HERMENEUTICS AND PRAGMATICS OF THE CONCEPT OF SUSTAINABILITY

HERMENEUTIK UND PRAGMATIK DES NACHHALTIGKEITS-BEGRIFFS

Joachim Schwarte, Helen Hein

Institute of Construction Materials, University of Stuttgart

SUMMARY

The conceptual ambiguity of the demand for sustainability poses particular challenges for work in the engineering sciences, that are not usually encountered in this field. This article describes associated problems. The attempt is made to make clear which consequences arise for research activities in engineering sciences. As an essential instrument to avoid statements in the context of research results, which can turn out to be imprecise or wrong because of the described conceptual ambiguity, the application possibilities of interval arithmetic are pointed out. A corresponding method is currently being successfully tested in the context of life cycle assessments. The applicability of the corresponding method to other evaluation scales in the field considered here is discussed.

ZUSAMMENFASSUNG

Die begriffliche Unschärfe der Forderung nach Nachhaltigkeit stellt insbesondere die Arbeit im ingenieurwissenschaftlichen Bereich vor Herausforderungen, die in diesem Feld üblicher Weise nicht auftreten. Im vorliegenden Artikel werden die hiermit im Zusammenhang stehenden Probleme dargestellt. Es wird der Versuch unternommen, zu verdeutlichen, welche Konsequenzen sich daraus für ingenieurwissenschaftliche Forschungstätigkeit ergeben. Als ein wesentliches Instrument zur Vermeidung von Aussagen im Rahmen von Forschungsergebnissen, die sich wegen der dargestellten Begriffsunschärfe ihrerseits als unscharf oder falsch erweisen können, wird auf die Einsatzmöglichkeiten der Intervallarithmetik hingewiesen. Eine entsprechende Methode wird im Rahmen von Ökobilanzen aktuell erfolgreich erprobt. Die Anwendbarkeit dieser Methode auf andere Bewertungsmaßstäbe im hier betrachteten Feld wird diskutiert.

1. WHAT DOES SUSTAINABILITY MEAN?

Sustainability is not a "normal term". ARMIN GRUNWALD emphasizes this fact in his fundamental monograph „Nachhaltigkeit verstehen – Arbeiten an der Bedeutung nachhaltiger Entwicklung“ („Understanding sustainability - working on the meaning of sustainable development“; see [1], S. 25). It is rather a “normative-ethical concept of considerable if not breathtaking scope” (ibid. p. 27; this and all following quotations from German were translated by the authors) comparable with “likewise large-scale challenges of human thought and life such as justice, democracy, good life, human dignity, transcendence” (ibid. p. 29). We are dealing with a diversity of meaning, which corresponds to a diversity of interests of those who use the term. The ultimate meaning of statements that use or presuppose the concept of sustainability can therefore usually only be elucidated with a hermeneutic approach, whereby the intentions of the authors and the interests of the respective addressees must be taken into account. HARALD WELZER even recommends making the ideal of sustainability superfluous by civilizing the economy, and writes that one could “then forget the meanwhile unsuitable concept of sustainability, which is used for a too wide variety of purposes” (see [2], p. 129) and summarizes: “We are only sustainable when the concept no longer exists” (ibid.).

What are the consequences in cases where the term “sustainability” is introduced and even quantified in the context of engineering science as a criterion for the characterization of technical methods or technical objects? What is the significance of “sustainability”, which, for example, is solemnly attested to an innovatively designed building in a certificate following a corresponding sustainability assessment, if the building is characterized, for example, by the fact that the building envelope has a particularly high level of thermal insulation, thus minimizing the heating energy requirement? Is it hermeneutically permissible to reduce the concept of sustainability to that of energy saving, or is there the danger that the statement concerning the certified object is incomprehensible or simply wrong? GRUNWALD writes: “It is anything but clear what is a 'sustainable' or a 'more sustainable' technology. Nevertheless, appropriate evaluations are constantly being made and some of them have real consequences for technology development and implementation” (see [1], p. 263). The way in which this problem can be solved pragmatically is well known. It consists in each case in the provision and application of a weighted catalog of criteria, with regard to which a “predeliberative agreement” (“prädeliberatives Einverständnis”; ibid. p. 82) can be presupposed, which must therefore also be the subject of a “constant questioning and further development” (ibid. p. 83). However, the method of weighted aggregation of individual criteria in the course of a comprehensive sustainability assessment is sometimes sharply criticized, for example in connection with emissions trading. CLAUDIUS SEIDEL for example, expresses the same concerns regarding the evaluation of buildings, as already mentioned above, when he claims: “If we insulate the houses and issue energy certificates, then it is a question of the right to continue to urbanize the landscape” (see [3], p. 375) and HARALD WELZER sums it up: “Every optimization only serves the purpose of ensuring that everything can continue as before” (see [2], p. 43). In fact, it is not appropriate at all to qualify a technical object as sustainable. Sustainability is an attribute that can only be meaningfully assigned to processes or practices. Ultimately, any sustainability debate must take into account people's lifestyles and the expected future changes in these lifestyles. Whether this can be influenced at all by innovative technical solutions in a way that serves the purpose is not to be further examined here.

2. COULD THE DIRECTION BE WRONG?

The reduction of the environmentally harmful effects of technology is undoubtedly a goal that must be increasingly demanded and realized in the course of sustainable development. One possible measure that can be used to illustrate the corresponding developments in the world is the “ecological footprint”. Here, various environmental factors are ultimately converted into land consumption, which is expressed in “global hectares per person” (in short: “gha”). This can be balanced against a biocapacity, which is also expressed in gha. The corresponding procedure is described in detail in the brochure “Großer Fuß auf kleiner Erde?” (“Big Foot on Small Earth?”; see [4]) of the German Society for Technical Cooperation (GTZ). The biocapacity available per capita in Germany in 2010 was approximately 1.7 gha (ibid. p. 17), which is roughly the same value that should be used as a basis for global considerations. The average ecological footprint of the German population in the same year was about 5.3 gha per capita (see [5]), leading to a deficit of 3.6 gha per capita (ibid.).

It was already recognized in the early stages of the sustainability discussion that besides ecologiy there were other fields of aspects that needed to be considered. In particular, economic, social and cultural conditions must not be ignored. However, it is far more difficult to prepare such aspects in such a way that they can be presented in a single measure. One measure used for this purpose is the

Human Development Index (HDI). A description of the procedure and current figures can be found in the “Human Development Report 2019” (see [6]). The HDI can take numerical values between 0 and 1, whereby 0.71 is the minimum value that the United Nations considers to correspond to an acceptable minimum standard of living (see [7], p. 20)

By using the two measures introduced above, it is now possible to create diagrams in which the corresponding pairs of values for the nations of the world are entered as points. It would be desirable that all points are located within the range where the ecological footprint does not exceed 1.7 gha per person and the HDI is at least 0.71. In fact, not a single nation in the world is in this range (see [2], p.99). In a further step, therefore, it is necessary to examine what trace the points representing the development of a nation over the years leave in such a diagram.

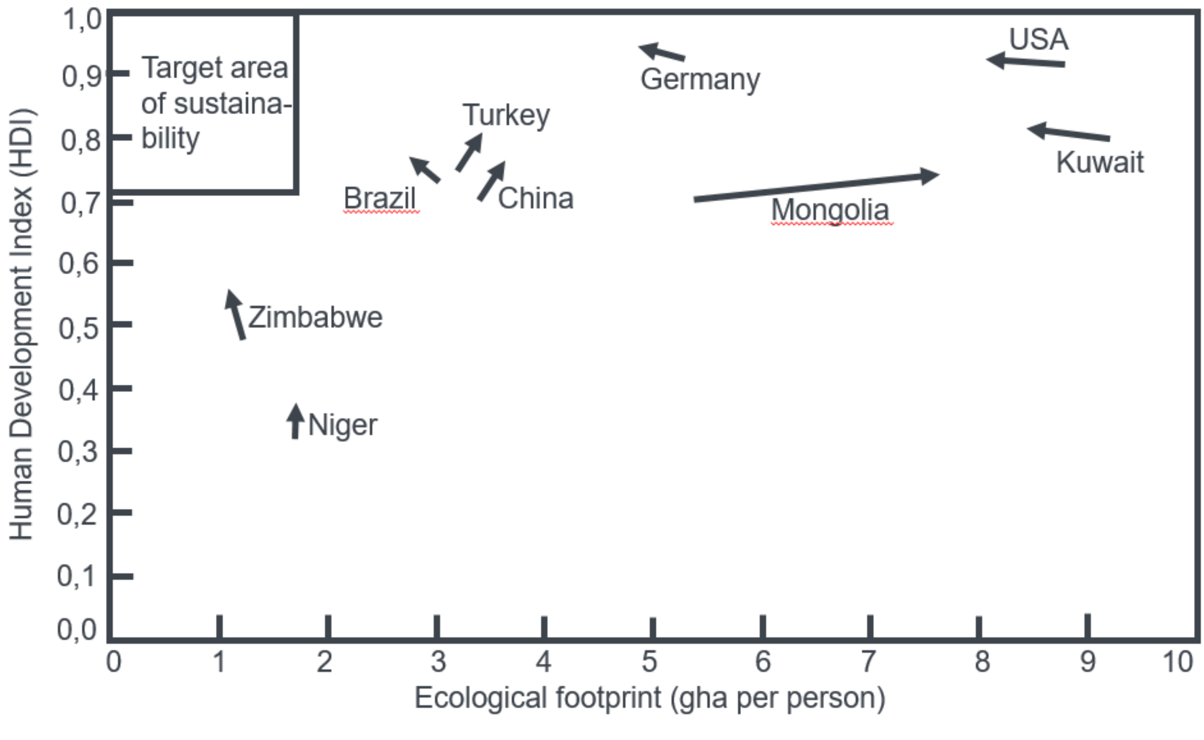

Fig. 1: Development of sustainability indicators of some nations from 2010 to 2016

Fig. 1 shows the development of the above-mentioned indicators for a few selected nations, with the starting point of each arrow representing the situation in 2010 and the corresponding end point representing the situation in 2016 (see [5] and [8]). Obviously, this picture can be interpreted in the sense that, apart from the already mentioned fact that no nation can already claim the attribute “sustainability” for itself, some nations are even moving away from this goal. It should not be forgotten, however, that the very terms that form the basis for the definition of the presented key figures require a critical hermeneutical analysis. For example, it is not to be expected that all nations will agree with the statements presented and the underlying approach in a predeliberative way (see above).

3. HERMENEUTICS AND PRAGMATICS OF KEY FIGURES

In the context of engineering scientific work, numerical values are generally used in a pragmatic sense. This means that possible conceptual ambiguities do not have to be addressed. It is rather assumed that such ambiguities may be considered as settled in advance by previous work or in the form of regulations and standards. However, this approach is generally not appropriate in the area of sustainability assessment, as it is in principle impossible to define the terms relevant in this area in a definitive way and to prescribe appropriate calculation methods. Every development in the field of sustainability always has a retroactive influence on the meaning of the term of sustainability, which has to be updated accordingly. In this context GRUNWALD speaks of a “hermeneutic circle” (see [1], p. 46). Such an approach is primarily found in the area of the humanities, and in the engineering sciences it is at least unusual and also uncomfortable. For established methods that are used in practice to determine sustainability-relevant indicators, as is the case with life cycle assessments, for example, the demand for hermeneutic reflection means that the concept of “hard” measurement results would have to be abandoned in favor of “soft” “creation of meaning” (“Bedeutungserzeugung”; ibid. p. 291).

The creation of meaning in the sense of a hermeneutic circle can be systematically supported in connection with technical tasks by the use of interval arithmetic. The idea is initially based on abandoning “hard” numerical values (see above) in favor of numerical ranges or intervals. The development and application of a corresponding interval-based method for the field of life cycle assessment has already been discussed in detail elsewhere (see [9] and [10]). An implementation is available in the form of the life cycle assessment system Multi-VaLCA (see [11]) and is being continuously developed at the Institute of Construction Materials at the University of Stuttgart.

The usability of interval arithmetic as a concept to support the creation of meaning is briefly discussed in the following with recourse to the example from section 2 (see above).

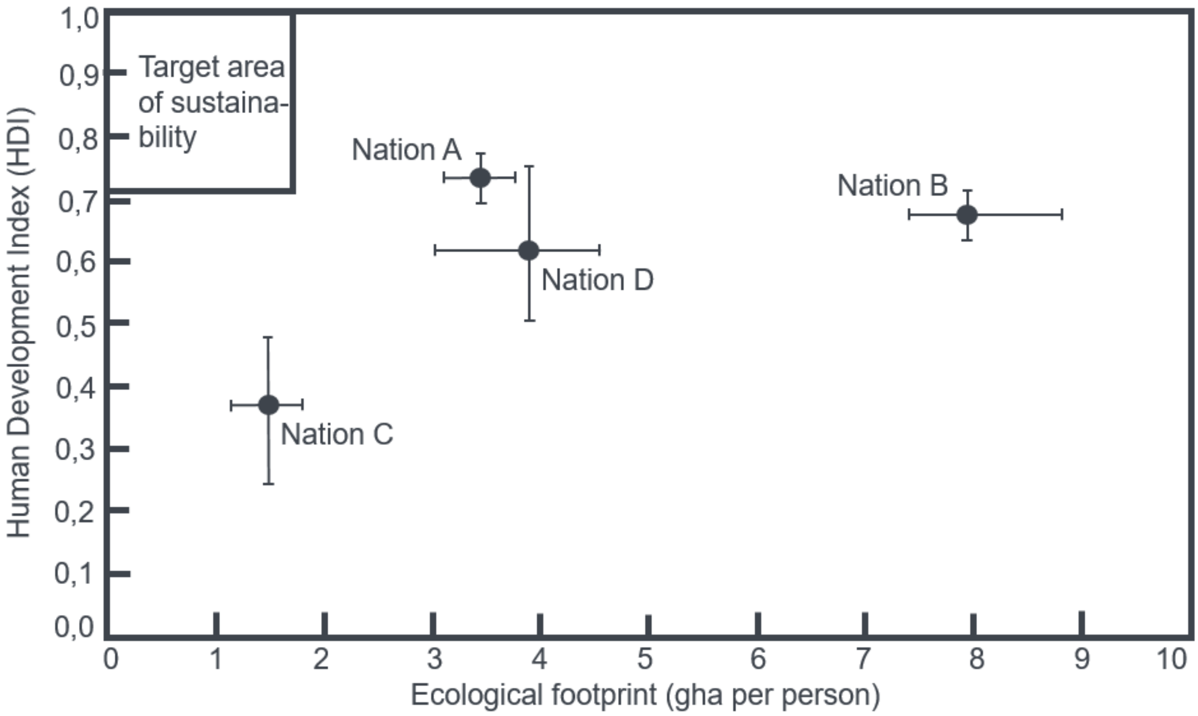

Fig. 2: Fictitious sustainability figures with interval display

In Fig. 2, in addition to the points that could result from the pairs of values with the usual pragmatic approach, intervals are entered for four fictitious nations. As can be seen, the interval widths for nation A are relatively small. For nation B, on the other hand, the value of the Ecological Footprint is in a rather wide interval. This can be caused by highly scattered data, the inaccuracy of which was taken into account by recording the corresponding intervals. It is also conceivable that the inaccuracy is caused by disagreement about the weighting factors to be used in the course of the aggregation of individual criteria. For example, the relevance of a specific criterion might be assessed very differently by different actors involved in the design of the procedure. This can be taken into account by setting the weighting factor to be applied to the disputed criterion as a sufficiently wide interval instead of a “hard” numerical value. This will only have an interval-widening effect on the final result in those cases in which the corresponding criterion actually appears in a considerable way. For Nation C, there is a wide range of intervals with respect to the HDI. This can be caused, for example, by the fact that a considerable portion of the population does not yet benefit at all from the technical standard already achieved in the nation in question. Large interval widths, as in cases B and C, provide indications as to the necessity of a targeted further development of the calculation methods used in each case.

In the case of the fictitious nation D, the interval widths are so large that even a comparison with the neighboring nation A in the diagram no longer allows a clear statement to be made as to which of the two nations performs better. Such a statement can and may only be made once the procedure, including the consent of all parties concerned, has been further developed to such an extent that the result intervals no longer overlap. Similar results from the field of life cycle assessments have been reported elsewhere (see [12]).

4. SUMMARY AND OUTLOOK

Sustainability is a “large-format” term whose proper use requires continuous critical analysis and further development of the respective meaning of the term. Research results that attempt to quantify sustainability with “hard” measures contradict this claim. The potentially resulting misunderstandings and misinterpretations can be avoided at least in part by the consistent application of a methodology based on interval arithmetic. Therefore, it seems advisable to modify the corresponding databases and calculation methods in the future in exactly this sense.

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