

The Imperatives of Sustainable Development

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ABSTRACT

The United Nations sustainable development goals are under fire. By attempting to cover all that is good and desirable in society, these targets have ended up as vague, weak, or meaningless. We suggest a model for sustainable development based on three moral imperatives: satisfying human needs, ensuring social equity, and respecting environmental limits. The model reflects *Our Common Future's* central message, moral imperatives laid out in philosophical texts on needs and equity, and recent scientific insights on environmental limits. The model is in conflict with the popular three-pillar model of sustainable development, which seeks to balance social, environmental, and economic targets. Rather, we argue that sustainable development constitutes a set of constraints on human behaviour, including constraints on economic activity. By identifying indicators, and thresholds, we illustrate that different regions or groups of countries face different challenges. Copyright © 2016 John Wiley & Sons, Ltd and ERP Environment

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Introduction

IN THE 2015 REPORT *TRANSFORMING OUR WORLD*, THE UNITED NATIONS (UN) ANNOUNCED A SET OF SUSTAINABLE DEVELOPMENT goals (SDGs) to guide world development until 2030 (United Nations, UN, 2015). However, in stark contrast to the 1987 UN report *Our Common Future* (World Commission on Environment and Development, WCED, 1987), the reality of environmental limits and the potential drawbacks of ever-increasing economic growth have not been firmly placed on the sustainable development agenda.

We claim that any notion of sustainable development must acknowledge environmental limits, as suggested by *Our Common Future*, various scholars (e.g. Meadows and Club of Rome, 1972; Meadows *et al.*, 1992; Spangenberg, 2013) and the new planetary boundary approach (Rockström *et al.*, 2009; Steffen *et al.*, 2015). Moreover, we claim that economic growth cannot be one of sustainable development's key goals (Holden and Linnerud, 2007; Stiglitz *et al.*, 2010; Daly, 2007; Griggs *et al.*, 2013; Meadowcroft, 2012; Holden *et al.*, 2014). Rather, the key dimensions of

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sustainable development – which we claim to be the moral imperatives of satisfying needs, ensuring equity and respecting environmental limits – represent constraints on human activities, including our efforts to maximize economic value. Thus, we believe that the announced SDGs rest on wrong premises as they seek to ‘balance the three dimensions of sustainable development: the economic, social and environmental’ (United Nations, UN, 2015, p. 2).

Furthermore, by attempting to cover all that is good and desirable in society, the SDGs have ended up as vague, weak or meaningless (Hopwood *et al.*, 2005; Stafford-Smith, 2014; Stokstad, 2015). First, they do not distinguish between what we regard to be primary and secondary goals.¹ In not prioritizing the goals, the UN risks being satisfied with achieving secondary goals while simultaneously failing to achieve primary goals. Indeed, having too many goals (*Transforming Our World* announced 17 SDGs, 169 targets and a preliminary set of 303 indicators; Hák *et al.*, 2016) amounts to having no goals at all, even more so if no priority has been allocated. Second, many of the SDGs are mere tautologies. Does it really help to have an SDG that will ‘promote sustainable agriculture’ or ‘make cities sustainable’? Third, the SDGs are a mixture of goals to be achieved and the means by which to achieve them. Fourth, whereas the development goals² (Goals 1–6) are concrete and quantifiable, the environmental goals (Goals 12–15) are merely unquantified ambitions to ‘protect’, ‘strengthen’ and ‘promote’. Clearly, the lack of quantifiable ambitions results from not acknowledging that there are environmental limits (ICSU, ISSC, 2015).

Our Common Future firmly placed sustainable development on the global political agenda. The 1992 Rio Summit gave the agenda further momentum. After the Rio Summit the political interest in sustainable development slowly waned and hit bottom at the unsuccessful 2002 Johannesburg Summit (often referred to as Rio+10). The 2012 Rio Summit (Rio+20), however, led to a ‘rebirth of sustainable development’ (Dodds *et al.*, 2014). The strong language in *Transforming Our World* leaves no doubt that sustainable development is now very much back on the international agenda. At the heart of this agenda, UN member states decided on ‘new global Sustainable Development Goals’ and bravely committed themselves ‘to working tirelessly for the full implementation of this Agenda by 2030’ (United Nations, UN, 2015, p. 3).

The research community has responded to this commitment by publishing a tremendous number of books on sustainable development (e.g. Baker, 2016; Sachs, 2015; Mulligan, 2015; Washington, 2015; Kopnina and Shoreman-Ouimet, 2015; Blewitt, 2015; Jacques, 2015; Miller, 2015; Mandal, 2015; Williams, 2014; Caradonna, 2014; de Vries, 2013). Based on these books, and other literature (e.g. Redclift, 2005; Agyeman, 2013; Stern, 2015), we argue that there has been ‘an ethical turn’ in the academic literature on sustainable development.³ This article aims to contribute to that turn by presenting a normative model of sustainable development.

We suggest a model based on three moral imperatives: satisfying human needs, ensuring social equity and respecting environmental limits. The model reflects the emphasis on needs and limits in the sustainable concept’s origin: *Our Common Future*. More importantly, it reflects both moral principles laid out in philosophical texts on needs and equity, and new scientific insights into environmental limits. Since *Our Common Future*, a tremendous number of sustainable development models, assessments and indicators have been suggested.⁴ However, they suffer from ‘an insufficiently developed theoretical framework’ (Hák *et al.*, 2016). The moral imperatives presented later here constitute the theoretical foundation of our model.

Our model is in conflict with the popular three-pillar model, which seeks to balance social, environmental and economic targets.⁵ Rather, we argue that sustainable development constitutes a set of constraints on human activities, including economic activities. By identifying key themes, headline indicators and thresholds, we claim that the moral imperatives of needs, equity and limits should guide policy-making.

The remainder of the article is structured as follows. In the following section, we define the three moral imperatives of sustainable development: satisfying human needs, ensuring social equity and respecting environmental limits. In the next section, we lay out a theoretical foundation for the three moral imperatives. In the fourth section, we link theory

¹No one will question the importance of goals such as ‘strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol’ (Target 3.5), ‘ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy’ (Target 4.6) and ‘ensure that all learners acquire the knowledge and skills needed to promote sustainable development’ (Target 4.7). These targets are, we would argue, well outside what should be the primary goals of sustainable development.

²Built on the millennium development goals (MDGs).

³Stern (2015) suggests a similar turn in the academic literature on climate change.

⁴For example, by the European Environmental Agency, Organisation for Economic Cooperation and Development, United Nations Environmental Programme, Eurostat and World Bank.

⁵Also known as the ‘tripartite model’, ‘three-legged stool model’, ‘3P model’ (people, planet, profit) and ‘triple bottom line’.

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to practice by identifying goals, choosing suitable indicators and setting thresholds to be met. We conclude the article by briefly discussing some policy implications and the moral imperatives of sustainable development.

The Moral Imperatives of Sustainable Development

Sustainable development is a normative value system, on a par with human rights, democracy and freedom (and it is closely interlinked with all these systems). Thus, sustainable development is essentially a strong ethical, or moral, pronouncement as to what should be done. We call such a pronouncement a moral imperative.

We claim that the concept of sustainable development rests on three moral imperatives: satisfying human needs, ensuring social equity and respecting environmental limits. Daly (2007) considers these ethical imperatives categorical, interpreting them as moral values when referring to them as ‘fundamental objective values, not subjective individual preferences’. The moral imperatives of satisfying human needs and ensuring social equity are thoroughly articulated in *Our Common Future* (World Commission on Environment and Development, WCED, 1987, p. 43) and in *Transforming Our World* (United Nations, UN, 2015). The moral imperative of respecting environmental limits – acknowledged in *Our Common Future* but not in *Transforming Our World* – is grounded on two claims. First, we agree with Brown Weiss (1992) that, as members of the present generation, we hold the Earth in trust for future generations. Hence, not respecting environmental limits most likely prevents future generations from having resources vital to meeting their needs. Second, we agree with Amartya Sen (2009) that, since we are enormously more powerful than other species, we have responsibility towards them. This responsibility means that we must respect environmental limits.

Moreover, we argue that these three moral imperatives set constraints on human behaviour. Thus, we agree with John Rawls (1999) that the priority of following moral imperatives (Rawls’s moral imperative was justice, to which we will return soon) sets the constraints that individuals need to comply with before deliberating on their own preferences. Consequently, sustainable development sets constraints with which individuals need to comply.

Thus, rather than having dimensions that should be balanced (as suggested by the popular three-pillar model), sustainable development can be defined, we argue, as three key constraints on human behaviour: satisfying basic human needs, ensuring social equity and respecting environmental limits. The constraints define ‘the sustainable development space’ (Figure 1).

Four Important Notes About the Model

First, a policy that leads to sustainable development is one that achieves a socially desirable goal that is not in conflict with the three sustainable development constraints. A socially desirable goal (for instance economic growth, well-being or quality of life) rests on different preferences in time and space, and so we do not define the specific policy

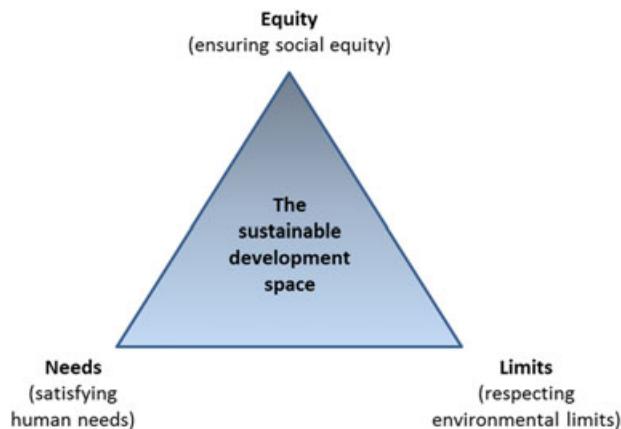


Figure 1. A model for sustainable development that rests on the constraints derived from the normative imperatives of needs, equity and limits

goal, nor do we define the policy goal as being optimal or the development path to get there. Rather, we define what sustainable development is *not* by identifying sustainable development constraints on human behaviour.

Second, the constraints are not negotiable. They are equally important. None can be trespassed. This approach excludes the possibility of trespassing one constraint because of 'overperformance' in another. Hence, there is no hierarchy among the constraints; rather they represent a panarchy.

Third, we argue (perhaps controversially) that economic growth is not one of the primary dimensions of sustainable development.⁶ True, economic growth may contribute to a more sustainable development by improving social welfare, satisfying human needs and lifting people out of poverty, but economic growth may also reduce social equity by contributing to income and wealth inequality (Atkinson, 2015; Piketty, 2014). True, economic growth may bring about the technological solutions needed to mitigate greenhouse gases and adapt to climate change (Stern, 2015), but economic growth may also contribute to a less sustainable development by increasing greenhouse gas emissions and by overexploiting species and resources for human use. Thus, economic growth is neither inherently sustainable nor inherently unsustainable. It may be part of the solution, it may contribute to the problem, or both; it depends on the policies, the laws and regulations, and the institutions in place. Thus, we present a model that interprets sustainable development as a set of constraints to which economic activities, and all other human activities, must adhere. Human activity is already exceeding environmental limits, income and wealth are unevenly distributed and extreme poverty exists. These facts show that such constraints are needed.

Fourth, we argue that social equity, including democratic participation, is a key theme of sustainable development (see later in this article). Consequently, even though a country or region successfully achieves all development and environmental targets outlined in this article, it cannot be assessed as sustainable if these achievements are made by a political system that does not secure effective citizen participation in decision-making. This argument also applies the other way around: even though a country or region successfully involves society in defining development and environmental targets, it is not necessarily sustainable if this involvement results in political aims and policies that are in conflict with planetary boundaries defined by natural scientists or in conflict with the needs of the poor.

However, we claim, this does not imply that stakeholder acceptance is crucial to defining and operationalizing sustainability as a normative concept (see, e.g., Martin and Rice, 2014; Martin *et al.*, 2014). Rather, we aim at designing a normative model against which the outcome of democratic processes could be evaluated. In this model, the choice of constraints (and the corresponding themes, indicators and threshold values) should not echo 'what people would like to sustain and how to reach agreement on this, constrained by estimates of what is feasible' (Ehrlich *et al.*, 2012, p. 69).⁷

The Moral Imperatives' Theoretical Foundation

Satisfying Human Needs

In *A Theory of Human Need*, Doyal and Gough (1991) argue that human beings have universal and objective needs for health and autonomy and, moreover, a right to their optimal satisfaction. They develop a system of social indicators to show what such optimization would mean in practice. While the individual's basic needs for physical health and autonomy are universal, they acknowledge that the goods and services required to satisfy these may depend on culture.

⁶The three-pillar model has an economic dimension, not an economic growth dimension. However, the economic dimension in the model is usually interpreted as an imperative for economic growth, recently illustrated by the UN in SDG 8. Moreover, the economic dimension is often given priority in policies (Giddings *et al.*, 2002).

⁷Given the normative imperatives of sustainable development, it is not up to any group of stakeholders to define what they would like sustainable development to be. It would (for example) be strange to let a group of stakeholders decide what part of, say, human rights (another moral imperative) they would like to accept and act accordingly. Likewise, it is not for any group of stakeholders to decide what part of the sustainable development imperatives they would like to accept. That would make *any* development sustainable as long as people agree and accept the conditions.

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Doyal and Gough call all objects, activities and relationships that satisfy our basic needs 'satisfiers'. Basic needs are always universal, but their satisfiers may not be. They identify universal satisfiers, that is, goods, services, activities and relationships that enhance physical health and human autonomy in all cultures.

They argue that universal satisfiers⁸ are most important for basic need satisfaction, and refer to them as 'intermediate needs'. The intermediate needs can be grouped as follows: nutrition and clean water, protective housing, a nonhazardous work environment, a nonhazardous physical environment, appropriate health care, security in childhood, significant primary relationships, physical security, economic security, appropriate education, and safe birth control and childbearing. Satisfying intermediate needs would therefore most likely help to eradicate extreme poverty and eliminate hunger.

However, seeing people's needs only in terms of these intermediate needs gives a 'rather meagre view of humanity' (Sen, 2009, p. 250). Indeed, *Our Common Future* acknowledged people's 'legitimate aspirations for an improved quality of life' (World Commission on Environment and Development, WCED, 1987, p. 43) and 'aspirations for a better life' (World Commission on Environment and Development, WCED, 1987, p. 44). Surely, there must be more to satisfying human needs than various forms of basic-need approaches.

Our point of departure for this broader view of human needs is the capability approach. According to Alkire (2010), the capability approach is the main philosophical foundation for the concept of human development.⁹ Amartya Sen's writings in the 1980s and 1990s are key to the literature on the capability approach. More recently, the approach has been further developed by the philosopher Martha Nussbaum and a number of other scholars (Robeyns, 2005).

The capability approach is a broad normative framework for evaluating individual well-being and social arrangements, the design of policies, and proposals for social change (Robeyns, 2005). It is used in a wide range of fields, most prominently in development studies, welfare economics, social policy and political philosophy. It can be used to evaluate several aspects of people's well-being, such as inequality, poverty, the well-being of an individual or the average well-being of the members of a group.¹⁰

The capability approach focuses on what people are effectively able to do and to be, that is, on their capabilities. Thus, according to Sen (2009), the capability approach contrasts philosophical approaches such as the basic-need approach (which focuses on necessities), utility-based approaches (which focus on individual happiness or pleasure) and resource-based approaches (which focus on income, wealth, or resources). Rather, Sen (2009) argues that policies should focus on assessing what people are able to do and be and on removing obstacles in their lives so that they have more freedom to live the kind of life that, upon reflection, they have reason to value.

A key analytical distinction in the capability approach is that which distinguishes between the means and the ends of well-being and development. Only the ends have intrinsic importance, whereas means are instrumental to reach the goals of increased well-being, justice and development. According to the capability approach, the ends of well-being, justice and development should be conceptualized in terms of people's capabilities to function, that is, their effective opportunities to act and do as they please, and to be whom they want to be.

According to Alkire (2010), the capability approach has two interpretations in the literature. The 'narrow' interpretation focuses on basic human development issues such as income, education and health. The 'broad' interpretation includes attention to principles such as freedom, equity and sustainability. The literature on human development (and the capability approach) was for a long time separated from the literature on sustainable development (Neumayer, 2010), and the broad interpretation of the capability approach is an attempt to reconcile the two literature strands. We acknowledge the importance of the broad interpretation, which, in fact, is very close to our notion of sustainable development. We argue, however, that each moral imperative in our model should be looked at separately to avoid any concealed trade-offs between them. Thus, the moral imperative of satisfying human needs

⁸The Chilean economist Artur Manfred Max Neef was one of the first to make a distinction between needs and satisfiers: 'A prevalent shortcoming in the existing literature and discussions about human needs is that the fundamental difference between needs and satisfiers of those needs is either not made explicit or is overlooked' (Max-Neef, 1991, p. 16).

⁹Though some authors attempt to distinguish between human development and the capability approach, there is no consensus as to a conceptually clear distinction between the two. Nor is it obvious that such a distinction is useful or required (Alkire, 2010).

¹⁰Importantly, the capability approach is not a theory that can explain poverty, inequality or well-being; instead, it provides a framework within which to conceptualize and evaluate these phenomena. Applying the capability approach to issues of policy and social change will therefore often require the addition of explanatory theories (Robeyns, 2005).

in our model is in line with the narrow interpretation of the capability approach, while the broad interpretation of the capability approach is captured by other aspects of our model.

The broad interpretation attempts to reconcile the narrow interpretation of the capability approach with sustainable development issues, and it has received a lot of attention recently (though the notion 'broad' is not necessarily used). Peeters *et al.* (2015) reconcile the capability approach with environmental sustainability by looking at the IPAT model that combines population growth, technology and consumption to determine impact. They argue that capabilities are rooted in material conditions, which ultimately rest upon biophysical preconditions and are therefore limited. The authors develop two new ideas: capability ceilings (which the authors find too limiting) and constraints on functionings (fair share of environmental resources). These ideas resonate well with the approach we take in this article.

Ballet *et al.* (2013) argue that, although attempts to take the environment into the capability approach have been successful, it has been criticized for not sufficiently including equity and justice issues. They show, however, that the capability approach provides a good analytical framework for an environmental justice approach, thus reflecting a broad interpretation.

In a series of papers, Martins (2011, 2013) explores the connections between the capability approach and sustainability economics. He argues that the interpretations of the capability approach as an ontological exercise enable us to have a better understanding of the essential categories used in the capability approach, and to establish a clearer connection between the capability approach and sustainability economics. The capability approach can address the central issues within sustainability economics, such as the satisfaction of individuals' needs and wants; and justice, between humans of present and future generations, and in human-nature relationships over the long-term and inherently uncertain future. Martin argues that the capability perspective shows how these aspects are deeply interconnected. Moreover, he argues that to engage in a more substantive study of the connections between the capability approach and sustainability issues we must first understand the place of the capability approach within the history of economic thought. Only then, he argues, can we use the capability approach to specify concepts such as well-being, surplus, scarcity and sustainable reproduction, which are essential for the development of sustainability economics.

The work of Sen does not easily fit in a narrow or a broad interpretation. On the one hand, he links the capability approach to justice and sustainability (Sen, 2009, 2013). On the other hand, he does not sufficiently acknowledge material and biophysical limitation (Peeters *et al.*, 2015). Thus, we think Sen is closer to a narrow than a broad interpretation of the capability approach.

Ensuring Social Equity

Social equity, or social justice,¹¹ is closely related to the concept of equality. According to Amartya Sen, 'every normative theory of social justice demands equality of *something* – something that is regarded as particularly important in that theory. The theories can be entirely diverse (focusing on, say, equal liberty or equal income [...]), and they may be in combat with each other, but they still have the common characteristics of wanting equality of something' (Sen, 2009, p. 291, italics in original).

Our point of departure is John Rawls' 'two principles of justice' (Rawls, 1999, p. 266). The first principle (called the 'equal liberty principle') says that 'Each person is to have an equal right to the most extensive total system of equal basic liberties compatible with a similar system of liberty for all'. The second principle says that 'social and economic inequalities are to be arranged so that they are both: (a) to the greatest benefit of the least advantaged, consistent with the just savings principle, and (b) attached to offices and positions open to all under conditions of fair equality of opportunity'. Part (a) of the second principle is often called the 'difference principle' and part (b) the 'fair equality of opportunity principle'.

The basic liberties included in the first principle are political liberties, liberty of conscience, freedom of association, freedom and integrity of the person, and rights covered by the rule of law (Maffettone, 2010). We argue that political liberty is particularly important in terms of social equity and sustainable development, and that participation is a particular feature of this liberty. Maffettone (2010) argues that the first principle implies a principle of equal

¹¹We see no major differences in the terms 'equity' and 'justice' and will thus use them interchangeably.

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participation. Participation ‘takes place in the traditional constitutional context through the democratic election of a representative body with extensive legislative powers’ (Maffettone, 2010, p. 63).

The right to vote is an important part of participation. However, we need an understanding of participation that in two senses is ‘richer’ than ‘seen in terms just of ballots and elections’ (Sen, 2009, p. 326). First, though ballots have an important role, they can be seen just as one part of the participation process. The effectiveness of ballots themselves ‘depends crucially on what goes with balloting’ (Sen, 2009, p. 327). Indeed balloting can be thoroughly inadequate on its own, as is amply illustrated by the astonishing electoral victories of ruling tyrannies. This understanding of participation was acknowledged in *Our Common Future*: ‘participation requires a political system that secures effective citizen participation in decision making’ and, moreover, ‘an administrative system that is flexible and has the capacity for self-correction’ (World Commission on Environment and Development, WCED, 1987, p. 65). Thus, participation in itself is not enough, but must be embedded in a system that makes it possible to transfer individual voices to action. In this sense, participation is a central part of governance, which in its broadest sense refers to ‘the intersection of power, politics and institutions’ (Leach *et al.*, 2010, p. 65). We refer to participation in this broader sense as ‘rich participation’.

Second, participation of the ‘low voices’ should be given particular attention. Such voices include poor people, nature and future generations. Whereas poor people have a low voice, nature and future generations do not have a voice at all; they are what Meadowcroft (2012) refers to as ‘absent constituents’.

There are three additional reasons to include rich participation in our definition of social equity. First, rich participation acts as a safety valve against political neglect in following up the imperative of ensuring social equity (Sen, 2009). Second, rich participation enables collective processes of monitoring, reflection, debate and decision that establish the goals to be pursued (Meadowcroft *et al.*, 2005). Thus, rich participation has the ability to influence norms and values and to make acceptable any necessary changes in unsustainable policies and practices. Third, we acknowledge the ‘pervasive demands for participatory living’ around the world (Sen, 2009, p. 322).

The second principle applies, according to Rawls, to the distribution of income and wealth and to organizational design that makes use of differences in authority and responsibility. Rawls thinks income and wealth should be *fairly* distributed among people. Inequalities in income and wealth are acceptable, provided that those who are least well off are better under the present set of social rules than those under any alternative set of social rules – this is the controversial difference principle. Although the difference principle does not require an equal distribution of income and wealth, its underlying idea ‘expresses a powerful, even inspiring vision of equality’ (Sandel, 2009, p. 156).

Rawls thinks positions of authority and responsibility must be open to all. However, an organizational design that results in inequalities in authority and responsibility may still be acceptable if it simultaneously contributes to a better functioning society. This means that ‘injustice is simply inequalities that are not to the benefit of all’ (Rawls, 1999, p. 54). Thus, justice does not imply perfect social and economic equality; rather, justice implies that social and economic inequalities (e.g. income) must be ‘fair’.¹² We understand the second principle to call for a fair distribution of income and wealth.

The two principles of justice serve, according to Maffettone (2010), a dual purpose. On one hand they aim at the best possible set-up of political institutions (the first principle), while on the other they relate to the socio-economic structure of distributive justice (the second principle). It is quite easy to suggest, again according to Maffettone, that the first principle – based on liberty – concerns for the most part political institutions, while the second – focusing on equality – concerns socio-economic relations among citizens. According to Sen (2009), a theory of justice must be alive to both the fairness of the process and the fair distribution of opportunities.

Respecting Environmental Limits

Presently, the most promising take on stressing the importance of environmental limits, and moreover on attempting to quantify these limits, is the ‘planetary boundary approach’. This approach originated in 2008 from a group of researchers at the Stockholm Resilience Centre, the Stockholm Environment Institute and the Tällberg Foundation. Since then, the group has grown to include researchers from many institutes around the world, and the group’s work has frequently been reported in high-ranking journals (see, e.g., Rockström *et al.*, 2009; Steffen *et al.*, 2015).

¹²Social and economic inequalities are evaluated by Rawls in terms of social primary goods, such as income, wealth, liberty and opportunity (and more).

The researchers made a preliminary effort at identifying the planetary boundaries in 2009 (Rockström *et al.*, 2009). They defined planetary boundaries as the safe operating space for humanity with respect to the Earth's systems. These systems are associated with the planet's biophysical processes, and the researchers attempted to quantify for each process the boundary level that should not be transgressed if we are to avoid unacceptable global environmental change. The researchers then defined unacceptable change in relation to risks humanity faces in the planet's transition from the Holocene to the Anthropocene.

Nine planetary boundaries were suggested: climate change, ocean acidification, stratospheric ozone depletion, interference with the global phosphorus and nitrogen cycles, rate of biodiversity loss, global freshwater use, land-system change, aerosol loading and chemical pollution. The researchers assessed that there was enough scientific evidence to make a preliminary attempt at quantifying control variables for seven of these boundaries. The remaining two (aerosol loading and chemical pollution), the researchers argued, should be included among the planetary boundaries, but they were at the time unable to suggest quantitative boundary levels.

In a recent study, the group presents improved planetary boundaries (Steffen *et al.*, 2015). The basic framework is still to define a safe operating space for humanity. Alas, according to the authors, four of the nine planetary boundaries have already been crossed as a result of human activity. The four are climate change, loss of biosphere integrity,¹³ land-system change and altered biogeochemical cycles (phosphorus and nitrogen). Crossing a boundary could well, according to the authors, drive the Earth system into a much less hospitable state, limit efforts to reduce poverty and deteriorate human well-being in many parts of the world, including in wealthy countries.

Two of these, climate change and biosphere integrity, are what the researchers call 'core boundaries'. Each of the two core boundaries has 'the potential on its own to drive the Earth system into a new state should they be substantially and persistently transgressed' (Steffen *et al.*, 2015, p. 737). The crossing of one or more of the other seven boundaries is also problematic, but does not by itself lead to a new state of the Earth system.

Key Themes, Headline Indicators and Thresholds

It was always clear that achieving sustainable development would require quantitative indicators. Agenda 21 (United Nations, UN, 1992) already affirmed that 'indicators of sustainable development need to be developed to provide solid bases for decision-making at all levels' (chapter 40.4). Since then, many indicators, indicator sets and dashboards, compound (composite and aggregated) indicators and compound indices have been introduced (e.g. United Nations Commission on Sustainable Development, UNCSD, 1996; Holden and Linnerud, 2007; Pintér *et al.*, 2012; Dahl, 2012; Holden *et al.*, 2014; Hák *et al.*, 2016; United Nations Statistical Division, UNSD, 2015). However, consensus has been lacking on how to measure sustainability (see, e.g., UNECE, OECD, Eurostat, 2008; Stiglitz *et al.*, 2010).

In this section, we link theory to practice by identifying key themes, choosing suitable indicators and setting thresholds to be met. An overview of the resulting model for global sustainable development is given in (Figure 2).

We would like to make some comments on the choice of indicators and thresholds at this point. First, although we have based our thresholds on the best scientific evidence and current best practice, these thresholds need agreement at the global level and will therefore to a great extent be subjective and in many cases also political compromises. The fact that we include participation as one of the key themes opens up for everyone accepting or not accepting the normative imperatives of sustainable development. Indeed a democracy should always reason about its normative foundation. Moreover, the key indicators and thresholds presented in this paper must be changed as new evidence arises and/or new and better indicators become available.

Second, the number of key indicators is somewhat arbitrary. There could be more and there could be fewer. The important point is that the number of key indicators is small and that a priority is allocated to them. The key indicators can be supplemented by more indicators in practical policy; these must, however, relate to the key themes.

¹³Though the framework retains the same processes as in 2009, two of them have been given new names, to better reflect what they represent. 'Loss of biodiversity' is now called 'change in biosphere integrity'. 'Chemical pollution' has been given the new name 'Introduction of novel entities'.

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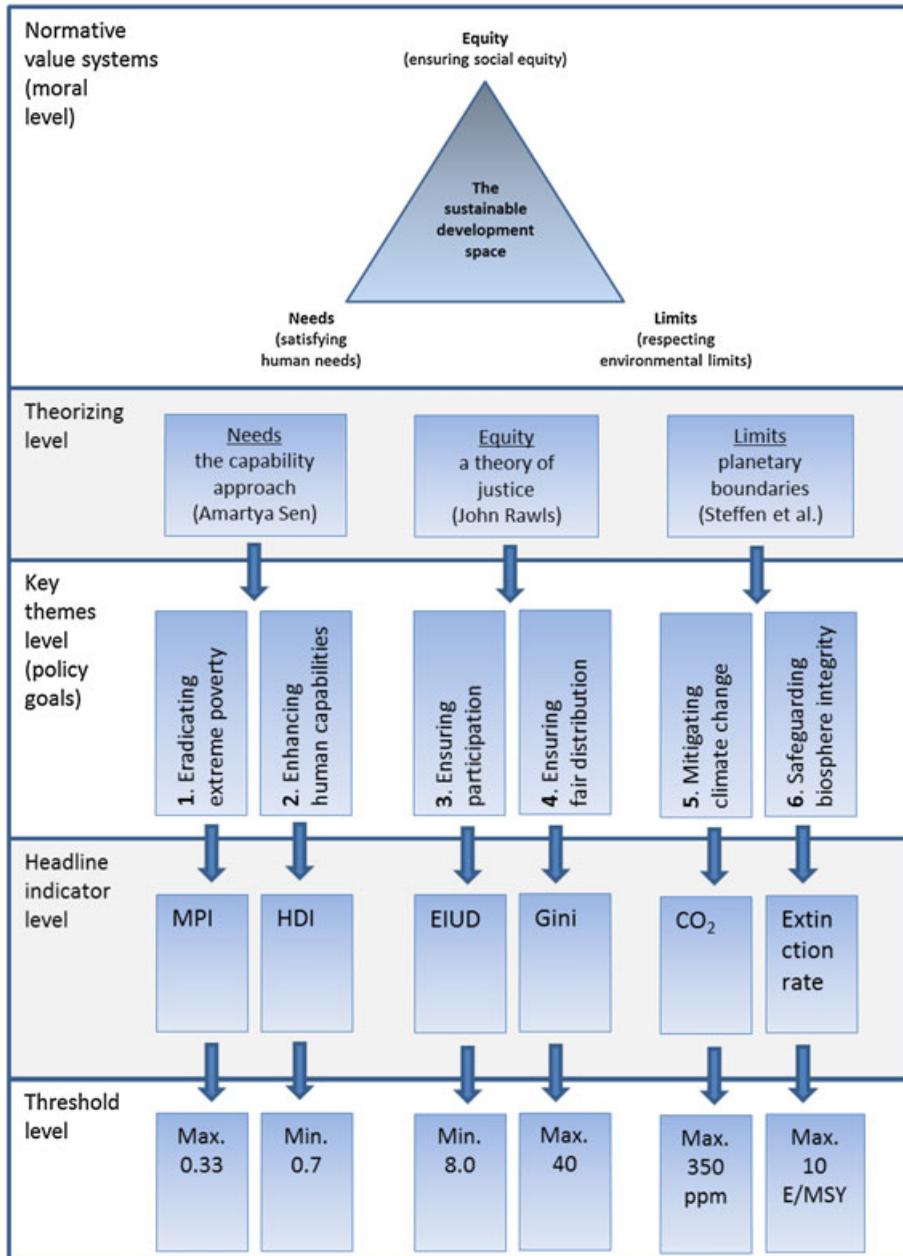


Figure 2. A model for global sustainable development

Third, there are several concepts related to sustainable development but partially distinct from it, such as human rights, human security and happiness. These concepts have their own indicators and thresholds. To some extent there is a tension between these concepts and the concept of sustainable development. At some level, however, 'they share a similar agenda which can be framed as focusing the objective of professional efforts on improving people's lives' (Alkire, 2010, p. 28). It is beyond the scope of this article to examine the similarities and differences between sustainable development and related concepts. However, we would like to stress that our approach is one that tries to carve out the most important features of sustainable development, or, as we have called them, the imperatives. In doing so, some important aspects of the related concepts are part of our approach; some fall outside it. This does

not mean that important aspects of related concepts that fall outside our approach to sustainable development (e.g. peace¹⁴) are unimportant.

Key Themes

Policy documents (e.g. *Our Common Future* and *Transforming Our World*) and/or processes (e.g. the UNCED process¹⁵) serve as a frame of reference to identify sustainable development's key themes. Three things are important here. First, and most important, the key themes must adhere to the moral imperatives of needs, equity and limits, and moreover to the theories that are fundamental to these imperatives (e.g. the 'core boundaries' suggested by the planetary boundary approach). Second, they must be applicable at the appropriate geographical and institutional scale in question. Global, national and local sustainable development should address global, national and local key themes, respectively. In this article we address the global scale, thus the key themes must reflect this scale.¹⁶ Third, to communicate well, the key themes must be limited in number.

At the global scale, we suggest six key sustainable development themes: eradicating extreme poverty, enhancing human capabilities, ensuring 'rich' participation, ensuring fair distribution, mitigating climate change and safeguarding biosphere integrity. (These themes correspond to the SDGs.) This does not mean that there are no other key themes or policy goals. The SDGs, with their 17 goals and 167 targets, clearly illustrate that there is no shortage of goals. Our point is, however, that the six goals mentioned are *key* in the sense that they have precedence over all other goals.

Headline Indicators and Thresholds

Indicators should be relevant, measurable and, preferably, easy to communicate. Relevance implies that indicators should link to theme in a trustworthy way and provide a reliable measurement of progress towards the goal related to that theme. Composite indicators, those that refer to more than one goal, must be avoided because they can conceal an underperformance with respect to one goal (say, mitigating climate change) with an overperformance with respect to another goal (say, eradicating extreme poverty).¹⁷ The indicators should be chosen so that it is somehow possible to collect data. Easy to communicate implies that the indicator set should be of 'a manageable size' (Hák *et al.*, 2016). To obtain 'a manageable size', we suggest a small set of headline indicators: one indicator for each key goal.

We reject using composite indicators and making trade-offs *across* themes. *Within* themes, however, we open up the possibility for using composite indicators and for making trade-offs between the sub-indicators for two reasons: first, because available composite indicators (e.g. the Human Development Index) better capture the multidimensional nature of the themes (e.g. a set of capabilities); second, because we believe that the advantage of using composite indicators that build on an implicit trade-off between sub-indicators is greater than the disadvantage of allowing for such trade-offs. However, we acknowledge that striving for more or less independent, one-issued indicators for each theme would be preferable.

We assign thresholds for each headline indicator. By setting explicit minimum and maximum threshold values, our approach runs contrary to those focusing on relative changes. For example, suggesting that sustainability can be achieved by demonstrating a 'positive rate of change' (Amekudzi *et al.*, 2009) for a country or region is not satisfactory. Neither would an 'as far as possible' approach (NESC, 2010) suffice. Changing an unsustainable state to a less unsustainable state is good, but the result cannot be considered sustainable.

The indicators we have chosen are as follows.

¹⁴We regard peace as a necessarily *prerequisite* for sustainable development (or indeed *any* development). We agree that 'there can be no sustainable development without peace and no peace without sustainable development' (The citation "UN, 2015" (original) has been changed to "United Nations, UN, 2015". Please check if appropriate. United Nations, UN, 2015, p. 3).

¹⁵The 1992 United Nations Conference on Environment and Development (UNCED) and all UN follow-up meetings.

¹⁶On other scales (e.g. local) there could be other key themes.

¹⁷Examples of composite indicators that include several policy goals are the Inclusive Wealth Index (UNEP, 2014), the Index of Economic Well-Being (Osberg and Sharpe, 2002), the Environmental Sustainability Index (YCELP *et al.*, 2005), the Index of Sustainable Economic Welfare and the Genuine Progress Indicator (Daly and Cobb, 1989), the Sustainable Measure of Economic Welfare (Nordhaus and Tobin, 1972) and the World Bank's Adjusted Net Savings.

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- Eradicating extreme poverty.* We use the global Multidimensional Poverty Index (MPI) as an indicator for eradicating extreme poverty.¹⁸ The MPI is an index designed to measure acute poverty. MPI uses 10 indicators belonging to three dimensions, which mirror the HDI (see the next section). Their intrinsic and instrumental values have been presented by Alkire *et al.* (2011). Ten indicators compose the MPI: two for health, two for education and six for living standards. If people experience deprivation in one-third or more of the 10 indicators, the global index identifies them as ‘MPI poor’, and the extent – or intensity – of their poverty is measured by the number of deprivations they experience. We suggest that the threshold value must be 33 per cent (which corresponds to population with a weighted deprivation score of at least 33 per cent).
- Enhancing human capabilities.* We use the Human Development Index (HDI) as an indicator for enhancing human capabilities. The HDI is a composite statistic of life expectancy, education (measured as school enrolment) and per capita income indicators, and it is used to rank countries into four tiers of human development.¹⁹ The HDI was developed by Pakistani economist Mahbub ul Haq and is anchored in Sen’s work on human capabilities (Robeyns, 2006). Empowered by capabilities of health, education and income, individuals can achieve their desired state of well-being (Stanton, 2007). We argue that the threshold value must be, at minimum, high human development, which was 0.7 in 2013 (United Nations Development Programme, UNDP, 2014).²⁰
- Ensuring ‘rich’ participation.* We use the Economist Intelligence Unit’s democracy index (EIUDI) as an indicator for ‘rich’ participation.²¹ The EIUDI measures the state of democracy based on 60 indicators, grouped into five categories, measuring pluralism, civil liberties and political culture. In addition to a numeric score and a ranking, the EIUDI categorizes countries as having one of four regime types: full democracies (8.0–10), flawed democracies (6.0–7.9), hybrid regimes (4.0–5.9) and authoritarian regimes (0–3.9).

Admittedly, democracy is not the same as ‘rich’ participation. Yet, according to Sen (2009), there are common features, and the workings of democracy, which Sen argues are not a purely Western phenomena, can be seen as ways of enhancing participation. Campbell (2008) shows that there are several approaches to measure the extent of democracy, including Freedom House’s, Polity IV’s, Vanhanen’s index of democracy and the EIUDI. Yet there is no consensus about how to conceptualize and measure regimes such that meaningful comparisons can be made through time and across countries (Coppedge *et al.*, 2011).

Because of its ‘rich’ approach to participation and the availability of data for a large number of countries, we use the EIUDI as an indicator. We argue that the threshold value must be at minimum 8.0, which corresponds to ‘full democracy’.

- Ensuring fair distribution.* We use the Gini coefficient as an indicator of ensuring fair distribution. The Gini coefficient is the most widely used measure of inequality (United Nations Development Programme, UNDP, 2010). It is a statistical measure of the dispersion of income in a country. A Gini coefficient of zero expresses perfect equality (for example, where everyone has an exactly equal income). A Gini coefficient of 100 expresses maximal inequality (for example, where one person has all the income). Using the target level set by the United Nations Human Settlements Programme (United Nations, UN, 2010), we set the threshold value to 40.
- Mitigating climate change.* We use atmospheric CO₂ concentration as an indicator for mitigating climate change. Rockström *et al.* (2009) proposed two control variables: the level of atmospheric CO₂ concentration and the increase in top-of-atmosphere radiative forcing. The radiative forcing control variable is the more inclusive and fundamental, although the level of atmospheric CO₂ concentration is important because of CO₂’s long lifetime

¹⁸The global MPI was developed by the Oxford Poverty & Human Development Initiative within the UN Development Programme (UNDP) and has been reported yearly in UNDP’s Human Development Report since 2010.

¹⁹The HDI has been reported yearly in UNDP’s Human Development Report since 1990. The HDI classifies countries according to ‘very high human development’, ‘high human development’, ‘medium human development’ and ‘low human development’.

²⁰HDI classifications are based on HDI fixed cut-off points, which are derived from the quartiles of distributions of component indicators. The cut-off points are HDI of less than 0.550 for low human development, 0.550–0.699 for medium human development, 0.700–0.799 for high human development and 0.800 or greater for very high human development (UNDP, 2014, p. 156).

²¹The index was first produced for 2006, with updates for 2008, 2010 and the following years since then (<http://pages.eiu.com/rs/eiu2/images/Democracy-Index-2012.pdf>).

in the atmosphere and the very large human emissions. We think that atmospheric CO₂ concentration is easier to communicate than radiative forcing, and therefore suggest using the former as an indicator for mitigating climate change. We use the threshold suggested by Steffen *et al.* (2015): atmospheric CO₂ concentration at maximum 350 ppm.

- 6 *Safeguarding biosphere integrity.* We use extinction rate as an indicator for safeguarding biosphere integrity. Steffen *et al.* (2015) propose a two-component approach to safeguarding biosphere integrity. The first approach captures genetic diversity, and provides the long-term capacity of the biosphere to persist under and adapt to abrupt and gradual abiotic change. For the present, Steffen *et al.* suggest the known extinction rates of well-studied organisms as indicators for genetic diversity. The second approach captures the biosphere's role in Earth-system functioning and measures loss of biodiversity components at both global and biome/large ecosystem levels. For the present, Steffen *et al.* propose an interim control variable, the Biodiversity Intactness Index (BII). We think that extinction rate is easier to communicate than functional diversity and we suggest using the former as an indicator for safeguarding biosphere integrity. We use the threshold suggested by Steffen *et al.* (2015): maximum extinctions per million species years (E/MSY) of 10.

Conclusion and Some Policy Implications

We suggest an interpretation of the WCED model for global sustainable development based on three moral imperatives: satisfying human needs, ensuring social equity and respecting environmental limits. The model reflects both moral imperatives laid out in philosophical texts on needs and equity, and recent scientific insights on environmental limits. By identifying key themes, indicators and thresholds, we demonstrate both the difficulties and the possibilities for understanding sustainable development with the context of needs, equity and limits, and here we present some conclusions that might help guide policy-making.

One important implication of our model is that different regions or groups of countries face different policy priorities. First, some countries may satisfy the imperatives of respecting environmental limits and satisfying human needs, but not the imperative of ensuring social equity. The priority is to facilitate a transition to richer participation.

Second, some countries may satisfy the imperatives of respecting environmental limits and ensuring social equity, but not the imperative of satisfying human needs. Clearly, the main policy priority is then to help eradicate extreme poverty and enhance human capabilities. Policies and institutions that facilitate economic growth may be essential in achieving sustainable development for these countries.

Third, some countries may satisfy the imperatives of needs and equity but, as a result of their affluent lifestyles, not the imperative of respecting environmental limits. The policy priorities lie partly in technological improvements, partly in changing our lifestyles and partly in reducing our consumption of fossil fuels and scarce resources. Whether the moral imperative to stay within environmental limits can be reconciled with our desire for continued economic growth remains to be seen.

Not trespassing outside the sustainable development constraints is as challenging today as it was described in *Our Common Future* three decades ago: 'We do not pretend that the process is easy or straightforward. Painful choices have to be made. Thus, in the final analysis, sustainable development must rest on political will' (World Commission on Environment and Development, WCED, 1987, p. 9). However, rather than sitting like Vladimir and Estragon, who wait endlessly and in vain for someone named Godot to arrive, we cannot wait for politicians to act. As the poet T. S. Eliot (1939) wrote, 'the general ethos of the people they have to govern determines the behavior of politicians'.

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