

# Future generations: Economic, legal and institutional aspects

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## Abstract

In economics, the issue of ‘future generations’ is mainly related to the environmental problems of resource consumption and pollution and their distribution over long time horizons. This paper critically discusses fundamental concepts in economics, such as efficiency and optimality, in relation to the incorporation of future generations in present day decision-making. Cost–benefit analysis (CBA) and discounting are used as a starting point and criticized for its inherent flaws such as incommensurability of values and its tendency to hide rather than reveal underlying values which are assumed to be fixed. We then investigate alternative approaches, in which, unlike in CBA, the preferences are not assumed to be a priori but must be constructed. Thus, interest groups or individuals must sit down together and figure out what things seem to be worth. The aim is to involve all interested parties in planning for the future.

Similarly, on a national and regional level, increasingly stakeholder processes, deliberative and interest group procedures are used to develop strategies and visions for resource management and conservation. A similar case can be made for institutions at the international level. The legal examples provided in this paper show that rather than only installing an institution such as the guardian for the future on the global level, more ‘democratized’ bottom up approaches might be more appropriate.

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## 1. The context: environmental discussion and sustainable development

The issue of ‘future generations’ is mainly related to the environmental problems of resource consumption and pollution and their distribution over long time horizons. In the late 1960s and early 1970s, system modellers and natural scientists pointed out the apparent limits of the Earth’s resources facing the growth of human population and changes in consumption and production patterns [1, p. 80,2]. Following the cycle of public awareness for environmental problems, the attention ebbed after the oil crisis in the mid-1970s. A renewed discussion of environmental issues in public and academic discourses was instigated when the concept of sustainable development was put forward by the International Union for the Conservation of Nature in 1980 [3] and the World Commission on Environment and Development [4]. This widely used definition of Sustainable Development for the first time brought future generations into the focus of a larger audience: “Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [4].

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In the following discussions within economics two concepts emerged: strong and weak sustainability. The advocates of weak sustainability maintain that the aggregate stocks of human-made and natural capital should be non-decreasing; this assumes that natural resources can be replaced by human-made capital [5]. Closely related to this view is a non-intervention stance based on the idea that future generations will benefit from advances in technology, investments in both man-made and natural capital, and direct bequests [6]. For example, Adams (1989, p. 1274 quoted after Spash, p. 30; [6]) describes this view in terms of alleviating our responsibilities for global warming: Future generation “typically benefit (in the form of higher material standards of living) from current investments in technology, capital stocks, and other infrastructure.” Advocates of strong sustainability argue that a minimum necessary condition is that the stock of natural capital be maintained [7,8]. In between is the viewpoint that certain stocks of ‘critical natural capital’ have no substitutes, so that they must be maintained in addition to the general aggregate capital stock [9,10]. Common to the latter two approaches is the recognition of the limitations of technological progress with regard to natural capital [9].

Closely related to the arguments for maintaining at least a stock of critical natural capital are the questions of uncertainty and irreversibility. Uncertainty refers to the fact that most of the time our decisions are based on incomplete information about the consequences of our actions. For instance, regarding the role of biodiversity in maintaining essential ecological processes researchers are just beginning to produce compelling theories. Without thorough knowledge about the benefits and costs of substituting human-made capital for natural capital, any trade-off between them could result in irreparable damages. Irreversibility has to do with the fact that once depleted, natural resources cannot be restored. For instance, tropical forests cannot be created, desertified land is very difficult and costly to reclaim, and species lost are gone forever [9].

In the context of irreversible effects, it is also important to note that the depletion of stocks affects future generations in a different way than the creation of long-term environmental damages. The former refers to the provision of basic materials for maintaining a certain standard of living whereas environmental damages might lead to a violation of the right to remain unharmed [6]. Conservation approaches based on Muir and Leopold add dimensions of balancing current (material) welfare against moral and aesthetic values of present and future generations. Norton [11] describes what he refers to as the extensionist-preservationism<sup>1</sup> perspective which does not perceive wild species and ecological systems as ‘resources’ but rather allows for interests that reside in nature itself, independent of human interests. According to this view nonhuman species have intrinsic values and ‘rights’ of their own [7,14,15]. Thus, these values cannot be reduced to human values and are thus incommensurable with human interests, thus limiting the morally permissible range of resource use [11]. Ideas that are of course difficult to operationalize as no quantitative models exist representing holistic concepts of the health of entire landscapes [16].

Neo-classical economists argue that irreversibility is a problem of investment and time, given sufficient time and capital, ecosystems can be restored to its original condition. Hence, the policy descriptions of neoclassical economics are often based on the notion of reversibility and future generations are just another parameter in an optimization exercise in using renewable and non-renewable resources [17]. The concept of optimality conveys that there exists a best choice and that more research reveals what that choice is. But studies on, e.g. climate change, come up with very different results than cannot be rectified by further research on getting the important parameters right. Rather the disagreement on certain key parameters and on modelling choices is value laden [18,19]. A similar sentiment is expressed by Freyfogle [19, p. 10156]: “Intentionally or otherwise, they display an individualistic if not libertarian political perspective; they ignore and hence devalue ecological connections; and they embrace a presentist, anthropocentric moral scheme that rejects, ab initio, the ethical claims of future generations and nonhuman life. By no means are economic models neutral constructs.”

<sup>1</sup>At the other end of the spectrum is what Norton [11] describes as the ‘exploitationist society’ (e.g. the early colonists in the US) which can be characterized by a view in which wilderness and natural resources are valueless until transformed by human labor. Shortages in raw material do not play an important role as any natural resource can be replaced by a substitute resource (a view still subscribed by prominent present-day economists such as noble laureate Robert Solow [12, p. 181]: “Resources are ... fungible in a certain sense. ... Sustainability does not require that any particular species of owl or any particular species of fish or any particular tract of forest be preserved”). Related to this view is also the notion of conservationism nicely expressed by Ciriacy-Wantrup [13, p. 48]: “conservation does not mean non-use. Conservation of non-renewable resources, in the sense of leaving the stock undiminished, is a meaningless concept, as this would be logically inconsistent with what is meant by the term resource”.

## 2. Conventional economic analysis: the example of cost–benefit analysis (CBA) and discounting

CBA is a good example of conventional economic thinking. It is one of the most frequently used environmental planning tools as it is supposed to facilitate achieving superior environmental performance at lower costs and thus higher welfare for society. CBA estimates and totals up the equivalent money value of benefits and costs related to a certain project.

A number of eminent economists rejected the monetary valuation used in CBA, arguing that prices do not properly reflect resource scarcities. In economic theory there is the axiomatic assumption that economic agents base their decisions on market signals but one cannot expect economic indicators to contain more information than the economic actors had at the time they generated them, i.e. resource managers use biophysical indicators to make management decisions which then via the market process lead to prices. Prices are then subject to and further distorted, e.g. by the power structures in actual markets [20,21].

In addition, consequences of environmental degradation and benefits from environmental improvement are heterogeneous and therefore in principle not comparable. The process of causation is complex since it is governed by the interaction of a series of variables that may react upon one another. Neither the scope nor the tools of conventional economic analysis are adapted to these types of interdependencies and complex causal sequences:

“These interdependencies have nothing to do with market transactions or exchanges of any kind, nor are they the result of choices unless one is prepared to argue that they are caused by the deliberate action of private firms which in full knowledge of the consequences decide to shift part of their costs to third persons or to society” [21, p. 839] or, one might add, to future generations. These interdependencies in socioeconomic-ecological systems make the price setting for ecological services impossible. To assign prices based on an exact evaluation demands a precisely demarcated object, i.e. that conceptual boundaries can be drawn and property rights attached. “[M]any environmental goods ... fail to conform to discrete units which can be broken into marginal changes for the purpose of economic valuation.” [22, p. 527]

Another set of criticisms arises from the incommensurability of different qualities through their translation into monetary values. The aggregation of different types of values into one ‘supernumeraire’ rather hides than reveals underlying values and thus is an obstacle rather than a tool to support deliberative stakeholder processes. In CBA the participants in evaluation exercises are treated as individual consumers appraising various goods. Contingent valuation fails to allow people to judge value collectively as citizens rather than as consumers by treating political decisions as market decisions [23–25]. “The highly complex, resource-intensive, and expert-driven nature of this method makes it extremely difficult for the public to understand and participate in the process. Thus, in practice, cost–benefit analysis is anything but transparent” [26, p. 2].

This reductionism to a common denominator allows the application of the basic axiom of CBA—the so-called Kaldor–Hicks criterion—total benefits exceed total costs. But if losers are not compensated then the ethical basis for this approach is not given. In CBA compensation is really only a theoretical construct and not a precondition or a goal to strive for; as Barry formulates so pointedly: “In general, doing harm is not cancelled out by doing good. If an individual pays to have a road straightened and saves two lives a year, they cannot shoot one motorist a year and simply calculate an improvement” (Barry 1983 quoted after Spash 1994, p. 32; [6]).

Another perceived problem in CBA is the assumption that ‘income equals well-being’; and that the marginal utility of money is constant. Nothing can be said with CBA about the fact that in reality income increases are judged by the individual in relation to the income of significant others, i.e. a policy favouring Bill Gates has a different effect on social well-being than one favouring a poor person. Thus, CBA probably reinforces existing patterns of inequality as the question of who suffers is usually ignored and hence CBA would justify putting greater environmental harm on poorer communities within and between generations.

Often times, costs and benefits are accrued at different points in time. To deal with these monetary flows economists discount future values by a rate of interest to arrive at an equivalent present value. CBA discounts all future impacts by applying time preferences of present individuals “as if society were made up of immortal individuals” [27, p. 70].

The basic idea of discounting is that money can be invested in a bank account where it grows at a given rate and this process is an alternative to investing money in other projects. This basic idea of growing or shrinking value of money is uniformly applied to money in bank accounts, fish population, forest stand, or casualties in an accident in a chemical plant. “The growth of fungible money in the bank thus becomes the archetypical paradigmatic norm against which all conceivable future events must be measured” [28, p. 154]. Thus, the notion of discounting is another expression of the currently dominant growth paradigm.

In principle there are two ways in which the discount rates are established [29]: the *descriptive* method takes the market interest rate to ensure that investments are made for the most profitable alternative. The *prescriptive* mode emphasizes that normative considerations are involved in project or consumption decisions with implications for future generations. Both approaches are riddled with problems (for a discussion, see e.g. Refs. [18,30]).

Obviously the choice of the discount rate has strong implications on the distribution of future well-being as conventional analysis would give less importance to flows that take place in the future. Projects with distant costs and present benefits are favoured over projects with distant benefits thus “discounting contains a built-in bias against future generations” [7, p. 211]. A related problem is that future costs or benefits are experienced by different people: “discounted present value represents the value to present people derived from contemplating the welfare of future people. It does not reflect the welfare of future people themselves, or even our estimate of their welfare. Rather it reflects how much we care about future people compared to ourselves” [28, p. 154]. Thus, the level of the discount rate is not based on any equity criteria but rather on an arbitrary extension of the time preferences of represented individuals of the present generation [6].

The bottom line is that interest rates and prices established in markets do not lead to efficient intergenerational allocation. The market rate does not reflect the preferences of individuals regarding the well-being of their descendants or future generations more generally. Altruistic behaviour is hardly reflected due to the ‘Isolation paradox’ according to which an individual will sacrifice consumption in favour of future generations only if the guarantee exists that others do likewise (Baumol 1962 quoted after Padilla 2002; p. 70; [27]). The social actors have only little incentive to behave in a ‘socially efficient manner’ when they receive the full benefit and have to suffer a small part of the cost of their actions. When external costs are extended further into the future affecting anonymous generations beyond immediate descendents these incentives are even fewer [31].

The acceptance of discounting as the proper approach to inter-temporal resource allocation requires an unavoidable moral judgement [32]. Similarly argues Parfit in recognizing that more remote bad consequences are less likely but because of this not less important: “The moral importance of future events does not decline at  $n$  percent per year” [33, p. 29]. Spash summarizes this discussion so eloquently “The debate on discounting has concentrated upon the appropriate rate to choose and differences between private and social time preferences as if the question were in some sense ‘objective’. Rarely are any obligations we may violate by adopting the procedure of discounting discussed. ... Thus obligations might be maintained on the basis of basic human rights. In this way, the consideration of the consequences of our actions for future generations implies concern for the harm caused and not merely the aggregate level of benefits addressed by the debate over which discount rate is the ‘right’ one” [6, p. 30].

In summary, we can say that environmental degradation tends to impose the largest costs on those generations that are yet to be born. Future generations are disadvantaged with regards to present generations because they can inherit an impoverished quality of life, share a condition of structural weakness in having no voice and representation among the present generation and so their interests are often neglected in present decisions and planning [34]. A number of adjustments to present policies and institutions have been suggested to overcome these described shortcomings.

### 3. Institutional approaches

Environmental policies and institutions representing future interests are regarded as important instruments to protect future generations. According to Padilla [27, p. 80] these institutions should be able to control the different socio-economic and biophysical variables related to sustainability, to act as trusteeship and protector of the rights of future generations (including sanctioning power for acting effectively against the practices that

jeopardize the rights of future generations), to articulate the compensations to future generations, to create economic incentives and finance the change to sustainable practices.

### 3.1. *Basic questions and practical issues*

From a legal perspective when dealing with future generations one of the key questions is, where do they begin and where do present generations end? This question could be examined from different perspectives, such as time (when does the future start?) or definitions of generation (human/non human and/or living or non-living being). With respect to the former the number of individuals changes every little time unit. Concerning the latter there are already barriers seen to fair treatment of non-human life (see e.g. Ref. [35]), on non-human species (e.g. Ref. [36]) and by discussing ‘units of significance’ [37, p. 178] this term is widened to include aesthetical aspects and the non-living environment. To complicate matters further the term species changes through biotechnology, when for example new creatures are ‘created’. Because these questions have often religious and ethical connotations, such as the discussion about the application of contraceptives and abortion with human beings, no ‘right’ or ‘wrong’ answer to the question what are ‘future generations’ could be easily derived.

To overcome this dilemma, a working definition relevant to resource consumption has to be chosen, bearing in mind that other conceptions of future generations exist [38]. For example with an anthropocentric view it was proposed to consider the term ‘future generations’ “to represent a collectivity ad infinitum of all human beings who succeed the present or living generations” [39, p. 41]. This focus on the term mankind rather than not yet born individuals or groups in an increasing number of international documents on ecological issues reflects a new direction in environmental policy. This is also expressed in the concept of common heritage introduced in international environmental laws regulating the environmental commons and also extended to bioethical contexts (such as in the UNESCO’s draft declaration for the Protection of the Human Genome; see Ref. [34]).

Why to care for future generations is not less diversely discussed than the term ‘future generations’ itself [40–47]. Arguments in favour of identifying and protecting future generations’ interests have been identified on moral, philosophical and religious grounds [48]. Many ethical theories have been raised; one of the most well known examples is based on Rawl’s *A Theory of Justice* (1971). Rawl’s argues that fairness requires the application of the ‘just savings principle’, calling for a redistribution of income and wealth so that the more disadvantaged people improve their situation to a greater extend than the advantaged [48, p. 54]. This is a situation in which the participants of this hypothetical construct would subscribe if they did not know where in history they belonged (‘veil of ignorance’). Applied to future generations, every generation is expected to pass on to posterity a better situation than it has inherited.

On the other hand, other writers argue that there should be room for the attitude denying that need, based on a consequent egotistical approach or philosophical and legal problems deriving from the uncertainty of the existence of concrete future individuals [48]. A similar sentiment is expressed by De George: “... since the children do not yet exist, we should properly say they do not now have rights. ... We cannot sensibly or intelligibly answer the question of whose right was infringed when there is no bearer of the right” [40, p. 96]. This discussion shall not be repeated here in more detail, but it is worth mentioning that it is a precondition for the question of interest. Because if a society does not decide based on moral grounds towards a certain responsibility on behalf of future generations, specially designed institutions do not have any basis for their tasks and therefore would be meaningless.

Hence for example article 1 of the Declaration on Responsibilities of the Present Generations for Future Generations [49] states clearly that the present generations have the responsibility ensuring that the needs and interests of present and future generations are fully safeguarded. Only if in this manner future generations are considered to have interests, those interests could be further defined and institutions could be established to protect these interests. Though it has already been argued that “we cannot even calculate the needs of the present generations within a climate and system that we can study” [50, p. 129], several ambitious studies have been undertaken to define the preferences of future generations [49,51–53].

Similar to the wants and needs of present generations, those of future generations have to be defined [54,55]. And priorities are necessary to be laid down within needs and wants of present and future generations, which

is again a highly ethically charged question [38,56]. Since, almost by definition, future generations are unable to express their preferences their interests have to be ‘constructed’ [27,57]. This procedure of setting interests and priorities, which is also immanently expressed especially within the principles 3, 6 and 7 of the Rio Declaration from 1992, is leading towards conflicts of interests between present and future generations and within them [58,59].

Already within this procedure, the setting of normative standards and its implementation by a sort of representation of future generations is considered to be necessary [43]. But already at this point it has to be mentioned that social advocacy of the future human generations seems to be less advanced than environmental advocacy on behalf of present human generation. Although in general social advocacy seems to be much closer to the mainstream anthropocentric picture of the world than environmental advocacy. One might call this the ‘Paradoxon of advocacy for future human generations’.

### 3.2. *Adjustments to legal institutions*

The global intergenerational significance of legal international institutions promoting international law has been already particularly well expressed [43]. Already long before sustainable development became a main topic with regards to the often cited intergenerational definition of the Brundland Report [60] the role of governance was emphasized in connection with the implementation of rights of future generations (e.g. Ref. [61]). A series of conventions, charters, agreements and treaties adopted by international conferences and organizations, such as the UN, reflect concern for the future of humankind [34]. Several main environmental agreements and institutions closely connected to the UN Conference on Environment and Development (UNCED) explicitly point out their commitment to future generations [39]. After the UNCED in 1992 the level of participation of environmental stakeholders increased through several UN-conventions.

Noteworthy in this context are the *Esposo Convention* (enforced since 1997)<sup>2</sup> and *Rio Declaration based Aarhus Convention*<sup>3</sup> (in force since 2001) [62,63]. These conventions institutionalize individuals and NGO’s in addition to the public authorities in order to supervise environmental matters, although without distributing specific financial support to them -a precondition to fulfill this task of public interest properly. However this globally introduced inclusion of current stakeholders on the national level could be a model for one kind of stronger advocacy of the interests of the future.

Beginning from this national level a stronger inclusion at the multinational level, such as a regulation on the application of the Aarhus Convention at the EU level [64] and further on the international level could be aimed for on behalf of the future. Already before these conventions were discussed, some countries introduced in environmental matters a more institutionalized participation of NGO’s (e.g. Germany), public interest law firms (e.g. USA) and specific public environmental attorneys (e.g. Austria).

Despite numerous suggestions, practical experiences with institutions bearing and enforcing explicitly and exclusively interests of future generations do not exist. At the multinational level of the European Union less institutionalized approaches have been established. For example, every European citizen or institution has the right to send a complaint to the European Commission and the complaint has to be dealt with. In this way also a lack in implementing European law through Member States concerning preventive environmental regulations may be claimed and imposed. Similarly, such a bottom up approach was put forward by submitting an ‘amicus curiae submission’ on behalf of global matters to the World Trade Organisation conflict settlement panel (see e.g. Ref. [65]). Similar in the US an amicus brief is generally submitted to the Supreme Court in order to draw the court’s attention to issues concerning facts or law that have not, or not likely to be, by the individuals or groups that are already a party to the action before the court [66, p. 156].

A wide variety of practical suggestions for institutional representations of future generations have been made. Within existing legislation new organizational approaches have been advocated such as a new evaluation process taking future generations interests stronger into consideration [27]. Related to this is the suggestion for an explicit constitutional restriction to protect the interests of future generations similar to

<sup>2</sup>UNECE Convention on Environmental Impact Assessment in a Transboundary Context (see <http://www.unece.org/env/eia/>).

<sup>3</sup>UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, see <http://www.unece.org/env/pp/>).

those protecting minorities [67]. Similarly, Tonn [68] proposed an amendment to the US Constitution to create the Court of Generations. This court should be an appendix of the Supreme Court, which is part of the political process, and its responsibility is to use the ‘conscience’ of the Constitution to resolve the particularly difficult complexities that continually arise in society. This court would have no authority to force the implementation of any agenda but rather would provide a focus for national discussion and prioritization important issues such as global climatic change, species extinction, soil erosion and genetic engineering.

### 3.3. *A vision: attorneys for the future*

Already in 1992 a proposal for the establishment of a guardian for future generations was submitted to the preparatory committee of the Rio Earth Summit (UNCED), which failed [69,70]. Meanwhile some doubts on the chances to establish a powerful guardian have been raised [66] and a different, softer approach to institutionalizing such a guardian, by means of an UN-Resolution, has been proposed [71].

The idea of an attorney for the future is without doubt a challenging one. It concerns difficult questions particularly regarding the procedure of institutionalization and the provision of powers to this attorney. The former question covers procedural as well as personal aspects [70]. Should an attorney for the future be institutionalized through decision or election or even randomly selected, for instance, from a limited number of people? The institutionalization could be done by governmental organisations, non-governmental organisations (NGO), other public or private legal entities or even individuals. A long duration of the functional period of an institutionalized attorney for the future might—similar to the duration of functional periods of judges of some Highest Courts—indicate a high scale of independency granted by the society. However, as such an attorney cannot ignore the existence of the state and its government [72] the content of powers distributed to an attorney for future generations is clearly a question of public governance.

Hence, the provision of powers to the attorney for the future is also a diverse issue in this discussion. The content of powers correlates somewhat with the extent of material and institutional support and funding. On the horizontal side, the provision of powers, topics such as privileges, immunities and the capacity to conclude treaties [48] as well as remedies and connected interim measures have to be discussed. More vertically, the extent of powers, relates to topics such as the variety of subject areas involved (environmental as well as non-environmental issues), the species favoured (human and/or non-human generations), possible changes in choice or taste of future generations over time and the role of an attorney vis-à-vis conflicts of interest between several future generations [39].

As far as the scale of conservation of public goods and their allocation between current and future generations is concerned it is reasonable to argue that attorneys for the future should be established at the appropriate geographic level. For instance the water in a river basin may only be of relevance at the transnational, national and local levels while climate issues are relevant on the global level.

### 3.4. *Adjustments to economic institutions*

Economists see the problem of future generations mainly as a market failure where this institution, for reasons described earlier, is not able to deliver the desired outcomes. With regards to this market failure a number of modelling exercises have been performed showing that intergenerational equity requires amendments to the current market model. The suggestions are often based on theoretical modelling used to justify those measures on efficiency grounds derived from long-term, intergenerational optimization exercises. Based on these exercise a number of amendments to current institutional guiding and influencing markets have been made.

For example, Pasqual and Souto [31] suggest intergenerational redistribution of natural resource property rights by conceding property rights, as a whole, to the future. The suggested mechanism is through the design of an adequate (but not more specifically elaborated) institutional framework to monitor their corresponding rights. Von Amsberg [73] suggests an intergenerational coordination mechanism that would link the relative risks of generations, requiring later generations to compensate earlier generations for insurance investments. Gerlagh and Keyzer [74] and Lind [30] mention a ‘trust fund’ as a mechanism that entitles all members of present and future generations to an equal claim over natural resources. This fund should be set up as an

independent institution, comparable to a central bank with precise rules of conduct, which should ensure that future generations receive their claims independently of preferences of intermediate generations.

Fitzpatrick [75] envisages a property regime where certain goods are held in common—intra- and intergenerational. Under this ‘eco-social’ property regime, people are not allowed to buy or sell the environmental good itself but they are entitled to a rent, i.e. a monetized share of this resource. This entitlement reverts back to the common property on the death of the title holder. This approach is supported by a tax system, based on the ethics of stewardship, where destructive utilization is taxed higher than activities contributing to a ‘sustainable welfare’. This so-called green tax system is based on the idea that hidden external costs and benefits are fully quantified and internalized thus guiding resource consumption.

The effects of such a tax are, for instance, investigated by Bovenberg and Heijdra, who analyse intergenerational effects of environmental taxation. They show that a small pollution tax benefits both young generations alive and the generations that are yet to be born at that time, whereas older generations lose. In order to compensate the current generation for welfare losses they propose to reduce current non-environmental taxes by using not only the revenues of pollution taxes but also deficit financing, i.e. by increasing public debts. Debts could be increased so that future generations reaping most of the benefits of a pollution tax compensate current generations bearing most of the costs [76].

Suggestions do not only focus on inefficient markets due to biases and selfish actions of social actors but also to activities in the government sector. To counter the problem of government failure caused by e.g. lobbying and information asymmetry, Andersson [77] suggests a compensation mechanism, supported by a super-national institution, according to which countries could, for example, be required to deposit membership fees which would be confiscated in case they violated their own commitments.

Lots of emphasis has been put on developing conceptual models to analyse the causes for market and government failure and to model the best way forward, but as Dahle [78] critically remarks: “Less emphasis has been put on the question of finding viable pathways that can take us from where we are to where we want to be. ... Green thinkers normally spend much time on examining what is wrong, some time on sketching theoretical alternatives and hardly any time at all on asking how these alternatives can be carried out in practice.” [78, p. 279].

#### 4. Conclusions

Claiming that everything in theory can have a price that captures all its social and environmental qualities past, present and future is the main assumption of CBA. This assumption instantly makes everything subject to trade and makes ‘efficiency’ the sole criterion for evaluating policy [79]. If everything is substitutable and measured in monetary terms then the only responsibility of present generations toward the future is to leave them as much money as possible. Given increasing population and aspirations for material consumption, efficiency goals need to be complemented by absolute threshold levels for environmental pollution (see the discussion on the rebound effect [80,81]; and monetary indicators need to be supplemented by biophysical indicators representing physical limits to growth (see examples of the extensive literature on ecological footprints [82,83], industrial metabolism [84], HANPP [85]).

The goal of efficiency is highly compatible with the predominant growth paradigm which might explain the prevalence of efficiency goals in policy making. Increasingly ethical issues are incorporated into environmental decision-making through expert-based approaches. One set of approaches might be summarized as the ‘economic capture’ approach, which is an extension to existing economic methods to include ethical concerns. The other is a ‘moral expert’ approach which confines economic methods to the analysis of welfare gains, and assigns committees with ethical experts to complement economic expertise [22,85]. Both of these approaches have been heavily criticized: “The prescriptive assertions ... are concerned with telling the citizens of a political community which actions will enhance aggregate welfare, and therefore which actions are ‘socially preferred.’ Why are economists surprised and dismayed when the citizenry ignores such claims?” [86, p. 90].

Alternatively, on a national and regional level, increasingly stakeholder processes, deliberative and interest group procedures are used to develop strategies and visions for resource management and conservation. The aim is to involve all interested parties in planning for the future [22]. These approaches also reflect work in psychology and philosophy in which unlike the given preferences in economic theory and more specifically



CBA approaches preferences are not assumed to be a priori but must be constructed. Since “there is no such thing as a priori truth about preferences or about what various parts of nature are ‘worth’ either structurally, functionally, or monetarily. Individuals must sit down together and figure out what things seem to be worth” [86, p. 85]. This process was developed as an alternative to decisions made on the basis of scientific expertise, mediated by measures of economic efficiency. Such citizen’s juries move the focus from expert knowledge to the process of knowledge creation and thus foster civic habits and democratic values [22].

A similar case can be made for institutions at the international level. The legal examples provided show that rather than only installing an institution such as the guardian for the future on the global level, more ‘democratized’ bottom up approaches might be more appropriate. Hence a “de-unified institutional attempt with an unified direction” might be a more appropriate approach. This unified direction should be clearly addressed towards a multinational and especially global direction to secure a more eco-centric and trans-century view than the view followed on the more short-sighted national level due to elections every several years. Hence for each geographic level and topic a tailor-made institutionalized solution has to be sought to address the common and unified aim of safeguarding the interests of the future.

## References

- [1] D.H. Meadows, Club of Rome. *The Limits to Growth: A Report for the Club of Rome’s Project on the Predicament of Mankind*, Universe Books, New York, 1972.
- [2] P.R. Ehrlich, A. Ehrlich, *The Population Explosion*, Simon & Schuster, New York, 1990.
- [3] International Union for Environment and Conservation of Nature (IUCN), *World Conservation Strategy: Living Resource Conservation for Sustainable Development*, IUCN—UNEP—WWF: Gland, Switzerland, 1980.
- [4] World Commission on Environment and Development, *Our Common Future*, Oxford University Press, Oxford, 1987.
- [5] D. Pearce, G. Atkinson, Measuring sustainable development, in: D.W. Bromley (Ed.), *The Handbook of Environmental Economics*, Blackwell, Oxford and Cambridge, 1995, pp. 166–181.
- [6] C.L. Spash, Double CO<sub>2</sub> and beyond: benefits, costs and compensation, *Ecological Economics* 10 (1994) 27–36.
- [7] D. Pearce, K.R. Turner, *Economics of Natural Resources and the Environment*, Harvester Wheatsheaf, New York, 1990.
- [8] J.M. Gowdy, C. McDaniel, The physical destruction of Nauru: an example of weak sustainability, *Land Economics* 75 (1999).
- [9] P.A. Victor, Indicators of sustainable development: some lessons from Capital Theory, *Ecological Economics* 4 (1991) 191–213.
- [10] Editorial Board, *Ecological Economics* 63 (2007) IFC.
- [11] B.C. Norton, Intergenerational equity and environmental decisions: a model using Rawls’ veil of ignorance, *Ecological Economics* 1 (1989) 137–159.
- [12] R.M. Solow, Sustainability: an economist’s perspective, in: R. Dorfman, N.S. Dorfman (Eds.), *Economics of the Environment—Selected Readings*, third ed., W.W. Norton & Company, New York and London, 1993, pp. 179–187.
- [13] S.V. Ciracy-Wantrup, *Resource Conservation: Economics and Policies*, third ed., Division of Agricultural Sciences, University of California Press, Berkeley, 1968.
- [14] J. Muir, *A Thousand Mile Walk to the Gulf of Mexico*, Berg, Dunwoody, GA, 1916.
- [15] D. Ehrenfeld, *The Arrogance of Humanism*, Oxford University Press, Oxford, 1978.
- [16] B.G. Norton, Intergenerational equity and environmental decisions: a model using Rawls’ veil of ignorance, *Ecological Economics* 1 (1989) 137–159.
- [17] K. Hubacek, J.C.J.M. van den Bergh, The role of land in economic theory, *Ecological Economics* 26 (2006) 5–27.
- [18] C. Azar, Are optimal CO<sub>2</sub> emissions really optimal?, *Environmental and Resource Economics* 11 (1998) 301–315.
- [19] E.T. Freyfogle, Private land made (too) simple, *Environmental Law Reporter* 33 (2003) 10155–10169.
- [20] R.B. Norgaard, Economic indicators of resource scarcity: a critical essay, *Journal of Environmental Economics and Management* 19 (1990) 19–25.
- [21] K.W. Kapp, Environmental disruption and social costs: a challenge to economics, *Kyklos* 23 (1970) 843–847.
- [22] J. O’Neill, C.L. Spash, Conceptions of value in environmental decision-making, *Environmental Values* 9 (2000) 521–536.
- [23] S. Marglin, The social rate of discount and the optimal rate of investment, *Quarterly Journal of Economics* 77 (1963) 95–111.
- [24] A. Sen, Behavior and the concept of preference, *Economica* 40 (1973) 241–259.
- [25] A. Sen, Isolation, assurance, and the social rate of discount, *Quarterly Journal of Economics* 81 (1967) 112–124.
- [26] F. Heinzerling, L. Ackermann, *Pricing the Priceless: Cost–Benefit Analysis of Environmental Protection*, Georgetown University, Washington, DC, 2002.
- [27] E. Padilla, Intergenerational equity and sustainability, *Ecological Economics* 41 (2002) 69–83.
- [28] H.E. Daly, J.B. Cobb, C.W. Cobb, *For the Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future*, Beacon Press, Boston, 1989.
- [29] K.J. Arrow, W. Cline, K.G. Mäler, M. Munasinghe, R. Squitieri, J. Stiglitz, Intertemporal equity, discounting and economic efficiency, in: J.P. Bruce, H. Lee, E.F. Haites (Eds.), *Climate Change: Economic and Social Dimensions of Climate Change*, Second Assessment of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK, 1995.

- [30] R.C. Lind, Intergenerational equity, discounting, and the role of cost–benefit analysis in evaluating global climate policy, *Energy Policy* 23 (1995) 379–390.
- [31] J. Pasqual, G. Souto, Sustainability in natural resource management, *Ecological Economics* 46 (2003) 47–59.
- [32] T. Page, *Conservation and Economic Efficiency*, Johns Hopkins Press, Baltimore, 1977.
- [33] D. Parfit, Energy policy and the further future: the social discount rate, in: D. MacLean, P.G. Brown (Eds.), *Energy and the Future*, Rowman & Littlefield, Totowa, NJ, 1983.
- [34] E. Agius, Obligations of justice towards future generations: a revolution in social and legal thought, in: E. Agius, S. Busuttil, T.C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 3–12.
- [35] A. Johnson, Barriers to fair treatment of non-human life, in: D.E. Cooper, J.A. Palmer (Eds.), *Just Environments: Intergenerational, International and Inter-Species Issues*, Routledge, London, 1995, pp. 165–180.
- [36] D.E. Cooper, Other species and moral reason, in: D.E. Cooper, J.A. Palmer (Eds.), *Just Environments: Intergenerational, International and Inter-Species Issues*, Routledge, London, 1995, pp. 165–180.
- [37] A. Holland, Natural capital, in: A. Attfield, R. Belsey (Eds.), *Philosophy and the Natural Environment*, Cambridge University Press, Cambridge, 1994.
- [38] A. Dobson, Environmental sustainabilities: an analysis and a typology, *Environmental Politics* 5 (1996) 401–428.
- [39] A. Malhotra, A commentary on the status of future generations as a subject of international law, in: E. Agius, S. Busuttil, T.C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 39–49.
- [40] R.T. De George, The environment, rights and the future generations, in: K.E. Goodpaster, M.S. Kenneth (Eds.), *Ethics and Problems of the 21st Century*, University of Notre Dame Press, Notre Dame/London, 1979, pp. 93–105.
- [41] R.R. Dipert, Reflections on the rights of the future generations, in: T. Machan, M. Johnson (Eds.), *Rights and Regulations: Ethical, Political and Economic Issues*, 1983, pp. 177–201.
- [42] P. Streeten, What do we owe the future?, *Resources Policy* 12 (1986) 4–16.
- [43] E. Brown-Weiss, *In Fairness to Future Generations: International Law, Common Patrimony, and Intergenerational Equity*, Transnational Publishers Inc., The United Nations University, Tokyo, Japan, 1989.
- [44] J. Pasek, Obligations to future generations: a philosophical note, *World Development* 20 (1992) 513–521.
- [45] L.E. Johnson, Future generations and contemporary ethics, *Environmental Values* 12 (2003) 471–487.
- [46] B.G. Norton, Future generations, obligations to, in: W.T. Reich (Ed.) (Ed.), *Encyclopedia of Bioethics*, Simon & Schuster Macmillan, 1995, pp. 892–899.
- [47] R.A. Slaughter, Why we should care for future generations now, *Futures* 26 (1994) 1077–1085.
- [48] B. Nagy, Speaking without a voice, in: E. Agius, S. Busuttil, T.C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 51–63.
- [49] UNESCO Declaration on Responsibilities of the Present Generations for Future Generations, <[http://portal.unesco.org/en/ev.php-URL\\_ID=13178&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/en/ev.php-URL_ID=13178&URL_DO=DO_TOPIC&URL_SECTION=201.html)>, 1997 (accessed 08.08.2007).
- [50] S. Sneddon, On future generations and international law, in: E. Agius, S. Bussuttil, T.C. Kim, K. Yazaki (Eds.), *Environmental Values*, vol. 10, 2001, pp. 127–129 (book review).
- [51] A. Tough, Making a pledge to future generations, *Futures* 25 (1993) 90–92.
- [52] S. Inayatullah, Future generations thinking, *Futures* 29 (1997) 701–706.
- [53] J.K. Horowitz, Preferences in the future, *Environmental and Resource Economics* 21 (2002) 241–258.
- [54] S. Alkire, Dimensions of human development, *World Development* 30 (2002) 181–205.
- [55] J.J. Boersma, How to prepare for the unknown? On the significance of future generations and future studies in environmental policy, *Environmental Values* 10 (2001) 35–58.
- [56] S. Anand, A. Sen, Human development and economic sustainability, *World Development* 28 (2000) 2029–2049.
- [57] D.W. Bromley, Searching for sustainability: the poverty of spontaneous order, *Ecological Economics* 24 (1998) 231–240.
- [58] G. Kirsch, Solidarity between generations: intergenerational distributional problems in environmental and resource policy, in: A. Schnaiberg, N. Watts, K. Zimmerman (Eds.), *Distributional Conflicts in Environmental Resource Policy*, 1980, pp. 381–404.
- [59] W. Beckermann, Economic growth and the environment: whose growth? whose environment?, *World Development* 20 (1992) 481–496.
- [60] WCED (World Commission on Environment and Development), *Our Common Future*, Oxford University Press, Oxford, 1987.
- [61] R. Sartorius, Government regulation and intergenerational justice, in: T. Machan, M. Johnson (Eds.), *Rights and Regulations: Ethical, Political and Economic Issues*, 1983.
- [62] K. Brady, New convention on access to information and public participation in environmental matters, *Environmental Policy and Law* 28 (1998) 69–75.
- [63] J. Wates, The Aarhus Convention: a driving force for environmental democracy, *Journal for European Environmental and Planning Law* (2005) 1–11.
- [64] Regulation (EC) No. 1367/2006 of the European Parliament and of the Council of 6 September 2006 on the application of the provisions of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters to Community institutions and bodies, *Official Journal L* 264, 25.9.2006, pp. 13–19.
- [65] Field Amicus Curia Submission to the World Trade Organisation dispute settlement process in the dispute before the Panel European Union—Measures concerning the approval and marketing of Biotech Products (WT/DS 291, 292, 293), 2004.
- [66] R.S.J. Macdonald, Future Generations: Searching for a System of Protection, in: E. Agius, S. Bussuttil, T.-C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 149–159.
- [67] E. Lagerspetz, Rationality and politics in long-term decisions, *Biodiversity and Conservation* 8 (1999) 149–164.

- [68] E.B. Tonn, The court of generations: a proposed amendment to the US constitution, *Futures* 23 (1991) 482–498.
- [69] G. Rao, The United Nations as a guardian for future generations, in: E. Agius, S. Bussuttil, T.-C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 143–148.
- [70] C.D. Stone, Safeguarding future generations, in: E. Agius, S. Bussuttil, T.-C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 65–79.
- [71] M. Bruce, A draft instrument concerning the role of a guardian, in: E. Agius, S. Bussuttil, T.-C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 163–165.
- [72] R. Driss, The responsibility of the state towards future generations, in: E. Agius, S. Bussuttil, T.-C. Kim, K. Yazaki (Eds.), *Future Generations and International Law*, Earthscan Publications Ltd., London, 1998, pp. 21–25.
- [73] J.V. Amsberg, Excessive environmental risks: an intergenerational market failure, *European Economic Review* 39 (1995) 1447–1464.
- [74] R. Gerlagh, M.A. Keyzer, Sustainability and the intergenerational distribution of natural resource entitlements, *Journal of Public Economics* 79 (2001) 315–341.
- [75] T. Fitzpatrick, Making welfare for future generations, *Social Policy & Administration* 35 (2001) 506–520.
- [76] A.L. Bovenberg, B.J. Heijdra, Environmental tax policy and intergenerational distribution, *Journal of Public Economics* 67 (1998) 1–24.
- [77] T. Andersson, Government failure—the cause of global environmental mismanagement, *Ecological Economics* 4 (1991) 215–236.
- [78] K. Dahle, Toward governance for future generations: how do we change course?, *Futures* 30 (1998) 277–292.
- [79] D.W. Bromley, The ideology of efficiency: searching for a theory of policy analysis, *Journal of Environmental Economics and Management* 19 (1990) 86–107.
- [80] M. Binswanger, Technological progress and sustainable development: what about the rebound effect?, *Ecological Economics* 36 (2001) 119–132.
- [81] E.G. Hertwich, Consumption and the rebound effect: an industrial ecology perspective, *Journal of Industrial Ecology* 9 (2005) 85–98.
- [82] M. Wackernagel, W. Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth*, New Society Publishers, Gabriola Island, British Columbia, 1996.
- [83] J.C.J.M. van den Bergh, H. Verbruggen, Spatial sustainability, trade and indicators: an evaluation of the ecological footprint, *Ecological Economics* 29 (1999) 61–72.
- [84] S. Anderberg, Industrial metabolism and the linkages between economics, ethics and the environment, *Ecological Economics* 24 (1998) 311–320.
- [85] H. Haberl, K.H. Erb, F. Krausmann, V. Gaube, A. Bondeau, C. Plutzer, S. Gingrich, W. Lucht, M. Fischer-Kowalski, From the cover: quantifying and mapping the human appropriation of net primary production in earth's terrestrial ecosystems, *Proceedings of the National Academy of Sciences* 104 (2007) 12942–12947.
- [86] D.W. Bromley, Reconsidering environmental policy: prescriptive consequentialism and volitional pragmatism, *Environmental and Resource Economics* 28 (2004) 73–99.