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Sustainable Development: A Typology of Perspectives

(Draft3)

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1. Introduction:

In more than two decades after the publication of the Brundtland Report (1987), which popularized the term Sustainable Development (SD), SD has come a long way. While there is now hardly any politician or businessman who denies the desirability of sustainable development, the meaning of the term itself, let alone the necessary policies and practices (national and international) to achieve SD, has become a matter of contention. Accordingly, the academic study of SD now includes a host of distinct approaches and a number of diverse perspectives. One recent survey of approaches to SD, citing approvingly a prior survey, puts the matter like this: "(SD is) laden with so many definitions that it risks plunging into meaningless, at best, and becoming a catchphrase for demagoguery, at worst. (It) is used to justify and legitimate a myriad of policies and practices ranging from communal agrarian utopianism to large-scale capital-intensive market development." (Hopwood et al. 2005) Pluralism is admittedly a good thing; not least to the advocates of sustainability. To be sure, the diversity of perspectives, the vast range of approaches, and the impressive number of tools now available provide a strong foundation for the practice of SD. Yet the fact also implies that the practitioners of SD have first to justify their particular choice of perspective, and make sure that what they pick from different approaches and tools for their specific purpose is combined in a consistent manner.

1.1. Typology vs. Classification

The aim of the paper is *not* to review the debates within SD or to present an exhaustive list of all approaches (there are already good surveys for these purposes; see the bibliography). Rather, the paper attempts to work out a simple *Typology* that can be used as a practical guide in choosing between different approaches and tools, and in applying them when devising policies or assessing practices. Different approaches in SD can obviously be divided into a number of

'classes' according to some criteria. A Typology is different from such common classifications in that it is not merely descriptive, but claims that the Organizing Principle of the Types has an explanatory power; that is to say, it can explain different features of each type in a consistent manner. For our purpose (as will be discussed in Section 2 below) a typology of SD should provide some criteria for judging the consistency between aims – declared or tacit – of SD, concepts, and tools within each type.

1.3. Development and Environment: the inherent tension

Before discussing the typology in detail (below, part 2), it is necessary to stress that no approach in SD can claim to have found the recipe for a path that equally satisfies the requirements of the eco-system and the economic system. Rather, different approaches offer different ways of handling an inherent tension between economic growth and environmental concerns. In other words, it is best to regard the concept of SD not as the solutions to the clash of projects of developmentalism and environmentalism, but as formulating the inherent tension between economic growth and environmental concerns. Different approaches in SD should accordingly be viewed as different ways of handling this tension.

Originally, in the Brundtland Report, SD was presented as a development path that *unites* the concern of 'the North' environmentalism with 'the South developmentalism. (Adams 1990, Carter 2007) Developmentalism was an international project born in the aftermath of the WWII and in the context of the Cold War. (Rostow in Miers and Seers 1985) With the pervasive (rural) poverty of the Third World countries providing a hotbed for subversive radical ideas, the social and political stability of the Third World countries came to be regarded as dependent on a thorough modernization program. (Oman and Wignaraja 1991, Meier and Seers 1985) The modernization program was expected to move these countries towards the stable and affluent model already established in Western societies. (Rapley 2002) The linchpin of this modernization program was rapid economic *development*, defined as, not merely rapid quantitative economic *growth* (measured in GDP per capita), but also qualitative economic change; namely the *structural transformation* of the economy from agrarian to industrial. Such a crucial matter could not be left to the spontaneous operation of (world) market, which had so far

failed to transform the backward economies (be it for internal shortcomings or for external barriers). (Cowen and Shenton 1996)

Development of the Third World, later 'the South', thus became one of the overriding international projects of the second half of the 20th century. Extensive foreign aid programs of the Western governments, a host of international organizations, newly-founded ministries and planning organization in developing countries, and, last but not least, the academic field of Development Studies were all different components of this project.

Meanwhile, by the 1970s the environmentalist movement had fully emerged as a reaction against the degradation of the environment caused by unbridled industrial expansion in the Western countries. The dependence of the economic system on the ecosystem was widely recognized and 'Limits to Growth' were being explored. (Arndt 1978, Ch. 9) Although the early environmentalist critique of industrial expansion would not, at least in theory, pose a problem in the affluent West (Galbraith 1958), the same critique could not simply be extended to the South; where the alleviation of sordid poverty was almost universally recognized to be dependent on growth in national income, and the latter in turn dependent on industrialization and economic development. The Third World was thus the site where the tension between environmentalism and developmentalism was first acknowledged. Indeed, the Brundtland Report accepted the tension by pointing to trade-offs (win-lose) between environmental concerns and economic growth, and the Report's claim to uniting these two concerns in the concept of Sustainable Development hinged upon a special case of win-win; namely when it is the poor who, forced to eke out a living, are damaging the environment. In such cases, the Report argued, economic development by improving the income of the poor would make such desperate practices redundant. (The Report did not explore the environmental degradation that comes with the industrial production and the consumption pattern that the rise in the income entails.)

As far as developmentalists were concerned this was a welcome move. It is worth remembering that by the 1980s the original development project was on retreat. The global economic recession of the early 1970s had resulted by the early 1980s in the ascendancy of Reaganism and Thatcherism. The Anglo-Saxon neoliberal policies were in full swing and the Keynesian policies

were on defensive everywhere; not least in the international bodies sponsoring development, such as the World Bank and IMF. (Toye, 1987) The developmentalist paradigm, which rested more or less on the same Keynesian foundation, was under attack from within and without. From within the discipline, the leftist critique had for some time pointed to the meager record of some thirty years of development experience in improving the lot of the poor in developing countries. They had advanced theories of Dependency and World System to explain why the attempt at capitalistic economic development was doomed from the start. From without, the neoclassical economists, who were from the start skeptic about the soundness of the special branch of Development Economics (Bauer in Meier and Seers 1985), could now point to the success of the first generation of East Asian economies. (Balassa 1981, Kreuger, 1984) The East Asian countries, disregarding the developmentalists' prescriptions, had managed to transform their economies by, allegedly, putting their faith in the world market and opening up their economies to foreign trade and investment. Consequently, in the realm of academy the sub-discipline of Development Economics came under fierce attack as bad science justifying worse policies. (D. Lal 1983, Toye 1987) The Developmentalist community had every reason to welcome the currency that Sustainable Development quickly came to enjoy. Economic development had found a new, environmentalist, justification; provided that it targeted the poor who were damaging the environment. One should not simply rely on the invisible hand of the market. Given the monumental threats to the ecosystem, there was a need for careful policy formulation, for devising special projects, and for targeting special sections of the population. In other words, there was still a need for the special field of Development Studies. A third dimension, social sustainability, has duly been added as the third pillar (of which more below) to the two dimensions of economy and environment although rarely with consistency or theoretical justification; the significant exception being Human Development approach (discussed below, section 3.3.). The study of interactions, trade-offs and synergies, between these three dimensions are by now familiar features of SD.

1.3. SD generalized

In the late 1980s the literature on SD concerned itself mainly with the path of economic development in the developing countries, but soon the usage was generalized and SD established itself as equally applicable to the course of economic growth in the advanced economies. (To

demonstrate the point, it suffices to compare two surveys by an authoritative author published some 16 years apart: Adams 1990 and 2006.) The move was natural, since the environmental concerns were formed originally in the context of advanced industrial economies of the West. That SD had to be first formulated for developing countries was due to the fact that for the early environmentalists the obvious solution in the advanced economies could be nothing but the zero-growth or steady-state economy. (Jarret 1966 etc, cited in Arndt 1978, Ch. 9) In a sense, the generalization of the term SD to advanced economies was a sign of the environmentalists abandoning the ideas of zero growth in advanced economies and accepting the inevitability of economic growth. There were several reasons for this. The obvious fact that environmental problems are by nature global is of course the underlying reason. At the theoretical level, the difficulty of mapping an operational strategy for achieving the steady state economy was certainly a handicap. But perhaps more decisive was the experience of the drawn-out recession of the 1970s in the advanced economies that had hammered home the indispensability of economic growth for fighting the increasing unemployment. This also made Labor Unions along with the already strong business community vocal defenders of growth. Meanwhile, by the decline and fall of Soviet block and the ascendancy of Globalization, the international scene went through a sea-change. Accordingly, now and at least up to the financial crisis of 2008-2009 there was but one single path open to all countries: joining in the globalization. The strategy of economic development in developing countries thus was not particularly different from the path of growth in industrially advanced countries. *Economic Development*, far from its original implication of industrialization, thus became synonymous with economic growth, and Sustainable Development applicable to all economies, developing or developed.

2. Typology

Achieving SD logically presupposes the knowledge of the consequences of human actions for sustainability. Politicians, business leaders, and consumers are more and more required to take into account the impact of their decisions for sustainability when formulating policies, embarking on a business project, or simply choosing products and services. To this end an impressive array of tools (methods, indicators, models) have been developed. In their different ways all these tools are meant to contribute to ‘the process of identifying, predicting, evaluating

and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.’ (IAIA 1999)

The crucial practical question is of course which set of tools to choose. There are already useful classifications that show the relevance or application of each set of tools to particular areas of investigation (Ness et al 2007). There is also a vast literature on modeling that specifies the requirements and applications of models in sustainability (Stocker 2006). But the problem of choosing between different tools cannot be settled only on technical grounds such as relevance, applicability, or the availability of data. The fact remains that all tools, all indicators or models, are designed within a particular perception of SD. For instance, in mathematical modeling of SD, as a careful technical survey demonstrates, different models can be ranked differently, depending on what criteria one chooses as being crucial for sustainability issues. (Boulanger and Bréchet 2005) If one prioritizes, for instance, an interdisciplinary approach, then System Dynamics models obviously rank higher than General Equilibrium or Macro-economic models, while the latter are clearly better in assessing the impact on economic growth. Or if one gives Participation a high priority for sustainability, Multi-agent-based models will of course rank first. And so on and so forth. In other words, a certain perception of SD is already reflected in weighing different impacts of a decision, or weighing different features of competing projects. A choice of tools is at the same time the choice of a particular conception of sustainability.

One could speculate that the fact that many NGOs concerned with sustainability often oppose the most carefully researched decisions of governments or business projects has less to do with blind opposition than different visions of SD. The best the practitioners can do, it seems, is to make explicit at the outset their underlying assumption of what constitutes SD, and justify their choice of tools and techniques with reference to this particular vision of SD. A typology of different approaches to (or 'paradigms' of) SD is useful for this purpose; provided that it provides more than a classification of different conceptions of SD, and tells us what tools are consistent with this conception. That is to say, what methods can capture the particular conception of SD, and what indicators can be used to quantify SD in each type.

2.1. The Organizing Principle: what is to be sustained?

Ness et al (2007) note that 'The U.S. National Research Council (1999) argues that there are three important components of sustainable development: what is to be sustained, what is to be developed, and the intergenerational component'. In constructing a typology of SD approaches I take 'what is to be sustained' as the organizing principle of the types. I would argue that the choice of 'what is to be sustained' is enough to capture all the three essential components, since, as will be shown below, 'what is to be developed' for each type will logically follow from 'what is to be sustained', and, furthermore, the 'intergenerational component' for all the types is already present in our organizing principle. If the suggested typology is supposed to be more than a simple classification it must have some explanatory power in accounting for different features of each type in terms of the organizing principle of the typology. (This method for constructing Typologies is inspired by Gerschenkron 1968, Ch. 4.) I would further argue that the indicators and methods for the conceptual operationalization of each SD type can be explained (or, what is the same thing, deduced) consistently from the organizing principle. In this way, if one starts from a particular conception of SD, the Typology can help guide us in choosing the appropriate tools to operationalize the particular approach. Or alternatively, if one starts by choosing the tools as it befits a particular case, the Typology can serve to make explicit the conception of SD the choice of tools implies.

With the organizing principle 'what is to be sustained' we end up with four main types of approaches in SD, which correspond with the familiar approaches of weak sustainability, strong sustainability, critical sustainability, and what is commonly called human development. These will be discussed in some detail in sections 3.1. to 3.4., where the strategy to achieve SD and the indicators to quantify SD along the way will also be explored for each type.

3. The Types

3.1. What is to be sustained? Type 1, Weak Sustainability: Human well-being, GDP and total stock of capital

Type 1 is usually known as 'weak sustainability'. The widely quoted definition of SD in the Brundtland Report is development that "meets the needs of the present without compromising the ability of the future generations to meet their own needs". Many have seen the vagueness of the phrase (giving priority equally to meeting the needs of the present generation, protecting the

environment, and economic growth) as responsible for the wide range of diverging views in SD debate (Carter 2007, Hopwood et al 2003, Wackernagel and Rees 1996).

Initially, the concept of sustainability posed a problem for economists, but in the 1990s the consensus emerged that 'sustainability implies that certain indicators of welfare or development are non-declining over the very long term' (Stern, 1997). To this end, 'capital theory approach' became a useful means to address sustainability (ibid). The foundations of 'weak sustainability' were laid by Solow's interpretation of the Brundtland definition of SD. (Solow, 1993) Solow, a Nobel laureate economist, argued that in Brundtland's postulation the crux of SD is sustaining human welfare. We must make sure that future generations will enjoy a GDP per capita at least equal to ours. In other words, SD was simply a matter of intergenerational equity in terms of GDP per capita. (Brundtland's definition is silent about intra-generational distribution of income, so Solow is quite justified in saying nothing about the distribution of GDP among the existing generation.)

Economists regard the GDP per capita, i.e. monetary income, as the measure of people's welfare or well-being. This constitutes the rationale for economic growth, i.e. increase in GDP per capita. It must be stressed that although this view of human well-being might seem simplistic, it has a respectable pedigree that goes back to Scottish enlightenment philosophers and Adam Smith. Smith regarded the Market as *the* social institution for realizing the aim of the enlightenment, i.e. human autonomy and freedom. As opposed to Rousseau, whose political institution of Republic demanded from the individual to put the general interest above his or her individual interest, Smith saw the beauty of the market in that while each individual would selfishly pursue his or her basest instinct, i.e. their own private interest, the market, as if guided by an invisible hand, would bring out the best for all by creating more wealth. And material wealth is the indispensable condition for attaining individual autonomy or freedom. (Callinicos 1999, Ch. 1) Solow's argument is likewise in no way empty of lofty ideals.

Solow's contribution does not lie in merely interpreting Brundtland's definition of SD as sustained GDP per capita, but, as an accomplished economist, he brings in such economic conditions for sustained GDP per capita that includes the relation between the economy and the

environmental resources. Solow adopts a Capital Theory Approach to the problem of sustainability. As all economists know, the level of GDP per capita depends on the capital stock of a country. A country can sustain (or increase) its level of GDP per capita only if it keeps the same (or a higher) level of capital stock. Non-renewable resources are regarded as part of the stock of capital (natural capital), but, unlike plants and equipments (manufactured capital), their use in creating the present GDP means that there will be less of the stock of resources left for the future generations. Now, according to Solow, the principle of SD (sustaining the levels of GDP) means that the using up of the non-renewable resources for creating present income the use is only allowed when a) production is carried out efficiently (no waste), and b) the lost welfare of the future generation (the used-up stock of non-renewable resources) is at least compensated by an increase in the total stock of capital that we accumulate for future use. Technically, the calculation of the price of non-renewable resources lost to future generation is not carried out at their present market price, but takes into account a 'discount rate' that in effect favors the consumption of the present generation compared with future generations; although Solow believes 'the discount rate should not be too large'. This is the core of Solow's solution to the problem of inter-generational equity, which in his understanding establishes the essence of SD. (Solow 1993)

It must be clear from the short account above why this approach is labeled 'weak sustainability'. It has no commitment to preserve the environment, and takes a utilitarian view of environmental resources. But all this is quite consistent with Solow's interpretation of SD. He puts the matter very clearly:

If sustainability means anything more than a vague emotional commitment, it must require that something be conserved for the very long run... I think it has to be a generalized capacity to produce economic well-being... The duty imposed by sustainability is to bequeath to posterity not any particular thing (...) but rather to endow them with whatever it takes to achieve a standard of living at least as good as our own... We are not to consume humanity's capital, in the broadest sense.... The standard of living achievable in the future depends on a bundle of endowments... That includes nonrenewable resources, inventory of technological knowledge, and even general level of education and supply of skills. A

sustainable path for the economy is thus not necessarily one that conserves every single thing or any single thing. It is one that replaces whatever it takes from its inherited natural and produced endowment, its material and intellectual endowment. What matters is not the particular form that the replacement takes, but only its capacity to produce the thing that posterity will enjoy. (Solow 1993)

In order to sustain the level of GDP per capita for the future, the present total stock of capital (Net National Product) has to be kept (at least) at the same level. But there are two caveats here. First, if SD means taking the well-being (income per capita) of the future generations into account, then the current market prices are not reliable indicators, least of all the current market prices of natural resource products. The current prices have to be adjusted for calculations regarding sustainability. Second, '(i)t is absolutely vital that 'capital' be interpreted in the broadest sense to include everything, tangible and intangible, in which the economy can invest or disinvest, including knowledge.' (Solow 1993) A number of tools and techniques are necessary to meet the requirements of these two caveats.

3.1.1. Strategy: Economic choice

As we saw Weak sustainability's answer to 'what is to be sustained?' is the level of GDP per capita, which in turn necessitates sustaining or increasing the level of total stock of capital. The answer to 'what is to be developed?' is, naturally enough, the economic productive power. That is to say, a path of economic growth which stresses the accumulation of Net National Product, i.e. accumulation of capital, in the language of classical political economists. The market mechanism is the corollary of such a strategy, provided that a) market prices are generally adjusted to reflect the prices of future opportunity, and b) the price of natural capital in particular is corrected to take note of their value in future.

The adjustment of present market prices involves several techniques and technical innovation. First, as Solow makes clear, the national accounting of the economy has to be adjusted to take into account the stock of natural capital and to come up with a precise Net National Product (Solow 1993). This line of argument has led to Green National Accounting, which duly adds the monetary value of environmental resources to the national account, or subtracts the monetary

value of environmental degradation from it. Second, taking the inter-generational dimension into account, as was briefly touched upon, involves the choice of a discount rate, which has remained very controversial among economists. (Page 1997, Lind and Schuler 1998) Moreover, measuring the total stock of capital, which includes natural capital, is problematic since much of the natural capital is not owned privately and hence has no market price. A number of techniques are used to 'shadow price' the monetary value of such resources. The fact that much of the natural capital is not on the market also means that the cost of its degradation to society (and future generations) is not captured in economic terms and is treated as externality. Environmental economics, with the pioneering work of David Pearce, has attempted to find some ingenious methods to assign a negative price to the practices that in one way or another degrade the natural environment, and design the institutional arrangement that can enforce the idea of 'the polluter pays'. The problem of devising the appropriate institutions can in principle be solved by privatization, or by involving local governments or national government (e.g. tradable permits for CO₂ emission). However, the huge environmental problems at the global level cannot be tackled in this way, because in a world of nation states it is impossible to enforce ownership or guardianship on environmental resources that are global by nature, such as the atmosphere or the oceans.

The strategy of weak sustainability to achieve SD relies on the market mechanism, albeit with adjusted prices. What drives the process is the Economic Choice of the actors on the market whose decisions are determined by self-interest (profit maximization or utility maximization) and price signals. It can best be described as relying on the logic of Economic Choice. The values and environmental awareness of the actors need not to be discarded in this approach, since they are reflected in the consumer's preference. Weak sustainability is quite compatible with Green consumerism.

3.1.2. Tools: CBA

The logic of economic choice implies a cost-benefit analysis (CBA) of alternative decisions. In the case of the consumers, the economists argue, this is self-evident, since their very behavior in the market (their 'revealed preference') is proof that the benefit of their choice of product to them is worth the price they pay. For policy makers, as for business decisions, the CBA is a tool for choosing between alternative projects. In SD, as we saw above, the matter is complicated by

having to assign monetary values to things that are not on the market, or their market price does not capture their value. There are a number of techniques for monetary valuation of non-marketed goods, and environmental economics relies heavily on such techniques (Ness et al). At the macro level, since weak sustainability relies on market mechanism, the obvious choices for modeling are general equilibrium models or macro-economic models, with adjusted prices.

3.2. What is to be sustained? Type 2, Strong Sustainability: Human well-being, non-substitutability and steady state growth

Type 2 is usually known as 'strong sustainability'. This approach starts from the same premise as weak sustainability, i.e. of sustaining human welfare, and it shares Solow's economic approach. 'Strong sustainability', however, differentiates itself from Solow's approach by advancing a technical reservation, which has immense implications. The reservation is simple: unlike what Solow assumes, there is no perfect substitutability between natural capital and manufactured capital. They are very often complementary. The depletion of natural capital cannot simply be compensated by the additional manufactured capital in the total stock of capital, but it might rather render some manufactured capital useless, as demonstrated by the familiar example of the depletion of the fish stock resulting in the redundancy of the fishing fleet. If the aim of SD is sustaining human well-being (measured in GDP per capita), keeping the same level of total stock of capital is no guarantee for SD. Maintaining the present level of Natural capital is also necessary. (Costanza et al 1997)

As can be seen from this cursory account, what starts as a simple technical reservation about the assumption of substitutability of different types of capital in weak sustainability ends up by requiring the protection of the environment as an indispensable factor for maintaining human welfare; hence 'strong sustainability'. Here the environmental concern is truly in line with the aim of human economic well-being. But what are the implications? First, one technical implication of 'strong sustainability' is that it needs something more than environmental economics. Non-substitutability implies that a monetary quantification of all kinds of capital is not permissible. We need to qualitatively differentiate between natural capital and manufactured capital and treat them differently; hence Ecological Economics. (Costanza et al 1997) Second, if the stock of natural capital has to be maintained in its own right, then over-exploitation of renewable

resources should be avoided, and non-renewable resources should be preserved; or if used as a last resort, the proceeds be invested in developing natural capital. For the same reason, the use of a discount rate in calculating the intergenerational benefit is questionable (some have even advocated a negative discount rate). (Harris 2001)

So far these implications seem to be generally in line with the procedure in weak sustainability, albeit with a correction. Indeed that is how many practitioners of strong sustainability carry on their work. But the logic of strong sustainability points to a much more important implication that Herman Daly, arguably the founder of strong sustainability, has advocated; namely steady state economy or zero growth. (Daly 2005 and 2008) Given the fact of finitude of non-renewable resources, non-substitutability of manufactured capital for natural capital implies that there are natural limits to growth. This is in sharp contrast to Solow's belief that, 'the world can, in effect, get along without natural resources, so exhaustion is just an event, not a catastrophe.' (Solow 1974) Daly, in contrast to Solow, believes in the dependence of the economic system on the finite ecosystem. In this way Strong sustainability, at least as advanced by Daly, retrieves the original premise of the early post-WWII environmentalists. For Daly steady state or zero growth economy need not mean lack of development. It means focusing on the quality of (economic) products rather than their quantity; not more useless stuff, but better useful stuff. Given the enhanced efficiency, the quality of life can go on to improve under conditions of steady state economy. (Daly 2005)

3.2.1. Strategy: Political choice

Two different strategies can follow from the type 2, strong sustainability. In its 'soft' version it is no more than a qualification of the weak sustainability procedure in evaluating the stock of capital or Net National Product. In terms of strategy the soft version of strong sustainability then will follow the same route, i.e. the logic of economic choice on the market, albeit with more accurate prices for more differentiated types of products and capital. But if one pushes the implications of strong sustainability to their logical conclusion, as Daly's really strong version does, then it has to formulate a different strategy to get to zero-growth or steady state economy.

The possibility of natural limits to economic growth has been discussed by economists since the time of Malthus and Ricardo, but John Stewart Mill was the first to welcome such a prospect (Arndt 1978). Accepting the desirability of steady state, as Mill did, or indeed its necessity, as Daly does, the question is how are we going to get there? One problem in answering this question is that steady state cannot really be aimed at nationally. As Mill knew only too well, '(f)or the safety of national independence it is essential that a country should not fall much behind its neighbours in these things (economic growth)'. (Mill quoted in Arndt 1978) Another problem in achieving steady state economy is that the driving forces of economic growth are the impersonal forces of the market. Growth is in the nature of things, given the market institutions and the institution of private ownership. Only harsh political intervention, which few people would regard as desirable, can bring about steady state. Daly shows awareness of the 'political impossibility' of zero-growth, but puts his faith in the fact that wealthy countries have already crossed the threshold of 'futility limits', 'at which point further growth does not increase happiness'; although he admits that people may go on with their consumerist behavior, out of innate acquisitiveness or under the spell of aggressive advertising. (Daly 2005) If this is the case, only a transformation of culture and basic values of a large majority of population can make the choice of steady state a political possibility.

This is incidentally a conclusion that the Global Scenario Group, who also advocates a 'Great Transition' to a steady state economy, has drawn (Raskin et al 2002). Mill himself believed that until "the better minds succeed in educating the others into better things" the energies of mankind are better spent in struggle for riches. (Mill quoted in Arndt 1978) If the strategy is for cultural change pave the way to political choice of zero-growth, then, despite difference in analyses, Strong Sustainability finds its strategic allies in all the (often marginal) schools of thought in the SD debate, like Deep Ecology, whose main aim is to bring about a change in discourse or cultural attitudes that stop emphasizing economic growth and material gains.

3.2.2. Tools

Type 2, strong sustainability, in its 'soft' version is not that different from type 1, weak sustainability, in using CBA. This is done with the corrections in discount rate, more stringent pricing of natural capital, and a differentiation between the stock of natural capital and

manufactured capital. In modeling, more holistic, ecological modeling is used to take into account the state of the ecosystem. The really strong version of type 2 that aims for steady state economy uses the quantitative tools not to quantify the path to sustainability, but to demonstrate the point of unfeasibility of the on-going quest for economic growth. As such it falls beyond our present concern.

3.3. What is to be sustained? Type 3, Critical Sustainability: Sustaining Human Well-being, limited substitutability of natural and manufactured capital

Type 3, Critical Sustainability, is best seen as the reaction of Type 1 to the critique of non-substitutability of natural capital and manufactured capital. Critical Sustainability concedes that different forms of natural capital are not merely an economic *input*, but often a general prerequisite of human life and economic activity (Lerch and Nutzinger, 2002). At the same time, this approach qualifies the general statement of 'non-substitutability' of Type 2. The question, here, is to identify those ecological processes (instances of 'natural capital') that are critical, and establish some boundaries, some 'safe minimum standards', "for admissible economic evaluation and trade-offs". Within these boundaries, i.e. as long as the minimum standards are not violated, Critical Sustainability follows the same route as Weak Sustainability, that is to say it allows the degradation of the environment, "as long as it is compensated by a corresponding increase in other forms of capital" (ibid).

3.3.1. Strategy and Tools: Identifying critical natural capital

Formally speaking, Critical Sustainability approach is in effect a stronger variant of Weak Sustainability; as acknowledged by the proponents of this type (Jahnke and Nutzinger 2003, Lerch and Nutzinger 2002). Once the point raised by Strong Sustainability about non-substitutability of natural capital by manufactured capital is qualified by the concept of 'Critical Natural Capital', it seems unproblematic to follow the strategy of Economic Choice of Type 1, i.e. to let market mechanism take its course with the adjusted prices of critical natural capital. As for the Tools, similarly it seems that the basic tools of Type 1, i.e. CBA and economic modelling can be used here with some minor corrections. But the problem arises, and the strategy diverges, once we give due thought to the question of identifying the instances of *critical* natural capital.

The question at first glance seems simply a technical one, best to be answered by experts at the local level, and then generalized. Thus, following Ostrom's lead on generalizing local practices in the management of commons (Ostrom 1990), an early advocate of Critical Sustainability saw the solution in relying on the local ecological and biological knowledge of the experts in 'identifying the specifics' to construct a large 'matrix of concerns' at a general level (Lauternschlager, 1998). In the meantime, more sophisticated attempts have been made by ecologists to identifying the critical natural capital more accurately (Brand 2009). Yet the problem is not simple, nor is it a purely ecological one. To begin with, given our imperfect knowledge of (not to speak of the inherent uncertainty in) ecological processes, how can we be sure of having identified the right critical natural capital? Recommending the pre-cautionary principle, it has been argued, is not a satisfactory reaction to this problem since "(i)n a situation of fundamental uncertainty, inactivity cannot claim any particular dignity compared with specific activities" (Lerch and Nutzinger 2002, p. 18). Furthermore, identifying some critical natural capital, if followed consistently, will end up accepting the undesirability of economic development and growth at least in some cases (as we saw with the inevitable logical conclusion of no-growth in the case of Strong Sustainability; section 3.2.1. above). Once a 'critical natural capital' is identified, sustainability is no longer in line with 'development', and the latter must give way to Economic Sufficiency, or some similar concepts. And because instances of 'critical natural capital' occur at specific spaces and are by nature local, a host of questions about distributive justice and ethics in general are raised (Jahke and Nutzinger 2003, Lerch and Nutzinger 2002). Once again, as with Type 2, what started as a modest correction to Type 1 ends up far removed from the realm of economics, and has to grapple with the question of values for its vision of Sustainable Development. Similarly, Type 3, Critical Sustainability, drifts away from adopting the tools of Type 1, CBA and economic modelling, and has to recourse not only to the techniques of ecological modelling, but to try and operationalize some ethical principles. Which brings us to the next Type, Human Development, which explicitly handles the question of values from the start.

3.4. What is to be sustained? Type 4, Human Development: Freedom, human capability, and SD

Type 4, commonly known as human development, is associated with Amartya Sen. Sen elaborated his ideas in the context of development and only later extended them to the SD debate. So it is necessary to start from his view on development. As mentioned above (section 3.1.), the ultimate rationale for economic growth and economic development has been the enlightenment belief that material wealth is a condition of human freedom. Sen does not question the link between material wealth and human freedom, but he questions the common practice of economists (and developmentalists) to take monetary income as an indicator of development. His reasoning is straightforward: if income (material wealth) is a means to the end of human freedom, why shouldn't we use directly the freedom as the indicator of development? Hence development as freedom. (Sen 1999a)

Sen operationalizes progress in human freedom as the expansion of human capabilities (a longer life, a healthier life, more education, participation in community life, more disposable income, etc.). And his case for measuring development in terms of an increase in human freedom (expansion of capacities) seems more plausible as one reflects on his evidence of how at comparatively lower levels of GDP per capita better results in terms of education, health, gender equality, and so on, have been achieved in some communities and societies. (Sen 199a) This is the core of a development paradigm that has come to be called Human Development. UNDP Human Development Index is inspired and based on Sen's ideas (UNDP 1990). It is not quite satisfactory, however, because it simply adds life expectancy and education to GDP per capita in a composite index, all of them in terms of national average.

Yet there is more to human development than simply specifying the desirable ends of the development process. When the aims are known, the crucial question for any development strategy is how to realize those aims. Here Sen claims that freedom is not only the end of the development process, but it is also the means: aiming at improving human capabilities, apart from its intrinsic value, is good investment in human capital, and, as acknowledged by modern economics and borne out by the experience of successful economies, human capital is a crucial factor in economic growth. Human Development approach or paradigm does not neglect the role of the markets for economic growth, but argues that a) people should have the relevant capabilities (among them, the entitlement to land or/ and education) to take part in and benefit

from the market; b) the fruits of economic growth must be shared equitably; and c) the expansion of the capabilities of the poor and the deprived must be prioritized. Sen defends these qualifications on two grounds, both for ethical reasons (the intrinsic value of human freedom, the ethical obligation of equity) and for instrumental reasons (successful outcome of market economy is dependent on capable participants, equitable initial conditions, etc.).

The question arises, however, of how the arrangements that Sen advocates can be imposed on the market? Who is to decide what capabilities of what group of population is to be expanded, or what level of equity should prevail? Mainstream economists believe that such arrangements cannot be based on any objective criteria (known as Arrow's Impossibility Theorem, i.e. the impossibility of inter-personal utility comparison). Drawing on the debates in welfare economics and moral philosophy, Sen maintains that what is involved here is not the comparison of individual subjective utilities, but prioritizing objective capabilities. Once we accept that the outcome of economic development should be measured not simply in terms of a rise in GDP per capita but in terms of expansion of human capabilities (constituents of freedom), there are universal ethical grounds for ranking the claims of participants. Here we come to the concept of 'Social Choice' (distinct from economic choice of the invisible hand of the market and political choice of one-man-one-vote in a democracy). The alleviation of poverty, gender equality, 'command over primary goods', can be taken as universally accepted values, as social imperatives. A free society must make sure its members enjoy such capabilities (freedoms). (Sen 1999 and 1999a)

The features of the human development paradigm outlined above are crucial for understanding how Sen responds to the requirements of SD. To begin with, Sen's understanding of development as freedom (capability expansion) embraces easily the 'third pillar of sustainability', i.e. the social aspect of sustainability. In a sense, a society of free human beings is Sen's vision of sustainability, and for Sen both economic and environmental aspects of SD should be seen through this lens. When it comes to economic sustainability, Sen accepts from Solow that sustainability is a question of intergenerational equity; although he hastens to add that if one accepts such commitment to future generations on ethical grounds one could not neglect intra-generational equity. Equitable distribution for the existing generation follows from the principle

of sustainability, and as always with Sen, it is not just a matter of an ethical obligation, but it has instrumental desirability for sustainability, in that an equitable distribution now will leave a larger stock of capital for future generations; both by its usefulness for economic growth and by the accumulation of higher levels of human capital that follows from a more equitable distribution. (Anand and Sen 2000) It must be stressed that although Sen shares with Solow the idea of sustainability as intergenerational equity, Sen's idea of what is to be sustained is quite different from Solow's and from the weak sustainability approach. Sen is not an advocate of maximizing growth; this is so because he does not see GDP per capita as the supreme criteria for human well-being. His idea of development as freedom implies that, even when accepting from Solow the importance of maintaining the level of total stock of capital for the future generation, economic growth is only justified while it serves the expansion of the capabilities of the future generation. The 'highest possible rate of growth' is not a positive value per se. So Sen could be much more flexible when economic growth comes into conflict with environmental concerns.

Unlike Solow, Sen is not an advocate of weak sustainability, but his way of integrating the environmental concerns in his view of SD is also different from advocates of strong sustainability or critical sustainability. It will be remembered that strong sustainability advocates the preservation of natural capital (or of critical natural capital) on the instrumental grounds that it is indispensable for sustaining GDP per capita. Sen's starting point is different. Since he regards the end of the development process as expanding human freedom, he evaluates the preservation of the environment in relation to preserving the freedom of future generations. Put differently, intergenerational equity requires that we make sure the future generations have the same freedom as us in enjoying the natural environment. This is 'why we should preserve the spotted owl', even if preserving it does not contribute to sustaining the future generations' income per capita (Sen, 2004). Here Sen is closer to Andrew Dobson (2003), who believes environmental responsibility should best be regarded as a requirement of contemporary citizenship, and not as something induced by financial incentives. What makes Sen's conceptualization of the matter probably more interesting is the fact that he can deduce such concept from his overarching idea of development as freedom.

3.4.1. Strategy: Social choice

As we saw, the strategy for achieving SD in Type 1 is economic choice (market decides) and in Type 2 political choice (politicians should opt for zero-growth). In Type4 the strategy can usefully be termed Social Choice. Social choice entails participation, and the Human Development Approach is often enough associated with participatory development. However, it is worth repeating that 'social choice' does *not* imply that the priorities of society in the realm of development or sustainability should be the accidental outcome of social interaction or dialogue of the members (as the fashionable prescription of Stakeholders Dialogue). Rather, it means that, once we accept the ends of development as freedom, we are obliged to prioritize a series of targets as choices that are socially justified; among them removal of capability deprivation (which in Sen's conceptualization is the mechanism of poverty creation), securing basic needs to all members of society, gender equality, universal health and education, entitlement to some productive asset, etc. Bringing in the perspective of SD adds to this list intergenerational equality; not only leaving adequate productive assets to future generations, but taking responsibility for nature and environment in such a way that future generations have the same freedom regarding the environment (Nature) as we have.

To operationalize the strategy of social choice for SD one needs to draw policy conclusions for this strategy. Sen's vision of development as freedom, i.e. the expansion of capabilities (with priority given to the most deprived section of population), lends itself easily to policy formulation, but to be meaningful the policies must be informed by statistical information for relevant issues. Sen's vision of SD, as far as the economy is concerned, agrees with Solow's postulate on intergenerational equity and maintaining the level of total stock of capital; although Sen naturally stresses the stock of human capital (Anard and Sen 2000). For environmental sustainability Sen is definitely an advocate of strong sustainability, but more on ethical grounds. The conflict between sustaining environment and sustaining economy probably is less pronounced from Sen's perspective, since he does not aim for high rates of growth per se, and he would be more prepared to forego higher rates of growth as, in his understanding, the gain for environmental sustainability is directly an increase in the freedom of future generations. The problem of comparing different types of freedom (or what is the same, different types of capabilities) has of course to be handled. The problem of trade-offs between different types of capability (e.g. expanding education or health?) will surely arise. But the logic of social choice

might help us avoid the headaches of purely monetary CBA. What most urgently is needed is a set of indicators that allows a degree of quantification necessary for any meaningful policy formulation.

3.4.2. Tools: some new indicators

For economic sustainability, as mentioned before, the UNDP's Human Development Index, also used by the World Bank, is loosely based on Sen's ideas about development. A recent publication by a commission that has among others Sen and Stiglitz as its members put out a report about indicators about economic performance and social progress. Their report and its preparatory material probably contain the indicators closest to Sen's understanding of development as freedom. (Stiglitz et al 2009, Fleurbaey 2008) For environmental sustainability human development approach would use the same indicators as advocates of strong sustainability would use; although in Sen's approach there is no need to ascribe a high monetary value to environmental resources in order to stress the importance of their preservation, or to show the productivity of the stock of natural capital and its non-substitutability to advocate strong sustainability. Since Sen's mechanism of decision making is based on social choice, quantifications and comparison of alternative costs and benefits do not automatically dictate a decision, but serve as one consideration that should be taken into account when making decisions. There are always other, non-monetary, value-inspired, ethical, considerations that are informed by the overriding imperative of expanding human freedom, especially that of the deprived part of the population.

3.5. What are excluded from the typology?

To be sure, there are other approaches and schools of thought in the SD debate that fall outside the typology suggested here, but the reasons for their exclusion can be accounted for. The reasons fall in three categories. First, those approaches that are not at the same level of generalization as the three main types, in the sense that they do not give a clear-cut answer to 'what is to be sustained'. Some of them (e.g. ecological modernization) either fall squarely under one of the types in the typology, or (again ecological modernization) can be used by different types as a tool, depending on what is taken to be sustained by their practitioners. (Orsato and

Clegg 2005) One could usefully treat these schools as providing some technical tools, rather than advocating a distinct conception of SD.

Second, there are schools of thought that, while engaging in SD, do not recognize economic growth (or *development* in the strict sense used by developmentalists) as a legitimate claim. In effect, their way of handling the tension between economic development and environmental concerns is simply to deny the legitimacy of economic growth and development. The ideas of Vandana Shiva are a case in point. (Shiva 1989) Despite the use of the rubric SD for their ideas, I believe their exclusion from the typology is as justified as the exclusion of those views that deny the existence of any environmental problem and could thus regard the existing economic course as sustainable. To exclude these views from the typology is not the same as underestimating the significance of their ideas. In this category there are schools of thought, notably Deep Ecology, that decidedly do not share the basic assumption of anthropocentrism that at least since the Enlightenment has been the cornerstone of modern thought and social science. These views may in time prove to be epoch-making, but for the very same reason, at least for the present, their influence on shaping a path to SD flows through cultural channels, i.e. via changing the basic values and behavior of people. Although our typology takes note of the role of ethical concerns and cultural ideas (see above, sections 3.1.1., 3.2.1., 3.3.1., 3.4.1.), these views do not constitute a distinct type of SD in our typology.

Third, there are schools in the SD debate that despite a promising start have not been able to elaborate their perspective to the level of an operational strategy for SD, political ecology and Marxian ecology being the main examples. Engaging in a debate with these perspectives is undoubtedly fruitful, but they cannot be taken (as yet) as distinct types in the topology.

4. Concluding Remarks

As may be seen from the account above, the author's sympathy lies with Type 4 of SD, i.e. Sen's Human Development approach and Social Choice strategy. Yet it is hoped that the typology is objective enough to be of use in helping the choice of indicators and models that are consistent with a clear conception of SD.

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