SUSTAINABLE DEVELOPMENT – BEHAVIORAL CHANGES WITH A VIEW TO A MORE SUSTAINABLE FUTURE

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ABSTRACT

The title clearly splits in three different parts. Above all: Sustainable Development. As an introduction, the first part of the paper will be influenced by the work of Donella Meadows and Dennis Meadows, which has been done in the seventies of the last century. The findings, based on a computer model, earlier developed by Jay W. Forrester, set the foundation for a book, published in 1972. "The Limits of Growth" has been criticized, mainly because of incorrect predictions. Even though the direction of worldwide developments published in the book is right there have been deviations in the dimension of several parameters. In order to correct this, the book has been updated 30 and 40 years later.

Other authors, who the paper refers to, are the economists Tim Jackson and Herman Daly, as well as the German post-growth economist Niko Paech. Since the term "Sustainable Development" means a wide range of possible interpretations, this definition is fundamental at the beginning.

According to behavioral changes it needs to be worked out who has to change the way of living in a non-sustainable setup and, even more important, why. The American scientist Jared M. Diamond has done a whole lot of research regarding the possibility of catastrophic near-future consequences to mankind which many of us have to endure already, especially in poor countries. In order to get an idea why sustainability is a good choice, several concepts will be considered. A very important concept to measure fairness is the ecological footprint. It measures the human demand on the Earth's resources and is distributed highly unfair between monetary rich and poor countries. Based on the results of Kate Pickett's work "The Spirit level - Why More Equal Societies Almost Always Do Better", published in 2009, worldwide fairness will be proven to be the only way to a global sustainable development.

After the definition of "A sustainable future" has been done, the last part of the paper deals with the accuracy of predictions and the limits of models. Do mathematical models, even highly sophisticated, really describe reality in a sufficient way? Certainly not! Yet, we are not even able to describe a comparatively simple subsystem as the weather. It is just too complex to be predicted for as little as just a few days in advance. Besides that a few more questions will be considered. Since we know that systems are adaptable one can argue that today nobody cares about the fall of Easter Island. People have learned to deal with the different situation and abandoned the Island. Indeed not voluntarily at all. What we could learn as society for our present situation is: To exclude the possibility that mankind will settle other planets one day would certainly be wrong. To assume it will happen within the next days too. Considering that the earth will be there for about another

three billion years it is safe to say that we are not in a hurry. At least for the construction of space ships there is plenty of time left. But since this is a very unlikely case it needs a real plan A.

Therefore the biggest challenge in Governing the Anthropocene is to be aware of the large impact of our behavior. This large impact goes hand in hand with a large responsibility. It is our turn now to act in a way that living conditions on our one planet either stay as good as they are or -even better - improve.

Keywords: Anthropocene; Sustainability; Growth; Future

INTRODUCTION

Through the industrialization of the Western world, especially during the past century, there have been a large number of new challenges that humanity faces today. Many issues could not be anticipated, while others were apparent right at the moment they got used for the first time. For example: nuclear energy. At the time at which the first barrel of oil has been exploited, this resource began to run low. On the other hand, it is obvious that consequences of the extensive use of fossil fuels, most notably climate change, were not foreseeable for all those, involved at the beginning of the industrial revolution. The presence is different. Especially the Western world differs enormously from the days at the beginning of the last century. Although people do comparatively better understand the consequences of their actions today, it seems as if our hands are tied. Are we really caught in the system?

A life in abundance, which is based on a non-sustainable use of practically all resources from the forest to water, land use and oil, as it is done in most developed countries, starts to spread slowly over the populous emerging and developing countries. The wonderful ability of our planet to renew resources, used by humanity, gets reduced. Out of all species, this reduction is caused by mankind itself. Rising temperatures and sea levels, extreme rapid melting of the earth largest ice sheets, the decimation of (origin) forests and of species diversity, at least 50 species are currently the earth per day forever lost, as noted by McKinney, Schoch & Yonavjak (McKinney, Schoch & Yonavjak, 2007 p.320). These are just a few examples for possible consequences we will have to deal with.

The publication of “The Limits to Growth” by Meadows, Meadows & Randers (Meadows, Meadows & Randers, 1972) marked a milestone in the development of awareness of sustainability. It was written after commission of the Club of Rome, a non-profit organization with headquarters in Switzerland. The object was not less than gaining common concern and responsibility for the future of humanity, as well as building a just, sustainable and peaceful global society in the 21st Century.

The content of the book is mainly based on the findings of a relatively young scientific discipline, in the sixties and seventies in the last century. Jay W. Forrester, a professor at MIT, co-founded the field of system dynamics (Hungenberg, 2004, p.9). The findings of the Meadows are basically based on Forrester's "world model". They developed it further, in order to create an advanced computer model. This model should be fed with

parameters in order to predict the development of the world according to different scenarios. These parameters are:

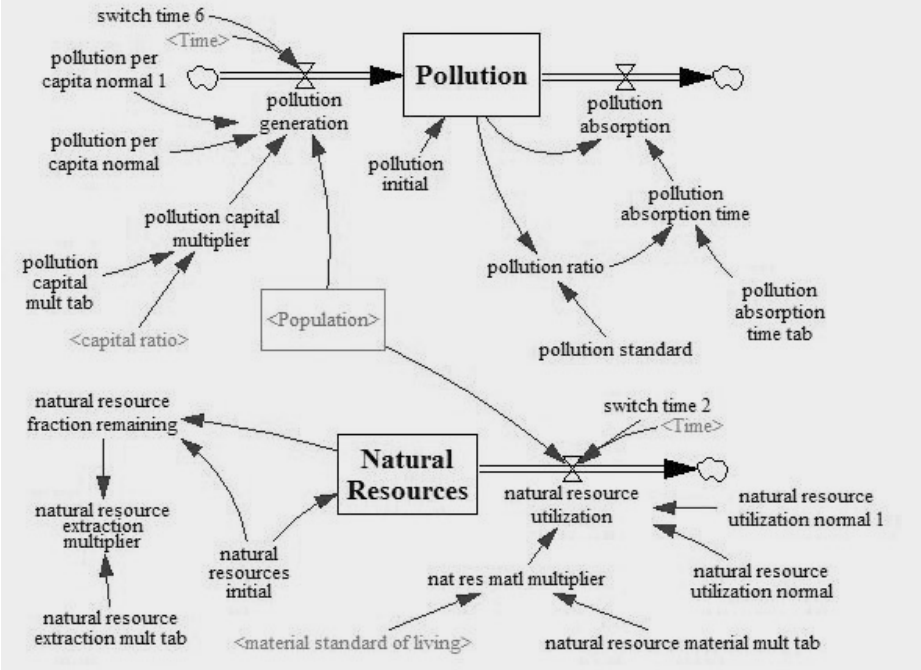

Figure 1: Non-renewable natural resources system / pollution

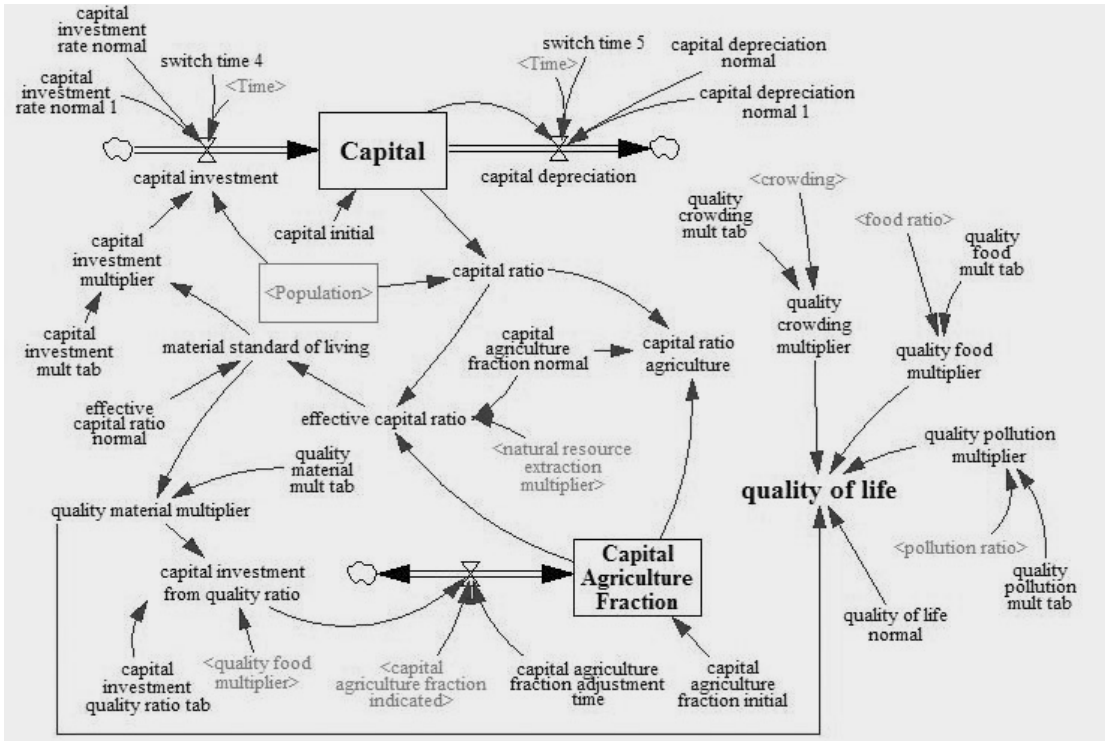

Figure 2: Capital, industrial system / food production and agriculture

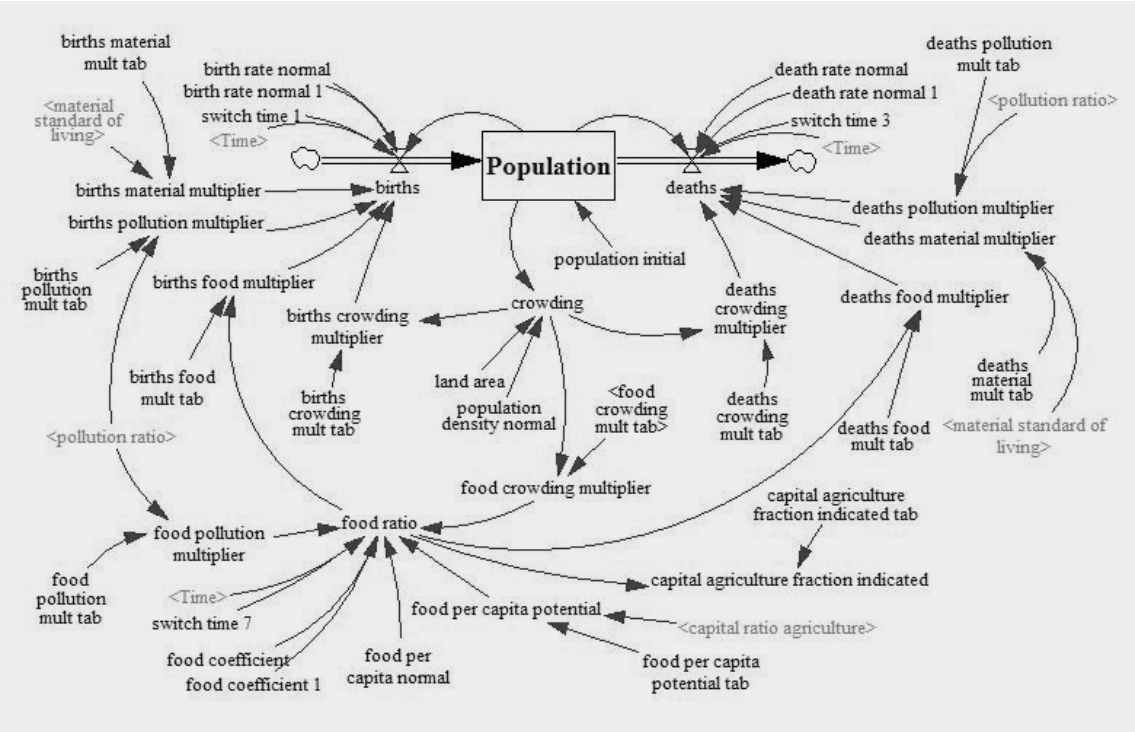

Figure 3: Population system

Since its appearance, The Limits to Growth produced a lot of controversy. Wilfred Beckerman from Balliol College, Oxford University called it in an article in the Oxford Economic Papers as a "brazen, impudent piece of nonsense". Henry Wallich, professor of economics at the American University of Yale, comes to the conclusion that it is "a piece of irresponsible nonsense" (Bardi, 2011, p.50). Today both, the based model as well as the book itself have undergone three major revisions. Developments of the past years have been integrated and new insights according to natural resources were incorporated as written in Meadows, Meadows & Randers (Meadows, Meadows & Randers, 2006). Besides that, Graham Turner, from the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) came out with a study that compares already known developments with the forecasts in 1972. Turner concluded with a completely different result, compared to the assessments of Wallich and Becker 30 years earlier. „Given the high impact of the LtG (Limits to Growth) and the implications of their findings it is surprising that such a comparison has not been made previously. This may be due to the effectiveness of the many false critisms attempting to discredit the LtG. As shown, the observed historical data for 1970-2000 most closely matches the simulated results of the LtG standard run scenario for almost all the outputs reported; this scenario results in global collapse before the middle of this century." as indicated in his report *A comparison of the limits of growth with thirty years of reality* (Turner, 2008, p.37). Regardless of the forecasts success rate achieved in the book, there is no question that the work has made a great contribution, to draw to the attention of the public onto sustainability. In comparison with LtG, a way more complex study, with 24 parameters was done on the authority of the United Nations in the year 2001. The main outcomes of the Millennium Ecosystem Assessment Synthesis Report are:

Behavioural changes with a view to a more sustainable future

- The rapidly growing demand for food, water, timber, fibre and energy led to a substantial and largely irreversible loss in diversity of life on Earth.
- Degradation of many ecosystem services, increased risk of nonlinear changes, and rise of poverty among parts of the population represent major challenges. If we manage to overcome these challenge, future generations will be able to obtain benefits from ecosystems in the future.
- The degradation of ecosystem services could become significantly worse in the first half of this century. This is a barrier in achieving the Millennium Development Goals.
- The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios that the MA has considered, but these involve significant changes in policies, institutions, and practices that are not currently under way. Many options exist to conserve or enhance specific ecosystem services in ways that reduce negative trade-offs or that provide positive synergies with other ecosystem services. *Millennium Ecosystem Assessment Synthesis Report* (UN, 2000, p.1).

The next level is, to concretize necessary changes in order to fix problems, caused by the system of permanent growth. After all the system of constant growth needs to be reconsidered. The theory of steady state highly associated to the economist Herman Daly has contributed an important approach to get out of the downward spiral that permanent growth leads to (Daly, 1977). So did the British economist Tim Jackson. His report *Prosperity without Growth: economics for a finite planet* consist of many constructive suggestions that can help on the way to a more sustainable world (Jackson, 2009).

WHICH INDICATORS NEED A CHANGE

The American evolutionary biologist Jared Diamond has studied the immediate past in which man began to play a role of global measures. In his book on the question why societies survive or perish, he analysed the example of the Mayans and the Easter Islanders how environmental degradation has a direct impact on society. He determined five factors that could cause the demise of a whole society.

- Damage to the environment. It does not matter whether such damages were caused deliberately. It is also irrelevant whether the society is aware of the damage to the full extent.
- Climate change
- The increase of Enemies
- The reduction of Allies
- The previous four points all correspond to the most important fifth point, namely the question of how the society responds to these points.

Diamond describes current and future problems in his book (Diamond, 2006, p.25-29) very detailed. Especially the following 12 problem areas (indicators) need to be solved all together, if environmental sustainability wants to be ensured in the future.

- Eradication of resource "wild foods" (extensive hunting)
- Same for fish
- The destruction of natural habitats (land use change, deforestation) and eradicating "minor" animal and plant species. If at all, their meaning only becomes clear on very close inspection.
- Soil erosion
- Transfer of alien species, can take place faster than a reasonable adjustment (introduced species)
- Exploitation of water resources in a faster pace than it can regenerate
- The increase in the world population
- The possible threat, that soon all people will live on a similar large environmental footprint, as currently "still" few
- Full human use of the Earth's photosynthetic capacity
- The release of toxic chemicals by the industry to air, land seas and lakes
- Consequences of the use of fossil fuels a.k.a. anthropogenic climate change
- Energy shortages (DIAMOND, 2006, p.25-29)

All 12 indicators in his assessment correspond to each other, which leads to a holistic approach, like the field of systems thinking provides it.

Diamond continuously points out the risk, to consider the points just mentioned as "individual problems".

Approach one: Equality

A key that links all 12 indicators is fairness. As long as we have a gap between rich and poor people in the world as it is now, change towards sustainability is highly improbable. In order to keep the label "functioning" on a state or society on the long run, in addition to a certain material wealth, the distribution of existing goods in a country plays an important role.

In an extensive meta-analysis the British researchers Richard Wilkinson and Kate Pickett could impressively demonstrate that equality in societies is primarily responsible for a permanent "functioning" system. Social parameters such as mental health, drug use, life expectancy, obesity, school success, young parenthood, violence and more were compared with the distribution of wealth. The clear conclusion, that societies with small income differentials work better than societies with large income gaps, was the

impressive result. According to the level of disposable income, a limit has been found. If it is exceeded, no more increase in quality of life can be expected.

Once the average income per person has reached $ 25,000 per year, there is no further increase in life expectancy. While happiness correlates with increasing income, it remains static at about this amount of money. (Wilkinson & Pickett, 2009, p22)

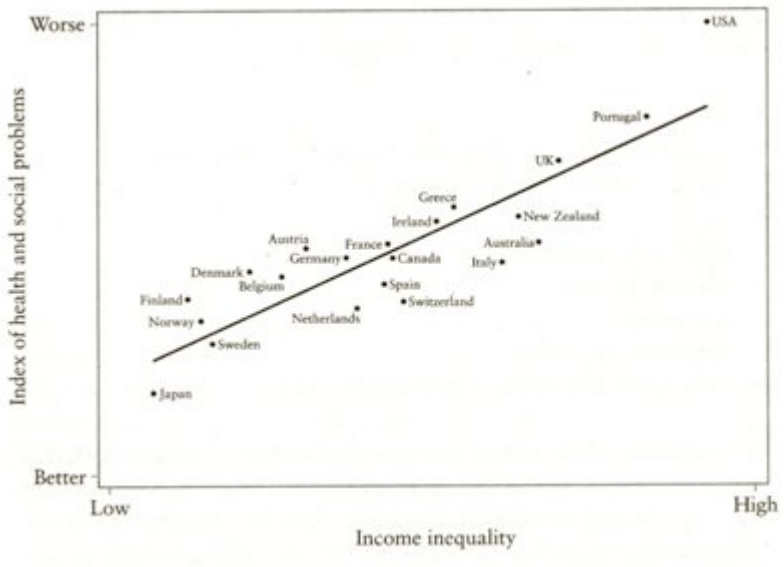

Figure 4: Clear correlation between countries with large income inequality and health / social problems of the population

Another interesting fact, that underlines this phenomenon is that Americans, clearly equipped with much greater wealth, do not feel happier than relatively poorer Danes, Finns and Norwegians. The opposite is true. After the conclusion of Wilkinson and Pickett the reason is the unequal distribution of wealth in the United States. The Scandinavian countries are here in the area of the smallest inequality. The US is behind Singapore in second place in the ranking. As Wilkinson and Pickett, Duncan Green relies on the independent development organization Oxfam on the figures from the Human Development Report 2006. He makes a comparison between the two countries pairings Spain and Portugal and Sweden and Japan in the field (see the figure below). The high distance between the Iberian countries or the scarce distance between Japan and Sweden he leads back to the big income inequality in a large or income equality in the other case.

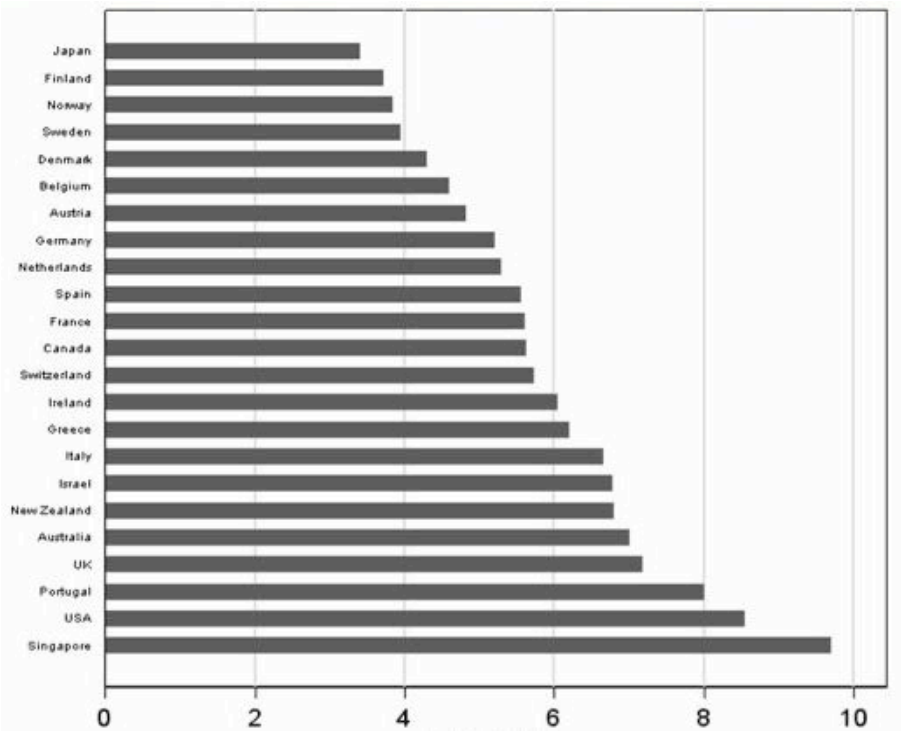

Figure 5: Factor of the income gap between the richest and the poorest fifth of the population by country

As Wilkinson and Pickett, Duncan Green of the independent development organization Oxfam relies on the figures from the Human Development Report 2006. He compares between the two countries pairings Spain and Portugal as well as Sweden and Japan in the field (see the figure below). The high distance between the Iberian countries or the scarce distance between Japan and Sweden he can be traced back to the big income inequality in first- and income equality in the second case. The most significant difference of visible social problems becomes evident after a comparison of the two developed countries USA (GDP: $49,601 per person) and Japan (GDP: $46.973USD per person). Again, there is a distinctive difference of income distribution in the two countries. Countries with an even distribution in income just work better

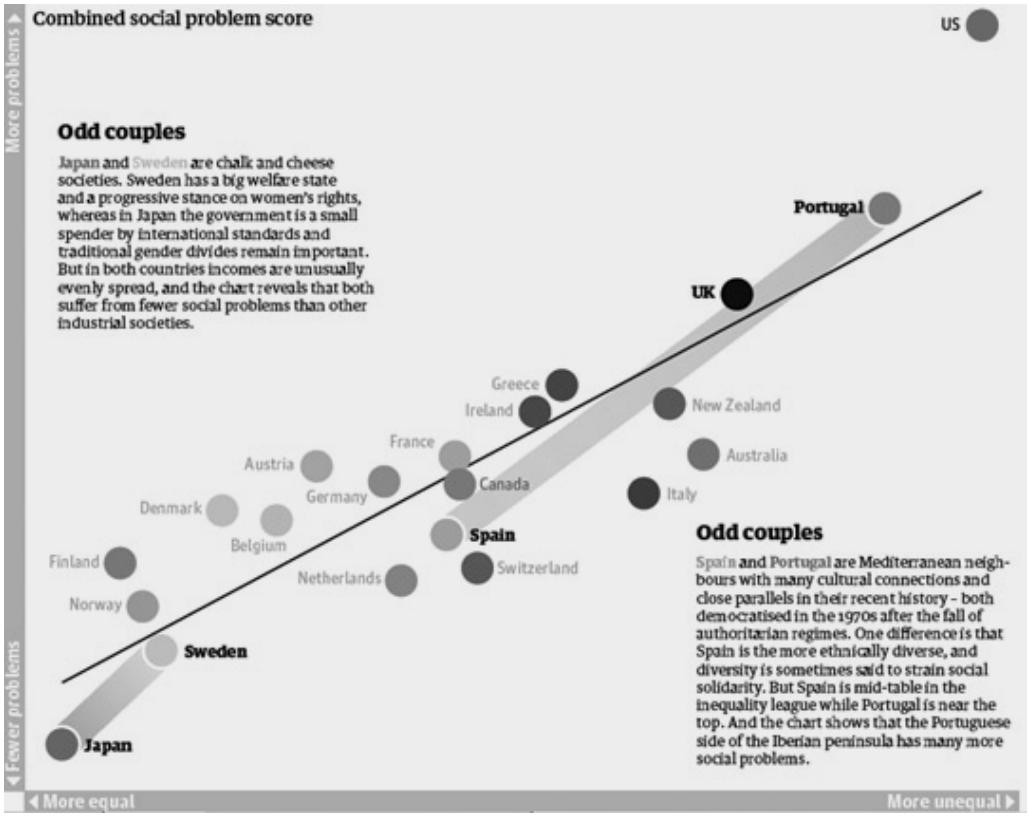

Figure 6: Factor of the income gap between the richest and the poorest fifth of the population by country

But equality in income is just one key on the way to a more sustainable future. Another very effective instrument to measure fairness in societies, respectively the world is the concept of measuring environmental supply and demand, better known as ecological footprint accounting.

Approach two: Footprint accounting

The ecological footprint is a way to measure resource consumption in relation to the availability of resources. It stands for the amount of bio capacity - specified in global hectares (gha) - a population needs to produce their goods and services or to absorb the arising pollutants. Is the ecological footprint higher than the available bio capacity, a shrinking natural capital stock will be the consequence. Or to put it a different way: There is less and less bio capacity available to produce things, for example food, clothes and cars or to receive the thereby emitted greenhouse gas and toxins. Currently, this applies to more than 60% of 124 recognized countries. The consumption of natural resources worldwide exceeds the regenerative capacity of the earth as much as 1.4 times, according to this calculation method. (Schulte & Butzmann, 2010, p.25-26).

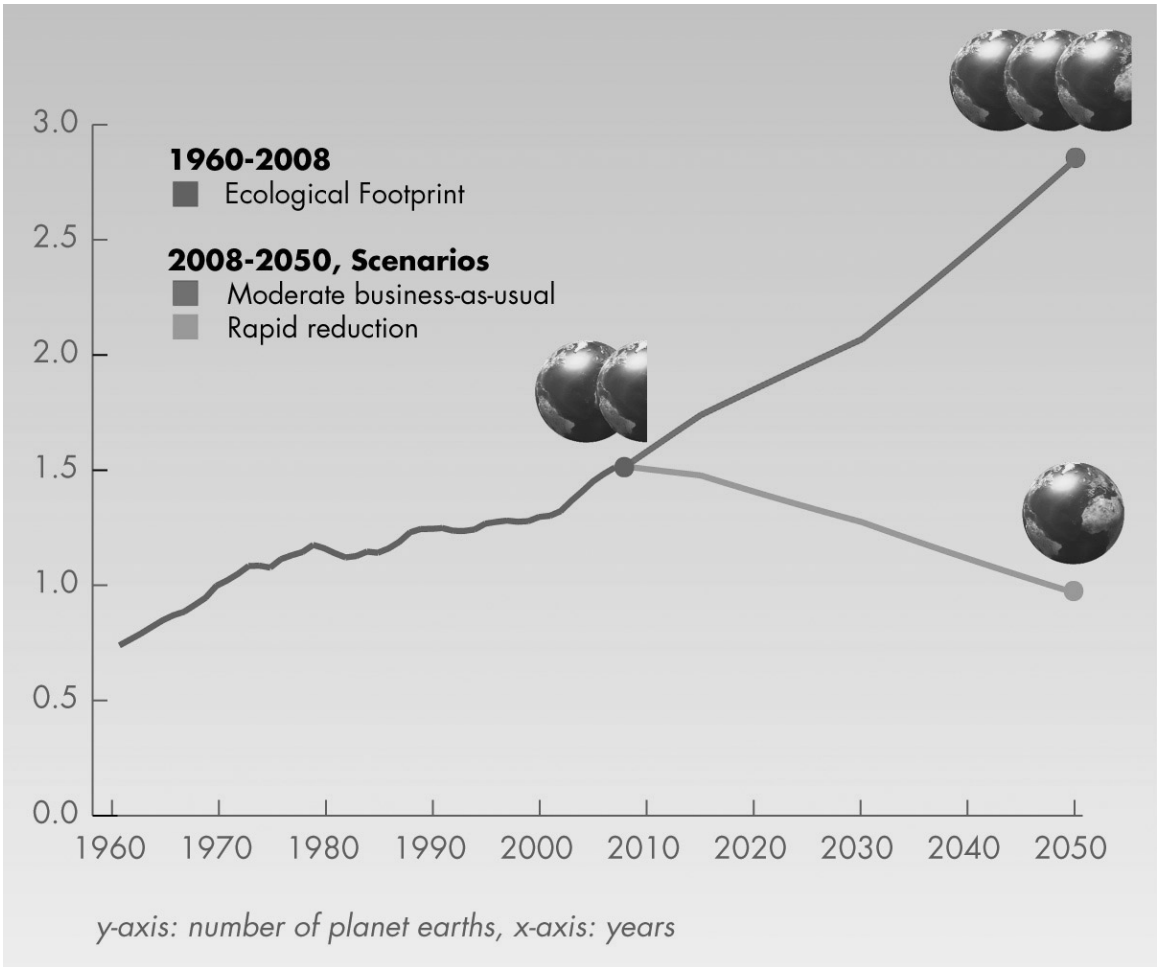

Figure 7: Development of the worldwide global footprint

From the relationship between the ecological footprint and the tolerance level it is clear that since the late 1970s, at least since 1980 no longer sustainability is given. This corresponds to the ecological footprint graph shown in Figure 7. 144% bio-capacity converted into consumed earth would equal the value of 1.44. The next table shows how unequal the ecological footprints are spread across countries.

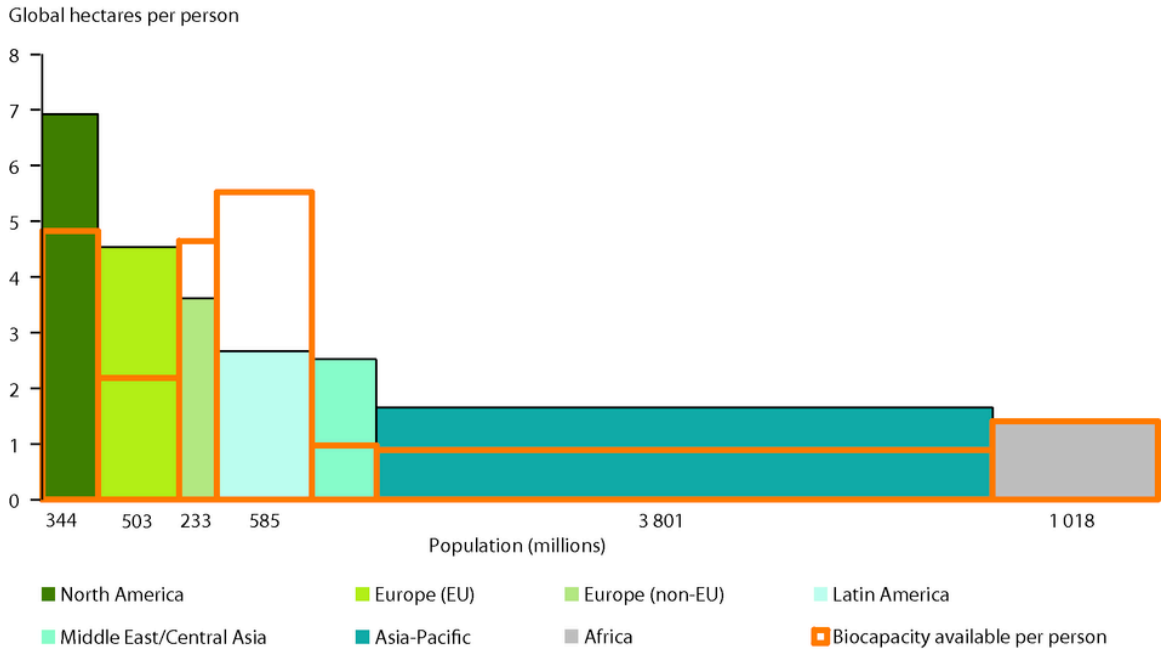

Figure 8: Large grade of unfairness in the distribution of resources worldwide. cf: http://www.eea.europa.eu/data-and-maps/indicators/ecological-footprint-of-european-countries/ecological-footprint-of-european-countries-2

The German post growth economist Nike Paech talks a lot about subsistence economy and sufficiency in the context of private initiatives (Paech, 2009). The following example shows the order small changes may have. Bernd Meyer, a professor of economics calculated the material savings potential by a decline in private consumption of one billion euros. "If the private households in Germany reduce their spending on Vacation Packages by the amount of billion Euros, the effect would be enormous. The extraction of raw materials from nature would decrease by 679500 tons. The calculations were carried out separately for fossil fuels (oil, gas, and coal), metals, industrial minerals, construction minerals (gravel, stone, sand), biomass, soil excavation and erosion. (Meyer, 2008, p.110) are:

Rang	Rückgang des Privaten Konsums im Verwendungszweck … um 1 Mrd. €	Δ TMR in 1000 t	davon	
			inländischer Materialverbrauch	importierte Materialien
1	Feste Brennst. (inkl. Fernw.)	−62964,4	−58099,2	−4865,1
2	Strom	−28109,6	−25133,3	−2976,3
3	Gartenerzeugnisse etc.	−4383,2	−3540,6	−842,6
4	Glaswaren u. a.	−3241,1	−2361,7	−879,4
5	Inst./Rep. der Wohnungen	−3215,7	−2512,8	−702,9
6	Nahrungsmittel	−3016,8	−2051,4	−965,4
7	Alkoholische Getränke	−2896,5	−1929,2	−967,3
8	Alkoholfreie Getränke	−2689,3	−1716,0	−973,4
9	Andere langl. Gebrauchsgüter	−2403,7	−1125,2	−1278,5
10	VerkehrsDL	−2046,3	−1207,4	−838,9
11	Haushaltsgeräte	−1998,0	−969,6	−1028,4
12	VerpflegungsDL	−1927,2	−1145,9	−781,4
13	BeherbergungsDL	−1912,3	−1134,3	−778,0
14	Gas (inkl. Flüssiggas)	−1809,8	−872,8	−937,0
15	Schuhe	−1804,2	−804,8	−999,5
16	Foto- u. EDV-Geräte	−1799,4	−735,7	−1063,7
17	Inst./Rep. von priv. Kfz	−1656,9	−991,8	−665,1
18	Pers. Gebrauchsgegenstände	−1652,5	−907,5	−745,0
19	Kauf von Fahrzeugen	−1549,2	−329,2	−1219,9
20	Flüssige Brennstoffe	−1482,7	−676,6	−806,0
21	Kraftstoffe	−1482,4	−676,4	−805,9
22	Werkzeuge und Geräte	−1361,5	−413,1	−948,4
23	Möbel u. Ä.	−1225,3	−521,9	−703,4
24	Körperpflege	−1061,8	−493,4	−568,4
25	Zeitungen, Bücher etc.	−1056,2	−418,4	−637,8
26	Wasserversorgung etc.	−1021,3	−801,2	−220,1
27	Medizinische Erzeugnisse	−889,8	−322,4	−567,4
28	Waren u. DL f. d. Haushaltsführung	−852,3	−300,3	−552,0
29	FinanzDL	−840,7	−604,8	−235,9
30	Bekleidung	−826,4	−235,7	−590,7

Figure 9: The effect of the reduction in consumption spendings by one billion to the consumption of resources (TMR: Total Material Requirement) in 1,000 tons for the most important consumer use purposes in 2000 in Germany (Meyer, 2008, p.110).

According to the study for the Aachen Foundation, to which Meyer refers, a Euro less for holiday packages therefore safes 0,679 kg on material. In clothing there are 0,840 kilograms, with shoes already 1,804 kilograms and with power even 28,109 kilograms.

Back to the footprint: In most countries with high ecological footprint values, it is impossible for individuals to reach the tolerance level or results below. This is because of

the collective share that each person is carrying. The collective part includes environmental impacts that are not specifically accountable, such as infrastructural networks, roads, public buildings, schools, hospitals and so on.

SYSTEMIC MODELS, ITS LIMITS AND FURTHER ANNOYANCES

Systems thinking can be described as the attempt, to see the world in its large context. The only way to prevent, that a part is mistaken for the whole. The consideration of contexts leads system scientists in a major dilemma. On the one hand it appears that everything is interconnected somehow, that each system is embedded in a larger context. On the other hand, the impossibility to consider all conceivable contexts, forces the scientist to investigate most precisely, how the various system levels are connected to each other.

The approach of system dynamics provides a powerful tool for those who have got to make decisions of everybody's concern. It helps govern a world that gained in complexity and became more interdependent due to the industrial revolution and globalisation. Criticism of LTG, partly legitimate and partly not, has shown that model-based predictions are less than resilient.

"As previously show, there are regions that apparently work better than others, by the means of Pickett's indicators, based on numbers of the human development report. One of the biggest challenges for governing (in) the anthropocene is finding a way to deal with known annoyances like corruption, lobbying and the fact, that money still rules the world, to name just a few.

Obviously, the quest for strategic capabilities in politics and governance is not new. In practice the quest has not stood a change because of the overriding importance of short-term voting cycles. Many instances of and some institutions for a strategic underpinning of governance have emerged nevertheless, providing blueprints and ideas for carrying on. There seems to be a fundamental role for political expertise organised by political foundations, think tanks, NGOs, non-partisan interest groups etc. … There is a lot to be learned for global governance from NGOs and similar organisations. They have a rich expertise in self-governance including building strategic intent, because that is their core resource for fostering commitment, expertise and authority." (Willke 2007)

Finally, the core message ends in the realisation that every citizen needs to recognise its large interconnection in the systems of a global society. Based on that, we have to act with appropriate responsibility in respect of the big impact our actions entail.

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