
GROWTH, DEVELOPMENT AND SUSTAINABILITY

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Abstract

Describing the relationship of interdependence through the materials balance, will be argued how the economy is a subset of the environment and the environment the natural limit to any economic initiative, or the limits imposed by the laws of thermodynamics. The theoretical debate moves, then, from the concept of growth to that of development, understood this in its three dimensions: economic, social, environmental. Bring the different environmental positions in four versions of sustainability, with the gained awareness that it's "a spectrum of overlapping sustainability positions from very weak to very strong".

Keywords: *growth, development, approaches to Sustainable Development, capital, stock*

1. Introduction

"The Limits of Growth" represents the moment when the theoretical elaboration moves the focus from the concept of "economic growth" to that of "economic development" (Masetti, E., 2006). There is talk of economic growth when there is an increase in value of goods and services produced by an economy. It is conventionally measured by the annual percentage change of a positive specific indicator: the gross domestic product.

Traditionally, this index was taken as a measure not only of the economic well-being, "Welfare" of a country but also, in more general terms, of its "Well-Being". In fact, often has been referred to the concept of economic growth as synonymous with development, but between these two terms, there are significant differences. In the current debate, economic growth must be seen as only one aspect of the development of an area. The term development means the set of "changes in the economic, social, institutional and policy that are necessary to make the transition from an agricultural economy to a capitalist pre-industrial capitalist" (Bresso M., 1993, p. 75).

A society that crosses a phase of economic development relates a series of improvements to a variety of indicators (and not only necessarily of a measure referring solely to the amount of wealth produced by a country),

such as literacy rates, life expectancy and poverty rates, population health, environmental quality, etc. Development means improvement, progress; indicates a change towards a situation preferable than the present one, changes that are also qualitative and not just quantitative. The development is a set of desirable goals for a society that cannot understand the sole objective of the growth of per capita income (Pearce D.W., Markandya A., Barbier E., 1991).

The material balance

The equation

$$A = [\text{inputs material}] - [\text{outputs material}] = [\text{remaining material}] - [\text{existing material}]$$

is called the accumulation.

For continuous processes, at steady state the accumulation is zero:

$$A = 0 \text{ and } [\text{inputs}] = [\text{outputs}]$$

2. From growth to development: the “Triple Bottom Line” approach

Following the controversy arose in the 70s the focus is then shifted from the objective of growth, the increase in the economic well-being, to the broader concept of quality of life by focusing on several variables, rather than of only one. We start to consider the new definition of well-being more specifically defined by the “Well-Being”. The use of a multi-dimensional concept, much more extensive than just the economic dimension, the result of a balanced management of the relationship among the economic, social system and environmental refers to the belief that, while economic growth generates Welfare, the Well-Being can be increased by the development. Depending on the achievement of such a goal, it begins to rise, in those years, the desire to adopt a model of development that cannot be reduced simply to an increase in the purchasing power of the possibilities of consumption over time, but takes into account also of all aspects of social and environmental, that contribute to determining the level of welfare of individuals.

It is the model of “Sustainable Development”. This expression begins to circulate in the literature until around 1979-80, and acquires as a proposal at an international level thanks to the report published in 1987 by the World Commission on Environment and Development, “Our Common Future”, also known as the “Brundtland Report”.

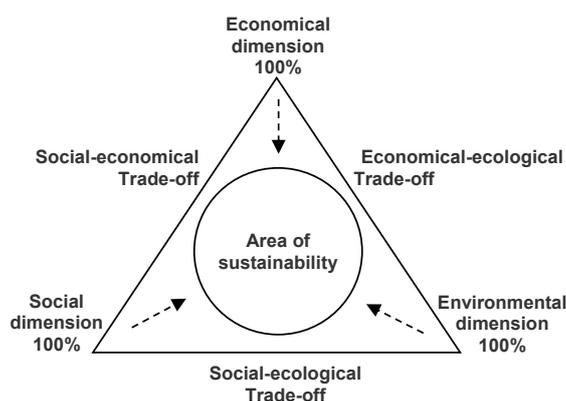
In this document is institutionalized the concept of Sustainable Development. However, while “sustainable development requires meeting the basic needs of all people at the same time, and extend to everyone the opportunity

to implement their aspirations for a better life” on the other in the proposal persists an optimistic confidence in the technology which will lead to a “new era of economic growth”: *“The concept of sustainable development implies limits, but not absolute, but rather imposed by the current state of technology and social organization, economic resources and the capacity of the biosphere to absorb the effects of human activities. The technical and social organization may, however, be managed and improved in order to open a new era of economic growth”*.

According to the report that it is a very broad concept, multi-dimensional, including the triangle of sustainability (Silvestri F., 2003): the economic dimension, the environmental dimension, the social dimension. Therefore, if the sustainability of growth can be understood as a non-decreasing path of consumption or GDP, or other indicators of economic well-being, in the case of sustainable development, to build over time a non-decreasing path of well-being (David P., 1991), it requires not only an economic but also environmental sustainability and social thereof. Thus, the pursuit of sustainable development depends on the ability of governance to ensure economic growth (if and as applicable) compatible with social equity and ecosystems through an appropriate trade-off between the economy, society and environment. The triangle of sustainability (Fig. 1) shows that sustainable development does not pursue the maximization of a single goal function, but is realized through the deployment of a dynamic compromise between the three dimensions according to what is described as the “Triple Bottom Line”.

The triangle of sustainability

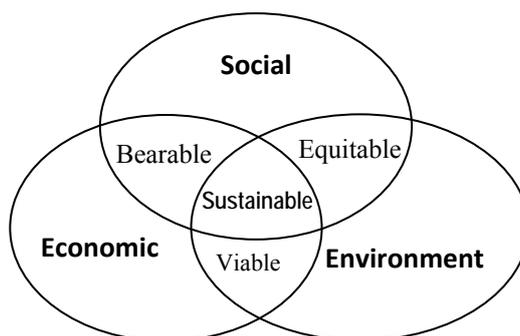
Figure 1



According to this three-pillar approach, there is not only one object of sustainability, but all systems (economic, social and environmental) must be sustainable at the same time because the same are considered interdependent and interconnected (fig. 2).

Interconnections between the dimensions of sustainable development

Figure 2



The sustainability assumes a systemic approach to problems: each action, is not to be assessed individually, but in relation to the effects that may result in the global system in which it takes place. Is therefore necessary always keep in mind the interrelationships and consequences arising from the interplay between the economic system social and the environmental one, which together contribute to forming the “global system”. Any programming intervention must take into account these interrelations, because there is always the risk of damage within a system in attempt to correct problems in another. Therefore, the decisions must be integrated in such a way that they considered the effects in all three systems before intervening (Reho M., 2000, p. 43).

Sustainable development has become a major goal of “European Community programme of policy and action in relation to the environment and sustainable development” (Maglia S., 2008, p. 20).

3. Versions of sustainability

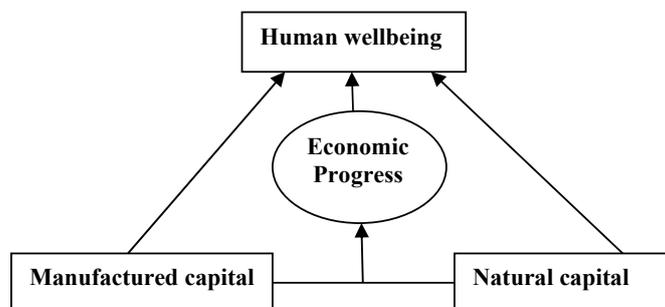
In order to follow a development path that is sustainable, we have seen how the “Triple Bottom Line” approach requires that the principle of economic efficiency, that is the soul and dominates the traditional economy, should be “revived” by social and environmental considerations. That is,

economic growth (if and as applicable) must be accompanied not only by the pursuit of environmental quality objectives but also of distributive equity, being equally important to the correct distribution of benefits and costs that a given allocation can result. The correct distribution of resources among nations and generations requires each state to define and implement their development policies, to take into account not only the relationship between the needs of its people and those of other countries (intra-generational equity), but also the relationship between the needs of the present generation and the future (Intergenerational Equity) in order to look for: “...to ensure that future generations are at least as well off, on a welfare basis, as current generations, it is therefore in economic terms a matter of intergenerational equity and not just efficiency...” (Turner R.K., p. 6); “...Economic definitions have tended to focus on sustainable development as non-declining per capita human well-being over time. Non-declining well-being is an intertemporal equity principle rather than an efficiency principle...” (Pearce D.W., Markandya A., and Barbier E.B., 1989; 1990). There is no doubt the key role that the “capital” plays in the development process. In fact, capital is both the natural Kn and the man-made total, represents a chance to reach a certain well-being (Turner R.K., Pearce D.W., Bateman I., p. 62) through the direct provision or through the production process of goods and services from which humankind depends. The Km contributes (Fig. 3) directly to human well-being in the form of artistic and cultural heritage, but also indirectly as the capital invested in the production process.

The Kn , in turn, contributes to it by the natural landscapes, the richness of flora and fauna, and as a source of resources necessary for the economic production and storage of its residues (Pearce D.W., Markandya A., and Barbier E.B., 1991, p. 54). Given that both are indispensable elements for development as is “right” that should be managed the capital by the economic system to ensure a well-being path that does not diminish over time. What are the resources that can be consumed at present and which should, however, be preserved to ensure the sustainability of development, and not only in its economic dimension. The answer goes through the “legacy of capital” (Turner R. K., p. 1). To ensure that future generations enjoy a non-decreasing level of well-being requires that the current one leaves an inheritance of capital not less than what they have, so as to allow those who will follow to achieve at least an equal level of well-being.

Forms of capital contribution to human wellbeing

Figure 3



This solution can be summed up as the “*Constant Capital Rule*” (Pearce D.W. & Atkinson G., “*Are National Economies Sustainable? Measuring Development*”, p. 8) becomes, then, the rule of sustainable development, a development which demands the respect of equity in capital transfer between people and over time (Turner, Pearce, Bateman, p. 43). Ethical basis of this rule is the right that future generations have to expect that legacy (in the form of a bequest by manufactured capital: physical, human and natural capital). A moral obligation towards the future generation by virtue of a kind of intergenerational social contract (Turner R.K., p. 6) that guarantees in the future at least the same opportunities that were available in the past.

The different definition of the legacy due to future generations is closely related to different assumption of a degree of substitutability between the various forms of capital that can be used in the production function and the more or less incisive influence of environmental and ethical considerations that accompany and justify (Turner R.K., 1993, p. 3-36).

These different versions animate the different environmental ideological positions. It goes from techno-centric, neoclassical array arriving to try to reconcile the objective of economic growth with the perceived social and environmental needs, and the Malthusian eco-centric, typically hostile to any future increase in the scale of economy, if not in favour of a significant reduction.

4. Very Weak Sustainability

The first version, “Very Weak Sustainability”(VWS) is the traditional neoclassical economics. Within this theoretical framework, in which indispensable point of reference is the work of Solow “*Solow Sustainability*” (Solow R.M., 1956; Solow R.M., 1986 Vol. 88, pp. 141-148; Common

M., Perrings C., 1992, vol. 6: 7-34.). The path of economic development is identified with a non-decreasing consumption level over time, while its sustainability, i.e., the ability to maintain economic growth, takes the form of constraint on the use of resources according to the “Hartwick-Solow Rule” (Hartwick J., 1977). Sustainability of the development understanding then, only as sustainable growth, as non-decreasing consumption level.

The VWS is defined with respect to mere economic capital in four different definitions of capital stock: economic capital, ecological capital, natural capital, total capital. In other words this stock is integrated by:

$$\textit{manufactured capital (Km)} + \textit{natural capital (Kn)} + \textit{human capital (Kh)} + \\ + \textit{ethical capital (Ke)} + \textit{cultural capital (Kc)}$$

On the basis of the definition of capital and replacement constraints considered in production function can be define four different meanings of sustainability (Gütes M.C., 1996; Hediger W., 2000). In fact, to ensure a level of per capita consumption at least constant (“*the lower bound of sustainability*” (Pearce D.W. & Atkinson G., p. 2) it is required that “the overall production capacity of an economic system” will not be reduced. There are two main criticisms of the Hartwick-Solow model. The first concerns the assumption of substitutability between the different forms of capital, which is deleted or changed largely from literature developed on the issue of sustainable development, especially within the so-called ecological stream. The second objection concerns the emphasis exclusively on economic growth, ignoring issues of equity and environmental quality. In other words, growth is not a phenomenon of a purely economic nature. Indeed, growth and development can be conflicting goals. The fact that the level of income or consumption per capita remains unchanged or grow over time does not mean that the quality of life or standard of living remain the same or grow in parallel.

The VWS animates that environmentalist position defined as “Techno-centrism of Abundance” and is linked to a model of “Anti-Green Economy”. The only goal is to pursue freely an unlimited growth, the maximization of GDP growth with resource exploitation, on the assumption that free markets and technical progress are able to provide infinite replacement capacity, so as to mitigate all constraints arising from “scarcity”. There is no ethical concern if not addressed to the interests of contemporary humans and recognizes only an instrumental value to nature.

5. Weak Sustainability

The second version, the “Weak Sustainability” (WS), arises from the review of hard core neoclassical model highlighting its critical points, such as: the blind trust towards the market, the logic of equilibrium prices, the potential of technological progress, the system’s ability to ensure maximum growth, the same assumption of perfect substitutability between the forms of capital. In a nutshell, were accepted the main criticism of the neoclassical theory pure to save its own orthodoxy. A critical process “inside”, implemented by neoclassical economists, to create the current economy of the environment as a new branch of economics. Firstly, WS is defined relative to the total capital. In fact, it requires that the potential social welfare resulting from total capital base does not decrease. This well-being is not restricted to that indicate to the maintenance of constant consumption level, but also includes the one connected to the values of life, heritage and recreational of environment. The change to “Solow’s Sustainability” has been characterized also by the introduction of an upper limit on the capacity of assimilation and a “...lower bound on the level of Kn stocks that can support sustainable development...” (Turner R.K., p. 11). That is, the VS continues to permit the substitution of one form of capital with another in order to allow at least maintaining the overall value of the total capital, but this substitutability is not the most perfect, recognizing that it is actually possible only within certain limits. It recognizes, in fact, the existence of minimum levels for some environmental resources known as “critical natural capital” (Turner K.R., pag.1). Therefore, the requirement of the conservation of the capital stock value was forced, by introducing limitations on sustainability aimed at preservation of at least part of Kn , to maintain respectful resource exploitation of ecosystem stability and resilience.

According to some scholars, those advancing a more rigorous version of the sustainability, such limitations should be seen as an expression of “precautionary principle” and similar to the notion of “*Safe Minimum Standards*”. This concept is a way to give a possible solution to the social contract between generations, to find a compromise between the use of current resources to achieve economic benefits and the preservation of those for the future. That is, through an adequate Cost-Benefit Analysis fastens the natural capital threshold below which it is not convenient to get off. The critical natural capital would be getting as that natural capital level, below which operating costs that will be incurred are too high compared to the benefits, but this calls into question the ability to economically evaluate the benefits and costs associated with our relationship with the environment without “*missing elements in economic calculus*” (Turner R.K.,

p. 13). It should not be so allowed the replacement of critical natural capital, but otherwise (assuming that the benefits to which we should give up are too high) then “*manufactured capital of equal value can take the place of natural capital*”.

The VS animate that environmentalist position defined as “Techno-Centrism Accommodating” due to a model of “Green Economy”. The need for a “greening” of the objective of economic efficiency is abandoning of unlimited growth path towards a growth adapted to take account of the burden on the environment and on society in patterns of production and consumption. We propose a rational management of resources.

6. Strong Sustainability

The third version is that of “Strong Sustainability” (SS) derivative as part of studies of Ecology Economy of Malthusian matrix showing how weak sustainability versions allow a decrease in the level of environmental quality and resource availability, unless other forms of capital replace the Kn . The focus is on the “*missing elements in economic calculus that underlies the weak sustainability*”. Many of the functions and services of ecosystems can be properly evaluated in economic terms, but others are beyond a monetary valuation. The reference is to a concept of “maintenance of environmental quality”, represented as a function of stocks of biological resources, ecosystem space, availability of nutrients, and other environmental assets necessary for the integrity of the ecosystem, which provides the society values of use and non-use. According to supporters of this third hypotheses, the preservation of capital is not sufficient if understood in terms of total capital, precisely because of the high risk of irreversibility of the destructive process of natural resources; for the presence of uncertainty (Pearce D. W. & Atkinson G., p. 2) on the functioning of ecosystems and the total value of their services and the critical (not substitutes), uniqueness of some components of Kn ; the loss aversion, felt by many individuals when environmental degradation processes become visible; for what Daly has called “scale effect”: for example, the impact of the level and rate of population change on the global carrying capacity (Turner R. K., p. 14).

Therefore, they propose that the next generation must “*inherit a stock of natural assets not less than the stock inherited from the previous generation*” (Pearce D., Markandya A., Barbier E., 1991, p. 54). In this way, with an emphasis on preservation of natural wealth, and not of the total wealth, can be assured effective protection of natural resources threatened by economic progress. This approach attaches primary importance to the maintenance of the structure and functions of the ecosystem, its integrity, responds to a precautionary principle (Atkinsons G., Dietz S., Neumayer E.,

p. 66; Pearce, D. W. & Atkinson, G., p. 2) but, unlike SMS (*Safe Minimum Standard*), natural capital for the SS must be maintained at least constant even if the expected benefits to which you give up are high, since a loss of natural capital is unacceptable (Turner K., Pearce W., Bateman I., 2003, p.66).

The SS refuses the ample replacements (Daly H.E., vol. 2, no. 1, 1990, pp. 1-6) between Kn and Km , and argues that these forms of capital must be maintained separately in time, without exchanges between one and the other being mostly complementary and not substitutive, while admitting internal exchanges in any form. To build an operating principle of SS some authors have translated the rule of Kn constant in a set of ecological criteria (SMSS, *Safe Minimum Sustainability Standard*) which are defined by the rate of regeneration of renewable resources and the assimilation capacity of the environment (Costanza R., Daly H.E., Bartholomew J.A., 1991, pp. 1-20; Daly, H.E. 1991; pp. 32-46), ie, the “carrying capacity of the planet”.

In SS the optimism about technological progress and its effects on the substitutability of capital, on changes in the rules of consumer/citizen conduct towards a more sustainable lifestyle is out of place, thus becoming the same invitation to stable state conditions for development, and ecological criteria to be followed as an invitation to “Steady State” based on thermodynamic limits and limitations they impose on the overall scale of the economy. The SS, in essence, invites to block any future increase in the scale of the economy: a null population growth and a null economic growth. The SS animate that environmentalist position defined as “*Community Eco-centrism*” and is traceable to a model of “Profoundly green Economy” oriented towards resource protection. There is a further extension of ethical reasoning. This is not only characterized by the recognition of a *secondary value* of nature for the functions and environmental services offered considered individually, but also from the attribution to ecosystems, to non-human nature - conscious and not -, a *primary value* because it can be useful in itself (European Commission, 2006, p. 6; Turner K., Pearce W., Bateman I., p.41; p. 49). The extension of ethics requires that the non-human component is granted “vested interests”. This means that when people undertake actions that affect the nature, the impact of environmental effects should be taken into consideration at least.

7. Very Strict Sustainability

The hypothesis of “Very Strict Sustainability” (VSS), in addition to maintaining a constant stock of natural capital, requires that each component or subsystem of the natural environment, each species and each physical stocks should be preserved (Atkinsons G., Dietz S., Neumayer E., p. 65;

Ayres R.U., Van Den Bergh C., Gowdy J.M, pag.4; Hediger W., 2004, p. 25). Sustainability of the ecological system is a priority, even if that means prejudice for human life. This very strict sustainability animate those environmental positions defined as “Extreme Ecological”. A “Deep Ecology”, a bio-centric vision argues a particular non-substitutability between Kn and Km based on ethical refusal (Turner R.K., p. 2). The VSS, in fact, is based on a more rigorous environmental ethic which says that non-human component (conscious or not) of ecosystems have properly “rights”. Some have even gone beyond extending moral reference class to the ecosystem itself, to “Gaia” (not just a simple metaphorical but literal interpretation of Gaia’s myth (Turner K., Pearce W., Bateman I., pag.48.) how custom entity in respect of which they have moral obligations.

The VSS has at a minimum a “*Steady State*”. When it appears that the global economic growth and extension of economic activities has already passed the critical points, and that is Kn already depleted /degraded, a reduced growth strategy may become necessary. The VSS is for a “Strictly Green Economy” oriented to extreme preservation and that, therefore, wants to reduce the economic scale. The economic systems must be translate soon in systems of minimum withdrawal of resources (with minimal impact on the sources and landfills). This transformation can only be achieved through a reduction in economic production and population levels (Turner K., Pearce W., Bateman I., p.42).

Conclusions

Assuming sustainability triangle at the base of the sustainable development requires the maximization of biological objectives, ecological and social and offer environmental economic and social basic services to all members of a community, without threatening the viability of natural systems, manufactured and social on which depends the provision of such services. The vision of sustainable development is clearly updated and enriched by the integration of its three pillars: economic, social and environmental. There is no longer a priority and separate proposal for economic growth, but a proposal for sustainable development founded on three equally important pillars and closely linked. It is not claimed, therefore, more priority of economic growth, but economic development, social and natural resource protection, seats on the same plane and connected to each other. An effective representation of the concept of sustainable development, which clearly highlights its three dimensions and underlines the importance of “legacy” can be summarized in four different definitions of capital stock available in an economic system depending on its use in the production function:

1. *economic capital*, defined as the generic capacity of an economy, which consists only of that part of the manufactured capital (physical and human) and natural resources (renewable or not), exploited for use in processes of economic transformation;

2. *ecological capital*, defined as the total stock of renewable resources (used and not within the production process), land in the natural and semi-natural state, ecological factors such as nutrient cycle and climatic conditions, which is the part of the natural capital that determines the overall quality of the ecosystem;

3. *natural capital*, defined as the basic natural resource of a geographical area, which consists of ecological capital and stocks of non-renewable resources;

4. *total capital*, the aggregate of physical capital, non-renewable resources, ecological capital and human capital.

On the basis of the definition of capital and the substitution constraints considered in production function can be define four different meanings of sustainability. On this basis it is clear that the concept of well-being refers to the assessment of the situation of person's life or of a group, as widely as possible. The concept of wellbeing is intuitive and there is no single definition but many related terms. Referring to this concept for indicate inclusively many aspects of life, including: quality of life, the tenor of life, happiness and life satisfaction, utility. The concept of well-being is therefore multidimensional, much wider than the economic dimension alone. It includes important non-economic aspects such as the social relationship, the state of health, life expectancy, level of education, etc., the welfare (or, the economic dimension of well-being) expresses the contribution of the economy to achieve a given level of well-being by all citizens.

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