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**The aspect of space in the concept of sustainable development  
- Overview and consequences for research -**

Gerd Lintz

Institute of Environmental and Regional Development, Dresden

E-mail: [Gerd.Lintz@POP3.tu-dresden.de](mailto:Gerd.Lintz@POP3.tu-dresden.de)

Tel.: 0351-4679-237

Fax: 0351-4679-212

**Abstract**

This article gives an overview of the various spatial aspects in the concept of sustainable development. The discussion about the concept is structured according to four fields of scientific disciplines. The text distinguishes between four major perspectives: the scientific conceptual, the market oriented instrumental, the political administrative and the society oriented perspective. Thus, it is possible to make a statement on the disciplinary and the interdisciplinary requirements of research.

## 1. Introduction

“Humanity stands at a defining moment in history. The world is confronted with abiding disparities within and between nations as well as growing hunger, poverty, illness and illiteracy. The ecological and economic effects of ozone depletion, climate change, soil and forest degradation, decline of biological diversity, and expanding pollution of land, water and air predict badly for the future of our small planet.”<sup>1</sup>

As a solution to these problems the United Nations generated, on the basis of the 1987 Brundtland-Report,<sup>2</sup> the ethically and politically demanding concept of sustainability which integrates the ecological, the economic and the social dimension of development.<sup>3</sup> The aim of sustainable development was accepted with the adoption of the Agenda 21<sup>4</sup> during the UN-Conference on Environment and Development held in Rio de Janeiro in 1992,<sup>5</sup> and was also taken up and specified in following conferences such as the second UN-Conference on Human Settlements Habitat II 1996 in Istanbul<sup>6</sup>. The first steps of implementing the sustainable development concept in Germany are to be seen when it is turned into a primary goal in the German Building/Construction Code of Law, and in the Law of Regional Planning.<sup>7</sup> Another catalyst to sustainable development of cities will be given by the congress Urban 21, to be held in Berlin in the year 2000.

However, the real global trends have not changed since the adoption of the Agenda 21. Surprisingly enough, the trends have partly worsened. This is indicated by several environmental balances reported five years after the Rio conference.<sup>8</sup> Therefore, it remains an important task for science to help spread and assert more precisely the sustainability concept and to improve the basis to transfer this concept into action.

In light of what was stated above, the goal of this article is to present the sustainability concept from two different perspectives. In the first one, the space and regional point of view is emphasized. There is extensive general literature on the sustainability concept,<sup>9</sup> and although the spatial and regional science intensively work on this subject,<sup>10</sup> there are hardly any contributions which could give an overview of various spatial aspects and its accompanying arguments.<sup>11</sup> Second, this article wants to show the great complexity of the notion of sustainable development, in order to underline the need of an interdisciplinary approach. This is the basis to make a statement on the disciplinary and the interdisciplinary requirements of research.

The goals of this article can be best achieved, by distinguishing four major fields of scientific disciplines that cover a large part of the whole discussion.<sup>12</sup> The first section deals with the scientific

conceptual perspective of analysis and action. The second section concentrates on the perspective of the market economy and policy instruments. The political administrative perspective is the subject of the third section. On the fourth section the society oriented perspective is given. Thus it is possible to make a statement on the disciplinary and the interdisciplinary requirements of research.

## **2. The scientific conceptual perspective**

The first perspective still plays the most important role in the discussion over sustainable development. This perspective is mostly constituted by the point of view of all subject areas of scientists and civil engineers. To the fore mentioned professionals, sustainability represents a question of materials and biophysics, e.g. a question about the impact of economic decisions on the environment and how this impact can be avoided in a technical manner in order to achieve sustainability.

The Brundtland-Report defined sustainable development as: "... development that meets the needs of the present without compromising the ability of future generations to meet their own needs."<sup>13</sup> This definition marks the social dimension of development in the sense of fairness between generations. In the following sentences the report points out the additional social goal of justice between different areas of the world: The report highlights that priority should be given to the satisfaction of basic needs of the poor that concentrate in developing countries mainly.

The social dimension is connected with the ecological and economic dimension of development. Accordingly, in the ecological dimension the needs of people can refer to natural goods as resources (e.g. crude oil), or environmental goods (e.g. climate). In the economic dimension the needs can refer to man-made goods like clothes, dwellings and mobility. Between the production and consumption of both categories of goods there are complex and partly unknown interrelationships. This is illustrated by the difficult prognosis of the effect of CO<sub>2</sub> emissions on global climate. Since natural goods represent the basis of human subsistence for every generation, protection of natural resources and environment plays an extraordinary role in the sustainability concept.

On a global context, the spatial structures of Germany are affected on three different aspects. First, the aim of justice on a global level is to be taken into consideration. This means that industrialized countries should increase their foreign development aid budgets. Additionally, the global ecological limits of economic growth are to be taken into account. The viable growth rate boundaries<sup>14</sup> must be

divided between industrialized and developing countries. This could imply that industrialized countries would have to decrease their growth rate. Both the factors of additional foreign development aid and of a possibly reduced growth rate, would strongly change conditions for the development of spatial structures in Germany.<sup>15</sup> The first aspect is often overlooked in policymaking and research.

The second aspect is the one represented by the fact that spatial structures can be used as a parameter to decrease the ecological impact of economic activities.<sup>16</sup> The discussion focuses on the reduction of traffic by means of bringing closer together functions that are interconnected by transport.<sup>17</sup> Especially in cities, the locations of production and dwellings should not be separated as strongly as before. On the regional level it is emphasized to decrease the inter-regional trade, and to increase the intra-regional trade in order to concentrate the different stages of the life cycle of products in regions.<sup>18</sup>

Apart from the traffic-oriented approach it is accentuated that spatial-economic development should be aimed at the conservation of nature and landscape much more than it has in the past.<sup>19</sup> For cities this would mean to consider a more dense land settlement. In the regional context the question of reserving large areas for nature is to be discussed again. A more general-conceptual approach would be to concentrate settlement in a number of decentralized cities.

It has to be mentioned that sustainable development of cities or regions not only refers to their spatial structures but to the general development of these areas.<sup>20</sup> It also must be decided what is locally produced and consumed (sectoral structure: e.g. services or industry), how much is produced and consumed (scale: e.g. living space per capita), and how resources are produced and consumed (techniques: e.g. ecological building). Altogether science can only tell us the rough directions of development of spatial structures, which are efficient in regard to resources and environment. There is still a lot of research to be done in this respect.

The third point refers to the aim of justice between regions at a national level. The question at hand is whether or not there should be a stronger convergence of living standards between regions in Germany. The reason for this is that the aim of convergence is already thought over on the global level. It is to be taken into consideration that the improvement of living standards in underdeveloped countries may partly decrease destruction of environment accounted for by poverty.<sup>21</sup> This effect will probably not occur in Germany. In any case, it is important that poorer regions in Germany do not mature into victims of an ecological oriented development of the spatial structures. How this could be guaranteed is an interesting question for further research.

### **3. The perspective of market economy and policy instruments**

Developing aims and concepts based on scientific and engineering knowledge, and on adopted values is only one side of the problem. But on the other hand, implementing these aims and concepts represents a quite dependent task. Implementation implicates questions of social control, or - as stated in the Brundtland Report - “social organization” of human acting. This has to be considered as a second aspect of the social dimension of sustainable development, which stands apart from the social justice direction. Beside the already mentioned open research questions, the still crucial question to be considered is, why does actual development remain that far behind the generally accepted aims and concepts?

Firstly, the free market economy system has to be considered as both the determinant of income distribution by means of property rights and productivity, and of human dealings with nature determined by the individual rational calculation of value reflected in their buying and selling forces in markets. This is the particular research field of economists, and amongst them especially of environmental and natural resource economists.<sup>22</sup> Crucial reasons for economic inequity are, first of all, the unequal distribution of means of production such as natural resources, production factors, and human resources; and further to this the possibly unequal conditions in terms of commercial and capital exchange. Therefore all industrialized countries are encouraged to, for instance, increase compensating transfer-payments, or to initiate a fundamental change in the world trade system to achieve convergence between developing and industrial countries.<sup>23</sup> Estimations of possible side effects of such measures have hardly been made.

In terms of achieving environmentally concerned spatial structures, two different approaches have to be distinguished. In the case of spatial functions which disturb each other, the responsible element has to be encouraged to an environmentally friendlier behaviour or eventually to a completely different choice of location in a spatially differentiated way. Hence, the regional planning system with its regulatory instruments should be further developed and completed with the spatially differentiated internalization of external environmental effects by means of taxes.<sup>24</sup> A long-term concept of spatial structure has to be considered as a necessary pre-condition to realize these solutions.<sup>25</sup> In the case of polluting traffic, probably the most efficient strategy is to make people pay for the induced external costs on the environment.<sup>26</sup> This implicates a strong impetus on the necessary adaptation of behavior in terms of mobility and of spatial networks. Unfortunately, there are also very few experiences on

implementation of the necessary instruments such as economic stimulation, therefore experiments are urgently required.

#### **4. The political administrative perspective**

As shown on the preceding analysis, research from the economic point of view is still required. It has to be assumed though, that the base of recent knowledge would facilitate nations to obtain more measures of sustainable development as are actually brought about. Thus it can be questioned if nations and their administrative systems are still structured adequately for these new challenges.<sup>27</sup> In this context, political and administrative scientists are particularly involved.<sup>28</sup>

From the spatial point of view, two interesting aspects can be distinguished. First, a new emphasis in the traditional hierarchy of administration is discussed. This new hierarchical order involves as well the strengthening of international organizations and the conception of a credible “global government”,<sup>29</sup> as the support of local and regional institutions and activities. Agenda 21 puts a specific weight on communities. This is illustrated, for example, by the call for Local Agendas 21,<sup>30</sup> and by the German project “Cities of the Future” (“Städte der Zukunft”)<sup>31</sup>. Regions are also being reinforced by programmes like the German competition “Regions of the Future” (“Regionen der Zukunft”)<sup>32</sup>. It still seems particularly difficult to evaluate whether or not the shift of responsibility from higher administrative levels to the local and regional level actually means a stronger orientation towards the aims of sustainability.<sup>33</sup>

Therefore, the emphasis on communities and regions is often seen in a second context, and that is, the implementation of innovative models of politics and planning in spatial planning and development policy.<sup>34</sup> A particular incentive is expected through participation and cooperation of large numbers of people involved, including enterprises<sup>35</sup> and environmental groups. The latter has to be specifically and potentially supported because it is doubtful that public administration and enterprises respect voluntarily the ecological dimensions of sustainability sufficiently enough. Additionally, the efforts to improve legislation concerned with environmental issues have to be mentioned. In this respect the formation of a legal base for environmental planning is an example (Umweltgrundlagenplanung). After all, concerning legal terms an integrated organizational concept has to be developed which could be established in all sectors and levels of administration and politics.<sup>36</sup> Which role regional planning can play in this process is still unclear.<sup>37</sup>

## **5. The society oriented perspective**

According to this argumentation several approaches exist to improve sustainability through administration and market oriented policies. Two important questions remain though: Why has relatively few been realised of these ideas? And more fundamental, are the two controlling mechanisms market and state really able to initiate an actual change in behaviour by themselves? Keywords such as change of values and consciousness,<sup>38</sup> ethics of sustainability,<sup>39</sup> learning<sup>40</sup> as well as changing lifestyle and transformed patterns of consumption have to be mentioned in this socio-cultural context. These considerations are particularly the research field of sociologists, educationalists and psychologists.

Partly the possibility of a certain inter-dependence between such kind of social changes and spatial patterns or at least a certain influence of spatial organisation has been discussed. For example it is expected that an increase in participation and cooperation in a large number of issues, but specifically on the local and regional level, results in effects of learning and modified perception.<sup>41</sup> Small communities are considered to enable a higher degree of social action. Neighbourhood and communication are supposed to result in renunciation of further extended consumption.<sup>42</sup> Some scientists express their expectation that a stronger identification with the quarter, the city or the region encourages to greater sense of responsibility as well for the fellow human beings as for nature.<sup>43</sup>

Although a large number of open questions remains, the latest rather economy orientated research about spatial networks and milieus<sup>44</sup> confirms that social and cultural aspects must not be neglected in spatial research. Finally it can not be ignored that society has to adapt to global scarcity of resources and environment.<sup>45</sup> It is the duty of academic research to provide a scientific base to avoid anti-democratic and in-humanitarian tendencies.

## **6. Conclusion**

The discussion on sustainable development reflects in various regard an important spatial aspect. In its context, spatial and regional sciences integrate important impulses. They also provide important contributions to the further development and operationalization of the concept of sustainable development. Many already known aspects are newly weighted and organized under the long-term horizon of the ecological, economic and social dimension of development. Some new aspects

emerge. The distinction of four different spatial perspectives for the systematical analysis of the very broad and heterogeneous discussion has proven as evident.

It can be concluded that the concept of sustainable development calls for an intensification of research in spatially oriented sciences. On one hand the demonstrated four fields of analysis and action need more specific investigation. Even on the basis of an uncoordinated research implementation of results in one field helps to improve the situation in the other fields. The sound implementation of emission taxes for instance can help to change environmental consciousness and guiding values of people. The change of environmental consciousness and the guiding values in turn makes it easier to implement emission taxes.

On the other hand interrelations between the four fields of analysis and action are to be studied more intensively. The research has to be coordinated in order to bring together the different perspectives on the same complex of problems. So the concept of sustainable development demands an interdisciplinary approach. For example the research on the spatial environmental effects of economic action should be coordinated with the research on shaping regional differentiated emission taxes. The design of the tax needs knowledge about the best way of assigning competences to different levels of administration and about the best way of political decision-making on the level of taxes. The latter aspect has to be seen in the context of the research on society and education. This research can help to improve the basis for the better implementation of new political administrative models. As interdisciplinary investigation requires a lot of effort the coordinated research should concentrate on the most important problems of sustainable development.

Summing up the concept of sustainability needs for its further development and operationalization the interdisciplinary spatial and regional science. Just the spatial and regional science is predestinated for this because of its initial intention of interdisciplinarity. One requirement is surely that scientists in the fields of science/engineering and arts as well as in the fields of economics and social sciences should try to understand each other more than they do now.

There is a second argument for a close connection between spatial/regional science and the concept of sustainable development which bases on the fact that the spatial/regional science seem to become perceived as less important. The latter is proved e.g. by the closing of the Central Institute of Regional Planning and Environmental Research (Zentralinstitut für Raumplanung und Umweltforschung) in Munich and the dissolution of the course of studies for regional planning in



Oldenburg. In this respect the spatial/regional science need reversly, as Hübler emphasises, a new connecting subject: the sustainable spatial/regional development.<sup>46</sup>

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- 2 Hauff (1987).
- 3 Vornholz (1993), Sp 114f.
- 4 Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (1997).
- 5 Engelhardt/Weinzierl (1993). See also the German "Bericht der Bundesregierung anlässlich der UN-Sondergeneralversammlung über Umwelt und Entwicklung im Juni 1997 in New York" (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit 1997b)
- 6 See the German "Nationalen Aktionsplan zur nachhaltigen Entwicklung" (Bundesministerium für Raumordnung, Bauwesen und Städtebau 1996). About the result of the conference see: Bundesministerium für Raumordnung, Bauwesen und Städtebau (1997) and Sibum (1996).
- 7 Schliepkorte (1997), Schmitz (1998).
- 8 See articles in the Frankfurter Rundschau, 17.6.1997, p. 27-30, and Vorholz (1997).
- 9 See for instance BUND/Misereor (1996), Umweltbundesamt (1997), Rat der Sachverständigen für Umweltfragen (1994a, 1996). See also Hey/Schleicher-Tappeser (1998) and Tegner/Jakubowski (1998).
- 10 See e.g. Politische Ökologie, Sonderheft 4 (1992); Akademie für Raumforschung und Landesplanung, ARL (1994); Informationen zur Raumentwicklung, H. 1/2; Raumforschung und Raumordnung, H. 1/2.1996; Three working groups of the ARL (ARL-Nachrichten, H. 3/96, S. 7-10) and Hübler/Weiland (1997).
- 11 There is one exception: Hesse (1996 und 1997).
- 12 The structure is based on Lintz (1997) and was supplemented by the society oriented perspective.
- 13 World Commission on Environment and Development (1987), p. 43, quoted in Pearce (1993), p. 7.
- 14 See about the concept of carrying capacity e.g. Eick (1993), Odell (1975) and Rees (1990, 1994).
- 15 See also Arlt/Siedentop (1996), p. 28.
- 16 Other parameters for environmental protection are: the quantity or scale of the production and consumption of goods and the way the goods are produced and consumed (Klaus 1975, S. 78f.). To the environmental efficiency of spatial structures see Schmid (1997), p. 3, 5 and Wolf (1996).
- 17 See e.g. Abart-Herisz (1995), p. 9ff.
- 18 See e.g. Gleich, v. (1991), p. 223-227, Lucas (1992), Hoppe/Gross/Kröger (1993) and Peters et al. (1996).
- 19 Brösse (1994), p. 40, Roch (1998).
- 20 About sustainable urban development see: Bundesforschungsanstalt für Landeskunde und Raumordnung (1996), Konukiewitz/Schmitz (1996), Töpfer (1996) and Petri (1998).
- 21 Heins (1994), p. 25.
- 22 See for example Frey (1992), Endres/Querner (1993), Junkernheinrich/Klemmer/Wagner (1995) and Siebert (1995).
- 23 BUND/Misereor (1996), p. 386-420.
- 24 Kosz (1995) und Huckestein (1996). The spatial aspect is discussed in: Wachter (1996), p. 12f.
- 25 This often is overlooked. Lintz (1997), p. 89f.
- 26 Prätorius/Steger (1994), p. 26f., show the different policy instruments to influence traffic.
- 27 Rat der Sachverständigen für Umweltfragen (1994b), p. 14.
- 28 See in general e.g. Klöpfer (1992) and Marz (1996).

- <sup>29</sup> BUND/Misereor (1996), p. 386, and Peters et al. (1996), p. 31.
- <sup>30</sup> See e.g. Agenda 21, Kapital 28, Europäische Kampagne (1994), International Council 1995, Lütjhe (1997) and Weiland/Lustig (1998).
- <sup>31</sup> Döhne/Krautzberger (1997), p. 83-86.
- <sup>32</sup> Adam/Blach (1997).
- <sup>33</sup> Peters/Sauerborn (1994), p. 7, Thierstein/Walser (1996), p. 13-15, Zimmermann/Nijkamp (1986), p. 86 and Keller (1997).
- <sup>34</sup> Cities: Bundesforschungsanstalt für Landeskunde und Raumordnung (1996), p. 128-130. Regions: Peters et al. (1996), p. 53-59, 72f. Private initiatives: Wirth (1996), p. 340f.
- <sup>35</sup> Spehl (1993), p. 168-174 and Peters et al. (1996).
- <sup>36</sup> Lintz (1997).
- <sup>37</sup> Diller (1996) und Fürst (1993).
- <sup>38</sup> Petschow/Meyerhoff (1996), p. 13.
- <sup>39</sup> Rat der Sachverständigen für Umweltfragen (1994), p. 179.
- <sup>40</sup> Meran (1996), p. 82-86, Thierstein/Walser (1996), p. 13f.
- <sup>41</sup> Peters u.a. (1996), p. 53-59.
- <sup>42</sup> Binswanger/Geissberger/Ginsburg (1979), quoted in: Kleinewefers (1995), p. 327.
- <sup>43</sup> Weise (1996), p. 51. Also Nohl (1996), p. 38f.
- <sup>44</sup> Maier (1996).
- <sup>45</sup> Catton/Dunlap (1978).
- <sup>46</sup> Hübler (1998)

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