The needs of developing countries

The Needs of Developing Contries

Besoins des régions en développement

Bedürfnisse der Entwicklungsgebiete

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SUMMARY
The basic material and non-material needs are defined, and dimensions of inequalities are listed in terms of 27 economic and social indicators. Factors limiting the growth capacity of present economic systems, and possible extensions of the growth potential are discussed on the basis of five reference scenarios within the time horizon of 1975 to 2020 relating growth rates of population, GNP and energy use. It is stated that the industrial countries will not be capable and willing to support substantially the development of the Less Developed Countries as long as they have not solved their employment, inflation and energy problems.

RESUME
Les besoins fondamentaux matériels et immatériels sont définis et l'échelle des inégalités est illustrée par 27 indicateurs économiques et sociaux. Des facteurs limitant la capacité d'accroissement des systèmes économiques actuels et des développements possibles du potentiel d'accroissement sont discutés sur la base de cinq scénarios pour la période de 1975 à 2020; on fait appel à l'évaluation de l'accroissement de la population, des produits sociaux bruts et de la consommation d'énergie. On constate que les pays industrialisés ne seront ni en mesure ni disposés à supporter de façon considérable le développement de pays moins développés, tant qu'ils n'auront pas trouvé une solution à leurs problèmes d'emplois, d'inflation et d'énergie.

ZUSAMMENFASSUNG
Die grundlegenden materiellen und nicht-materiellen Bedürfnisse werden definiert und die Menge der Ungleichungen wird anhand von 27 ökonomischen und sozialen Indikationen dargestellt. Faktoren, welche das Wachstum der heutigen wirtschaftlichen Systeme beschränken und mögliche Erweiterungen dieser Wachstumsbeschränkungen werden aufgrund von fünf Szenarios für den Zeitraum von 1975 bis 2020 diskutiert. Dazu werden Bevölkerungswachstumsraten, Bruttosozialprodukte und Energieverbrauch verwendet. Es wird festgestellt, dass die Industrieländer nicht imstande und willens sind, die Entwicklungsländer wesentlich zu fördern, solange sie ihre eigenen Beschäftigungs-, Inflations- und Energieprobleme nicht gelöst haben.

1. THE NEEDS DEFINED

The basic material needs and the non-material needs are defined, by most international organisations and by individual researchers, as follows:

Basic Material Requirements

Nutrition:

3'000 cal. per person, day
100 gr. protein per person, day

Education:

8 years min.
12 years max.

Housing:

7 m^2 per person

Non-Material Needs

personal growth

diversity

equity

social justice

autonomy

solidarity

participation

ecological balance

However, at our present social discount rate which overestimates the immediate satisfaction of needs and underestimates future needs, these two sets of goals are - in the short run - mutually exclusive. The problem therefore is to minimize the required time for the attainment of the material goals without falling short in the fulfilment of the non-material needs. Although the non-material needs are difficult to measure, there are many indicators allowing for an indirect measurement.

2. THE DIMENSIONS OF INEQUALITY

The existence of inter- and intranational inequalities is in itself an indicator of the failure of our economic system to accommodate material and non-material needs. The inequalities, expressed in ratios, are not confined to per capita income, energy consumption or to the supply of food. They extend into many other areas of social life. In the following table some of the important indicators are listed:

Table 1:

The present situation: (1970 data)*

	Max.	Min.	Ratio	No. of Countries
Calories per day, person	3'420 (Ireland)	1'700 (Tansania)	1:2	98
Protein of non-animal origin, gr. per day, person	108,7 (Mongolia)	32,7 (Zaire)	1:3,3	98

	Max.	Min.	Ratio	No. of Countries
Infant mortality, rate per 1'000 live births	200 (Ethiopia)	11 (Sweden)	1:18	65
Expectation of life at birth	74,9 (Sweden)	38,1 (Ethiopia)	1:2	76
Crude death rate per 1'000 POP	26,8 (Ethiopia)	5,2 (Singapore)	1:5	78
Death rate due to infectious and paras. diseases per 100'000 pers.	595,2 (Guatemala)	6 (Canada)	1:99	47
Literate as % of tot. POP 15 and over	99,0 (USA)	12,1 (Mozambique)	1:8	65
Percent of POP 6-11 enroled at school	100 (many European countries, Japan, Cuba, Australia, New Zealand, etc.)	10,0 (Ethiopia)	1:10	89
Higher educ. enrolment per 10'000 POP 20-29	275 (USA)	0,3 (Centr.Afr. Rep.)	1:917	97
Average number of persons per room	3,1 (El Salvador)	0,6 (Can.,USA)	1:5	44
Dwellings with piped water as % of total dwellings	100 (many developed countries)	0,3 (Mongolia)	1:333	39
Dwellings with electricity as % of total dwellings	100 (many developed countries)	6,1 (Indonesia)	1:17	39
Water supply: % of POP with reasonable access	100 (many developed countries)	2 (Burundi)	1:50	84
Telephones per 100'000 POP	58'677 (USA)	53 (Nepal)	1:1'107	111
Radio receivers per 1'000 POP	1'415 (USA)	3 (Zaire)	1:472	111
TV-receivers per 1'000 POP	413 (USA)	0 (many LDC)	-	90

	Max.	Min.	Ratio	No. of Countries
Agricult. production per (male) worker at current prices, in US $ (purchasers value)	11'490 (USA)	150 (Niger)	1:76,6	70
Fertilizer consumption kg/ha arable land	886,8 (USA)	0,1 (Upper Volta)	1:8'868	81
Electricity consumption per capita in kWH	14'643 (USA)	3 (Yemen, A.R.)	1:488	116
Steel consumption cap. in kg	734 (Sweden)	1 (Niger, Somalia)	1:734	108
Cement consumption cap. in kg	2'328 (Hong Kong)	3 (Mali)	1:776	106
Energy cons./ cap. in kg coal equivalent	11'123 (USA)	8 (Burundi)	1:1390	115
GDP derived from industry as % of total GDP	66 (Saudi Arabia)	4 (Burundi)	1:16,5	91
Manuf. prod. per person active in manufacturing (in 1970 US $)	12'390 (USA)	430 (India) (no data for most of the African countries)	1:29	45
Foreign trade (EX+IMP) per cap. in US $	2'297 (Belgium)	8 (India)	1:287	111
GDP/cap. at curr. prices in US $	4'880 (USA)	55 (Mali)	1:88	109
Savings as % of National Income	34 (Libia)	3 (Vietnam)	1:11	51

*Source: Research Data Bank of Development Indicators, Vol. II, UN Research Institute for Social Development (UNRISD), Geneva 1976

From these dimensions of inequality we may derive the tremendous absorption potential in areas of construction, water supply and other infrastructure investments - to name just a few - which exists in the Less Developed Countries (LDC) and which could be supplied by the industrial countries, provided the LDCs could either pay for it or acquire enough loans. Here, the complex problem of foreign aid and the future international division of labor inters the scene. If the LDCs are expected to pay for their imports, they must be given the chance of placing their exports in the Industrial Countries, which consequently would have to give up certain industries. We all know that any decision taken by governments to change the industrial structure is politically very sensitive. The envisaged combination of Western technological know-how with Arab money and low wages in the LDCs did not yet contribute to narrowing the existing inequalities.

3. THE CORE OF THE PROBLEM

Although there exists a nearly inexhaustible potential for growth in order to satisfy the needs of the Developing Countries, there also exist some limiting factors which determine the speed, i.e. the rate of growth attainable at a given technology, and hence the time needed until a certain amount of needs can be accommodated. The relationship between growth, employment, distribution, use of resources and inflation is determined by a complex set of economic interactions which cannot be easily evaded without a profound change of our existing economic and political system.

The factors limiting our growth capacity:	Possible extensions:
1. Renewable resources	recycling
2. Non-renewable resources (fossil fuels)	substitution by other energy sources (solar, nuclear, hydro, geotherm. wind, tides, etc.)
3. Agricultural area	land reclamation, increase of productivity by fertilizers, mechanization, high yield varieties, water management, desalination of sea water, etc.
4. Pollution	abatement technologies, environmental protection

All extensions require more energy. In addition, increased requirements for housing, transport & communication, increased industrialization etc. in conjecture with increased growth rates in the LDCs require an overproportional extension of the energy system both in industrial countries and in the LDCs. This in turn implies an increased investment ratio from todays 20 to at least 40% of GDP.

This follows from the fact that at any given technology any energy generating and transforming system, even in a stationary state, will itself use up energy in two ways. First, energy is directly absorbed in the transformation of one form of energy into another. Secondly, energy is indirectly absorbed by the system through the energy required to produce materials needed for reinvestment. In a growing economy with an increasing total consumption of primary energy, the long lead times of investment make the energy generating and transforming systems absorb even more energy. Thus, even with physically unlimited energy resources, the growth rates of the two systems, the energy generating/transforming system and the non-energy production system of the economy are mutually interdependent: one system cannot "outgrow" the other. This situation can be visualized as follows:

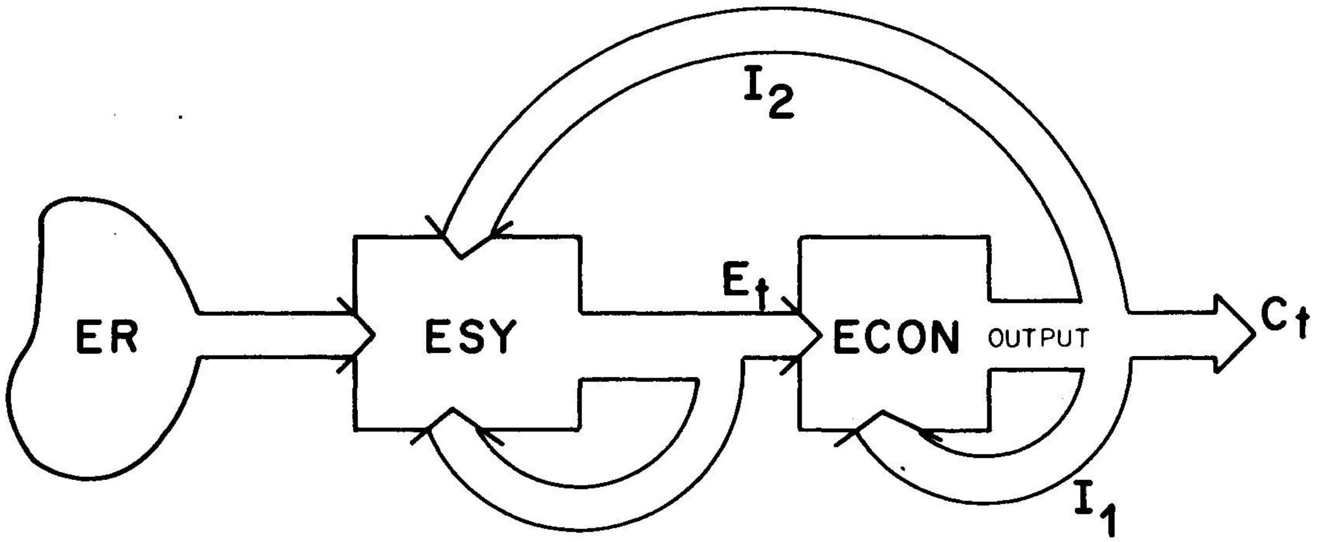

Figure 1

Given the following variables:

Y_o = initial income, Y_t = income at time t,

C_t = consumption at time t, I_1 = investment in the energy system,

I_2 = investment in the non-energy system, I = total investment (= $I_1 + I_2$),

E_t = energy production in time t, (= σI_2), K = lead time of investment

α = fraction of income used for consumption,

λ = fraction of unconsumed income going into the energy system,

σ = productivity of investments in the energy system,

we can determine the ratio

$$\frac{E_t}{C_t}$$

by using the following definitions and relationships:

$$C_t = \alpha Y_o \cdot e^{rt}$$

$$C_{t-K} = \alpha Y_o e^{r(t-K)}$$

$$I_2 = \lambda(1-\alpha)Y_o e^{r(t-K)}$$

$$E_t = \sigma_t I_2$$

$$\sigma_t = \sigma_o e^{r't}$$

$$\frac{E_t}{C_t} = \frac{\sigma_o e^{r't}\lambda(1-\alpha)Y_o e^{r(t-k)}}{\alpha Y_o e^{rt}} = \frac{\sigma_o e^{r't} \cdot \lambda(1-\alpha)}{\alpha e^{rk}}$$

Thus the fraction of production going into the energy system, together with σ, the growth rate of the economy and the lead time of investment, determines the ratio E_t/C_t. Since both λ as well as σ depend, among other factors, upon the technology available, the most important parameters influencing the ratio E_t/C_t are the rate of technical progress and the growth rate of the economy. Assuming that there is a positive correlation between the growth rate of the economy and technical progress, and assuming that λ is a decreasing and σ an increasing function of technical progress, one could envisage an equilibrium position between the growing demand for energy in a growing economy and the increased efficiency of the energy generation and transformation processes, thus keeping the net share of investment going into the expansion of the energy system as a percentage of total investment constant. For the time being, we are still far from achieving such a dynamic equilibrium.

The strategic factors in the whole set of relations which I cannot elaborate here in more details, are therefore the following:

- Investment rate
- The productivity of investments (capital/output ratio)
- Technical progress
- Proportion of investments going into energy systems
- The lead time of investments
- The efficiency of energy use (W/$): offseting factors:
  increase of efficiency vs. increasing share of
  industrial production in the LDCs
- Energy conservation
- The relation between attainable and expected increase of disposable income (social discount rate)

4. THE REFERENCE SCENARIOS

In order to solve their own economic problems, such as unemployment, inflation, resource availability etc., and in order to achieve an improvement in the intra- as well as in the international distribution of income, the industrial countries of the West (Market economies) have to continue growing. However, whereas growth may ease some of the short run problems, it causes, at the same time, in the long run, additional problems such as resource scarcities and hence price increases - which by no means are always offset by a corresponding increase of productivity -, environmental disruptions, energy shortages etc.

The following five reference scenarios (Table 2) - not to be mistaken for forecasts - reflect some of the magnitudes involved in various assumptions about growth rates of population (POP) and Gross National Product (GNP) within the time horizon of 2020. These various scenarios are presented on the background of our present situation which is given by $4*10^9$ POP, $5,3*10^{12}$\$ GNP and $7,6*10^{12}$W (=7,6 Terra Watt [TW]), and by historical growth rates of 2% p.a. for POP and 4-5% p.a. for GNP in real terms.

Scenario A reflects UN-estimates and targets proposed in various UN-publications. The target growth rate for the GNP is a weighted average rate composed of the target rates of various world regions. The point I wish to make here refers to the implications of such target values: if population is assumed to stabilize somewhere between 9 and 10 billion in 2020 (which is the figure given most frequently), and if the GNP-growth rate envisaged should really achieve 4% p.a. (the historical rate), we then would arrive in 2020 at a world GNP of $31*10^{12}$\$ and - at the given efficiency of energy use of 1,43 W per \$ of output - at an energy requirement of $44,3*10^{12}$W, i.e. 44,3 TW which represents nearly six times the present energy consumption. There is no question that this required power cannot be provided by the classical fossil fuels any more. Rather new energy sources must be made available. This in turn requires additional investment capital which has to be generated within the developed industrial countries[1].

Scenario B refers to the estimates resulting from the Bariloche Model which is a World Model presented by a group of scientists from Latin America[2]. This model is based upon the above mentioned definitions of basic needs. It is normative and redistribution oriented, however, it requires also growth. The implicit energy requirements of this scenario amount to 19,2 TW in 2020, i.e. to more than 2,5 times the amount of present energy consumption.

Scenarios C and D simply show what the values for GNP and POP would be if a growth rate of 3 and 2 per cent p.a. would be assumed for these two variables respectively, and what - at the historical efficiency rate - the corresponding energy requirements are. Again, even at a GNP-growth rate of only 2% p.a. - which certainly is insufficient to absorb the growing numbers of people looking for jobs - we are faced with an increase of total energy requirements of 2,43 times the amount of our present energy consumption.

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1) Estimates about the future capital requirements of alternative energy strategies were presented by the author at the 5th World Congress of the International Economic Association, August 29 - September 3, 1977, in Tokyo. See: B. Fritsch, Future Capital Requirements of Alternative Energy Strategies, Global Perspectives, Tokyo, 1977.

2) A.O. Herrera, H.D. Scolnik, Catastrophe or New Society? A Latin American World Model, International Development Research Center, Ottawa, 1976.

Scenario E finally represents the most unlikely case - it may be referred to as the "dream scenario" - since it assumes an increase in the efficiency of energy use by more than 50% and an increase of POP of only 1,5%. Even here we are confronted - however at 3% GNP growth rate - with the same increase of the total energy requirements.

YEAR	WORLD POPULATION (in Billions)	WORLD GNP (at 1975 prices) (in US $)	WORLD ENERGY CONSUMPTION (in TW=10^{12}W at 1.43 W/$	PER CAPITA ENERGY CONSUMPTION (in kW)
1975	4,0	$5,3 * 10^{12}$	7,6	1,9
2020 Reference Scenarios:				
A Various UN-estimates and targets, e.g. GNP-growth rate of 4% p.a. and POP growth rate of less than 1,9% p.a.	9,0	$31 * 10^{12}$	44,3	4,92
B The Bariloche Model	9,3	$13,4 * 10^{12}$	19,2	2,06
C With 3% growth rates p.a. for POP and GNP	15,1	$20,0 * 10^{12}$	28,6	1,9
D With 2% growth rates p.a. for POP and GNP	9,7	$12,9 * 10^{12}$	18,5	1,9
E with 3% growth rate for GNP, 2% growth rate for ENCON, 1,5% growth rate for POP	7,8	$20 * 10^{12}$	18,5	2,4
		increase in efficiency from 1,43 to 0,93 W/$		

Table 2

5. CONCLUSIONS

It is evident that something must give way: either the growth rate of GNP and/or the efficiency of energy use, expressed in the W/$ ratio must drastically increase, and/or the private consumption expenditures must be curtailed while the investment rate has to go up. In this context, the following concepts are important:

- rising costs for foregone opportunities (threshold values, trajectories),
- the "Quantum Jump" of the "Postindustrial Societies", and
- the learning capacity of complex societal systems (catalytic crisis) - the price of learning.

The ultimate scarce goods are:

- time
- options
- future oriented values
- capital formation

The International Association for Bridge and Structural Engineering has decided to devote the present symposium to problems associated with design and construction in developing countries. It has expressed its concern with the needs of the developing countries. I am afraid that - in the long run - the industrial countries will not be in the position to provide the urgently needed help to the less developed countries unless they achieve the impending "quantum jump" in their own energy supply system. If the industrial countries should fail to achieve higher employment, less inflation and a higher investment rate with no drastic balance of payments disequilibria, and if they fail to remain, at the same time, within the boundaries of the overall ecological equilibrium, then social unrest will follow and the political climate required for an additional support of the less developed countries will continue to deteriorate.