

# Weak and strong sustainable development models analysis

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## Abstract

The weak and strong sustainable development models are analysed in this paper. The emergence of weak and strong models of sustainable development, the bases and principles that distinguish them from each other, as well as the arguments of the supporters of these approaches are studied. It is noted in this paper that, believing that there can be a smooth replacement of resources, the weak sustainability approach does not see any environmental threat to economic growth. The disadvantage of this approach is that it does not take into account the fact that human life would be unstable if the basic natural resources were depleted without any compensation. From this viewpoint, the arguments of the strong sustainability approach are considered more realistic and accepted as more attractive. A strong approach to sustainable development, which is a more cautious approach to economic growth, emphasises that sustainable development can be achieved through environmental responsibility. Ensuring environmental responsibility is presented as one of the important conditions for economic expediency and social solidarity. Strong sustainability model opposes the possibility that human capital can be replaced by natural capital. Analysing the positions of those scientists, who support strong sustainability, it is concluded that the replacement of development characterised by quantitative growth with qualitative sustainable development to increase welfare is one of the important principles of strong sustainable development.

**Keywords:** sustainable development models, generations, natural capital, man-made capital, genuine savings, strong sustainability, weak sustainability.

## Analiza modeli słabego i silnego zrównoważonego rozwoju

### Streszczenie

W niniejszym eseju przeanalizowano tzw. modele „słabego” i „silnego” zrównoważonego rozwoju. Przede wszystkim, autor przedstawia i analizuje pojawianie się „słabych” i „silnych” modeli, podstawy i zasady, które je od siebie odróżniają, a także argumenty zwolenników tych dwóch podejść do zrównoważonego rozwoju. W opracowaniu zauważono, iż wierząc, że wymiana zasobów może odbywać się płynnie, podejście „słabej trwałości” nie widzi żadnego zagrożenia środowiskowego

w przypadku wzrostu gospodarczego. Wadą tego podejścia jest to, iż nie uwzględnia faktu, że życie ludzkie byłoby niestabilne, gdyby podstawowe zasoby naturalne zostały wyczerpane bez jakiegokolwiek rekompensaty. Z tego punktu widzenia argumenty podejścia opartego na „silnej trwałości”, które są przeciwieństwem „słabego” podejścia i są uważane za bardziej realistyczne, są akceptowane jako bardziej atrakcyjne. Model „silnej trwałości”, który jest ostrożniejszym podejściem do wzrostu gospodarczego, podkreśla, że zrównoważony rozwój można osiągnąć poprzez odpowiedzialność za środowisko. Zapewnienie odpowiedzialności za środowisko przedstawia się jako jeden z ważnych warunków optymalności ekonomicznej i solidarności społecznej. „Silny model” zrównoważonego rozwoju przeciwstawia się możliwości zastąpienia kapitału ludzkiego przez kapitał naturalny. Analizując stanowiska zwolenników „silnej trwałości”, można stwierdzić, że zastępowanie rozwoju charakteryzującego się wzrostem ilościowym przez trwały rozwój jakościowy w celu zwiększenia dobrobytu jest jedną z ważnych zasad „silnego” zrównoważonego rozwoju.

**Słowa kluczowe:** modele zrównoważonego rozwoju, pokolenia, zrównoważony rozwój, kapitał naturalny, kapitał wytworzony przez człowieka, silna trwałość, słaba trwałość.

## Weak sustainable development

The origin of the concept of weak sustainability is related to the theory of neoclassical economic development. The methodological features of the concept were created by Solow (see: Solow 1999).

Weak sustainability approaches justify the fact that as an anthropocentric approach for man-made capital is more important than natural capital. Therefore, environmental pollution by generations, where physical capital exists (such as cars, factories and harbours or consumption of non-renewable sources), should not be considered as a problem. It can be concluded that as long as natural capital becomes man-made production, there is no threat to sustainability.

An indicator that can be used to measure weak sustainability has been proposed by Pearce and Atkinson (1993). This indicator represents a measure based on the neoclassical saving by excluding the depreciation of man-made capital and natural capital from the resources of a country. This indicator, later called the *genuine savings* by Hamilton (1994), can be defined in the following format:

$$Z = \frac{S}{Y} - \frac{\delta_M}{Y} - \frac{\delta_N}{Y}$$

Here, depreciation values of man-made production and natural capital are represented by  $Z$  - *genuine savings*,  $Y$  - national income,  $\delta_M$ - and  $\delta_N$  show depreciation values of man-made production and natural capital. If this weak sustainability index shown in the equation above is greater than zero, we can say that weak sustainability is valid for the correspond-

ing economy. The World Bank has adopted this indicator to measure sustainability and has begun to publish calculations of actual savings for certain regions of the world.

Weak sustainability approach has been widely criticised by the environmental economy because of the fundamental assumption that technological capital can replace natural capital. In addition, the aforementioned sustainability index proposed by Pearce and Atkinson has been criticised by many other scholars. One of the most of these criticisms deserving attention is that according to the aforementioned equation, Nauru, the Pacific Ocean island country, is the most sustainable country where 80% of its natural environment has been destroyed by mining for nearly a hundred years extraction of rich phosphate sources.

Using the index proposed by Pearce and Atkinson (1993), researchers Ayres et al. (1998), Martinez-Alier (1995), and Cabeza Gutes (1996) said that industrialised North countries can be regarded as countries with high levels of sustainability, although they have destroyed a significant portion of their natural resources in the past. Gowdy and O'Hara (1997) have criticised the view that ecosystems and extinction of species or depletion of fossil fuel do not contradict sustainability, while maintaining the criteria for weak sustainable development.

According to the idea of weak sustainable development, despite certain restrictions, growth is a key tool in providing and maintaining the quality of the environment. This approach, which is consistent with the *Brundtland Report*,<sup>1</sup> offers bigger growth for all industrialised and developing countries. The weak sustainability approach coincides with the Kuznets curve hypothesis promoted in the neoclassical economy (see more: Kuznets 1955). Accordingly, economic growth provides resources to help solution of environmental problems and, thus, improves quality through ecological regulation and growth. Believing that exchange between sources can be made smoothly, without a problem, a weak sustainability approach sees no environmental threat to the endless continuation of economic growth. According to this approach the technological and natural capital that makes up the capital fund, can be easily exchanged with each other, and the total capital fund should be maintained.

Taken into account the gross exploitation of resources today, implementation of a weak sustainable development approach first of all, can be an important step. At least, it recognizes the limitations of growth and the necessity to save certain capital for future without consuming it. However, the disadvantage of this approach is that it does not take into account the fact that human life would be unstable if natural resources were depleted without any replacement. So, in this case, the man-made capital cannot help.

Taken into account the current situation in the world, it is believed that a development must be ensured for environmental responsibility that does not affect the services provided by the ecosystem. From this viewpoint, arguments for a strong sustainability approach, which is opposite to this approach, are more real, and accepted as more attractive.

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<sup>1</sup> Report is also called *Our Common Future*, publication released in 1987 by the World Commission on Environment and Development (WCED) that introduced the concept of sustainable development and described how it could be achieved.

## Strong sustainable development

A strong sustainable development approach, which is a more cautious approach to the limits of economic growth, emphasises that sustainable development can be achieved by environmental responsibility. Ensuring environmental responsibility is seen as one of the most important prerequisites for economic expediency and social solidarity.

A strong sustainability approach argues that technological and natural capital cannot be completely interchangeable and, to some extent, are mutually complementary. According to this approach, there is no substitute for natural capital, and natural capital has become a limiting element of economic activity today. This approach accepted by most environmental economists is based primarily on ensuring environmental sustainability.

The difference between strong and weak sustainability was first suggested by Pearce, Markandya and Barbier (see: Pearce et al. 1989). The difference between strong and weak sustainability has been made even clearer with contributions by Turner and Pearce (1992) and has been increasingly accepted by ecological scientists in response to the idea of sustainability in neoclassical ecological literature.

The concept of strong sustainability is based on the concept of environmental economists living in a world, where people have absolute biophysical boundaries. The natural consequence of this notion is that the environmental economy, which is different from the other types of capital: physical capital (K), human capital (H) and social capital (SC). Accordingly, natural capital is primarily a life support system for living beings on earth.

Along with providing with food, drinking water and other renewable sources for living beings, ecosystems also carry vital functions such as heritage information protection, soil protection and restoration, water circulation, conversion of organic and mineral nutrients, filtration of pollutants and absorption of plants, the absorption and assimilation of crops. Thus, ecosystems and biodiversity reveal a multifunctional framework in terms of shape and scope that other types of capital do not possess.

Secondly, the fact that irreversibility or almost impossibility of irreversibility of natural capital (*quasi-irreversibility*) should also be taken into account. Some types of natural capital cannot be reconstructed after the destruction. However, human can reproduce man-made capital if it is destroyed. Neumayer (1999), while giving ozone depletion and global warming almost as an example of irreversibility, gives the loss of biodiversity as an example of irreversibility. When the ozone layer and climate are allowed to be restored – although this process takes time when viewed from the viewpoint of a human life (Ayres et al. 1998). – they will be able to return to their former states.

Due to the above-mentioned features of natural capital, strong sustainability goes against the likelihood that human capital can be replaced by natural capital. Human capital and man-made capital, various forms of natural capital (eg: copper-aluminum) can be significant substitutes for renewable and non-renewable natural capital. However, natural capital supplements man-made production, because it provides raw materials

and energy for production and absorbs waste produced by human capital. Therefore, it is important to keep reserves for different types of capital separately. In this respect, strong sustainability is defined as follows (Markandya et al. 2002):

$$K \geq 0, H \geq 0, SC \geq 0, N \geq 0.$$

There are two different opinions regarding a strong sustainability approach in the relevant literature. The first of these interpretations; the sum total costs of both technological and natural capital and the total cost of natural capital should be at least constant. According to this interpretation, strong sustainability includes weak sustainability. In addition, it is necessary to invest in natural capital again to develop renewable sources of income from the use of non-renewable sources in order to keep the total value of natural capital reserves stable. These interpretations can be seen in the shadow project approach proposed by Pearce et al. (1990). This approach, based on cost-benefit analysis, requires that the environmental impact of the projects should be implemented is less than the environmental value of the shadow projects that will be used to compensate the damage caused by these projects.

The second interpretation of strong sustainability is that the irreplaceable natural capital should be achieved by conserving the stock as a physical reserve, not as a monetary value. According to Hicks' definition, income is a constant consumption (see: Hicks 1946: p.172). However, the consumption based on the destruction of natural capital should not be called income, because the consumption of natural capital is, in fact, a negative investment. If so, the recovery capacity should not be exceeded if flows from this natural capital fund are used. Thus, the ecological functions of natural capital will not be violated. An extension of this interpretation is suggested as the notion of *critical natural capital* (CNC). Ekins et al. (2003), based on environmental assets to identify sensitive natural capital, revealed three criteria based on a 1952 study by Ciriacy-Wantrup. These environmental assets are defined by the elegant natural capital that cannot be substituted by welfare insurance, which is irreversible and its loss causes other large-scale losses.

Daly (1991) proposes a programme consisting of four items for strong sustainability. The first item is the current volume set by an economy as a measure of metabolism, which must be limited by the world's carrying capacity; the second item should not only increase quantities of technological advancements, but also ensure efficient growth; the third one, which is the rate of renewable sources collection, should not exceed the renewal rate; and waste disposal should not exceed the environmental absorption capacity. According to the last statement, non-renewable natural resources should not be consumed faster than the rate at which renewable substitutes are created.

## Conclusions

Weak and strong sustainability approaches are the continuation of the ongoing debate over the link between economic growth and the environment. The common point

of approaches that aim to sustainable development is to explore what needs to be done to improve people's well-being over the long term. As the underlying arguments of these approaches differ, action proposals change as well. Proponents of weak sustainability, in favour of growth policies, argued that growth is indispensable in solution of environmental problems. They believe that technological development, as well as natural and human production, will not be depleted of resources and will continue to grow steadily, thanks to capital capability and people's ability to solve problems.

Those scientists, who support strong sustainability, claim that development has its limits. According to them, limited growth is essential to meet the basic needs of people in the world. At the same time, the replacement of development characterised by quantitative growth and qualitative sustainable development to improve welfare, is also an important principle of strong sustainable development.

If a weak sustainability approach continues to see growth as a way out of problems, supporters of strong sustainability often argue that economic growth should be stopped after a certain point, e.g. "sustainable economies". In addition, another group defends strong sustainable development while supporting limited substitution, and while offering continued development by different measures they defend the position of weak sustainability supporters.

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