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History, Definition(s) and Models of “Sustainable Development”

At the end of the last Millennium, the term ‘sustainability’ became an overall guiding principle for human development. Its success stems from the underlying reflections on existential problems of mankind perceived at that time: increasing concern over exploitation of natural resources and economic development at the expense of environmental quality.

The idea of „sustainable development“ was born in 1713 when Carlowitz edited the first book on forest sciences. He argued that timber would be „as important as our daily bread“ and that it should be „used with caution in a way, that there is a balance between timber growth and lumbering“. This would allow forever a continuous, perpetual use.

"For this reason, we should organise our economy in a way that we won't suffer scarcity [of timber], and where it is lumbered we should strive for young growth at its place“ (Carlowitz 1713, repeated in this sense by Kasthofer 1818). As forestry thinks in long-term dimensions (generations), the Carlowitz base law on ongoing use of resources is the central idea of the concept of sustainable development, redefined as broad political vision in 1987 by the World Commission on Environment and Development (also known as the Brundtland Commission; WCED 1987):

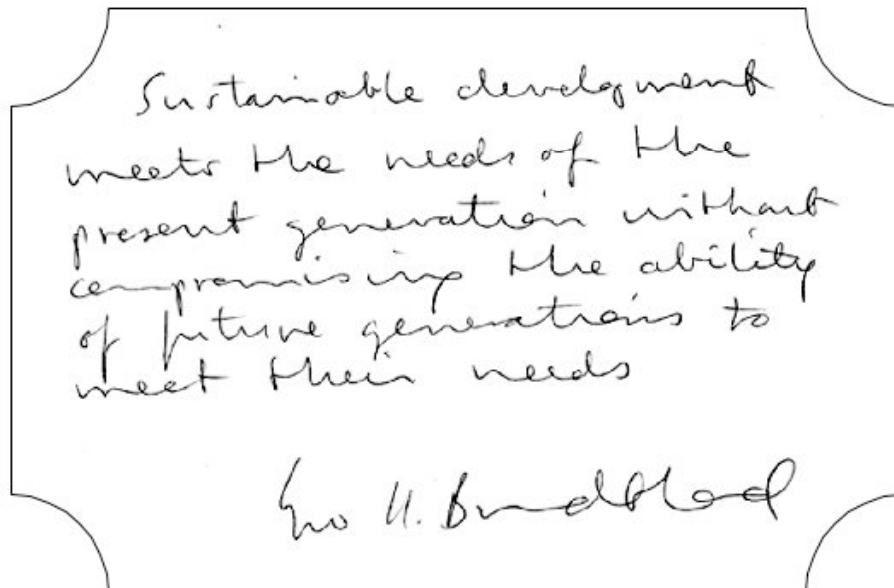


Fig. 1. The definition of Sustainable Development (autograph of Gro Harlem Brundtland)

Since the release of the Brundtland Commission report, this definition has been subject to several modifications and was re-formulated according different point of views. Thus, the umpteen definitions of sustainability vary considerably. Although today—more than ever—disagreement exists as to the precise meaning of the term, most definitions refer to the viability of natural resources and ecosystems over time, and to maintenance of human living standards and economic growth.

Making the Vision of Sustainability clearer

In order to offer a more workable interpretation of the principle of sustainable development, the Swiss ‘Monitoring of Sustainable Development Project’ MONET (BFS, BUWAL & ARE 2001) precise the Brundtland definition according to the first of the 10 ‘Bellagio Principles’, saying that ‘assessment of progress toward sustainable development should be guided by a clear vision of sustainable development...’ (cf. Hardi & Zdan 1996). In this sense, MONET modified the definition given in the Brundtland Commission report, using key elements like *justice, intra- and inter-generational equity, maintenance of options, meeting of needs, and maintenance of bio-diversity*. As a result, MONET proposes the following definition:

‘Sustainable development means ensuring dignified living conditions with regard to human rights by creating and maintaining the widest possible range of options for freely defining life plans. The principle of fairness among and between present and future generations should be taken into account in the use of environmental, economic and social resources.

Putting these needs into practice entails comprehensive protection of bio-diversity in terms of ecosystem, species and genetic diversity, all of which are the vital foundations of life.’

Developing Models of Sustainable Development

The popularity of ‘sustainability’ stems also from a simple model used to facilitate the comprehension of the term: the triangle of environmental (conservation), economic (growth), and social (equity) dimensions. Mostly, sustainable development is modeled on these three pillars.

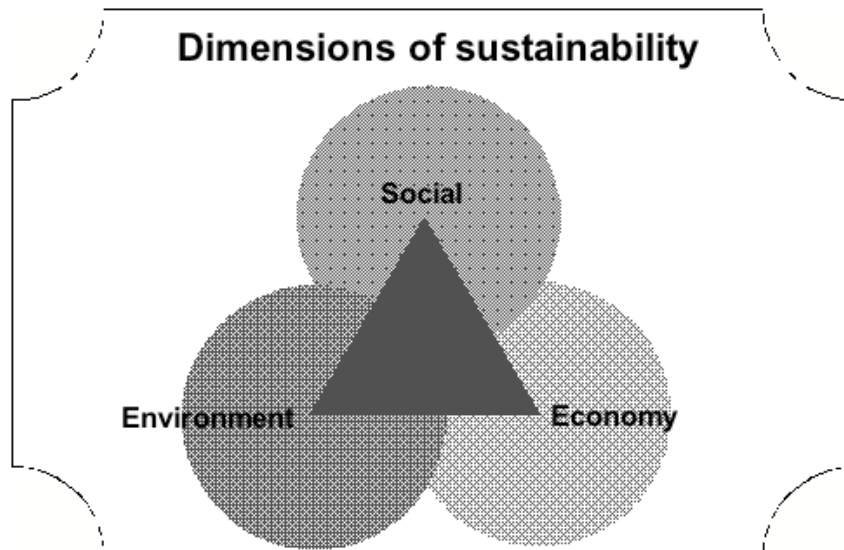


Fig. 2. The three pillar (triangle) basic model of sustainability, sometimes shown as three interlocking circles

This model is also called ‘three pillar’ or ‘three circles model’. It is based on basic aspects of human society, but does not explicitly take into account ‘human quality of life’.

Capital Stocks of Sustainable Development

In 1994, a study group of The World Bank developed the so-called ‘capital stock model’ with the basic idea being: if we live only off the interest and not the capital, the basis of prosperity is maintained—however, if we consume the substance, our means of existence is endangered in the long term. The definition of *ecological capital* for the planning process includes bio-diversity, landscape, mineral resources, clean air and healthy water. *Human and social capital* equates to health, social security, social cohesion, freedom, justice, equality of opportunity, and peace. The equation is simple:

$$\begin{aligned}
 & \textit{Capital stock of Sustainable Development (CSD)} \\
 & \quad = \\
 & \quad \Sigma \textit{Capital stock of the Environment (CE}_n\textit{)} \\
 & \quad \quad + \textit{Capital stock of the Economy (CE}_c\textit{)} \\
 & \quad \quad + \textit{Capital stock of the Society (CS)}
 \end{aligned}$$

Alternative Prism Models of Sustainability

In recent years, alternative models to the triangle of sustainability have been proposed. Among the most interesting one are *prisms* and *eggs*. The ‘prism of sustainable development’ adapted from the Wuppertal school (Spangenberg and Bonniot 1998, Valentin and Spangenberg 1999) stipulates four dimensions:

- *Economic dimension* (man-made capital)
- *Environmental dimension* (natural capital), and
- *Social dimension* (human capital) as the base for

- *Institutional dimension* (social capital)

In each dimension of the *prism of sustainable development*, there are imperatives (as norms for action). *Indicators* are used to measure how far one has actually come in comparison to the overall vision of sustainable development (cf. Valentin and Spangenberg 1999).

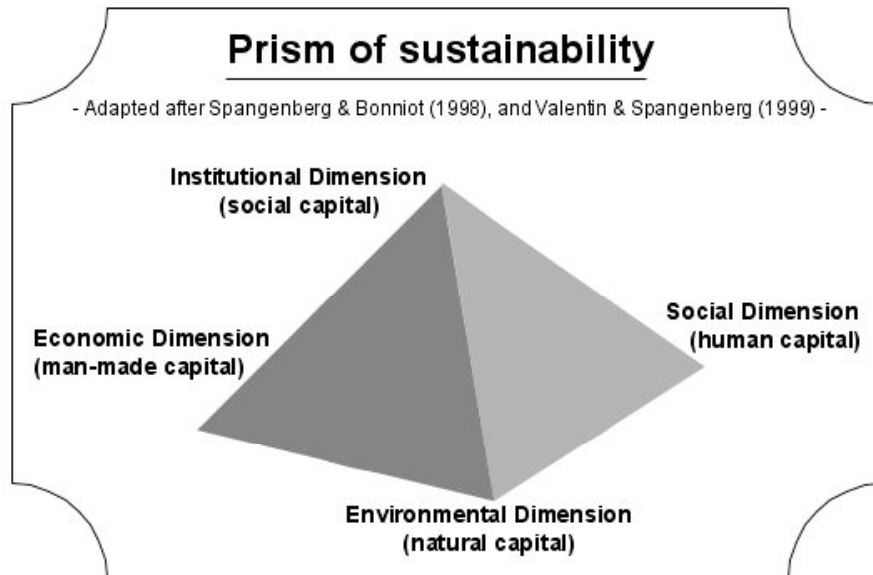


Fig. 3. The prism of sustainable development (Source: Stenberg 2001, p. 42)

Criticizing this prism of sustainable development, Kain (2000, p. 25) argues, that ‘the economic dimension tends to include assets emanating from all four dimensions, thus, adding confusion to the description and analysis’. Consequently, the same author proposes a ‘MAIN prism of sustainable development’. In this model, Kain uses the terms of *Mind*, *Artefact*, *Institution* and *Nature* in order to relieve the prism from the burden of expressions as *social* and *economic*, which are judged to be more confusing than explanatory.

The *environmental dimension* (nature) comprises all natural capital, which may be subdivided into stocks of non-renewable and stocks of renewable resources. The *economic dimension* (artefact) stands for all man-made material assets such as buildings and roads. The *social dimension* (mind) should be perceived as the awareness of the individual subject (worldview, knowledge, and experience). The *institutional dimension* concerns the organization of our society and the relation between people.

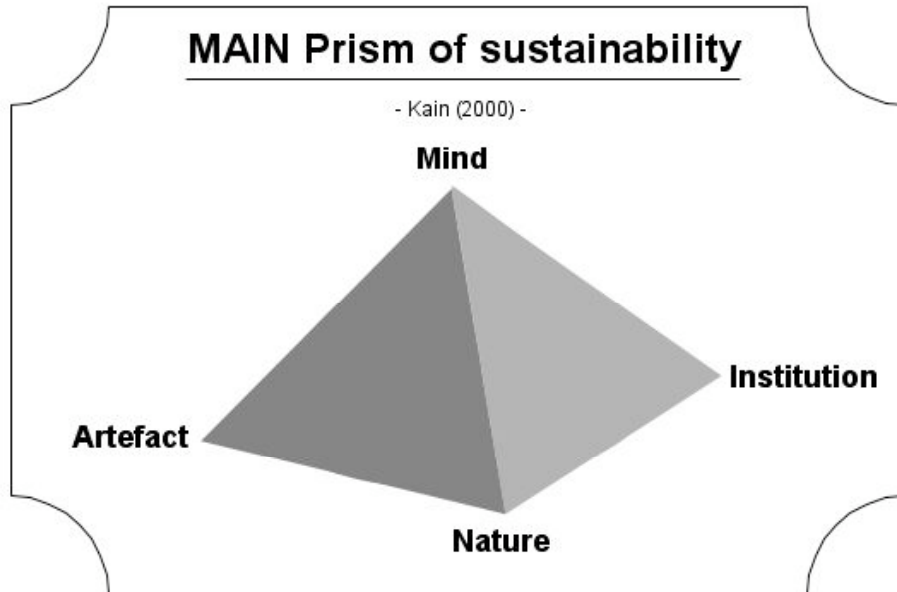


Fig. 4. The MAIN prism of sustainable development (Source: Stenberg 2001, p. 43)

The two prism models point out the impossibility that man-made capital, social capital and human capital can increase at the same time at the same amount. The focus has to be on the interaction between the four dimensions. Regarding all four dimensions simultaneously, sustainable development can be achieved (Stenberg 2001, p. 44).

The Egg of Sustainability and Well-being

The prism models, can be criticized that they pay too little concern to the environmental dimension (natural capital). For many, environment is the precondition for the development of human well-being. This view requires a model of sustainability, which puts the environment in the center.

In conceptual terms, the International Development Research Center (IDRC 1997) proposes to replace the graphics of three pillars or interlocking circles of society, economy, and the environment with the 'Egg of Sustainability', originally designed in 1994 by the International Union for the Conservation of Nature, IUCN (cf. Guijt & Moiseev 2001). The *Egg of Sustainability* illustrates the relationship between people and ecosystem as one circle inside another, like the yolk of an egg. This implies that people are within the ecosystem, and that ultimately one is entirely dependent upon the other. Just as an egg is good only if both the white and yolk are good, so a society is well and sustainable only if both, people and the eco-system, are well. Social and economical development can only take place if the environment offers the necessary resources: raw materials, space for new production sites and jobs, constitutional qualities (recreation, health etc.). Ecosystem is therefore to be regarded as a superordinated system to the other dimensions of the triangle or prism models: social, economical, and institutional. These latter can only prosper if they adapt themselves to the limits of environmental carrying capacity.

Hypothesis of IUCN:

sustainable development = human well-being + ecosystem well-being

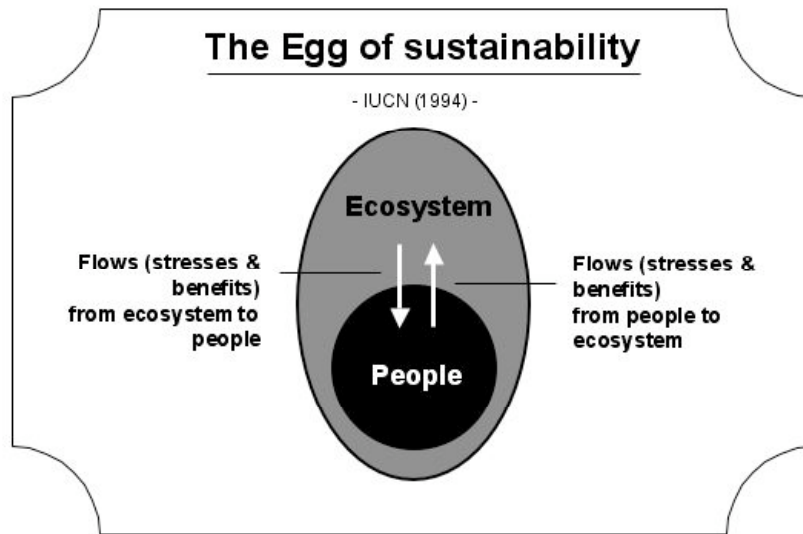


Fig. 5. IUCN's egg of sustainability (Source: IDRC 1997)

A similar egg has independently been proposed by Busch-Lüthy (1995), placing 'economy' and 'society' instead of 'people' in the yolk.

Those eggs put the ecosystem in the center, following the logic that without ecosystem well-being social and economic well-being won't be possible. Although all the shown models are too simple abstractions from reality, they are widely used in spatial planning to argue and to defend development options. Today, the debate on the future of spatial development is dominated by the term 'sustainability', which is the starting point for concepts and strategies leading to guidelines for (sustianbale) spatial development.

Furthermore, it is amazing to observe, how the marketing of 'economy' (i.e. investors, decision-makers, promoters asf.) has been absorbing the terms of sustainability in order to promote their interests and to jump on top of the 'new speak'. Doing this, representatives of economic interests use cynically the same vocabulary and the argumentation lines that has previously been developed by environmentalists in order to stop the increasing impact of economic growth on ecosystems. Finally, the adoption of the concept of Sustainable Development by economists and entrepreneurs has led to an equity between the several diimensions of sustainable development, relating the need for more intensive protection and promotion of natural values and primary resources. In other words: the thunder of the environment has been stolen and the strive for short-sighted material happiness can go on, at least until the next rear of ecologists. This is one reason why the current concept of sustainable Development has to be reviewed and questioned.

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