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Guido Lüchters and Lukas Menkhoff\*

## The Fourth Première of the Human Development Index

*The United Nations Development Program has published its Human Development Index values for most countries of the world for the past five years. It claims the index provides information that goes beyond the widely-used GDP data and is relevant for policy-making. Critical examination shows that the index does not yet live up to this claim.*

It was in the summer of 1990 that the United Nations Development Program first presented its so-called Human Development Index, or HDI for short, with the aim of offering a reliable indicator of the development of countries besides measurements of their national product.<sup>1</sup> The UNDP justified its claim as to the informational value of the index on the grounds that the HDI is calculated as a composite index in which only one of three dimensions is based on national product; the other two can be summarised as life expectancy and education.

The HDI is updated annually, in accordance with the agency's own stated desire to produce a development indicator that can also be used for purposes of economic policy-making. However, it is probably not generally known that the 1994 report, which was published recently, is not based on the definition of the HDI formulated in 1990.<sup>2</sup> This is, in fact, the third revision of the original index formula. Since only two of the various versions are directly comparable, it is justifiable to speak of the fourth première of the HDI in its five-year existence.

This continual change essentially thwarts the original intention of offering a "reliable" indicator of "progress", for the ever-changing indicator is not reliable nor can progress be measured if the definition is unstable. Moreover, critics from many quarters were quick to point to elementary weaknesses in the statistical concept, which since then have been steadily improved, but not completely eliminated so far. The 1994 HDI should be the best of the four versions published so far, but it has still not reached

maturity; what is more, it raises fresh problems. We shall first describe the advances made in the four versions of the HDI unveiled so far before turning to the new problems thrown up by the latest edition. We shall then discuss possible improvements in the HDI, some of which have long been demanded, but without calling the general concept into question.<sup>3</sup>

### The First Version

In developing countries, in particular, the measurement of national product is subject to a number of obvious weaknesses, which have led not only to severe criticism but also to numerous alternative proposals. The UNDP's proposal for a "Human Development Index" accords with this tradition.<sup>4</sup> As its name implies, the particular objective of the HDI is first to extend the perception of development beyond the purely economic aspect by measuring life expectancy and educational attainment as well as income and in principle giving all three dimensions equal weight. Secondly, the index aims to accord a conscious role to the quality of development, so that increases in income beyond a certain

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<sup>1</sup> See United Nations Development Program (UNDP): Human Development Report 1990, Oxford, Oxford University Press.

<sup>2</sup> UNDP: Human Development Report 1994, Oxford, Oxford University Press.

<sup>3</sup> Such fundamental criticism is expressed, for example, by T.N. Srinivasan: Human Development: A New Paradigm or Reinvention of the Wheel?, in: American Economic Review, Vol. 84, 1994, No. 2, pp. 238-243.

<sup>4</sup> With regard to previous proposals, see for example Meghnad Desai: Human Development, Concepts and Measurement, in: European Economic Review, Vol. 35, 1991, pp. 350-357, or Sudhir Anand and Martin Ravallion: Human Development in Poor Countries: On the Role of Private Incomes and Public Services, in: Journal of Economic Perspectives, Vol. 7, 1993, No. 1, pp. 133-150.

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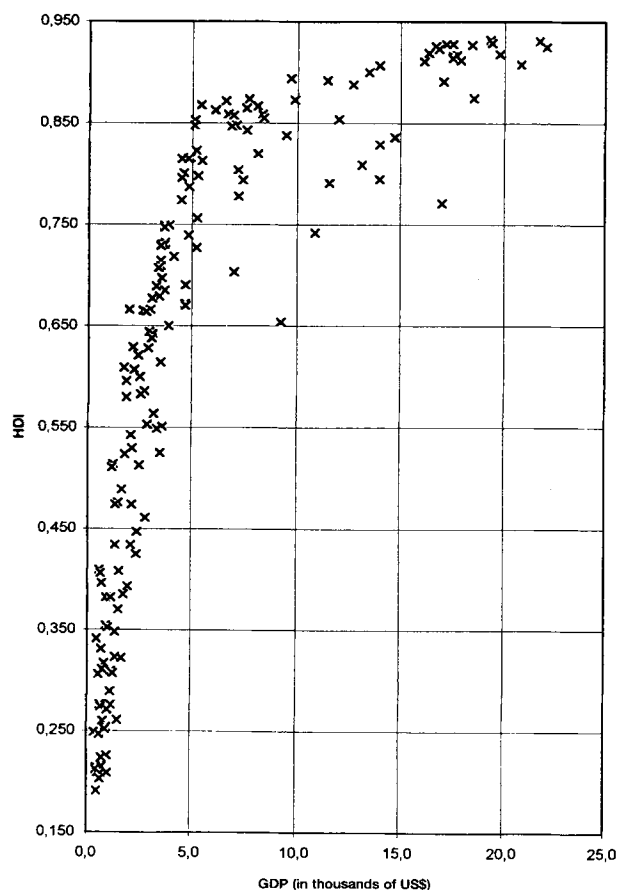
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threshold carry less weight than improvements in the other dimensions. The UNDP has adhered to these two basic principles through all the versions of the HDI.

The first version was constructed as follows:<sup>5</sup>

- ☐ the income dimension was represented by real per capita national product, expressed at purchasing power parities for purposes of comparison. Moreover, only logarithmic values were used and calculations were discontinued at the poverty line for industrialised countries;
- ☐ the life expectancy dimension was expressed by the average life expectancy of the population. This is the only index component that has remained constant in all versions;
- ☐ the educational attainment dimension was calculated from the adult literacy quotient.

**Figure 1**  
**Relationship between GDP and the HDI**  
(for 173 countries)



Source: UNDP: Human Development Report 1994.

The aggregated results based on this configuration produce no real surprises in relation of the criticised GDP figures: the HDI still places the rich Western industrialised countries in the lead as far as "human development" is concerned and the poor countries in black Africa towards the end of the list. In fact, this picture applies to all versions of the HDI, as, for instance, the graph for 1994 shows (see Figure 1).

Nevertheless, the often voiced criticism of the high correlation between GDP and HDI misses the point of the explanatory claims made on behalf of the HDI.<sup>6</sup> Rather, the UNDP points explicitly to the marked differences for some countries compared with their GDP rankings. This is evident in Figure 1 in the sometimes enormous vertical distance between two crosses, in other words between countries with the same GDP. At this disaggregated level it is therefore crucial precisely how the HDI is calculated.

### The Second Version

The second version of the HDI appeared as early as 1991. Criticism had focused among others on two points regarding the income and education dimensions.<sup>7</sup> First, it is far from clear why increases in income that take income over the poverty line should no longer be considered as progress. As a consequence, income above this level was now taken into account, albeit with a declining "marginal utility". This is measured using the Atkinson formula, which leads to a sudden flattening-off of the increases. A further change was the decision not to carry out a logarithmic conversion of low incomes, so that all additional income counts fully as a component of "human development" up to the industrial countries' poverty level but only on a much reduced scale thereafter.

A second criticism is purely technical and relates to the education dimension. It emerged that the representation that had been adopted was not meaningful, as it did not differentiate sufficiently between the industrialised countries. As a consequence, the average number of years of

<sup>5</sup> We have deliberately not reproduced the exact index formulae, which are not essential to an understanding of the argument but which can be found in the UNDP reports or other literature.

<sup>6</sup> See Richard Reichel: Der „Human Development Index“ – ein sinnvoller Entwicklungsindikator?, in: Zeitschrift für Wirtschaftspolitik, Vol. 40, 1991, No. 1, pp. 57-67, or Mark McGillivray: The Human Development Index: Yet Another Redundant Composite Development Indicator?, in: World Development, Vol. 19, 1991, No. 10, pp. 1461-1468.

<sup>7</sup> See Niels C. Lind: Some Thoughts on the Human Development Index, in: Social Indicators Research, Vol. 27, 1992, No. 1, pp. 89-101.

schooling were incorporated into the education dimension.

This second version also attracted strong criticism, of which the article by Trabold-Nübler is representative.<sup>8</sup> The proposed improvements he lists are very comprehensible; it is therefore astonishing that the entire response was to eliminate just one of the flaws in the index.

### The Third Version

In order to calculate the educational attainment dimension, the two components of literacy and years of schooling were simply added together, with the result that the desired differentiation among the industrialised countries did not occur. It is worth remembering in this regard that decades of compulsory schooling mean that practically the entire population can read and write, so that literacy rates are almost 100%, while the number of years of schooling is of the order of ten years. Schooling therefore carries about one-tenth the weight of literacy. This discrepancy was rectified from 1992 onwards by indexing the two components of the dimension to make them comparable and then weighting them on this basis, awarding a weight of two-thirds to literacy and one-third to the years of schooling.<sup>9</sup>

The UNDP stuck to this method of measuring development progress for the 1993 report, the first time it had not changed its methodology from one year to the next. The report discussed the advantages and weaknesses of the HDI at length; for understandable reasons, the description had strong justificatory overtones.<sup>10</sup> To that extent, the introduction of yet another version of the index the next year came as a surprise.

### The Fourth Version

The fundamental method of measuring the three dimensions remained unchanged for the 1994 report. What was new was the data base for the figures on national product, the replacement of the poverty level by worldwide average income and, especially, the change in the method of calculating the relative

position of a country in each of the three dimensions.<sup>11</sup> Whereas until then the points of reference for this purpose had been the values for the best and worst countries, absolute points of reference were now set for the first time.<sup>12</sup>

The advantage of this change, which had long been recognised in the literature, lies in the possibility of making comparisons of HDI values between periods for the first time.<sup>13</sup> Comparability had been impeded not only by the continual changes in the index formula but also by the changes in the points of reference, as can be illustrated by an example. With the old indices, in the theoretical extreme case in which only the worst country made progress the HDI values of all other countries fell and that of the worst country remained unchanged. Hence here progress was reflected in an almost universal decline in index values. This misleading property of the older versions of the HDI index – misleading because it was contrary to intuition – and the impossibility of making comparisons over time have probably been eliminated in the fourth version.<sup>14</sup>

Two new problems that should have been avoidable have “crept into” the latest version, however. First, there are surprising discrepancies in the data, and secondly the reasons given for the absolute points of reference chosen for the life expectancy dimension are not consistent with the arguments put forward the preceding year, without any explanation for the divergence.

### Data Discrepancies

The fact that there are data problems in the latest UNDP report is not immediately apparent but emerges only when one calculates the HDI values using the quoted base data and the stated index formula. The first problem is that a mathematical error

<sup>8</sup> See Harald Trabold-Nübler: *The Human Development Index – A New Development Indicator?*, in: *INTERECONOMICS*, Vol. 26, 1991, No. 5, pp. 236-243.

<sup>9</sup> The slip in the 1991 report can be seen from the fact that the original values were multiplied by these factors but without prior transformation of the components. This reduced the weight of schooling once more by half.

<sup>10</sup> See UNDP: *Human Development Report 1993*, Oxford, Oxford University Press, especially pp. 104 ff.

<sup>11</sup> The use of World Bank data instead of figures from the Penn World Tables was probably due to the more up-to-date nature of the former. On the other hand, the replacement of the poverty level in the industrialised countries by world average income was primarily a cosmetic correction, for after adjustment for the one-year extrapolation the new value is US\$ 5,120, about 3% higher than the old figure.

<sup>12</sup> For the values in question, see UNDP: *Human Development Report 1994*, op. cit., pp. 91 f.

<sup>13</sup> For more details, see Harald Trabold-Nübler, op. cit.; the *Human Development Report 1993*, pp. 108 f., had also discussed this procedure at length and in 1991 the UNDP had already used fixed points of reference for a longer time-span, but only related to the past.

<sup>14</sup> There nevertheless remains a problem with the measurement of national product when changing real world average income is adjusted, because the measurement procedures below and above this point are different.

may have been made in transforming incomes in accordance with the formula adopted by the UNDP, as the maximum income considered is not US\$ 40,000 but only just over US\$ 25,600.<sup>15</sup> The effects of this discrepancy are not serious, however. Leaving that aside, the second problem consists in differences in the final digit between the published and calculated data.

The latter discrepancies alone are to be found in 32 cases among the 173 countries considered, and in eight cases lead to a change in ranking. Five data discrepancies alone affect the first ten countries in the HDI ranking, leading to several changes in relative position. Rather embarrassingly, the leading two countries switch places (see Table 1).

A possible reason for this discrepancy between the published and calculated HDI values may lie in differences in the accuracy of the data. The stated index formula works universally to three places (always decimal places, in accordance with the procedure), but some of the input data in the report is rounded to fewer places.<sup>16</sup> Hence, rounding of the components can lead to a "false" aggregate value. Apart from this possible reason, it is of course conceivable that the data set for a particular dimension differs slightly from the published values because it has been updated.

Be that as it may: it is unsatisfactory if repeating the calculations using the stated formulae and data produces new HDI values and new rankings. If rounding really is partly to blame, care should be taken to ensure that the input values have at least the same degree of accuracy as the reported HDI values.

### Inconsistency of Argumentation

Apart from these discrepancies in the data, the latest version of the HDI also contains an unexplained inconsistency compared with the 1993 report. Both reports argue that the points of reference for ranking countries according to their level of development should be based on the observable and expected extreme values of a time span of about 60 years.<sup>17</sup> In concrete terms, this means that in the case of the life expectancy dimension, which generally shows measurable progress over time, countries are ranked

**Table 1**  
**HDI Values and Rankings of the Ten Leading Countries**

Country	UNDP <sup>1</sup>		Calculated <sup>2</sup>	
	HDI	Rank	HDI	Rank
Canada	0,932	1	0,931	2
Switzerland	0,931	2	0,932	1
Japan	0,929	3	0,929	3,5
Sweden	0,928	4	0,928	5
Norway	0,928	5	0,929	3,5
France	0,927	6	0,926	7
Australia	0,926	7	0,927	6
USA	0,925	8	0,925	8
Netherlands	0,923	9	0,923	9
United Kingdom	0,919	10	0,919	10

<sup>1</sup> HDI and ranking according to UNDP: Human Development Report 1994.

<sup>2</sup> Values and rankings recalculated according to the "Technical Notes".

Discrepancy between reported and calculated HDI values.

between the lowest life expectancy among all countries about 30 years ago and the highest (for another country) about 30 years hence.

The values used by the UNDP in 1994 give a range from 25 to 85 years. This contradicts the data of the previous year, when the agency had used the same argument to claim that a range from 35 to 85 years was reasonable. It was also mentioned that these extreme values could be even further apart when considered on a disaggregated basis, so that the lower minimum makes sense. But why is the upper limit not also raised for the same reason, given that female life expectancy in Japan and Switzerland, for example, is already 82 years?<sup>18</sup>

Admittedly this is not a very serious defect, but different ranges and points of reference affect countries differently and therefore alter their ranking. For example, if the range of life expectancy were merely lengthened from 25-85 years to 25-90 years, as many as 57 of the 173 countries would change places.

However troublesome these new problems in the 1994 version may be, they are marginal compared with certain fundamental question-marks over the HDI, which, it should be noted, do not invalidate the

<sup>15</sup> The UNDP bases its calculations on a transformed maximum income value of US\$ 5,385, which converts to just over US\$ 25,600. The true figure should be US\$ 5,449.

<sup>16</sup> See UNDP: Human Development Report 1994, op. cit., p. 108 with regard to the index formula and pp. 129 ff. on the rounded data.

<sup>17</sup> See UNDP: Human Development Report 1993, op. cit., p. 109 (the quotation from Anand and Sen), and UNDP: Human Development Report 1994, op. cit., p. 92.

<sup>18</sup> See World Bank: World Development Report 1994, Oxford, Oxford University Press, p. 219.

notion of a composite social indicator as such.<sup>19</sup> At least four weaknesses can be identified that could be improved: lack of uniformity in the discounting of national product, lack of uniformity in the handling of declining marginal utility, the exclusion of civil liberties from the definition of "human development", and a methodologically inadmissible mixing of cardinal and ordinal measurement.

#### Lack of Uniformity in the Discounting of GDP

The method chosen by the UNDP for discounting income above the poverty level for industrialised countries (from 1991 to 1993) or above world average income (since 1994) was attacked by Trabold-Nübler on methodological grounds. Its main weakness stems from the use of different versions of the Atkinson formula for different intervals.<sup>20</sup> As a result of this procedure, the notion of declining marginal utility applies only within each interval, which is determined as a multiple of world average income, the threshold value. At the transition from each multiple to the next there is a substantial increase in marginal utility. This

can be illustrated diagrammatically by plotting the partial HDI value determined by GDP against GDP itself (see Figure 2).<sup>21</sup>

Even if the effect of this lack of differentiation in the function type may not be very large, it is nevertheless analytically misleading and avoidable.<sup>22</sup> As recently as 1993 the UNDP described a uniformly logarithmic discounting of income as offering a "strong challenge" to the agency's own procedure.<sup>23</sup>

#### Declining Marginal Utility

The very sharp discounting of increases in income above the poverty line has been much criticised in the literature, but the basic principle of declining marginal utility has been accepted. It must be asked, however, why it should apply only to the income dimension. From the economist's point of view, declining marginal utility can be attributed to all goods.

In the specific context of the HDI, it seems at least worthy of discussion why the same principle should

<sup>19</sup> Fundamental problems of the HDI relate to the accuracy of data measurement, the measurability of the dimensions, the choice of the dimensions and every form of aggregation, which strictly speaking should be different for each country or even each individual.

<sup>20</sup> See Harald Trabold-Nübler, op. cit., p. 240; for an example of the use of the Atkinson formulae defined for different intervals, see UNDP: Human Development Report 1993, op. cit., p. 108.

<sup>21</sup> In view of the equal weighting of the three dimensions, even the maximum income cannot contribute more than one-third to the HDI.

<sup>22</sup> Moreover, the HDI value becomes dependent on the underlying unit of calculation. In other words, calculations in D-Mark instead of US dollars produce different results; for example, with calculations in units of US\$ 1,000, declining marginal utility even gives way to rising marginal utility above 1.63 times world average income (1.63 being the natural logarithm of 5.12).

<sup>23</sup> See UNDP: Human Development Report 1993, op. cit., p. 107.

Helen Winter

### Interdependenzen zwischen Industriepolitik und Handelspolitik der Europäischen Gemeinschaft

It is worth analyzing the various and often subtle connections between industrial policy and trade policy, because these policies are becoming more important and they are used as substitutes or as complements to one another. After defining both policies and their relationships, the study examines the industrial and trade policy of the EC as a whole.

The key targets of industrial policy are to prevent or promote structural change and to improve international competitiveness. The various instruments of European industrial policy are designed to deal with international problems, but they also influence the trade relationships between other countries.

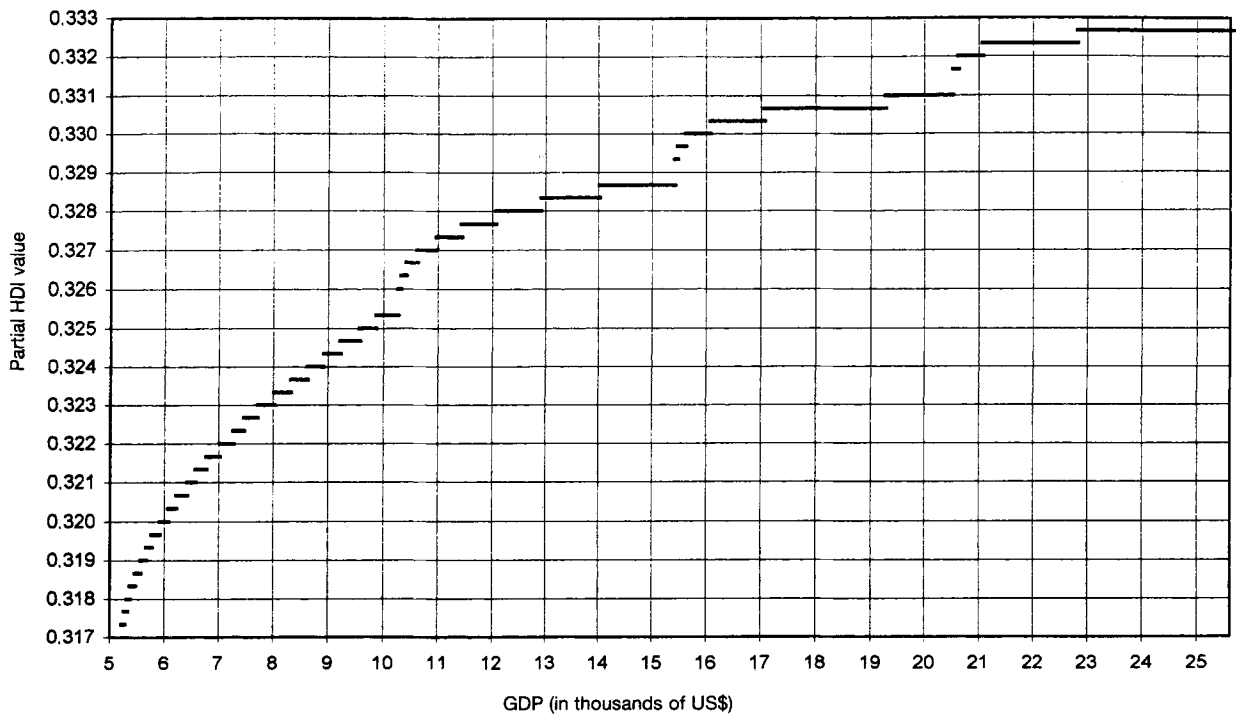
In addition to that, the EC uses trade policy instruments as some kind of industrial policy, or to protect industrial policy. This is sometimes cheaper as subsidies. But in some cases industrial policy substitutes trade policy because the application of traditional trade policy instruments is restricted by international agreements.

■ The book is published in German.

1994, 279 p., hardback, 89,- DM, 694,50 öS, 89,- sFr, ISBN 3-7890-3505-X  
(Integration Europas und Ordnung der Weltwirtschaft, Bd. 4)

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Figure 2  
Contribution of GDP to the HDI Value



not also apply to educational attainment. The UNDP does not elaborate on the substitution ratio between the three dimensions, but it clearly exists: for example, it is implicitly assumed that a doubling of per capita income in relation to world average income – from about US\$ 5,000 to 10,000 – represents the same progress as a lengthening of the period of schooling by about a year. This supposition may already be considered debatable at the level of elementary schooling, and very few people would agree with it in cases where schooling lasted many years.

This is not a purely theoretical debate, as two examples will serve to demonstrate. Poland represents the case of a country with a per capita income of US\$ 4,500 and a length of schooling of over eight years. Its counterpart is represented by Singapore, with a per capita income of just under US\$ 15,000 and an average of four years of schooling.<sup>24</sup>

Applying the notion of declining marginal utility to life expectancy may sound heretical,<sup>25</sup> but in everyday life it can be seen that although people regard life as their greatest asset they do not do everything to prolong it as much as possible, as the HDI implicitly suggests. For example, a normal level of tobacco

smoking reduces the statistical average life expectancy by several years. In certain circumstances this "irrational behaviour" can be interpreted as meaning that for large sections of the population there are desirable enjoyments that can be purchased and which are a trade-off against life expectancy.

We believe it would be advisable to apply the principle of declining marginal utility to all three dimensions, given the aim of treating them equally. The way in which this would be done would then have to be decided; for example, discounting could be continuous, or there could be a cut-off point set in relation to the meeting of basic needs.

### Freedom and Development

It is disappointing that a UN organisation, of all bodies, can continue to propose a measurement of human development that imperfectly reflects the fundamental human rights advocated by the United

<sup>24</sup> The figures are given in UNDP: Human Development Report 1994, op. cit., p. 129; for Singapore, see also Peter Smith: Measuring Human Development, in: Asian Economic Journal, Vol. 7, 1993, No. 1, pp. 89-106.

<sup>25</sup> In this vein see also T.N. Srinivasan, op. cit., p. 240.

Nations. We shall not go into the various reasons put forward for not taking account of (political) freedom, such as poor data,<sup>26</sup> but quote a reference in the 1993 UNDP Report that is enlightening in this regard: "Further work is needed, preferably by academics who can look at this question in an environment free from international political pressures".<sup>27</sup> In fact, Dasgupta and Weale have carried out just such an extension of the HDI, which produces considerable changes in many rankings.<sup>28</sup> One prominent change, for example, is the sharp fall in the ranking of China, which according to the 1994 HDI registers the largest rise by comparison with the ranking of countries according to GDP.

The existing HDI perpetuates the unsatisfactory situation that had already been reached in the debate about development indicators in the seventies: "Then it was recognised that material basic needs could be met in prison".<sup>29</sup>

### Cardinal Measurement?

The last central design problem that has permeated the HDI throughout its five-year existence stems from the mixing of cardinal and ordinal measurements. In view of its design, the HDI is based clearly on the notion of the cardinal measurability of the three dimensions. This naturally also implies gradual interchangeability. Furthermore, a doubling of the HDI would then also indicate a doubling of the level of development.

The UNDP shies away from such interpretations, however, with good reason. Instead, it repeatedly emphasises the ordinal nature of its measure, which indicates something about the ranking of countries. For example, the latest report describes its usefulness in terms of "measuring the relative socio-economic progress of nations".<sup>30</sup> At first sight this may appear to be a modest interpretation in order to leave a sort of "safety margin". It could appear that cardinal data were evaluated "only" in an ordinal manner. In fact, the question that should be asked is whether the degree of accuracy with which the cardinal measurement of the three dimensions is carried out is not itself an illusion.

The methodological problem is that it is quite permissible to interpret cardinal data in an ordinal manner, but not permissible to aggregate ordinal data as though they were cardinal. This places excessive strain on the data base. The results, unless they happen to coincide with an appropriate processing of ordinal information, are therefore statistical figments, which are no longer capable of interpretation.

As a consequence, it is probably preferable to treat the information purely in ordinal terms, as for example Dasgupta and Weale do without further explanation.<sup>31</sup> On the other hand, if one were determined to work with cardinal information, the UNDP would have to explicitly accept the interchangeability that is now only implicit and justify the relationships between the dimensions. It is inevitable that such a measurement will not enjoy the same acceptance as a purely ordinal consideration.

### Conclusion

The UNDP has published its HDI values for most countries of the world for the past five years. It claims the index provides information that goes beyond the widely-used GDP data and is relevant for policy-making. Critical examination shows that the index does not yet live up to this claim, although the fourth version of the HDI is the most convincing so far.

Essentially, the HDI has suffered from being constantly modified and hence neither reliable nor comparable over time. In addition, the slipshod way in which the HDI has been produced has damaged its reputation: the poor power of discrimination in 1990, the aggregation error in 1991, the lack of comparability over time until 1993, discrepancies between published and calculated data in 1994, abrupt or unrepeatable changes in argumentation from 1993 to 1994, avoidable lack of uniformity in the function type, the mixing of cardinal and ordinal elements, and so forth.

To summarise, the high claims made by the UNDP easily suggest an overinterpretation of the HDI. In view of the design problems that have still not been resolved, it is to be hoped that the index will be radically revised, contrary to the intentions of the UNDP;<sup>32</sup> the fifth première should come soon.

<sup>26</sup> See also Paul Streeten: Human Development: Means and Ends, in: *American Economic Review*, Vol. 84, 1994, No. 2, pp. 232-237, here p. 236.

<sup>27</sup> UNDP: Human Development Report 1993, op. cit., p. 105.

<sup>28</sup> See Partha Dasgupta and Martin Weale: On Measuring the Quality of Life, in: *World Development*, Vol. 20, 1992, No. 1, pp. 119-131.

<sup>29</sup> See Michael Hopkins: Human Development Revisited: A New UNDP Report, in: *World Development*, Vol. 19, 1991, No. 10, pp. 1469-1473, here p. 1471.

<sup>30</sup> UNDP: Human Development Report 1994, op. cit., p. 91.

<sup>31</sup> See Partha Dasgupta and Martin Weale, op. cit.

<sup>32</sup> See UNDP: Human Development Report 1994, op. cit., p. 92.