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Introducing Environmental Ethics into Economic Analysis:

Some insights from Hans Jonas' Imperative of Responsibility

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Abstract

This paper analyses how Hans Jonas' Imperative of Responsibility may provide useful insights into the analysis of sustainability issues. The challenges of environmental and social sustainability in terms of inter-generational fairness are analysed and involve a moral duty that is applicable to economic governance. To what extent responsibility is an alternative to utilitarianism and as a principle facilitating the coordination of the agents involved? Exploring this question may be a first step towards the long-term and sustainable conservation of Nature.

Keywords: Environmental ethics, intergenerational fairness, responsibility principle, self-binding behaviour, sustainability.

JEL: Q010, Q200, Q320, Q570.

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1. Introduction

Nowadays it seems impossible to avoid the subject of environmental ethics when attempting to understand certain topics in economics, particularly if they are in any way related to the biosphere, have irreversible environmental impacts, or if their scientific basis is subject to uncertainty. Humanity has become a major force in the workings of ecological and geological processes, and is the main actor of a new epoch called the Anthropocene (Crutzen, 2002).

Climate change, the exhaustion of natural resources, the accumulation of pollution and other forms of environmental damage all represent major challenges for human societies, in terms of their capacity to adapt (Barnosky *et al.*, 2012). The sheer scale of the global ecological crisis, driven by man-made activity, means that we cannot dismiss the possibility that human civilisation might collapse. More specifically, the fact that we have now entered the Anthropocene epoch (Bonneuil *et al.* 2013) should prompt us to rethink the role of economic activities in our definitions of sustainability trajectories capable of remaining within the "*planetary boundaries*." These boundaries correspond to threshold values for the major biophysical variables which govern the climate and the biosphere, and which underpin our social well-being (O'Neill *et al.*, 2018; Steffen *et al.*, 2015). The fact that some of these limits have already been breached (climate change, erosion of biodiversity, disruption of the nitrogen cycle) means that what Rockström et *al.* (2009) call the "*safe operating space for humanity*" is already under threat. For instance, rising temperatures could lead to non-linear effects on global economies, with severe consequences for output and well-being at the global level (Sterner, 2015). In addition, some environmental damage has specific features, such as being irreversible, involving long-term and cumulative phenomena, thus bringing high uncertainty about the future (Bourg, 2007). In such a context, backstop technologies do not seem to be a match for the scope

of the environmental challenge. Indeed, what is now at stake is no longer how to manage natural resources, but the very conservation of Nature itself.

According to Jonas (Jonas, 1974: 95), economics as a discipline intrinsically carries a responsibility for life in the future, and consequently economics cannot be a neutral observer of the exchanges with natural resources, but instead must 'Act so that the effects of [our] action are compatible with the permanence of an economic order'.[1] Economics is in clear need of an environmental ethics which permits the *ex ante* regulation of activities which fundamentally transform Nature, ensuring that life remains worth living in the long term.

The centrepoint of environmental ethics is its analysis of the relationships between humans and the other living species and nonliving components of the biosphere. It focuses on issues about how resources and access to them are distributed, and looks at why these issues are inseparable from the environmental impacts associated with certain forms of excessive use (overexploitation, degradation) of these resources over a prolonged period. The ability or inability to access certain resources determines the dynamics of development, and thus affects the level of well-being of the present generation. In this regard, it is becoming increasingly obvious that the distribution of wealth within society can strongly influence the conservation of environmental resources (Mikkelson *et al*., 2007; Gagnon *et al*., 2008).

More fundamentally, economics can provide a significant and universal system for preserving Nature. According to Jonas, the interaction between environmental and economic ethics occurs through futurology, in the sense that people who are currently alive and concerned about the future can organise a stock-based management system which will provide future generations with

[1] Jonas uses two similar phrases a few lines further on in which he expresses this in negative terms: 'Act so that the effects of your action are not destructive of the possibility of economic life in the future' or 'Do not compromise the conditions for an indefinite continuation of some viable economy' (its negative equivalent).

food and other goods and services[2]. This involves the management of goods, which is the essence of 'economics' (from the Greek *oikos*, house and *nomos*[3], to manage or administer). The responsibility imperative arises from concern for the well-being of descendants. It has to become an economics that is concerned about the future (the *sine qua non* for managing flows in the future), possessing a truly ethical dimension. Eric Pommier (Pommier, 2011: 197) adds that 'it is because the biological facts mentioned are immediately given value (…) that economics carries within itself an axiological dimension'.

In this context, environmental ethics can both help to ensure that natural resources are conserved and contribute to the fair distribution of these resources between successive generations. In this paper, we seek to outline a first proposal in that regard by looking to sustainable development as the latter concept has introduced the need to consider development and the environment as linked within a long-term perspective. To do this, we adopt the philosophical approach of Hans Jonas and apply it to the investigation of environmental problems as the new ethics he provides fits with the lengthy timescale of the biosphere.

The paper proceeds as follows. In a second section, we seek to outline the challenges of environmental and social sustainability in terms of inter-generational fairness, which gives rise to a moral duty applicable to economics. In the third section, we look at how, and to what extent, responsibility, as an alternative to utilitarianism and as a principle facilitating the coordination of the agents involved, can be a first step towards the long-term and sustainable conservation of Nature. The paper concludes by focusing on how environmental ethics could help economics to

[2] This is known in the literature of environmental economics and ecological economics as "strong sustainability approach".

[3] The Greek word "nomos" actually means "law" (in the scientific sense), the as in "astronomy" (and we do not manage or administer the stars). The first text in economics was titled Oikonomikos by Xenophon a contemporary of Plato.

better care for societies living within planetary boundaries which we regard as a very new challenge facing sustainability issues.

2. Sustainability, Ethics, and Justice within the Distribution of Nature

2.1. Justice and future generations

Through the concept of sustainable development as described in the Brundtland report[4] (Brundtland, 1987: 51), inter-generational justice has raised as a necessity in any long-term view. By defining sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs', preservation of the environment is seen to be intrinsically linked to the dynamics of the development of societies.

One may note that the Brundtland's definition is perfectly compatible with a weak sustainability approach. This one is meaning to bequeath to future generations both wealth and a culture of innovation so that they can make do with the stocks that remain after us. There is no explicit mention of biological diversity, climate or nature in this definition but because of the substitution within the various components of capital in the economy (social, labor, technologies, natural ressources), it is possible to preserve the environment.

By extension, the term 'socially sustainable development' is more appropriate than that of 'sustainable development'.[5] This semantic detail reflects a profoundly modern economic and social situation, because inter- and intra-generational problems (cf. capabilities vs. inequalities of

[4] *See* the 'Our Common Future', the WCED report better known as the *Brundtland report* (from the name of the Norwegian Prime Minister who coordinated the project). To see how the movement arose, *see* the concept of e*codevelopment*. Also *see* the first five articles of Agenda 21 of the Rio de Janero summit (1992), article 130 R of the Maastricht Treaty (1992), which also occurs in article 174 of the Amsterdam Treaty, and the European Commission's Green Book (1994). It should be noted that even though this definition is fairly broad, as Appel (1993) and Sen (1992) justifiably point out, it does leave many of the questions raised by the unequal distribution of wealth between nations in the shadows.

[5] For a detailed distinction between sustainable development and socially sustainable development, *see*: Ballet *et al*. (2010).

the most deprived) are clearly correlated with this phenomenon. When applied to development, sustainability corresponds to the need to ensure that the well-being of successive generations does not deteriorate over time. Well-being, which is perceived through the prism of needs, must be defined here. The Brundtland interpretation of the definition of sustainable development has adopted in a minimalist approach to the concepts of both need as a basic necessity and of inter-generational fairness (Dasgupta, 2008; Gosseries, 2008). The sustainability requirement that emerges from this report is based on inter-generational fairness, but with a restricted scope: it only binds the present generation to future generations by claiming that their basic needs can be met by maintaining a level of well-being that does not deteriorate over time, but nothing more than that. In this context, the economic problem that has to be dealt with, is the intertemporal distribution of the rights to use environmental resources (*via* the stocks and services provided by various functions of the biosphere and ecosystems), with the requirement of satisfying the basic needs of succeeding generations, at a time when some resources are becoming scarce and/or are deteriorating (World Resources Institute, 2000).

Nussbaum (1999, 2002) questions the pertinence of using wealth as a measure of quality of life in so-called civilised societies, she focuses on the general capacity of individuals to "do" and to "be" and suggests a wide spectrum of possibilities relating to the freedom of choice and action. She makes a distinction between an individual's *internal capabilities* (personality, intelligence *etc*.) and their *combined* or *central capabilities* (internal capabilities plus certain economic, social and political conditions). In other words, combined capabilities correspond to freedoms or possibilities created by combinations of personal capacities, but also made possible by the economic, social and political circumstances. In order to facilitate the concrete application of

these concepts, Nussbaum pragmatically proposes a list of ten capabilities,[6] derived from a theory of justice. We wish to argue that this enables to rethink our relationship with the environment. Under the capabilities theory, justice is no longer defined by the distribution of limited resources, but also includes freedom of choice. As such, there is no need to define a model of ideal or even transcendental (ethical or consequentialist) justice, as Rawls (1991) would have it. Instead, the priority is simply to ascertain how we can live our lives in a manner which is just.

Concern about the environment, as it appears in the definition of sustainable development (Brundtland, 1987), sheds unambiguous light on the minimalist basis of the environmental ethics adopted: Nature is rooted in an anthropocentric approach, and it is selfishly envisaged in an instrumental manner. Consequently, authors such as Birnbacher (2009) and Jonas (1979) propose a consequentialist type of moral architecture, which is both sustainable and global. This point is fundamental if we are to grasp the implications of the long-term protection of environmental resources. The ways in which these resources are protected in the long term depend on the sustainability approach that we adopt now. Indeed, the inheritance left to future generations will vary depending on whether we adopt a strong or weak approach to sustainability. Under a strong sustainability perspective, we need to ensure that natural resources are not depleted over time, where preservation of environmental resources including ecosystem services is concerned. In the case of a weak sustainability approach, the stock of natural resources with market value could be reduced in the long run but technical progress can circumvent the constraints of availability/scarcity of these resources. In addition, it also assumes the gross substitution axiom of neoclassical economics. The latter perspective is the one which is connected with the sustainability framework of the Brundtland report.

[6] Following Nussbaum (1999: 41–42), there are ten basic needs: 1. Life, 2. Bodily health, 3. Bodily integrity, 4. Senses, imagination, thought, 5. Emotions, 6. Practical reasons, 7. Affiliation, 8. Other species, 9. Play, 10. Control over one's environment: (A) Political and (B) Material.

From the point of view of future generations, weak sustainability implies a specific approach in which only natural resources with a market value are taken into account and does not imply any particular restriction on their use by the present generation. Sustainable development can thus be assured by setting up a compensation fund derived from the income earned by exploiting exhaustible resources. As a result of technological progress, future generations will be able to draw upon this inheritance to compensate for dwindling stocks of resources that have been over-extracted by the present generation (Solow, 1986; Hartwick, 1977).

In a way, this intertemporal sustainability rule deals both with the global effective distribution of resources between successive generations and with environmental ethics, *via* the procedure of discounting choices. The evaluation of economic decisions leads us to assign a discounting factor to various points in time. Selecting the social discount rate is not unimportant, since the greater its value, the greater the weight given to the present relative to that given to the future. This implies an asymmetry between the treatment of successive generations: those viewed in the very long term, more than a few decades in the future, will carry little weight compared to the current generation. The 'dictatorship of the present' in fact reflects the guardianship role of the present generation relative to generations yet to come: the decisions taken by the former express choices in which the argument of impatience predominates (Chichilnisky, 1996). In other words, the existence of a pure preference for the present de facto leads to unfair treatment of successive generations and promotes the use of natural resources to satisfy the needs and wants of generations in the present.

In this context, fairness between generations inevitably involves an adjustment of the discounting procedure for assessing economic choices (Almansa, Calatrava, 2007; Padilla, 2002). A differentiation of the level of social discounting on the temporal horizon can be envisioned, with a downward trend as we move away from the present time in order to give greater weight to

future generations. This differentiation may be based on a drop in the level of pure preference for the present or on a total lack of any preference for the present over the generations yet to be born (Bayer, 2003). The absence of a single social discount rate conveys a concern for both intra- and inter-generational fairness, and thus determines how environmental justice can be introduced into the economic calculations of the public decision-maker. For example, the long-term management of household waste may lead to different technologies depending on their expected environmental impacts and depending on how the discounting is implemented (with a very low discount rate in the long run - close to zero). In the context of projects with potential environmental impacts (various forms of pollution over time and space, the accumulation of waste, *etc*.), the values of the discount rate vary depending on whether it is associated with the intra- or inter-generational level, since the timeline and the role of long-term economic growth are key variables when inter-generational fairness is taken into account (Ferrari and Méry, 2008). Over several centuries, any discount rate reduces the value of the future to a trivial amount. Between generations separated by a significant distance of time, say 50 or 100 years, discounting the future value of natural capital is a question of ethics not economics.

2.2. Inter-generational fairness and Nature

From a utilitarian perspective, the existence of rights between successive generations legitimises the existence of inter-generational transfers to ensure fairness between the different generations. One instance of this is the introduction of positive ethics into economic decisions based on the co-ownership principle developed by Henry (1990). This principle stipulates that two successive generations have equal rights for the natural environment to exist: the first to arrive on Earth cannot irreversibly exploit the natural resources unless it can guarantee future generations a sufficient, specific compensation. The resulting obligation constitutes the principle that binds

successive generations together and is based on institutional redistribution mechanisms. The conditions for inter-generational trade-offs that determine the levels of transfers differ depending on whether the altruistic behaviour of agents in the presence/absence of a planner is taken into consideration on the one hand, and, on the other, on the equality/non-equality of consumption levels between children belonging to the same generation. In particular, Howarth and Norgaard (1995) show that if a constraint associated with intra-generational consumption that remains constant over time is imposed, then the intervention of a public agency is necessary even if the agents are altruistic: for parents are less inclined to transfer their possessions to their children. Parents underestimate the weight of their children's well-being, because they hope that the family of their offspring's spouse will be richer than they are and will therefore be able to transfer greater wealth to them.[7]

Within the strong sustainability approach, strict rules governing the use of natural resources are enforced for their long-term preservation: the rate of extraction must be lower than the renewal rate, exhaustible resources must be replaced by renewable resources, all natural elements for which no substitute exists must be preserved. Here, environmental fairness is expressed through the adoption of a criterion of the sustainability necessary to ensure a sustainable standard of living for future generations.

Such a sustainability approach leads to the introduction of standards and obligations into the analysis.[8] In this respect, the standard corpus devised by Birnbacher (1994) has the effect of moralising action, even if it takes place in a context of informational asymmetry, weighted in favour of the future. According to the author, to attribute to A a moral right towards B, four

[7] If altruism binds successive generations together, then the present generation can also contribute to improving the well-being of future generations through expenditure intended to improve the quality of the environment (Jouvet et *al.*, 1997).

[8] For further information, *see*: Birnbacher (1994). D. Birnbacher proposes a consequentialist and universalist ethical framework, ranging from metaethics to the application of ethics.

conditions must be fulfilled: 1/ A must exist[9]; 2/ A must have interests; 3/ B must have a moral duty towards A; 4/ A must have the right or duty to demand that B fulfil his moral duty, and/or any other has the right or duty to demand that B, in the name of A, fulfill his moral duty.

This asymmetry is considered to be a type of uncertainty that could be reduced to estimated risks. However, in the opposite case, where the uncertainty cannot be estimated, the only option is a strategy whose worst consequence represents the least-worst outcome. More specifically, the scope of application of the standards becomes the whole of humanity (both present and future generations). Birnbacher (1994: 88-89) wonders whether it is possible to grant rights to future individuals. That is to individuals who do not exist and whose future existence is indeterminate. The philosopher, from a strictly logical point of view (the 4 conditions), answers by stating that 'if we accept this analysis of the assignment of moral rights, no serious logical or metaphysical reason can be opposed to also attributing to future beings moral duties towards the present generation'. He concludes that the 'permission or obligation to demand that duty should be performed, whether on one's own behalf or that of others' and suggests that in the future, highly-evolved living beings will be able to demand rights, standards and obligations on behalf of others, even though these others may themselves be incapable of laying claim to them.

Birnbacher's approach provides a basis for inter-generational fairness in the allocation of rights and duties to all generations – and it is on the basis of the existence of such moral bonds that all generations can be treated fairly, independently of their position in time. Consequently, sustainability cannot be dissociated from the application of rules governing a precautionary use of Nature that ensure the permanence of environmental resources over time, given that each generation accomplishes actions that are enshrined by the recognition of moral obligations.

[9] Members of distant future generatiins do not presently exist. And, those who will exist are indeterminate by the Parfit Paradox or the non-identity problem, which is discussed subsequently.

An openness of the utilitarian and consequentialist approach to moral duty is also present in the writings of Page (1991), who defines sustainability on the basis of the preferences expressed by present generations. These determine the inter-generational obligations, but on the basis of a generalised interest in inter-generational fairness ensuring that resources are preserved over the long term. Inter-generational fairness here constitutes a criterion of sustainability. To the extent that the effective allocation of resources over time does not ensure the fair inter-generational distribution of resources, the criterion of sustainability enfolds that of efficiency in order to ensure acceptable standards of living for future generations. This approach considers environmental ethics as a particular expression of inter-generational fairness deployed in environmental terms: maintaining a level of well-being over time means preserving the quality of resources and that of their endowments *in situ*. Sustainability, established without any utilitarian framework, in contrast to the situation in which obligations unite successive generations by optimising an inter-generational social well-being function, constitutes a preliminary condition for any fair distribution of resources between generations over a long timeframe.

However, beyond these different pathways, one major difficulty still prevails: the choice of the duration of the timeframe. This is important if we consider that in the very long term there is a degree of uncertainty about environmental damage and preferences of future people, and that it is therefore difficult to integrate this factor into choices made today: how can we take the potential damage of human activities into account when the timeframe extends over several centuries? An analysis of the link between the value of the discounting rate and the timeframe has revealed two contradictory effects (Gollier, 2005). A ‘wealth effect’ associated with economic growth, which leads us to ignore generations that are remote from ourselves in the timeframe, and a ‘precautionary effect’, which introduces uncertainty about how this growth will change in the future. The former effect urges us to select a high discounting rate for the timeline, and to award

a significant weight to the present generation, while the second leads us to adopt a discounting rate that declines over the very long term: 2.5 to 3 per cent per year with a horizon of one century, and 1 to 2.5 per cent for much more remote horizons (over 500 years)[10].

Under these conditions, protecting environmental resources and distributing them over space and time makes it difficult to refer to any time dimension other than that used in economics. The irreversible aspect of certain economic phenomena over the very long term urges us to comply with appropriate environmental ethics.

3. Time, Environmental Ethics and Future-Oriented Actions

3.1. Jonas' environmental ethics: an ethics of the future

German philosopher Hans Jonas first came to prominence for his work on applied ethics in the field of biomedicine. Nevertheless, it is his philosophy of freedom which best defines his thought. This freedom is not restricted to human beings, but instead exists within the metabolism – and, by extension, in nature – as a "permanent exchange of matter" (*Stoffwechsel*). Jonas plots a path from life to ethics. He considers life to be fundamentally connected to time, which requires us to rethink traditional ethics[11]. In Jonas' view, traditional ethics exists in the present and the near future, and is thus incapable of taking the distant future – *i.e.* the time frame of future generations – into account. However, humanity's actions have very long-term consequences (Jonas, 1984: 45). It is therefore crucial that we develop a new, more profound approach to ethics. Jonas' philosophy is rooted in life, arguing that freedom through responsibility is the ultimate mark of

[10] At a discount rate of 3% per year, the value of $1000 in 100 years is $52. At 2.5% per year, the value in 500 years is falling to $0.

[11] We must not confuse a philosophy of life – a '*Lebensphilosophie*' – with a philosophy of biology. Jonas espouses biology, and not in an overhasty, intimate way. Ricoeur (1993:1) specifies that Jonas' concept of life is biological in the sense that "every species consists of so many individuals, none of which wishes to die". If living for an animal implies following a set of pre-programmed instincts, living for a human being becomes a moral endeavor as we are no longer endowed with a powerful set of instinctual resources.

humanity. With the publication in 1979 of *Das Prinzip Verantwortung,* the foundations of a new ethics were laid. The source of responsibility now lies in the future 'for what has to be done' (Jonas, 1984: 92),[12] and no longer in past or present obligations.

With regard to his categorical imperative "Act so that the effects of your action are compatible with the permanence of genuine human life"[13] (Jonas, 1984: 11), it is more concerned with the ontological concept of humanity than with humanity in and of itself. Jonas explains that a new ethical vision is essential because of both the devastating power of humanity and the finite capacities of nature. Jonas' categorical imperative transposes moral absolutes such as "Thou shalt not kill" into articles of ecological faith such as "Thou shalt not pollute." In order to avoid the destruction and disappearance of nature and humanity, ethics must be based on an absolute, universally acknowledged standard. By this imperative, man is bound to respect the ends of all beings who "share our human fate," and by extension the end of existence itself. This categorical imperative thus seeks to rehabilitate the idea of a normative standard and define the necessary conditions for an "authentically human life." This concern with authenticity implies that life must have meaning and cannot be reduced to the mechanical repetition of existence.

Ultimately, the ethical vision presented in Jonas' *Imperative of Responsibility* is based on the idea that the world and being itself might disappear (heuristic of fear). Man, as guarantor of Being, has a moral duty to nature. The proper consideration of nature requires mankind to assume a sense of responsibility. In this respect, Jonas can be considered as the founder of a form of environmental ethics which requires the preservation of humanity. Jonas' phenomenological work (1984) argues for the preservation of life in all its forms, human and non-human, in the interests of securing the

[12] In particular *see* Chapter 2 entitled: *Substantive Responsibility: The Positive Duty of Power*.

[13] *„Handle so, daß die Wirkungen deiner Handlung verträglich sind mit der Permanenz echten menschlichen Lebens auf Erden"*, (1979: 36).

long-term future of humanity. If life is worth living, then Other forms of life are also worthy of interest. It is also important to understand that the *imperative of responsibility* implies a responsibility to others and a responsibility to nature, as both are representations of life. “Act so that the effects of your action are compossible with the permanence of an economic order.” (Jonas, 1974: 95). This “Other” may be manifested in the immediate present, but also in the future (future generations). Nature (the central force of vitalism) plays a role in our relationship with future generations. The environment can thus be seen as a space in need of protection, since the survival and persistence of humanity (now and in the future) depend upon it.

Above all else, the philosopher’s environmental ethics is an ethics open to the biosphere and the Nature surrounding it (Jonas, 1984). From this point of view, this is a ‘biocentric anthropocentrism’ which is intended to preserve life in all its forms, whether human or non-human, with the ultimate goal of preserving humanity. Without Nature, humanity cannot survive. Successive generations are therefore united with each other through their relationship with the natural elements: preserving Nature means giving ourselves the means to ensure that the criteria required for the continuing existence of humanity are met, on condition that human actions are responsible, *i.e.* that they provide the conditions required for humanity to exist (Larrère and Larrère, 1997).

The origin of this shift in ethics can be found in the threats arising from the power of technology devised by Man. The nature of responsibility is directly linked to the human potential for action, one which has become a danger to the human species given the power of the technologies it has created. The limitation of human action results from the obligation that we have to the future, which obliges us to act responsibly today. Humans control Nature by means of technologies the effects of which they often do not control. The most striking example is that revealed by the impact of anthropogenic factors on climate, which illustrates the inability of societies to fulfil

their responsibility with regard to environmental considerations (Bourg, 2003). Considering the existence of numerous uncertainties and the limits of scientific knowledge about the future effects of our acts (environmental degradation), Jonas (1984) proposes resorting to an ethical judgement backed up by a fear-based heuristic, as an integral part of responsibility. Fear does not run counter to action; on the contrary, it invites us to act.

As a consequence, Jonas' heuristic of fear arises from a situation in which life on Earth is under threat, a situation engendered by the power of modern technology (critique of technological utopianism, technophobia). This heuristic presents itself as dystopian and as a "forecasting tool" enabling us to forestall the experience of future misfortunes and adjust our actions accordingly in order to combat procrastination. As such, this heuristic is a tool to encourage good deeds in the present in order to prevent catastrophes in the future. In this respect, the heuristic of fear is not so much a fear, since fear has a paralysing effect, but rather a sense of concern. Jonas argues in favour of action, but he does so *via* a warning perceived as a rational and reflexive premise concerning future dangers. In this respect a more appropriate phrase would be the heuristic of concern which is fundamentally a matter of precaution (see *Fortschritt mit Vorsicht*, *Imperative of Responsibility*, Chapter 6, *A Critique of Utopia and the Ethic of Responsibility*: 178–204), that is an imperative of extreme prudence. In concrete terms, the priority is to evaluate risks and dangers in order to avoid them. The heuristic of concern seeks to anticipate the future.

The present generation has a duty to anticipate the threats that will result from its omnipotence: the obligation concerns the future. Consequently, responsibility towards future generations is infinite over time: the current generation has the duty to exercise responsibility towards its descendants, a move that requires ethics. It justifies the involvement of an ethical approach that involves this responsibility that controls the ability of individuals to act as beings who are

responsible for their actions: 'Act so that the effects of your action are not destructive of the future possibility of such life' (Jonas, 1984: 11). Two obligations follow.

A first obligation results from an imperative of responsibility. This imperative is exercised towards individuals and involves both the present generation and future generations in a specific relationship. More precisely, there is a temporal mismatch between the inter-generational rights and obligations that form the basis of an asymmetrical inter-generational justice. The present generation has both rights and obligations towards future generations, because we are aware of the effect of our actions on the future, but future generations can neither lay claim to rights nor meet obligations towards present generations. Consequently, there is a disruption of the usual reciprocity between rights and obligations. The main consequence of this obligation lies in the impossibility of envisaging inter-generational justice based on redistributive justice between generations: any environmental resource that is irreversibly damaged or destroyed as a result of the actions of current human beings can no longer be the object of an inter-generational exchange. It is only by resorting to the imperative summoned by Jonas that we can prevent actions from hindering the future possibilities for human life on earth[14]: ethics limits *ex ante* any major and irreversible degradation of Nature (Ballet and Mahieu, 2003).

[14] Motivations for action can be found in otherness and the face of the Other. While the concept of otherness is central to Jonas' thought (1984), he does not follow Levinas (1987) in adopting a theory of responsibility based on the Other, which can be understood as a form of infinite responsibility rooted in the present. In fact, the concept of responsibility as found in Jonas extends Levinas' analysis over a longer time scale, stretching into the distant future. This brings us to the question of a fair compensation, which proves to be impossible in relation to our direct and indirect descendants. This in turn raises the notoriously tricky issue of the absence of reciprocity in the ethics of the future. But whether we side with Levinas or with Jonas, these responsibilities are urgent and binding, and calculated altruism is not an option. The vision developed by Jonas and Levinas contradicts that proposed by Rœmer (1986) in particular, and clashes with the Anglo-Saxon tradition in general. Rœmer insists that responsibility plays a role in compensation negotiated *ex-post*. This idea has been pushed so far that the idea of a centralised ministry has been floated, managing individual types on the basis of their handicaps and merits in order to limit the potential for manipulation.In the models proposed by Jonas and Levinas, responsibility is imposed *ex-ante* and is governed by consciousness threshold theory.

A second indirect obligation is expressed towards Nature and underpins environmental justice for Jonas. The elements that make up Nature form an obligation for human societies because they contribute to the preservation of the conditions required for the existence of humanity and because they have an intrinsic value, which is independent of any usefulness. Implicitly, environmental resources have non-use values, such as those of option value or bequest and existence values (independent of any present or future use). It is important to note that all the values associated with the elements of Nature must be preserved for all generations. The well-being of unborn generations depends explicitly on the quality of the natural environment: 'the common destiny of man and Nature, newly discovered in the face of common danger, leads us to rediscover Nature's own dignity and commands us to care for her integrity over and above the utilitarian aspect' (Jonas, 1984: 137).

Finally, there is harmony between living beings, both human and non-human, which must not be threatened, since it guarantees the survival of species in general and the human species in particular. Nature as the object of human responsibility enters directly into the field of ethics. The ethical dimension of the natural environment is based on the existence of inter-generational solidarity, which for philosophers is carried by the imperative of responsibility. Responsibility is of global ethical scope, since it encompasses the interdependences that exist between the human species and natural systems over a long timescale.

3.2. Environmental ethics and the Stern Review

Environmental ethics is far from being just theoretical and is truly applicable through major economic policies. Indeed, renowned economists such as Nicholas Stern defend just such a vision with regard to the challenge of climate (Stern Review, 2006). The approach adopted by Jonas is

very illuminating with regard to the present climate situation. We now examine this aspect in the following.

A novelty of the Stern Review[15] (Sir Nicolas Stern was Senior Vice-President of the World Bank from 2000 to 2003) published in 2006 is that it discusses the economics of risk. The problem no longer merely concerns a standardised reading of mathematical forecasts of damage, but proposes a vision of its possible extent by taking into consideration risks that are indeed likely but also very extreme. Furthermore, an ethical preference of a utilitarian type is proposed to treat future generations, because the implicit postulate is that all generations should receive equal treatment. This is what explains and justifies the very low discount level, of the order of 1.4 per cent (1.3 per cent being attributed to long-term growth in consumption and 0.1 per cent to a possible disappearance of the human race, which justifies the preference for the present). Lastly, the effects induced by unfair distribution are minimised by giving a value equal to one to the elasticity of the marginal utility of consumption.

The publication of the Stern Review met with mixed reactions. Commissioned by the British government, the report was always likely to attract controversy. It represented the first attempt to obtain a highly detailed analysis of the economic cost of climate change. The main message of the report was that an investment equivalent to 1% of global GDP per annum in efforts to reduce greenhouse gas emissions would serve to prevent a subsequent loss equivalent to somewhere between 5 and 20% of annual global GDP. What proved to be controversial was the method used to arrive at this conclusion. From a moral perspective, the aim of this report was to protect the future survival of humanity, and as such it met with approval from Sir James Alexander Mirrlees, Amartya Kumar Sen, Joseph E. Stiglitz and Robert Merton Solow (recipients of the Nobel Prize in Economics in 1996, 1998, 2001 and 1987 respectively). However, the apocalyptic view was

[15] For a discussion, *see* Howarth (2008).

not accepted throughout the academic world with regard to the economic sciences (Sen, 2013; Solow, 1986 and 1991; Stiglitz, 1974). Although the idea that the potential long-term damage was considerable and lasting, it drew considerable scrutiny from the international scientific community. This divergence arises from a criticism of the level of discounting, from how uncertainty is treated, and from how future generations will respond to new climate challenges. Criticisms of this approach have been raised by economists such as Williman D. Nordhaus (1992) and Richard S. Tol (2009). Perhaps the most prominent voice of opposition was the highly respected William D. Nordhaus, an economist specialising in climate change (and a 2018 Nobel laureate).[16] Central to this debate was a dispute over the discount rate to be applied. Where should our priorities lie: with the present or the future?

If we decide to adopt a Panglossian optimism and maintain that "all is for the best in the best of all possible worlds," then it is hard to believe in an alarmist vision based on a low discount rate, and a need to act rapidly. This, in essence, is the position adopted by Richard Toll (2006, 2007). In Toll's view, there are no major problems on the horizon that future generations will not be capable of solving. Why bother reducing greenhouse gas emissions, if future generations will be richer than their forebears? This wealth, synonymous with adaptability to risk (for example *via* investment in *backstop technologies*) will shelter them from the ill effects of any ecological catastrophe. This belief in salvation through technology can only be realised if growth remains steady in the long term. However, there is no guarantee that growth will persist in the coming decades, let alone centuries (Gollier, 2005). Indeed, history warns us to fear the opposite (theory of cycles). Above and beyond quarrels over figures (Stern's team proposed a discount rate of 1.4%, Nordhaus argues for 4.5%), whatever position one adopts (prioritising the present with a

[16] The dissenting voices were mostly North American economists such as Richard Tol, Robert Mendelsohn, Richard Richels and Gary Yohe.

high discount rate, or the future with a very low discount rate), the philosophical necessity of rethinking action theory is plain to see.

The approach adopted by the Stern Review was to take the worst-case scenario seriously. Underlying this choice is the assumption that economic development will lead to major disruptions. More specifically, expressed in terms of a constant annual rate, climate constraints are estimated to be between 5 and 20 per cent of the gross global product. Above 5 per cent, production will be affected. Above 20 per cent, an irreversible loss of capabilities will make itself felt in Africa, the Middle East, India, and South-East Asia. This catastrophic scenario is not however irreversible because, for a fairly moderate cost, humanity already has the means available to escape it by triggering early efforts to ensure intense decarbonisation so as to stabilise the atmospheric level of greenhouse gases at 550 ppm.

It must be however mentioned that this particular level is nowhere near satisfactory, and the resulting scenario is catastrophic. In pre-industrial Europe, the concentration of CO_2 in the air was 280 ppm. The threshold to be respected in order to avoid global warming is 350 ppm. That level was reached in the late 1980s. In the first decade of the current millennium, the level exceeded 400 ppm, due largely to the combustion of fossil fuels and rampant deforestation. Above 400 ppm the earth's energy budget is no longer balanced, meaning that the Earth absorbs more solar heat than it emits into space. According to the forecasts contained in the 5th report issued by the UN Intergovernmental Panel on Climate Change IPCC (the RCP scenario, Representative Concentration Pathways), we can reasonably expect the 550 ppm threshold to be reached by 2050 (regardless of the scenario, *i.e.* whether climate policy is ambitious or laissez-faire). This forecast is corroborated by the OECD report published in 2012. At the global level, this corresponds to a feedback loop whereby the release of methane from the Siberian permafrost sets off a chain reaction which accelerates the pace of climate change. This situation would imply

reaching a tipping point at a global level. The 550 ppm figure thus corresponds to an excessive and unacceptable concentration of atmospheric CO_2: the threshold justifies a heuristic of fear.

The Stern Review, beyond its methodological originality, demands that a basic ethical question be posed about how an altruistic dynamics can take account of the remote future. Concretely, this goes through a sacrificial approach, which arises from a moral asymmetry, and can only be understood if the present generation harms future generations. If we are to accept this hypothesis, it is imperative that we recognise that future generations have rights. Although Birnbacher (1994) conceptually defended this thesis, it remains true that there are no institutions in the world that formally represent future generations. So, is there some principle of justice that would allow future generations to blame the present generation for irreversible decisions taken? Since Parfit (1984), a problem of 'non-identity' has been actively annihilating any possible blame, and consequently prohibiting any possible compensation. The very simple idea underpinning this existential paradox springs from the fact that future generations are intrinsically incapable of complaining.

It is therefore rationally conceivable that an alternative to formalised utilitarianism can be subsumed into an economy of the environment through an 'imperative of humanity' (Jonas, 1984). We take the liberty of transforming this maxim into an 'imperative of transmission', which gives pride of place to the desire of human beings to transmit the Earth as they have inherited it to those who come after them. To do this, we have to accept that life is of primary importance. And indeed Jonas recognises that life has a finality in itself and that, consequently, everything that lives is useful not only to serve the ends of the human race, but also for the sole finality of living.[17] By situating himself within a very long timeline, with a horizon on the timescale of the biosphere, Jonas proposes an environmental ethics that challenges economic

[17] *See* Micoud (Micoud, 1997: 17) who adopts an unusual standpoint by considering life as a *personified entity*.

activity as it stands: far-reaching changes in the economic sphere, including the level of production and consumption modes, are necessary to allow the preservation of environmental resources in their entirety (in both their temporal and spatial dimensions).

The imperative of responsibility constitutes a moral obligation which incorporates future generations into the present material reality: an ethical obligation to the future guides present actions, and ultimately ensures that future generations occupy a prominent place in the choices made by present generations (we cannot decide without them). The inter-temporal choices made by generations are governed *ex ante* by adherence to the imperative of responsibility in each successive period, ensuring the preservation of nature for the future wherever it is not possible to provide intergenerational compensation (distributive justice operates exclusively at the intragenerational level in Jonas' thought).

The application of Jonas' prudence to a long time scale effectively suggests adopting the principle of precaution in our economic choices. Taking the long term into account negates any possibility for equivalence between successive generations in the framework of a utilitarian perspective based on the use of a discount rate. By contrast, preserving the interdependency of man and nature should be a pillar of intergenerational equity in the context of binding planetary boundaries[18].

3.3. An ethical approach that complies with sustainability: self-binding behaviour

The question here is how to combine the various timescales that are involved (*e.g.* the economic timescale and that of climate change) in a universal ethics of responsibility that inhabits the very long term, and how to determine its scale and its limitations in terms of compensation (*e.g.* distributive justice).

[18] Such a perspective is compatible with a strong approach to sustainability.

First of all, according to Jonas there is an asymmetry that favours future generations, which raises the question of the 'sacrifice' of the present generation in favour of those that are to follow (Bazin, 2007; Thévoz, 1993). One possible justification could be based in temporality. The solidarity between generations driven by the responsibility imperative leads Jonas to accept the intrinsic inequality that links successive generations: their belonging to distinct and irreversible moments of time gives them unequal positions in terms of rights and duties.

Jonas' maxim refers to the obligation to maintain an 'authentically human life on earth'. It looks as though this obligation will be difficult to fulfil if the lifestyle of the developed countries continues and is exported to the less developed countries. The finite nature of the planet, and the ecological threat materialised by the vulnerability of Nature, seem, from this point of view, to constitute two absolute constraints, even if we appeal to the boldness of technological progress.[19] In this context, public policies may promote and support changes that lead to a contraction of the consumer lifestyle in Western countries. Jonas is explicit on this point: 'This amounts to accepting severe restrictive measures with regard to our habits of unbridled consumption – in order to lower the 'western' standard of living of recent times […] the voracity of which – and the resulting excretions - appear to be particularly to blame for the global threats to the environment. […], because of the quite simple truth that the earth, which has a limited surface area, is not compatible with unlimited growth, and which wants the earth to have the last word.' (Jonas, 1998: 107). The rejection of growth from this perspective is envisaged in a logic of self-limitation considered as the preface to a distribution of resources between successive generations. The self-limitation proposed by Jonas is a moral motivation for individuals which requires us to accept this rule and apply it in our personal decisions. It is an essential motivation in order to take

[19] Technological progress is often proposed as holding the solution to many of the problems afflicting humanity. It was suggested recently that technologies intended to control the climate by limiting solar irradiation could be a way to combat climate change. On this point, *see* Barrett (2008).

the interests of future generations into account, existing within a tradition of self-binding imperatives stretching back to Kant[20] and reframed by the work of Birnbacher (2009) and Bigo (2010)[21]. According to Jonas, the motivation of self-limitation combined with a long-term perspective can provide an appropriate foundation for human action. This does indeed make it possible to take future generations into account, notably by overcoming the difficulties posed by various elements of a psychological nature, such as the preference for the present or the duration of the inter-generational horizon.

Concerned by the difficulty inherent in feeling genuine concern for moral agents who are temporally distant from ourselves, and positing that the existence of temporal preferences is universal, Birnbacher introduces self-binding mechanisms which may operate at the individual or collective level. Such mechanisms are in keeping with a prudential approach. As Birnbacher concludes: "a justification of environmental protection can be expected to be the more successful the more it invokes anthropocentric but unselfish values of a roughly 'prudential' sort: the values of stewardship and of keeping nature intact for future generations." (Birnbacher, 2009: 7).

Individuals promise to abide by rules, while delegating control to an external personal or institutional agency, thus protecting themselves against their own opportunism and any temptation to betray these objectives in the long term. External regulation – *via* long-term delegation of responsibility to institutions such as the State or other public bodies – may help to ensure adhesion to decisions compatible with the preservation of nature, as per Jonas' definition. We might also invoke the environmental ethics of Leopold (1949), using the concept of the "land

[20] In the revised version of the *Critique of Pure Reason* (*Kritik der reinen Vernunft),* Kant makes the distinction between the immanent economy and the transcendental economy. The former corresponds to a state of nature, while the latter corresponds to a society based on law and self-constraint. The transcendental economy requires individuals to transcend their opportunism by imposing their own constraints. An updated version of Kant's model can be found in both Jonas (self-limitation) and Birnbacher (self-binding), whose analyses are distinct but complementary.

[21] Responsibility according to Bigo, involves the abiltiy to respond, broken down semantically as response – able. In other words, she reminds us that behind the notion of responsibility are embodied and situated human beings that endeavour to engage in ethical behavious. On this count responsibility is a capacity that can be developped.

ethic" to mobilise internal self-binding mechanisms. In this context the "land ethic" is framed in anthropocentric fashion but serves an ecocentric purpose, with the solidarity between living beings occupying a fundamental role. Individuals should consider themselves to be part of nature, and thus obliged to behave respectfully towards her (respect for her values).

Thus, a self-binding perspective according to Birnbacher could result in a kind of 'sacrifice', meaning a reduction in today's consumption by the present privileged generation. At the same time, this implies revising our interpretation of the sustainability of development: it means considering that there can simultaneously be non-growth of well-being and a decrease in consumption for the most prosperous among the present generations. In fact, while the consumption of basic goods does not decrease over time, the consumption of other goods will do so: self-limitation – the physical expression of the 'sacrifice' of the present generation living in the developed countries and bound by a moral principle – allows the present generation living in developing countries and all future generations to achieve a level of well-being at least equal to the level at which essential needs are met.[22] This gives a glimpse of solidarity, both within the present generation and between successive generations through their dependence on Nature. Such a proposal could be compatible with the maintenance of both intra-generational justice and inter-generational fairness, which are two relevant dimensions of sustainability (Baumgärtner *et al.* 2012).

Overall, the main change is this: it is the obligation towards the future ('ethics of the future') that will decide whether any compensation is due from the most privileged members of the present generation to the least favoured, and it will also determine the effort to be made in terms of reducing the consumption of the most privileged members of the present generation (self-

[22] One could, for example, refer to primary goods in Rawls (1971).

limitation). In this way the scope of present actions is clearly demarcated and transcends any conflict between intra-generational and inter-generational fairness.

Subsequently, implementing an ethics of the preservation of the aspects of Nature that possess the characteristics of public goods is inevitably the task of public authorities and not of individuals. The ethical content of these choices rests on the legitimacy of the obligations, which implies that the whole of society accepts certain standards and rules. The rationality of the decision-maker's choice becomes a 'collective' rationality, in the sense that the acceptance by society of the imperative of responsibility depends above all on its social recognition. 'Knowledge, will and power are collective, and their control must be so also: only the public authorities can exercise them, and in the end this calls for their general acceptance at the ground roots level' (Jonas, 1998: 105).

The application of a self-binding rule can be considered at two different but overlapping levels: a redistribution (transfer) between generations that are present within a short space of time, and the long-term preservation of Nature as a result of self-limitation of present actions *via* the imperative of responsibility introduced into the sphere of human activities. It is at this price that it is possible to respect the integrity of the elements of Nature, and hope to promote the survival of humanity.

A first attempt to apply an ethical approach combined with fairness issues can be found with the fair-sharing principle at the inter-generational scale proposed by Howarth (2007). This principle is based on the idea that solidarity exists between all generations with regard to appropriating natural resources and that the preservation of the environment must be guaranteed over time. Compensatory redistributions between generations can be envisaged under certain conditions, but remain limited to financing substitution technologies targeting renewable energies, and to

maintaining permanent institutions over a very long-term horizon that could ensure that Nature is shared equally by different generations.

In this context, sustainability implies that the management of environmental resources includes the rights of future generations, such that '... [their] life opportunities are at least as good as those enjoyed today' (Howarth, 2007: 661). From this point of view, the moral obligation no longer concerns the transmission of a preserved environment (only some types of environmental resources are the shared property of present and future generations), but that of undiminished life opportunities available to members of future generations. Here, the idea of life opportunities is closely connected with the concept of capabilities developed by Sen (1992).

"Life opportunities," comprising various forms of natural, technical, cultural and political capital (institutions, standards *etc*.), lay the foundations on which societies are organised, and thanks to which they can sustainably manage Nature, while remaining accessible to future generations (Howarth, 2007). If we accept that future generations have rights, it is crucially important to apply the future ethics of Jonas in order to steer decisions towards preserving the necessary conditions for life to be lived within planetary boundaries. In this respect, the principle of "fair sharing," based on the idea that "certain types of environmental resources are the common property of each member of present and future society," (Howarth, 2007: 662) requires a spirit of solidarity between Nature and successive generations.

Thus, the fair-sharing principle could be compatible with the environmental ethics of Jonas, provided that it preserves an authentically human life on earth through the preservation of life opportunities for all generations. This point is valid given that the Jonas approach is holist and allows not only the satisfaction of basic needs but also a non-decrease in the set of opportunities for each member of society in the long run.

In this context, maintaining life opportunities and ensuring that all generations have access to Nature in an authentic state are key priorities of environmental justice. It is, however, worth noting that champions of the Wilderness (in the tradition initiated by Henry David Thoreau) do not promote a sublimated vision of Nature wherein everybody can access an authentic natural state; they are more interested in the philosophical injunction that failing to respect Nature is an affront to the human race. Thus, leaving humanity to rot is a sure way of ushering in excess and inequality. If Nature is a source of social inequality, it inevitably raises profound questions about social structures and morality. To put it slightly differently, if Nature is a moral matter then it must also be an issue of environmental justice.

The Anthropocene epoch is now the theatre of a struggle for environmental justice. The era of human history which began in the 18th century (Crutzen, 2002) has been marked by major man-made impacts on a global level (greenhouse gas emissions, the deterioration of biodiversity *etc*.) and rising socio-economic equality. In these circumstances, combining the self-binding principle (implied by the imperative of responsibility) with the fair-sharing principle may be a way of forestalling the deterioration of life opportunities for all generations, bearing in mind planetary boundaries.

4. Discussion and conclusion

Sustainability challenges are becoming increasingly pressing today. In this context, introducing environmental ethics could help economists to find better solutions to care for societies living in a closed world within planetary boundaries. The Imperative of Responsibility could be the first step towards a new age combining both human life and preservation of the biosphere to sustain the

well-being of all generations. Thus, sustainability could be achieved by placing some constraints on the use of Nature and at the same time decreasing the consumption levels of the favoured present generations, *i.e.*, self-restriction.

Nature and responsibility are fundamental issues which mankind must tackle. Jonas considers how best to split the burden of creating a fair society between the generations. In doing so he departs from the traditional philosophy whereby the burden should be shared equally between the contracting parties. Jonas' modernity derives from his insistence on a radical asymmetry in the burden placed on present generations, for the benefit of future generations. In concrete terms, this requires auto-limitation of consumption. An inequitable burden of responsibility must be placed on the shoulders of those currently living, with the spectre of apocalyptic eschatology looming in the background as the most likely alternative – the only way to make current generations accept the necessary economic sacrifice. Jonas' vision of responsibility thus demands an intergenerational sacrifice by present generations in favour of future generations. The degree of the sacrifice to be made by present generations is not up for debate: we must accept a moral imperative (lexicographic principle) in order for human civilization to survive (*in order for there to be a humanity*[23]).

In that regard, a kind of 'sacrifice' by generations which have achieved a high level of development could allow non-decreasing well-being in the long run for all generations. While transfers are possible between present generations (intra-generational ethics), the Imperative of Responsibility will ask us to preserve Nature in order to preserve life on the planet (inter-generational ethics) without any possibility of transfer. A review of our 'materialistic preferences' seems to be a necessary condition for accepting the principle as a guide in our decisions and ultimately maintaining an 'authentically human life on earth'. In doing so, we

[23] „Daβ eine Menschheit sei!", (1979: 90).

might be persuaded to prefer non-materialistic things like an aesthetically pleasing and healthy environment or an egalitarian community for instance.

From an economic perspective, the scope of Jonas' ethical thought requires us to reconsider the place of human activities in nature and to mobilise public institutions to oversee changes in behaviour as well as in changes in technology (public policies in favour of renewable ressources). The ethics of responsibility acknowledges the interdependences between the human species and environmental systems. Above and beyond the ultimate goal of preserving humanity, it must aim to preserve life in all its forms, human and non-human. This responsibility is thus rooted in a form of ecocentrism, wherein solidarity between living beings occupies a central role.

Finally, Jonas' ethical thought provides two things currently missing from economic analysis: the idea of human dignity and the concept of interdependency with Nature. Human dignity is a necessary precondition for any distribution/sharing of Natural capacities between generations. It is a vehicle for choices which transcend personal interests and the immediate short term. Interdependency, which underpins the solidarity between man and nature, defines the possibility of authentically human life surviving on earth in the long term. A genuine Jonasian life is achieved when human beings satisfy the *Imperative of Responsibility*. Those who do not satisfy this imperative, either because they reject it or elude it, or even because humanity no longer offers them the possibility, live an 'ungenuine' life, that is, a life not in keeping with the ontological notion of humanity. In addition, Jonas links the genuine nature of life to nature and the respect human beings show towards nature. By encapsulating the interdependencies that exist between human beings and environmental systems, the ethical scope of human responsibility becomes all-encompassing.

Taking the planetary boundaries into account, it puts sustainability at the heart of the development of human societies, combined with respect for the values associated with Nature's

capacities and with Others. This philosophy requires us to fundamentally rethink economics with reference to planetary boundaries, which demands profound behavioural changes as well as imposing restrictions on human actions over time[24]. At a purely pragmatic level, modes of production and consumption[25] will need to be revised to take two new dimensions into account. The *intragenerational* dimension means that disadvantaged generations in developing nations must be able to access basic needs; this presupposes the existence of transfers and a clear decision regarding the benchmark level of well-being. This will lead to a reduction in consumption for the richest generations, which in turn will make them better off because they will live in a better socio-ecological whole, but not a reduction in their level of well-being as long as they retain freedom of choice, including immaterial considerations (respect for others, solidarity, allocation of time etc.). In terms of the *intergenerational* dimension, preserving Nature's capacities for future generations will ensure that well-being does not decline in the long term (in the absence of transfers). Given the impossibility of managing distributive justice over such a long timeframe, the imperative of responsibility regulates *ex ante* the distribution of Nature over time.

Furthermore, the Imperative of Responsibility is closely related to a heuristic of fear, which has an altruistic origin. It is essential for humans to be able to imagine the long-term impacts of their actions and to believe in what is unthinkable today. This is a major cognitive challenge! We note that while the self-binding principle can be combined with the fair-sharing principle, this perspective does not tell us how all generations can cooperate with each other; indeed, if we

[24] Here, we need changes in preferences, not externally imposed changes in behavior, which implicitly assumes that current preferences are not immutable.

[25] This critique of consumption and the idea of economic growth bears some similarities to research on degrowth (Kallis *et al.*, 2012). It is particularly focused on reducing consumption in order to limit environmental impact (resource use and pollution).

assume that Jonas' approach is to be applied here, such a contract is no longer possible. This question is related to the way intra- and inter-generational justices are linked together.

Within planetary boundaries, on the one hand we must face up to restrictions on our use of Nature which represent a sacrifice for those generations which have reached a high level of development. This represents a form of environmental justice in a context of persistent inequalities (Kenner, 2015). On the other hand, making development more sustainable requires a reduction in the consumption of the richest present generations, which means abandoning the cult of economic growth in favour of a more long-term vision based on the well-being of future generations. In this respect, Jonas (1985: 49) questions the capacities of capitalism and fundamentally challenges the consumerist view of Nature. He advocates a prudent approach to consumption which is tantamount to austerity. In his view, prudence validated by the heuristic of fear could serve to "halt the pillaging, the pauperisation of species and the contamination of the developing world." By the same token, austerity could "prevent the depletion of the planet's reserves, including the extreme changes in the global climate caused by mankind. We need a new *austerity* in our consumption habits." Jonas (1966: 390) describes fear (*Furcht)* as a key inspiration in his ethical vision: "fear is part of responsibility."

Ultimately, Jonas' environmental ethics requires us to rethink the notion of responsibility in favour of sustainability (″Nachhaltigkeit″). Jonas warns us to be wary of practical knowledge that is not backed up by rigorous structures of thought. This is the space occupied by the contemporary German and European ecological consciousness. The idea that practical knowledge may prove to be a destructive force is taken up by Günther Anders (1984), who argues that the division of labour – and technology in general – risks making humans obsolete. Nevertheless, Anders suggests that a wave of moral indignation could help mankind reclaim the responsibility it has lost. The German collective conscience is always somewhat wary of such techniques, too

often associated with either religion or barbarism (war *etc*.). Indeed, a certain mistrust of technicism has informed the development of a number of modern European nations. Another important question is the role of technology in the exhaustibility of natural resources and the uniformisation of civilisations, a point made by Jacques Ellul (1980).

As Jonas is always suspicious of technical alienation and materialism (a disparity between actions and their irreversible effects), he is mistrustful of technicist utopias in the same way that *Deep Ecology* is sceptical of so-called *backstop technologies*. Jonas posits that our relationship with the non-human world can be construed on a purely technical level, making it ethically neutral. He examines the status of ethics itself, questioning our biocentrism and anthropocentric exclusivity. Jonas eschews biospheric egalitarianism[26] in favour of a hierarchical system in which humans occupy the uppermost rung. But ultimately, what really sets Jonas apart from his philosophical contemporaries is his condemnation of rationalism and advocacy of a return to the sacred. His concept of the heuristic of fear plays on atavistic notions of terror. This negative anticipation (technique) is nothing less than a deformation of man's image (Jonas, 1984: 38). *In fine*, considering fear as enlightening, perhaps even redemptive, is a manner of rehabilitating paternalism by infantilising mankind. There is an obvious risk here of banalising bad deeds, including the resurgence of certain negative externalities such as the crowding-out effect (Ballet *et al.*, 2004). In Jonas' view, this paternalism is in fact "the archetype of all responsibility." (Jonas, 1984: 130). Critics have bemoaned the fact that this ultimate responsibility should be defined by asymmetry (head of state / parent as authorities), posing a clear challenge to the principle of individual autonomy as established by Kant. Indeed it was these two elements of

[26] The "biospheric egalitarianism" concept is due to Arne Naess (2001) who has proposed the moral basis for preservation of non-human species.

Jonas' thought (infantilisation and fear) which attracted the most criticism, causing him to fall out of favour for many years.

It is only recently, with the rise of *Deep Ecology* and the realisation of the severity of the threats our planet faces, that Jonas has regained his status as a distinguished, influential (albeit controversial) thinker. To varying degrees, Jonas' thought chimes with *Deep Ecology* on several key points (albeit not sufficiently to suggest an affiliation), including the view of nature as *vulnerable* and *concomitant with life* (mystical for the ecological movement; finite for the philosopher). As Jonas himself wrote: "Nature harbors values because it harbors ends and is thus anything but value-free." (Jonas, 1984: 78) This sharing of value between humanity and Nature means that the future of humanity is inextricably linked to the fate of Nature. At a time of the Anthropocene epoch, and by reminding us that we are linked to the Nature, Jonas sounds a vital warning to humanity. Recognising the contribution his environmental ethics can make to economics is an urgent priority!

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