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The relationship between intragenerational and intergenerational ecological justice

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Abstract: The principle of sustainability contains two objectives of justice regarding the conservation and use of ecosystems and their services: (1) global justice between different people of the present generation ("*intra*generational justice"); (2) justice between people of different generations ("*inter*generational justice"). Three hypotheses about their relationship – independency, facilitation and rivalry – are held in the political and scientific sustainability discourse. Applying the method of qualitative content analysis to important political documents and the scientific literature, we reveal six determinants underlying the different hypotheses: quantity and quality of ecosystem services, population development, substitutability of ecosystem services, technological progress, institutions and political restrictions.

Keywords: sustainable development, ecosystem services, intragenerational justice, intergenerational justice, ecological justice, sustainability research.

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Do we have to make a hard choice between fighting today's poverty and preserving the environment for future generations? Or are there conditions which enable to foster both intragenerational and intergenerational justice?

1 Introduction

Global justice between different people of the present generation (*intragenerational justice*) and justice between people of different generations (*intergenerational justice*) are the great ideas underlying the politics of sustainable development.[1] These ideas of justice are the core normative guidelines with regard to the sustainable use and conservation of the services provided by ecosystems, such as food and fresh water production, flood protection and erosion control. As it could be philosophically justified that people living today and people living in future have equal rights to use ecosystems and their services (cf. e.g., Feinberg 1981, Tremmel 2008, Visser't Hooft 2007), the impacts of political institutions and instruments on both intragenerational and intergenerational justice have to be considered.

The political discourse about the relationship between the aim of a juster distribution of rights to ecosystem services between countries of the global North and the global South as well as within countries and the aim to preserve ecosystems for future generations is blurred. Is a globally just distribution of access to ecosystem services a necessary precondition to achieve justice with respect to future generations? Or the other way round, does the satisfaction of the elementary needs of the world's poor inevitably imply the long-term degradation of ecosystems?

Possible conflicts between intragenerational and intergenerational justice have already been noted (e.g., by Adams *et al.* 2004, Langhelle 2000, Wissenburg 2006), but analyzed rather specifically, such as for the relationship between the conservation of biodiversity and the eradication of poverty through protected areas (cf. Adams *et al.* 2004), and not directly referring to the fundamental objectives of intragenerational and intergenerational ecological

[1] Sustainable development as defined by the Brundtland-Report is "a development that meets the needs of the present without compromising future generations to meet their own needs" (WCED 1987: 43).

justice. Our study investigates the relationship between intragenerational and intergenerational ecological justice in a systematic manner as a clarification of this relationship is of high importance for devising an ethically legimate, politically consistant and actually effective sustainability policy.

Three hypotheses about the relationship between the objectives of intragenerational and intergenerational ecological justice are logically possible: (1) Achieving one objective may not have any effect on the chances to also achieve the other one (*independency*). (2) Achieving one objective may make it easier to also achieve the other one (*facilitation*). (3) Achieving one objective may make it more difficult to also achieve the other one (*rivalry*). We evaluate important political documents on sustainable development as well as the scientific literature from various disciplines in terms of these hypotheses, applying the method of qualitative content analysis (Mayring 2000).

As a first step of evaluation, we assign the core statements and arguments to one of the hypotheses, thereby systematically revealing the lines of reasoning supporting each of the three hypotheses. In a second step, we identify the assumptions which are used to argue in favour of each hypothesis. These assumptions concern the following underlying determinants: the quantity and quality of ecosystem services, population development, substitutability of ecosystem services by human-made goods and services, technological progress, institutions and political restrictions. These determinants impact on the relationship between intragenerational and intergenerational ecological justice and, therefore, influence which hypothesis holds true. The higher the intrinsic growth rate of renewable resources, the smaller the population growth rate, the greater the substitutability of ecosystem services, the higher the rate of technological progress, the stricter the institutional restriction of ecosystem use and the greater the political scope for redistribution of environmental property rights, the less likely is a conflict between the objectives of intragenerational and intergenerational justice.

The paper is organized as follows. In Section 2, we discuss why ecosystem services are a core object of intragenerational and intergenerational justice in sustainability policy. In

Section 3, we specify our selection of literature and method of text analysis, introduce the three logically possible hypotheses and describe the main arguments given in the literature to support each of these hypotheses. In Section 4, we extract and discuss the determinants underlying the argumentations. In section 5, we conclude with consequences for sustainability policy and perspectives for sustainability research.

2 Ecosystems and justice

Humans vitally depend on the Earth's ecosystems, which deliver a large variety of economically, socially and culturally valuable services to them (Costanza *et al.* 1997b, Sukhdev and Kumar 2008). A common definition by the Millennium Ecosystem Assessment (MEA) describes ecosystem services as "the benefits people obtain from ecosystems" (MEA 2003: 53). They are classified along functional lines in provisioning, regulating, cultural and supporting services. Ecosystems *provide* materials to humans such as food, fiber and freshwater, and create benefits by *regulating* ecosystem processes including climate regulation, air quality maintenance, erosion control and pollination. Furthermore, people obtain non-material benefits from ecosystems through *cultural* services such as recreation, aesthetic experiences and spiritual enrichment in natural or cultivated landscapes. Necessary for the production of the mentioned ecosystem services are *supporting* services: soil formation processes, cycling of nutrients and water, primary production and production of atmospheric oxygen. Changes in all types of ecosystem services affect human well-being in multiple ways: through impacts on secure and adequate livelihoods, on health, on safe access to natural resources and on security against natural and human-made disasters, on good social relations and on freedoms available to people.

Ecosystems are degrading faster than ever (MEA 2005: 26*ff.*). This is accompanied by the loss of important ecosystem services such as climate regulation, flood protection and water purification. The harmful effects of diminishing ecosystem services affect especially the poor, who have lost access to essential ecosystem services disproportionately with their

degradation (MEA 2005: 62, Sukhdev and Kumar 2008: 15*ff.*). The scarcer the availability of ecosystem services, the more urgent becomes the question of their just distribution. Especially the human-caused global warming has placed the question of intragenerational and intergenerational justice in the centre of political debate. Whereas the industrialized countries in the global North bear the main responsibility for human-induced climate warming, the poor people in the countries of the global South and future generations are worst affected by its harming impacts. Further important societal problems of intragenerational and intergenerational justice are the rapid and irreversible loss of biodiversity (cf. e.g., Adams *et al.* 2004), the shortage of fresh water and the overfishing of oceans.

The imperative of sustainability regarding the conservation and use of ecosystems and their services is widely accepted in today's international policies (e.g., UN 1992, WCED 1987). *Intragenerational and intergenerational justice* are, in general, taken as constituent for the guiding principle of sustainable development (Kopfmüller *et al.* 2001, Langhelle 2000: 298, Ott and Döring 2004: 58*f.*, WCED 1987: 43).[2] This raises the question of how the idea of intragenerational and intergenerational justice can specifically be applied to the use and conservation of ecosystems. In the remainder of this section, we elaborate on the specific link between justice and ecosystems, yielding a conception that we call *ecological justice*.

In his "Nicomachean Ehics" the Greek philosopher Aristotle (1998: Book 5) makes a fruitful distinction between two forms of justice: general justice (iustitia universalis) and particular justice (iustitia particularis). Whereas general justice is about the "lawful", that is, the basic institutions of a just political system, particular justice deals with what is "fair", that is, the aversion or correction of unjust gains caused by acts of overreaching. Aristotle further divides particular justice in the distribution of divisible goods (iustitia distributiva) and the rectification of voluntary transactions (iustitia commutativa) and involuntary transactions such

[2] The modern concept of sustainable development refers fundamentally to three relationships of the human being: the relationship to contemporaries, to future generations and to nature (cf. Becker 2009: 23ff.). In this paper we leave aside the dimension of justice towards nature.

as theft and assault (iustitia correctiva). This classification can be meaningfully applied to the conservation and use of ecosystem services.

Distributive justice requires that the recipients of justice have common claims to scarce goods. Because natural ecosystems are not created by any particular human or any group of humans, it seems plausible that ecosystems and their services are the common property of humankind, and that every present and future person has a legitimate claim to use them (Helm and Simonis 2001, Schlosberg 2004).[3] A commonly mentioned premise for the application of distributive justice is the scarcity of the object of distribution (e.g., Hume 1975: Chapter 3), which is certainly given for ecosystem services. Furthermore, distributive justice can be regarded as the most comprehensive type of particular justice as it does not depend on transactions or prior caused environmental harm (Leist 2005: 1). Whereas corrective justice is orientated towards individually caused environmental harm, the most pressing environmental problems, such as human-caused climate change and biodiversity loss, are caused by a vast number of polluters and need to be tackled before the worst consequences will appear. By applying principles of distributive justice, collectively caused ecosystem degradation and precautionary ecosystem preservation can be addressed. As a result, there are many good reasons for taking distributive justice as a core principle of ecological justice.[4] In fact, in most contributions to the political and scientific literature relevant for this analysis, "justice" is (implicitly) meant to be distributive justice.

The abstract and general idea of "distributive justice" needs to be further specified. According to Dobson (1998: Chap. 3), every conception of distributive justice has to specify the objects, the community and the basic principle of justice. In our proposed conception of ecological justice the *objects of justice* are ecosystem services. For intragenerational justice, this basically implies the distribution of rights to enjoy the benefits produced by ecosystems and the distribution of duties to conserve ecosystems as well as to pay or compensate for the

[3] Nozick (1974: 175) proceeds on the assumption that the original nature was owned by nobody before individual property rights have been invented.
[4] The implementation of distributive justice presupposes a stable political system, which is itself based on certain principles of justice (i.e., iustitia universalis), such as the protection of the universal human rights.

harms caused by ecosystem degradation. Intergenerational justice with regard to ecosystem services can only mean sustaining the potential of ecosystems to produce ecosystem services in the future (Dobson 1998: 131).[5] Thus, the objects of justice in the intergenerational context are the duties to preserve stocks of natural capital, which deliver ecosystem services to future people.

The *community of justice* comprises all recipients of ecological distributive justice. Humans' present and local action towards nature affects the provision of ecosystem services at the other end of the globe and in the remote future. Thus, the central question is whether the community of justice can be extended to the *global* human community and *future* generations. This question can be affirmed by referring to the moral equality of all people (Feinberg 1981, Kant 1949: 59, Rawls 1973: 179, UN General Assembly 1948: Article 1), which implies the necessity to guarantee rights to essential ecosystem services.

The third component for building a conception of ecological justice is the *basic principle of justice*, that is, the principle of distribution. Rawls' influential "Theory of Justice" (1971) appears as a fruitful starting point to derive such a principle. The "Theory of Justice" bears on the distribution of basic freedoms and basic goods. Ecosystem services can be subsumed under these categories (Dobson 1998: 125*.,* Visser't Hooft 2007: 88*ff*.). Furthermore, Rawls' original position, in which everyone decides on the principles of justice from behind a *veil of ignorance,* offers the potential to extend the community of justice to include all people living at present and living in future (Beitz 1979, Hayden 2002, Langhelle 2000, Pogge 1989, Tremmel 2008). A consequent extension of this original position would produce the following intragenerational (or: intergenerational) principles of distribution: (1) Each presently living person (or: each person living in the present or the future) has an equal right to use essential and non-substitutable ecosystem services. (2) The user rights to all other ecosystem services have to be distributed in such a way that they are to the greatest benefit of the least-advantaged members of the present generation (or: across the present and all future

[5] Sustaining ecosystems and complying with ecological limits can also be viewed as a "precondition for intergenerational justice" (Langhelle 2000: 318).

generations). We interpret *benefit*, based on the "capability"-approach by Sen (1982), as the valued possibilities to live a good life, which are set by the equipment with rights to ecosystem services.

Bringing together these three elements, we define *ecological justice* as an intragenerational and intergenerational distributive justice, which is about distributing rights to ecosystem services and duties to conserve stocks of natural capital according to the Rawlsian principles of justice, including all present and future people as recipients of justice. Whereas *intragenerational ecological justice* relates to global justice between different people of the present generation regarding the distribution of rights to access ecosystem services and of the benefits arising out of their utilization, *intergenerational ecological justice* relates to justice between people of different generations regarding the duties to conserve intact ecosystems for future generations. For instance, both objectives of ecological justice are expressed in the UN-Convention on Biological Diversity (1992: Article 1), which explicitly aims at both the “conservation of biological diversity“, which can be interpreted as the aim of intergenerational ecological justice, and the “equitable sharing of the benefits arising out of the utilization“, which can be interpreted as the aim of intragenerational ecological justice.

3 Survey of the literature

In the political and scientific discourse, there is a multitude of views on how the establishment of global intragenerational and intergenerational ecological justice relate to each other. Our literature survey includes important political documents on sustainable development (among others, WCED 1987, UN 1992, UN 2002, UN/DESA 1992) as well as the scientific literature from various disciplines, encompassing natural resource management, ecosystem ecology, neoclassical and ecological economics, political science on environment and development issues, environmental ethics as well as interdisciplinary

analyses.[6] The selection of literature is based on two criteria: (i) a broad covering of all scientific disciplines dealing with ecological justice, and (ii) the political importance of documents on sustainable development. We considered all aspects of the literature concerning the relation between intragenerational and intergenerational ecological justice.

In most of the selected political and scientific documents links between poverty and environmental degradation are explored in general (cf. UN 2002, WBGU 2004, WCED 1987) whereas the hypotheses under study here specifically focus on justice with regard to ecosystem services. Therefore, the question arises whether the extent of poverty can be equated with a measure of intragenerational ecological justice, and whether the extent of ecosystem degradation can be equated with a measure of intergenerational ecological justice. Certainly, the conservation of non-substitutable and vital ecosystem services is generally regarded as a necessary precondition for safeguarding the basic rights of future generations. Therefore, we view environmental degradation with harmful impacts on future generations as an indicator of intergenerational injustice. The report "World in Transition – Fighting Poverty through Environmental Policy" of the German Advisory Council on Global Change (WBGU 2004) shows that links exist between a lack of access to ecosystem services and multiple dimensions of poverty, encompassing income poverty, disease and malnutrition as well as lack of education and social stability. Likewise, the MEA-report illustrates how the constituents of human well-being depend on the provision of ecosystem services (MEA 2003: 78), and the TEEB-Report illustrates the links between ecosystem services and the Millennium Development Goals (Sukhdev and Kumar 2008: 21). Nevertheless, a lack of access to ecosystem services is one important cause of poverty, but not an equivalent to poverty. Therefore, we try to focus on those parts of the texts that directly deal with the access and user rights to ecosystems.

[6] We searched the databases *Web of Science* and *Google Scholar* for the key words "ecological justice"; "environmental justice"; and "ecosystem" or "environment" combined with "justice", "sustainable development", "sustainability", "intragenerational justice" or "intergenerational justice" – both in English and German language.

Three relationships between the objectives of intragenerational and intergenerational ecological justice are logically possible: independency, facilitation and rivalry. The following hypotheses are constructed to express these logical relationships:

- *Independency-hypothesis*: The objectives of intragenerational and intergenerationial ecological justice can be reached independently, that is, achieving one objective does not have any effect on the chances to also achieve the other one.
- *Facilitation-hypothesis*: Achieving one objective makes it easier to also achieve the other one. This facilitation may be one-way, or the other way, or a mutual facilitation between the achievement of the two objectives.
- *Rivalry-hypothesis*: A fundamental rivalry (trade-off) exists between the objectives of intragenerational and intergenerational ecological justice, that is, achieving one objective makes it more difficult to also achieve the other one.

To evaluate the selected literature, we apply the method of qualitative content analysis (Mayring 2000). As a first step of analysis, we extract the core statements and arguments found in the selected literature about the relationship between intragenerational and intergenerational ecological justice and assign them to the different hypotheses, thereby systematically revealing the lines of reasoning supporting each of the three hypotheses (Sections 3.1–3.3). In a second step of analysis, we identify the assumptions about the fundamental determinants which are used to argue in favour of each hypothesis (Section 4).

3.1 Independency-hypothesis

The independency-hypothesis states that the objectives of intragenerational and intergenerationial ecological justice can be reached independently, that is, achieving one objective does not have any effect on the chances to also achieve the other one. This hypothesis cannot be found explicitly in empirical studies or political documents. However, it is an implicit assumption, or a consequence of more fundamental assumptions, made in many economic conceptualizations and models.

In the environmental-and-resource-economics literature, sustainability is commonly defined as the maintenance over an infinite time horizon of a further specified measure such as, for example, the total capital stock, the natural capital stock, per capita consumption, welfare, or a vector of such measures (Arrow *et al.* 2004, Atkinson *et al.* 1997, Costanza *et al.* 1997a, Hanley *et al.* 1997, Perman *et al*. 2003). Thereby, sustainability is reduced to its intergenerational dimension. In contrast, economic theories and analyses of distributive justice (surveyed, e.g., by Roemer 1996) solely refer to the present. By this seperation, environmental and resource economics eludes the analysis of possible interdependencies between intragenerational and intergenerational justice.

Contributions to ecological economics regard both objectives of justice as highly important and acknowledge that interactions may occur in the implementation of them. Nevertheless, ecological economics stresses the conservation of ecosystems for future generations in the context of sustainable development. Sustainability is conceptualised with reference to concepts such as ecological carrying capacity or ecological resilience[7] (cf. Atkinson *et al.* 1997: 119*ff.*, Costanza *et al.* 1997a: 3), leading to notions of "strong" sustainability (Pearce *et al.* 1989, Daly and Cobb 1989, Ekins *et al.* 2003, Ott and Döring 2004).

Also, some basic models and results of welfare economics support the independency-hypothesis. They imply that the overall intergenerational impact of human economic action towards nature is independent of the initial distribution to different individuals of rights to use ecosystems. As a prominent example, cap-and-trade systems for formerly open-access ecosystem services, such as the atmospheric sink function for greenhouse gas emissions, are assumed to work accordingly. The cap, that is, the overall volume of greenhouse gases allowed to be emitted into the atmosphere in each year, would be decisive of intergenerational distributive justice. The initial endowment of individuals with emission certificates would be decisive of intragenerational distributive justice. Economists suppose

that all initial allocations of emission certificates would equally ensure the compliance with the set cap of greenhouse gases (e.g., Perman 2003: 219*ff*.).[8] Thus, intergenerational and intragenerational justice could be governed independently. An important presumption underlying this insight is the existence of a perfect and decentralised private ownership market economy without any externalities or transaction costs.

To sum up, implicitly the independency-hypothesis is underlying many concepts and models in the context of sustainability in ecological, environmental and resource economics.

3.2 Facilitation-hypothesis

The facilitation-hypothesis states that achieving one of the objectives of intragenerational and intergenerational justice makes it easier to also achieve the other one. It represents a core belief of important political documents on sustainable development, for example, the *Brundtland-Report* (WCED 1987) and the *Report of the United Nations' World Summit on Sustainable Development* (UN 2002). The hypothesis points to two possible causal connections between intragenerational and intergenerational justice, specified by variant A and B, respectively. A third variant C is based on the simultaneous existence of both causal links.

3.2.1 Facilitation-hypothesis A: The achievement of intragenerational ecological justice facilitates intergenerational ecological justice

According to facilitation-hypothesis A, an increase of justice to future generations is a positive side effect of a juster intragenerational distribution of rights to ecosystem services today. The literature contains three chains of reasoning resulting in this hypothesis. One chain of reasoning focuses on poverty-induced ecosystem degradation and recommends poverty reduction by means of human-made substitutes for ecosystem services, increases in ecological efficiency through technological progress, population control or education as a

[7] Resilience is commonly defined as „the potential of a particular configuration of a system to maintain its structure/function in the face of disturbance, and the ability of the system to re-organize following disturbance-driven change" (Holling and Wagner 2003).

[8] This says nothing about up to what extent the welfare-optimal level of ecosystem utilization can guarantee the preservation of intact ecosystems in the long-term and thereby intergenerational justice.

means to achieve greater intragenerational justice, which is at the same time to the benefit of future generations. The second line of argument states that a redistribution of environmental property rights can be established in a way that facilitates the preservation of ecosystems. A third line of reasoning says that international agreements on ecosystem preservation to the benefit of future generations are facilitated if the agreements are accepted as "fair" by all negotiating, that is, contemporary, parties. In the following, the three chains of reasoning are described in detail.

The first line of argument states that a reduction of extreme poverty without increases in overall ecosystem use addresses a major cause of long-term environmental degradation and, thereby, facilitates intergenerational justice. The Brundtland-Report (WCED 1987) identifies poverty as a cause of ecosystem degradation because "those who are poor and hungry will often destroy their immediate environment in order to survive: They will cut down forests; their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers they will crowd into congested cities. The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge" (WCED 1987: 28). Likewise, it is pointed out that local communities living in extreme poverty are often forced to apply management methods with negative long-term impacts on ecosystems (Adams *et al.* 2004, WBGU 2004: 79). Poverty-driven environmental stress brought about soil erosion of 20% of vegetation-covered land in countries of the global South (WBGU 2004: 77). Poor rural communities usually possess only marginal land and are, therefore, forced to migrate. This poverty-environment-loop led to deforestation and soil erosion in mountain areas in Central America and to desertification in arid regions of Africa resulting from overgrazing by livestock (WBGU 2004: 72). The rapid rise in population is generally considered as a factor speeding up poverty-driven irreversible degradation of ecosystems (e.g., WCED 1987: Chapter 1).

But how can poverty be addressed in a way that, at the same time, reduces pressure on ecosystems? The Brundtland-Commission argues that this would be possible through increases in ecological efficiency, development of environmentally sound technologies and

especially technology transfers into the countries of the global South (WCED 1987: 25). Advocates of an efficiency revolution consider a four- to tenfold increase of material and energy efficiency possible (e.g., Harrison 1992, von Weizäcker *et al.* 1995). The German Advisory Council on Global Change points to technological leapfrogging, that is, overleaping of resource-consumptive stages of development, as a key strategy to reduce poverty without rising ecosystem degradation (WBGU 2004: 97*ff.*), and the Agenda 21 suggests a transfer of environmentally sound technology (UN/DESA 1992: Chapter 34). According to this line of reasoning, environmentally sound substitutes for ecosystem services, for instance the use of solar cookers instead of fuel-wood in Africa, and efficiency increases through technological progress und technology transfer, such as improved irrigation systems to use fresh water more efficiently, are crucial measures to address poverty and ecosystem degradation simultaneously.

Two further strategies are mentioned to reduce poverty in a way that favors ecosystem preservation: controlling population development and improving education (e.g., MEA 2005: 92*ff.*, UN/DESA 1992: Section 4, WBGU 2004: 55*ff.*). Appropriate training measures would equip poor people with knowledge about the links between ecosystem processes and their own livelihood and with capabilities to adapt to a changing environment. Thereby, education measures could reduce the poors' vulnerability to changing environmental conditions and lay the foundations for adopting and advancing environmentally sound technologies (WBGU 2004: 55*f.*).

The second line of argument supporting facilitation-hypothesis A runs as follows. A transfer of user rights to ecosystems from the countries of the global North to the countries of the global South would create greater intragenerational justice. At the same time, it would reduce total environmental stress because sufficient user rights to ecosystems to secure their livelihood would allow the poor to afford an environmentally sound management of their local ecosystems.

Advocates of this argumentation regard the overuse of local ecosystems by the poor to survive from day to day as only one side of the coin. The other side would be the massive

consumption of global natural resources and the overuse of, in many cases global, ecosystem services by the industrialized countries (Bartelmus 1994: 11, Visser't Hooft 2007: 18, Sachs 2001: 75). The investigation of the causes of human-induced global ecological problems, including global warming, fresh water shortage and pollution, soil degradation, loss of biological diversity and air pollution, revealed that the negative impacts of poverty on the environment are overestimated. Industrialization and high levels of well-being are a much greater issue (WBGU 2004: 4). If intragenerational justice was achieved by *redistributing* user rights to ecosystem services between countries of the global North and countries of the global South, this would not be to the harm of future generations (Costanza *et al.* 1997b: 16, Goodland 1992: 40, Kopfmüller *et al.* 2001: 107, Sachs 2001: 2*ff.*). But does this kind of redistribution really *reduce* absolute pressure on ecosystems? Would rural communities stop degrade their local ecosystems, which are the basis of their own present and future income, if their user rights to ecosystems are expanded by means of redistribution? The answer to this question depends, besides sufficient user rights to ecosystems to secure a livelihood, on many institutions including well-functioning credit, product and labor markets, effective monitoring of rules, proper enforcement of policies and secure land tenure (Ruijs *et al.* 2008: 9).

The third line of argument, why the achievement of intragenerational justice can facilitate intergenerational justice, is based on the observation that only international agreements on ecosystem conservation which are preceived as beneficial and intragenerationally "fair" by all parties are politically feasible (Sachs 2001: 94*ff*., Lange *et al*. 2010). By employing game theory, it can be shown that a win-win-situation is a precondition for a successful self-enforcing international environmental agreement which facilitates intergenerational ecological justice (e.g., Elsasser 2002).

3.2.2 Facilitation-hypothesis B: The achievement of intergenerational ecological justice facilitates intragenerational ecological justice

Facilitation-hypothesis B is logically possible, but we found no arguments supporting this hypothesis in the literature. Facilitation-hypothesis B is included in facilitation-hypothesis C, which states that one cannot argue that intragenerational justice is facilitated by realizing intergenerational justice without arguing that intergenerational justice is facilitated by realizing intragenerational justice. Someone who argues in favour of facilitation-hypothesis C, thus, holds that both facilitation-hypotheses A and B are correct.

3.2.3 Facilitation-hypothesis C: There is a mutual facilitation between the achievement of intragenerational and intergenerational ecological justice

The core content of facilitation-hypothesis C is that many human-made environmental problems, threatening the lives and well-being of future generations, vitally affect the access to essential ecosystem services of the world's poor already today (MEA 2003: 71*ff.*, Tremmel 2008: 63, WCED 1987). It would, therefore, prove advantageous for today's poor as well as for future generations to tackle these environmental problems.

Global climate change is a prime example, being a presently acute as well as a long-ranging global environmental problem. The industrialized countries in the global North are largely responsible for human-induced climate change. In contrast, its harmful impacts first of all affect poor people in countries of the global South as well as future generations. The poorest are worst affected because their livelihoods directly depend on their natural environment, and they are in a far worse position to adapt to changing climate conditions and extreme weather events (IPPC 2007b). Already today, global warming exacerbates the water crises in Southern Africa and Western Sahel, affects food production and food security, just as it fosters the spread of infectious diseases like malaria (IPPC 2007b., WBGU 2004: 65*ff.*). The effects of global warming jeopardize and undermine human rights (such as the right to physical integrity) of the poor people living today and will further deepen global injustice concerning the access to ecosystem services in the decades to come (Neefjes 1999: 253).

Slowing down climate change would, therefore, help both fulfil the rights of future generations to live under stable climate conditions and favor intragenerational justice today.

The situation is very similar for biological diversity. The drastic loss of biological diversity carries long-term risks, such as the loss of ecosystem resilience, as it threatens food, income and health security of rural communities in the global South at present whereas intact ecosystems with their great diversity of species and breeds are supermarket, property market and pharmacy to poor rural communities (Sukhdev and Kumar 2008: 15*ff.).* Put positively, the protection of intact ecosystems, and the restoration of degraded ones, proves advantageous to the well-being of today's poor people as well as to the well-being of future generations by enhancing the delivery of vital ecosystem services now and in the future (WCED 1987: 19*ff.*, MEA 2003: 3*ff.*, Sukhdev and Kumar 2008).

3.3 Rivalry-hypothesis

The rivalry-hypothesis states that a fundamental rivalry (trade-off) exists between the objectives of intragenerational and intergenerational ecological justice, so that achieving one objective makes it more difficult to also achieve the other one. In other words, the quantity and quality of existing ecosystem services are insufficient to fulfil both the justified claims of present and future people. More intragenerational ecological justice would imply less intergenerational justice, and vice versa. The creation of protected areas to preserve intact ecosystems for future generations often negatively impacts on today's poverty as it closes land use options to poor rural communities (Adams *et al.* 2004). Vice versa, it is assumed that the vital needs of the poor in the global South, especially for ecosystem services characterized by rivalry in use, such as food, fuel and freshwater, can only be met at the expense of long-term ecological interests (Visser't Hooft 2007: 84, Roemer 2007: 226). Alleviating poverty by securing sufficient access of today's poor to ecosystem services, would, according to this hypothesis, cause an increasing overall degradation of ecosystems, thereby reducing the availability of ecosystem services to future generations.

This chain of reasoning does not consider an intragenerational redistribution of environmental property rights, neither within nations nor between industrialized countries and countries of the global South. If fundamental intragenerational redistribution of environmental property rights is impeded by political restrictions or simply not taken into account (as in WCED 1987), intragenerational justice can only be achieved by extending the poors' rights to use ecosystems. This would inevitably lead to ongoing environmental degradation to the disadvantage of future generations. Hence, extending today's poors' user rights to ecosystems without reducing them elsewhere is inevitably at the cost of future generations. Obviously, this conflict intensifies if the countries of the global South claim environmental property rights which do not only guarantee subsistence level but also allow for the same opportunities to economic development than were enjoyed by countries with earlier development. It is claimed as highly unlikely that ecosystem degradation can be stopped solely through technological progress if most of the world's population is to reach the resource consumption level of today's industrialized countries (Ekins 1993, Wissenburg 2006: 429). Goodland illustrates this dilemma as a conflict between two realisms:"On the one hand political realism rules out income redistribution and population stability as politically difficult, if not impossible; therefore the world economy has to expand by a factor of five or ten in order to alleviate poverty. On the other hand ecological realism accepts that the global economy has already exceeded the sustainable limits of the global ecosystem and that a fivefold to tenfold expansion of anything remotely resembling the present economy would simply speed us from today's longrun unsustainability to imminent collapse" (Goodland 1992: xiii).

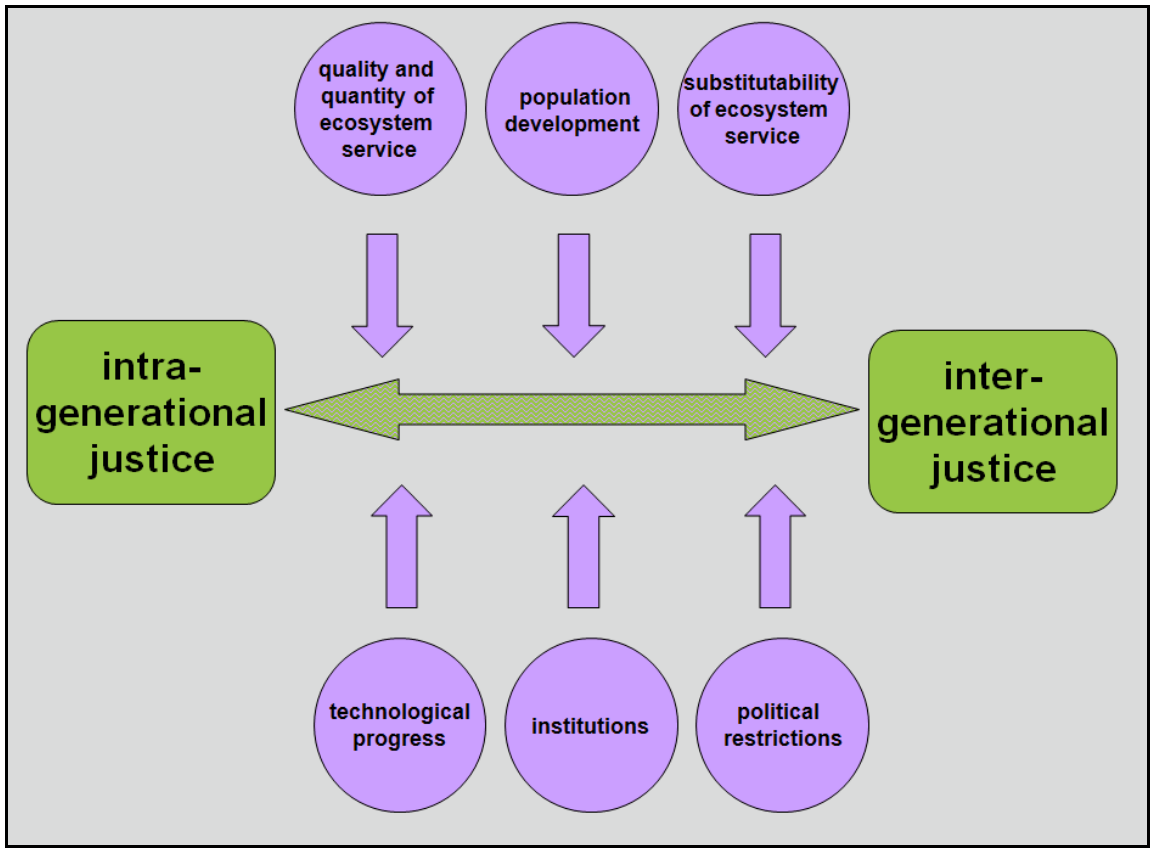
Whereas advocates of facilitation-hypothesis A (according to which the achievement of intragenerational ecological justice facilitates intergenerational ecological justice) presume a stabilization of population number as well as either an intragenerational redistribution of environmental property rights or a decoupling of environmental pressure from economic growth, advocates of the rivalry hypothesis challenge exactly these premises (e.g., Dobson 1998: 134, Goodland 1992: 42, Sachs 2001: 88). Supporters of the rivalry hypothesis

question the predominant Western model of development and the associated patterns of production and consumption. To reduce the conflict between the objectives of intragenerational and of intergenerational justice, they point out pathways to resource-conserving prosperity models. These give priority to the adaptation of material and energy flows to the regenerative capacity of ecosystems and raise the question of "How much is enough/too much?" (Kopfmüller *et al.* 2001: 107, Sachs 2001: 197).

4 The underlying determinants

A more fundamental analysis of the arguments used to support the three hypotheses reveals that they draw on specific assumptions about underlying determinants. These determinants are the quantity and quality of ecosystem services, population development, substitutability of ecosystem services by human-made goods and services, technological progress, institutions and political restrictions. The analysis of the arguments for each of the three hypotheses shows that different assumptions regarding the underlying determinants lead to different hypotheses. Hence, the determinants act upon the relationship between intragenerational and intergenerational ecological justice and, thereby, influence which hypothesis holds true (cf. Figure 1: 20). Clarifying the impact of the underlying determinants on the objectives of intragenerational and intergenerational ecological justice is of high importance for sustainability policy, which can strive to change these determinants to prevent and solve goal conflicts.

Figure1: *Six underlying determinants affect the relationship between the objectives of intragenerational and intergenerational ecological justice: the quantity and quality of ecosystem services, population development, substitutability of ecosystem services by human-made goods and services, technological progress, institutions and political restrictions.*



4.1 Quantity and quality of ecosystem services

The *quantity* of ecosystem services refers to the *amount* of ecosystem services produced by today's ecosystems as well as to the *intrinsic growth rate* of renewable resources, which determines the potential amount of delivered provisioning ecosystem services in the future. The quantity of ecosystem services determines, inter alia, whether and to what extent there is a rivalry between meeting the justified claims on ecosystem services of people living at present and meeting such claims of future people. For instance, the rivalry-hypothesis holds

true if the quantity of ecosystem services is insufficient to realise both intragenerational and intergenerational ecological justice.

We describe the *quality* of ecosystem services with reference to two fundamental and distinctive characteristics: *rivalry/non-rivalry in consumption* and *excludability/non-excludability from use*. *Rivalry in consumption* means that the use of an ecosystem service by one person does diminish another person's ability to use the same service. An example is the provisioning service of food production. One unit of food consumed by one person cannot be consumed by another person anymore. Many regulating and cultural ecosystem services are characterized by *non-rivalry in consumption*, that is, their use by one person does not diminish another person's ability to use the same service. Examples include climate stabilization or aesthetic beauty of a landscape. *Non-excludability from use* means that within the current social, legal and economic order no one can be excluded from using the service. For example, the services climate regulation and flood protection prove advantageous not only to people who contributed to their delivery, such as through preservation of bogs or reforestation, but also to many other persons locally and globally who cannot be excluded from benefiting from these services. *Positive externalities* spring from ecosystem services that are characterized by non-rivalry in use and non-excludability from use. The provision of ecosystem services by one person has a direct positive impact on the well-being of other persons.

The basic models and results of welfare economics supporting the independency-hypothesis presuppose that ecosystem services, characterized by rivalry in consumption and non-excludability from consumption, can be made excludable by an institutional arrangement, such as privatization or implementation of a cap-and-trade-system. Facilitation-hypothesis C is essentially based on the assumption of positive externalities springing from the preservation or restoration of ecosystems to today's poor and to future generations. Advocates of the rivalry-hypothesis refer to ecosystem services characterized by rivalry in consumption. The present overuse of such services would lead to the depletion of the delivering stocks (e.g., fish populations and forests) and the degradation of supporting and

regulating services (e.g., the loss of erosion control) with harmful consequences for future people.

4.2 Population development

The determinant *population growth* refers to the *growth rate of human population* in total as well as to the spatial *distribution of demographic development* at present and projected into the future.[9]

In the context of facilitation-hypothesis A, it is assumed that controlling population development in countries of the global South is a means to achieve greater intragenerational justice, which at the same time reduces poverty-induced ecosystem degradation and, thereby, facilitates intergenerational ecological justice. Conversely, the promotion of intragenerational ecological justice can reduce poverty and, thereby, slow down population growth (Neefjes 1999: 257, Thompson 1992, WCED 1987: 98), what again takes human pressure from ecosystems. In this sense, the WCED argues that almost "any activity that increases well-being and security lessens people's desires to have more children than they and national ecosystems can support" (WCED 1987: 98). In contrast, the rivalry-hypothesis presupposes that population cannot be controlled at a stable number, but grows to a number which does not allow to fulfil the justified claims on ecosystem services of all people living at present and living in the future in relation to the delivered quantity of ecosystem services. [10]

4.3 Substitutability of ecosystem services by human-made goods and services

A definition of *substitutability* requires a measure according to which there is no change when an ecosystem service is replaced by a human-made good or service. Whereas in environmental and resource economics social welfare or individual utility is commonly used

[9] The UN-Department of Economic and Social Affairs prognosticates between 7,7 and 10,7 billion people in 2050 (UN/DESA 2005). For the most part population growth is predicted to occur in poor regions, especially in the biggest cities (WBGU 2004: 89).

[10] There is a considerable body of empirical evidence that conflicts with the paradigm – used in both lines of argument discussed in this section – that population growth causes poverty and environmental degradation (Attfield 1998).

as the measure to define substitutability, contributions to ecological economics define substitutability predominantly as the availability of functional substitutes for every single individual. In case of many vital ecosystem services, such as the provision of clean fresh water, a non-substitutability according to both evaluation criteria must be assumed. Neither basic human needs nor the specific function of the ecosystem service for human well-being are substitutable. In the following, we understand substitutability with reference to the functional substitutability of ecosystem services by human-made goods and services.

Examples that illustrate substitutability of ecosystem services by human-made goods and services include the various ecosystem services delivered by a forest: Its water regulation service could be substituted by building a system of reservoirs and embankments, its filtering of fresh water could be substituted by a desalination plant, its recreational service could be substituted by an artificial forest, a yoga course or a theme park, the provision of wood as fuel or construction material could be substituted by the use of solar cookers or by plastics. For each service it has to be examined whether the human-made alternative really substitutes for the functions delivered by the ecosystem service to each affected individual. For the whole forest ecosystem it has to be examined whether human-made alternatives can adequately substitute for all delivered ecosystem services.

The more ecosystem services are regarded as substitutable, the less harmful is a present overexploitation of ecosystems to the realization of justice to future generations, as long as the present generation sufficiently invests in other forms of (physical, social and human) capital. In the context of facilitation-hypothesis A, one line of argument assumes substitutability: Environmentally sound functional substitutes for ecosystem services, such as the use of solar cookers instead of fuel-wood in Africa, are pointed out as a means to achieve greater intragenerational justice, which at the same time facilitates intergenerational ecological justice. In contrast, advocates of the rivalry-hypothesis primarily relate the quantity and quality of delivered ecosystem services to the number of present and future people. Thereby they implicitly assume a limited substitutability of ecosystem services.

4.4 Technological progress

We define *technological progress* as the rate of increase in ecological efficiency, realized by innovation of new technologies, or by means of technology and knowledge transfer of already existing technologies.

There are specific assumptions about technological progress made in the context of facilitation-hypothesis A. Technological progress is mentioned as a strategy to reduce global intragenerational injustice in a way that also facilitates the preservation of ecosystems to the benefit of future generations. Advocates of an efficiency revolution consider a four- to tenfold increase of material and energy efficiency possible (e.g., Harrison 1992, von Weizäcker *et al.* 1995). The Brundtland-Report points out the importance of technological efficiency increases in industrialized countries and technology transfer into the global South (WCED 1987: 24*ff.*). The WBGU terms two key strategies to realize intragenerational justice through economic growth of the countries in the global South without rising ecosystem degradation: technological leapfrogging, that is, skipping resource-consumptive stages of development, and dematerialization, that means decoupling the consumption of natural resources from economic growth (WBGU 2004: 97*ff.*).

In contrast, advocates of the rivalry-hypothesis assume a decoupling of total ecosystem pressure from economic growth by means of technological progress to be highly unlikely, especially if most of the world's population is to reach the resource consumption level of today's industrialized countries (Ekins 1993). This would entail a conflict between the objectives of intragenerational and intergenerational justice. In addition, efficiency increases can stimulate further demand and, thus, raise total consumption of ecosystem services (cf. e.g., Sorrell 2007).

4.5 Institutions

Sustainability-relevant *institutions* are all mechanisms which structure and govern human use of ecosystem services at all levels of society (Vatn 2005: 6). They encompass the legal structure, formal and informal markets, agencies of government, interpersonal networks as

well as the rules and norms guiding their behavior (Arrow *et al.* 2004: 149, Vatn 2005: 6*ff.*). Relevant institutions in the context of ecosystem use include private property or user-rights to ecosystems and the rules regulating their distribution, as well as management rules for common goods, and sanctions securing compliance with them.

The basic models and results of welfare economics supporting the independency-hypothesis are grounded on institutional arrangements (e.g., the assignment of property rights or the implementation of cap-and-trade-systems) which exclude non-authorized users from the consumption of formerly open-access ecosystem services. Institutions are also of importance in the context of facilitation-hypothesis A: Private property or user rights to local ecosystems for the world's poor are mentioned as a precondition for realizing intragenerational ecological justice and facilitating intergenerational ecological justice. For example the MEA and WBGU recommend the institutionalization of rights to use ecosystem services, which enable the poor to satisfy their basic needs and assure a livelihood, as a means to reduce poverty-driven ecosystem degradation (MEA 2003:81, WBGU 2004:4).

An important issue for establishing such institutional arrangements is who carries the transaction costs[11] for contracting, implementing, monitoring and controlling the transactions made under some institution. In a market economy transaction costs depend on the regulation of liability rules, which distribute responsibilities and, thus, serve as a starting point for negotiations. The success of market solutions, based on private user rights to ecosystem services, may be limited by excessive transaction costs. Theory and empirical results indicate that a full liability rule[12] decreases the extent of market failure from negative environmental externalities stronger than a zero liability rule, and that it redistributes income in favor of the negatively affected party (Norgaard and Hall 1974, Randall 1972).

Whether securing sufficient user rights to ecosystems really stops the poor degrading their local ecosystems, further depends on many other institutions, including well-functioning

[11] Following Randall (1972: 176), we define transaction costs as the "costs of making and enforcing decisions. Included are the costs of obtaining information, establishing one's bargaining position, bargaining and arriving at a group decision, and enforcing the decision made".

credit, product and labor markets, effective monitoring of rules, proper enforcement of policies and secure land tenure (Ruijs *et al.* 2008: 9) as well as the empowernment of the local population to participate in decisions concerning their local ecosystems (WBGU 2004: 4, Stoll-Kleemann 2005 and WRI 2008: 47*ff.*).

4.6 Political restrictions

We define *political restrictions* as the limits to an alteration of political institutions, such as agreements or laws, at any level – from the local to the global level. Political restrictions are an expression of existing power relations. For example, a redistribution of property rights to private land may be impossible due to effective resistance of those parts of society who would loose from the redistribution.

Advocates of facilitation-hypothesis A argue with the underlying assumption that there are no or only slight global political restrictions. Both a redistribution of environmental property rights and the recognition of the claims of the global South to reach enforceable environmental agreements are based on the possibility to fundamentally alter political institutions. On the contrary, proponents of the rivalry-hypothesis consider political restrictions to be tight and, therefore, a redistribution of rights to ecosystem services to be politically difficult if not impossible.

5 Conclusion

Our investigation shows that the relationship between intragenerational and intergenerational ecological justice is multifarious and multilayered. Whether the elementary needs for ecosystem services of the world's poor can be satisfied and at the same time intact ecosystems for future generations be preserved, crucially depends on certain determinants: the quantity and quality of ecosystem services, population development, substitutability of

[12] Under full liability rule the environmental property rights are initially assigned to the (potential) pollutees, under zero liability rule they are initially assigned to the polluter.

ecosystem services by human-made goods and services, technological progress, institutions and political restrictions.

The influence of these determinants can be summarized as follows: The higher the intrinsic growth rate of renewable resources, the smaller the population growth rate, the greater the substitutability of ecosystem services, the higher the rate of technological progress, the stricter the institutional restriction of ecosystem use and the greater the political scope for redistribution of environmental property rights, the less likely is a conflict between the objectives of intragenerational and intergenerational justice.

The different (and mutually exclusive!) hypotheses about the relationship between intragenerational and intergenerational ecological justice – independency, facilitation and rivalry – reflect positions in realpolitik and hinder developing common objectives and agreements. Scientists, political advisors, politicians and the public need to be aware of, and explicitly discuss, the conflicting opinions about the determinants underlying these positions and their impacts on both intragenerational and intergenerational justice. Furthermore, sustainability policy needs to recognize that there are differences between specific ecosystem services, for example between biodiversity and climate regulation, in terms of substitutability, reversibility, actual quality and quantity. Whereas political restrictions are an inherent attribute of political power structures and the quality and quantity of ecosystem services are given, sustainability policy could strive to change the determinants population development, substitutability, technological progress and institutions in an integrated way.

The literature survey raises two questions for further research. There are different concepts of intragenerational and intergenerational ecological justice underlying the discussions in the literature. Yet, they are rarely introduced explicitly. Therefore, one question for further research is which concepts of ecological justice underly important political documents on sustainable development (especially UN 1992 und WCED 1987). The political debate about the ethics of sustainable development could be further enriched by a philosophical explication and justification of global intragenerational and intergenerational ecological justice. The other question concerns the issue of political implementation: How

must political institutions and instruments be designed to facilitate intragenerational and intergenerational justice simultaneously?

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