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sustainability

city and building

1. Introduction

The 20th century was shaped by the experience of two brutal World Wars with high casualties and severe destructions on all sides, so any kind of development in the second half of the 20th century strongly focused on securing peace, usually by means of deepening international relations and development of economic prosperity.

But latest in the forth quarter of the 20th century a critical undertone to economic prosperity and assumed limitless growth entered the public debate. Both individual and political actors started to warn that disaster was imminent if steps were not taken. As an example, on the grassroot level it was the foundation of the NGO Greenpeace 1971 which has since in spectacular campaigns drawn attention to dangers for our natural habitat and the species living in it. On the political level it was the publication of *The Limits to Growth*, sponsored by the Club of Rome in 1972 and the UN Conference on Human Environment in Stockholm the same year. The Brundtland Commission then coined the term of 'sustainable development' in the report *Our Common Future,* published and adopted in 1987.[1]

2. City - the reality of Tokyo

Originally the purpose of 'sustainable development' was to reconcile economic growth and environmental protection. But since then the usage of the term 'sustainability' has skyrocketed and it has become very fashionable to apply it to almost every aspect of life, like for instance sustainable cities, tourism, etc. But what does this term actually mean or imply when used so freely for almost everything?

When looking at some definitions, for instance from the dictionary Merriam Webster[2] or Wikipedia[3], the general notion of sustainability is drawing attention to two key issues, first of all the 'need' and secondly the 'lack', with both of them circulating around the issue of 'resources'. A 'need' will always exist, it is one of the basics of life and an imperative of human activities. What is required to satisfy needs can be called 'resources'. In case of a 'lack' of resources, the initial need cannot be satisfied. Resources can be scarce from the beginning or become depleted when overused.

One popular way to measure the value of necessary environmental resources is the so called ecological footprint, a term coined by Mathis Wackernagel and William Rees in 1992.[4] It basically is used to

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compare the 'needs' or the demands of any kind of human activity with the 'resources', planet earth's regenerating capacity. It is measured in global hectares (gha) of required land area, thus the term footprint on planet earth. According to The Ecological Footprint Atlas 2008, the available biocapacity per person on planet earth equals 2.1 gha.[5] In contrast, the per-person ecological footprint of Japan exceeds this value already 2.4 times with 4.89 gha.[6]

The inner city of Tokyo is one of the densest habitated urban areas in the world.[7] When calculating the ecological footprint of Tokyo, the results are becoming even more astonishing. The name "Tokyo" is rather ambiguous and depending on the administrative and geographical boundary chosen, different footprints can be calculated (see Table 1).

Tokyo [September 1, 2007]	Land area	Population	Density	Ecological Footprint
City of Tokyo (東京市), which existed independently until 1943 and are now the 23 special wards or "inner city" of Tokyo[8]	621 km² (62,100 ha)[9]	8,650,000[10]	13,929 / km²	42,298,500 gha (exceeding 681 times)
Tokyo nowadays, officially Metropolis of Tokyo (東京都), including Tama area, 23 special wards and islands[11]	2,187 km² (218,700 ha)[12]	12,790,000[13]	5,848 / km²	62,543,100 gha (exceeding 286 times)

Table 1

If compared with the land area of Japan, which is 377,923 km² (37,792,300 ha)[14], it becomes apparent that the footprint of Tokyo alone exceeds the land area of whole Japan, in the case of the 23 special wards 1.1 times and in the case of the metropolitan Tokyo 1.6 times, which could be called way beyond any notion of sustainability with regard to the ecological footprint.

This example strongly illustrates how much a city nowadays depends on the bearing capacity of the hinterland, which is in the case of Tokyo also highly populated and adds to the urgency of the problem. In this light all efforts of Factor 4[15] or even Factor 10[16] seem to fall short if we want to achieve true sustainability of cities, which might be impossible. It rather proofs a simple fact as Kano (2000) points out, the fact that cities have, and will continue to have their resource base outside their boundaries. It underlines the axiom, that without this base, there can be no city and that a city cannot sustain by itself.[17]

3. Building - building standards

The approach of the ecological footprint is supposedly one of the broadest considering environmental issues of human activities on planet Earth. But as it is with all reporting and assessment tools of this kind the question of boundary arises. Is it actually necessary to achieve full sustainability or self-sustainability for everything? For every house and city for instance? Where do we 'draw' the boundary for evaluating the issue of sustainability?

To address this issue the Global Reporting Initiative (GRI) has published a Boundary Protocol[18] to define the boundary used in their reporting method.

Here the two measures are:
- degree of control or influence and
- level of significance or impact.

It clearly illustrates that the notion of a boundary, to be able to exclude something is clearly opposed to a holistic approach that would aim at considering the totality of relevant issues. The boundary defines what is relevant and what is not, it reflects the initial value judgement and is usually based on assumptions about a manageable scale.[19]

The uncertainty of what is important and what is not, what should be included and what should be excluded has led to the development of thousands of indicators and sustainability standards. When we look on the building industry and their green building standards, the number is easily reaching a hundred. Their main objective in general is to evaluate the environmental performance of singular buildings with focus on mitigation - reducing stresses on natural systems. They rarely address societal questions or medium and long-term issues.[20] Their measurements and targets are often largely differing. Moreover every standard is for marketing resons or due to nationally legal binding force claiming that their method is the best and when building according to the standard the final product will be a sustainable building.
Saunders hshows the difference for instance of BREEAM, LEED, GreenStar and CASBEE[21], but even though some assessment method may be more severe than another one, it is hardly believable that appart from reaching the target set by the standard the main goal of all the effort as pointed out in chapter 2 can thus be achieved.

4. Conclusion

What is needed in this confusion is an approach beyond the existing boundaries, like the interests of professional groups, to achieve the real goal behind our efforts. This as pointed out in chapter 2 is to avoid the 'lack' of 'resources' to be able to satisfy the 'needs'. This approach can properly only be understoond if seen in a wider context as exemplified with the analysis of Tokyo. The existing green building standards on the other hands are focussing mostly on delivering singular buildings as explained in chapter 3.

Sustainable building standards need to broaden their main objectives and try a bit harder to fulfill their role in channeling the urban development towards the sustainability track. Buildings have to be considered in relation to their surrounding environment, as parts of the bigger entity that a city organism is. Otherwise these standards can not carry the label of promoting sustainable buildings.

References

1 United Nations. (1987). *Report of the World Commission on Environment and Development: Our Common Future.* Retrieved July 29, 2009, from http://www.un-documents.net/wced-ocf.htm

2 sustainable. (2009). In *Merriam-Webster Online Dictionary.* Retrieved July 29, 2009, from http://www.merriam-webster.com/dictionary/sustainable 3 sustainability. (2009). In *Wikipedia.* Retrieved July 29, 2009, from http://en.wikipedia.org/wiki/Sustainability

4 Rees, William E. (1992). "Ecological footprints and appropriated carrying capacity: what urban economics leaves out", *Environment and Urbanization*, Vol. 4, No. 2, p.121-130, School of Community and Regional Planning, UBC, Vancouver, B.C., Canada. Retrieved July 7, 2009, from http://eau.sagepub.com/cgi/content/abstract/4/2/121

5 Global Footprint Network (2008, December 16). *The Ecological Footprint Atlas 2008, Version 1.1.* Retrieved July 11, 2009, from http://www.footprintnetwork.org/download.php?id=506, p. 72.

6 Ebd, p.53

7 Wikipedia. *List of cities by population density.* Retrieved July 11, 2009, from http://en.wikipedia.org/wiki/List_of_cities_by_population_density

8 Wikipedia. *Tokyo City.* Retrieved July 11, 2009, from http://en.wikipedia.org/wiki/Tokyo_City

9 Tokyo Metropolitan Government (TMG). *Geography of Tokyo.* Retrieved July 11, 2009, from http://www.metro.tokyo.jp/ENGLISH/PROFILE/overview02.htm

10 Ibid.

11 TMG. *Administrative areas of Tokyo.* Retrieved July 11, 2009, from http://www.metro.tokyo.jp/ENGLISH/PROFILE/overview04.htm

12 See footnote 8.

13 Ibid.

14 TMG. *Statistics: Fig. 1 Tokyo Compared to the rest of Japan.* Retrieved July 11, 2009, from http://www.metro.tokyo.jp/ENGLISH/PROFILE/appendix02.htm

15 Wuppertal Institute for Climate, Environment and Technology (2004). *Factor Four.* Retrieved July 11, 2009, from http://www.wupperinst.org/FactorFour/

16 Factor 10 Institute (2008). *Factor 10.* Retrieved July 11, 2009, from http://www.factor10-institute.org/

17 Kano, Katsuhiko (2000). *Observations: Proceedings of the International Conference in Sustainability of Cities,* UNU/IAS & IICRC, Kanazawa, Japan.

18 Global Reporting Initiative (GRI). (2005, January). *GRI Boundary Protocol.* Retrieved July 29, 2009, from http://www.globalreporting.org/NR/rdonlyres/CE510A00-5F3D-41EA-BE3F-BD89C8425EFF/0/BoundaryProtocol.pdf

19 Maru, Y.T. and K. Woodford (2007). "Revisiting Sustainability Boundaries from a Systems Perspective". In Oxley, L. and Kulasiri, D. (eds) *MODSIM 2007 International Congress on Modelling and Simulation.* Modelling and Simulation Society of Australia and New Zealand, December 2007, pp.477-482. ISBN : 978-0-9758400-4-7. http://www.mssanz.org.au/modsim07/papers/8_s33/RevisitingSustainability_s33_Maru_.pdf

20 Cole, Raymond J and Daniel Pearl (2007). "Blurring Boundaries in the Theory and Practice of Sustainable Building Design". In *International Conference on Whole Life Urban Sustainability and its Assessment,* Glasgow, 2007. Retrieved July 29, 2009, from http://download.sue-mot.org/Conference-2007/Papers/Cole2.pdf

21 Saunders, Thomas. *A Discussion Document Comparing International Environmental Assessment Methods for Buildings.* BRE Global Ltd. Retrieved July 1, 2009, from http://www.breeam.org/page.jsp?id=101