystems, and the rural poor. *World Development*, 34 (8): 1405–1418.
- Arrow, K.J., and Fisher, A.C. (1974). Environmental preservation, uncertainty, and irreversibility. *Quarterly Journal of Economics*, 88 (May): 312-319.
- Barbier, E.B. (2012). Natural capital, ecological scarcity and rural poverty. Policy Research Working Paper 6232, Development Research Group. Washington, D.C.: The World Bank.
- Barbier, E.B. (2005). *Natural Resources and Economic Development*. Cambridge: Cambridge University Press.
- Bergius, M. (2012). *Large scale agro investments for biofuel production in Tanzania - Impact on rural households*. Thesis, Institute of Development Studies, University of Agder, Norway.
- Berkes, F., Colding, J., and Folke, C. (2001). *Linking Social-Ecological Systems*. Cambridge: Cambridge University Press.
- Bishop, R.C. (1978). Endangered Species and Uncertainty: The Economics of a Safe Minimum Standard. *American Journal of Agricultural Economics* 60(1), 10-18.
- Bohman, J. and Rehg, W. (2011). Jürgen Habermas. In: E. Zalta (ed.) *The Stanford Encyclopedia of Philosophy*, Winter 2011 edition.
<http://plato.stanford.edu/archives/win2011/entries/habermas/>. Accessed 14 Nov 2013.
- Bond, R. and Hulme, D. (1999). Process approaches to development: Theory and Sri Lankan practice. *World Development*, 27(8): 1339-1358.
- Boons, F. and Mendoza, A. (2010). Constructing sustainable palm oil: how actors define sustainability. *Journal of Cleaner Production* 18: 1686-1695.
- Borras Jr, S. M. & Franco, J. (2010). *Towards a broader view of the politics of global land grab: Rethinking land issues, reframing resistance*. The Hague/Amsterdam: ICAS/LDPI/TNI.
- von Braun, J., Gerber, J., Mirzabaev, A., Nkonya, E. (2013). *The economics of land degradation*. Working Paper 109, Center for Development Research (ZEF), University of Bonn.
- van Buren III, H.J. (2001). If fairness is the problem, is consent the solution? Integrating ISCT and stakeholder theory. *Business Ethics Quarterly* 11(3): 481-499.
- Carrington, D. (2011). UK firm's failed biofuel dream wrecks lives of Tanzania villagers. *The Observer*, Sunday 30.
- Chachage, C. & Baha, B. (2011). *Accumulation by land devaluation and labour devaluation in Tanzania*. Dar es Salaam: HAKI ARDHI.
- Ciriacy-Wantrup, S.V. (1968). *Resource Conservation: Economics and Policies*. 3rd edition. Berkeley and Los Angeles: University of California Press.
- Claude, H. (1974). Option-values in the economics of irreplaceable assets. *Review of Economic Studies: Symposium on The Economics of Exhaustible Resources*: 89-104.
- Conant, J. (2012). The dark side of the “green economy”; Why some indigenous groups and environmentalists are saying no to the “green economy”. *Yes Magazine*, Fall issue.

- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B. (1998). The value of the world's ecosystem services and natural capital. *Ecological Economics*, 25(1): 3-15.
- Cotula, L., Dyer, N. & Vermeulen, S. (2008). *Fuelling exclusion? The biofuels boom and poor people's access to land*. London: IIED.
- EC (2009). Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC Renewable Energy Directive, O.J. L 140: 16–62.
- van Eijck, J.A.J., Romijn, H.A., Smeets, E., Bailis, R., Rooijackers, M.J.A.M., Hooijkaas, N., Verweij, P. and Faaij, A.P.C. (in press). Comparative analysis of key socio-economic and environmental impacts of smallholder and plantation based jatropha biofuel production systems in Tanzania. *Biomass and Bioenergy*.
- van Eijck, J.A.J., Rom Colthoff, J., Romijn, H.A., Heijnen, S., de Ruijter, F. and Jongschaap, R. (2013). *Jatropha sustainability assessment; data from Tanzania, Mali & Mozambique*. Utrecht: NL Agency, Netherlands Ministry of Economic Affairs.
- Fisher, A.C. and Krutilla, J.V. (1974). Valuing long run ecological consequences and irreversibilities. *Journal of Environmental Economics and Management*, 1: 96-108.
- Greenwood, M. (2007). Stakeholder Engagement: Beyond the Myth of Corporate Responsibility. *Journal of Business Ethics*, 74: 315-327.
- Habermas, J. (1987). *The Theory of Communicative Action, Volume II. Lifeworld and System: a Critique of Functionalist Reason*. Boston: Beacon Press. Trans. from German by McCarthy, T. (1985). *Theorie des kommunikativen Handelns, Band 2: Zur Kritik der funktionalistischen Vernunft*, 3rd corrected edition. Frankfurt am Main: Suhrkamp Verlag.
- Habermas, J. (1996). *Between Facts and Norms: Contributions to a Discourse Theory of Law and Democracy*. Cambridge: MIT Press. Trans. from German by Rehg, W. (1992). *Faktizität und Geltung. Beiträge zur Diskurstheorie des Rechtes und des demokratischen Rechtsstaats*. Frankfurt am Main: Suhrkamp.
- Hall, A., Sulaiman, R., Ojha, H. (Eds) (2012). *Adaptive Collaborative Approaches in Natural Resource Governance: Rethinking Participation, Learning and Innovation*. London: Routledge.
- Hansson, S.O. (2003). Ethical criteria of risk acceptance. *Erkenntnis* 59, 291-309.
- Hickey, A. and du Toit, A. (2007). Adverse incorporation, social exclusion and chronic poverty. CPRC WP 81, School of Environment and Development, University of Manchester, Manchester.
- Hodbod, J. and Tomei, J. (2013). Demystifying the social impacts of biofuels at local levels: Where is the evidence? *Geography Compass*. 7 (7): 478–488.
- van der Horst, D., Vermeulen, S. (2011). Spatial scale and social impacts of biofuel production. *Biomass and Bioenergy*. 35: 2435-2443.
- Humphrey, M. (2001). Three Conceptions of Irreversibility and Environmental Ethics: Some Problems. *Environmental Politics* 10(1): 138-154.
- Illies, C.F.R. and Meijers, A.W.M. (2009). Artefacts without agency. *The Monist* 92(3): 420-440.
- Jonas, H. (1979/1984). *Das Prinzip Verantwortung, Frankfurt am Main: Suhrkamp / The imperative of responsibility. in search of an ethics for the technological age*, Chicago: The University of Chicago Press.
- Kitabu, G. (2012). So much to lose than gain in foreign land investments, IPP Media, 24 January.

- Lall, S. (1992). Technological capabilities and industrialization. *World Development*, 20 (2): 165-186.
- Manyena, S. B. (2006). The concept of resilience revisited. *Disasters*, 30(4): 433-450.
- Marten, G.G. (2001). *Human Ecology. Basic Concepts for Sustainable Development*. London: Earthscan.
- Matondi, P. B., Havnevik, K. & Beyene, A. (Eds) (2011). *Land Grabbing and Food Security in Africa*. Uppsala/ London/ New York: Zed Books.
- McShane, K. (2007). Why Environmental Ethics Shouldn't Give Up on Intrinsic Value. *Environmental Ethics*, 29(1): 43-61.
- McShane, K. (2012). Environmental ethics: An overview. *Philosophy Compass* 4(3): 407-420.
- Merkerk, R.O. and van Lente, H. (2005). Tracing emerging irreversibilities in emerging technologies: The case of nanotubes. *Technological Forecasting & Social Change*, 72: 1094–1111.
- Mol, A.P.J. (2007). Boundless Biofuels? Between Environmental Sustainability and Vulnerability. *Sociologia Ruralis* 47(4), 297-315.
- Msyua, T.S., Kidesgesho, J.R., and Mosha, T.C.E. (2010) Availability, preference, and consumption of indigenous forest foods in the Eastern Arc mountains, Tanzania, *Ecology of Food and Nutrition*, 49: 208–227.
- Mutch, T. (2010) *Jatropha biofuels: The true cost to Tanzania*. *The Ecologist*, 15 February.
- Norton, B.G. (2005). *Sustainability: A Philosophy of Adaptive Ecosystem Management*. Chicago: University of Chicago Press.
- NOU (2012). *Cost-Benefit Analysis*. Review from a committee appointed by Royal Decree chaired by P.K. Hagen, submitted to the Norwegian Ministry of Finance. Official Norwegian Reports NOU 2012:16, Oslo.
- Nussbaum, M. (2006). *Frontiers of Justice: Disability, Nationality, Species Membership*. Cambridge, MA: Harvard University Press.
- Persson, I. and Savulescu, J. (2008). The perils of cognitive enhancement and the urgent imperative to enhance the moral character of humanity. *Journal of Applied Philosophy*, 25(3): 162-177.
- Peterson, M.B. and Spahn, A. (2011). Can Technological Artefacts be Moral Agents? *Science and Engineering Ethics*, 17(3): 411-424.
- Pols, A.J.K. and Houkes, W.N. (2011). What is morally salient about enhancement technologies? *Journal of Medical Ethics*, 37(2): 84-87.
- Rawls, J. (1971). *A Theory of Justice*. Cambridge, MA: Harvard University Press.
- Robeyns, I. (2011). The Capability Approach. In: E. Zalta (ed.) *The Stanford Encyclopedia of Philosophy* (Summer 2011 Edition).
<http://plato.stanford.edu/archives/sum2011/entries/capability-approach/>. Accessed 14 November 2013.
- Romijn, H.A. and Caniels, M.C.J. (2011). The jatropha biofuels sector in Tanzania 2005-9: Evolution towards sustainability? *Research Policy*, 40: 618-636.
- Romijn, H.A. Heijnen, S., and Arora, S. (2013). Standardizing sustainability: Certifying Tanzanian biofuel smallholders in a global supply chain. In: A. Lindgreen, S. Sen, F. Maon and J. Vanhamme (Eds) *Sustainable Value Chain Management: Analyzing, Designing, Implementing, and Monitoring for Social and Environmental Responsibility*. Farnham: Gower: 473-487.

- Scheffer, M., Carpenter, S., Foley, J.A., Folke, C. and Walker, B. (2001). Catastrophic shifts in ecosystems. *Nature* 413, 591-596.
- Sen, A. (1992). *Inequality Re-examined*, Oxford: Clarendon Press.
- Silva-Castañeda, L. (2012). A forest of evidence: third-party certification and multiple forms of proof—a case study of oil palm plantations in Indonesia. *Agriculture and Human Values* 29, 361-370.
- Van der Sluijs, J.P. and Turkenburg, W. (2006). Climate change and the Precautionary Principle. In: Fisher, E., Jones, J. and Von Schomberg, R., *Implementing the Precautionary Principle, Perspectives and Prospects*, 245-269.
- Smith, B. (2007). Annotated Bibliography on Social Exclusion, Adverse Incorporation and Chronic Poverty. CPRC WP 86, School of Environment and Development, University of Manchester, Manchester.
- Spash, C.L. (1997). Ethics and Environmental Attitudes With Implications for Economic Valuation. *Journal of Environmental Management* 50, 403-416.
- Stewart, F. (1977). *Technology and Underdevelopment*. London: Macmillan.
- Stilgoe, J., Owen, R. and Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy* 42(9), 1568-1580.
- Sulle, E. and Nelson, F. (2009). *Biofuels, land access and rural livelihoods in Tanzania*. London: IIED.
- UN (1992). Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992.
- UNDP (2009). *Capacity Development: A UNDP Primer*. New York: United Nations.
- Valentino, S. (2011) Tanzania biofuel project's barren promise. *IPS News*, 9 March.
- Verbruggen, A. (2013). Revocability and reversibility in societal decision-making. *Ecological Economics*, 85: 20-27.
- Walker, B.H., Gunderson, L.H., Kinzig, A.P., Folke, C., Carpenter, S. R., Schultz, L.(2006). A handful of heuristics and some propositions for understanding resilience in social-ecological systems. *Ecology and Society* 11(1): 13.
- Widengård, M. (2011). Biofuel governance: a matter of discursive and actor intermesh. In: P. B. Matondi, K. Havnevik & A. Beyene (Eds). *Biofuels, Land Grabbing and Food Security in Africa*. Uppsala/London/New York: ZED Books, pp. 44-59.
- World Bank (2008). *Putting Tanzania's Hidden Economy to Work: Reform, Management and Protection of its Natural Resource Sector*. Washington D.C.
- Young, I.M. (2004). Responsibility and Global Labor Justice. *The Journal of Political Philosophy* 12(4), 365-388.
- Young, I.M. (2006). Responsibility and global justice: a social connection model. *Social Philosophy and Policy* 23(1), 102-130.