Modification of sustainability indicators

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Abstract: During time, a more attention was paid to the sustainability indicators. While formerly they regarded only the environment area, gradually they were extended also to the social, economic and institutional sphere. However, their use is rather problematic in developing countries the majority of which was not persuaded of their importance. Developing countries also often reason that they have not the relevant data to their disposal.

Key words: computation, bio-capacity, ecological footprint, new indicators, sustainable development

After the Stockholm conference in 1972, the U.N. Environmental Programme (UNEP) was founded. Its aim is monitoring of environment and supplying data for the decision-making and policy measures formulation and evaluation. In cooperation with other organisations, like the World Meteorological Organisation, the World Health Organisation and the Food and Agriculture Organisation, the UNEP also provides the Global Environmental Monitoring System. At the end of the 70s, the Geneva Convention on the Atmosphere Pollution Cross-border Transfer was signed in the frame of the European Commission and based on it, another environment monitoring system was founded (Gore 2000).

THE U.N. COMMITTEE FOR SUSTAINABLE DEVELOPMENT INDICATORS

In 1995, the U.N. Committee for Sustainable Development published a list of more than 100 indicators. For most of them, the use on the national level is presupposed; however, not every indicator can be used in every situation. Therefore, the individual countries chose different indicators to suit their goals. One year later, the methodological lists for the individual indicators were published. The U.N. indicators are often criticised according to their numerousness. Some experts are of the opinion that there should be less of them so that they are more understandable and accessible to the general public. After an intensive analysis, the first revision of the indicators went through in 2001. Several years later, they were re-evaluated again and a bigger group of 98 indicators of sustainability was set. The key indicators should regard the phenomena common to most countries, which could be computed relatively quickly and without excessive costs. Still, the indicators are divided into groups and sub-groups, but they are not tied to the sustainability pillars any more. Formerly, the indicators were divided into the economic, environmental and social group (Long 2001).

The Tables 1 and 2 show the overview of some indicators as they are used since 2007.

Table 1. New indicators in the poverty sphere

Topic	Subtopic	Indicator	Key indicator
Poverty	insufficient income	percentage of people living under the national poverty level	yes
		share of people with daily income below 1 USD/2 USD	
	income disparity	share of individual groups in national income	yes
	hygiene	share of people with access to hygienic appliances /countryside/town)	yes
	drinking water	share of inhabitants with access to clean drinking water (countryside/town)	yes
	access to energies	share of households with access to electricity of commercial energies	yes
		share of inhabitants using solid fuels for cooking	
	living conditions	share of town inhabitants living in neglected conditions	yes

Source: United Nations Division for Sustainable Development (http://www.un.org/esa/sustdev/natlinfo/factSheet.pdf)

Table 2. Indicators in other areas

Topic	Subtopic	Indicator	Key indicator
Government	government quality	percentage of corruption cases	yes
	criminality	number of violent criminal deeds and murders per 100 000 inhabitants	yes
Health	mortality	mortality of children up to 5 years	yes
		life expectancy at birth	yes
		healthy life expectancy	
	access to health care	share of people with access to primary health care	yes
		inoculation against children diseases	yes
		level of contraception use	
	nutrition	children nutrition level	yes
	health state and risks	percentage of smokers	yes
		number of suicides	yes
		spreading of main diseases e.g. AIDS, TBC	
Education	education level	number of students entering the primary education last year, according to gender	yes
			yes
		number of students enrolled into primary education	yes
		share of secondary education, according to gender	yes
		lifelong education	
	literacy	adult literacy according to gender	yes
Demography	population	population growth	yes
		natality	
		percentage of families	yes
	tourism	percentage of domestic population in main tourist areas	

Source: United Nations Division for Sustainable Development (http://www.un.org/esa/sustdev/natlinfo/factSheet.pdf)

Other indicators regard areas like natural catastrophes, economic development, production and consumption patterns, atmosphere, seas and oceans, biodiversity, global economic cooperation, fresh water and soil.

Overview of other indicators

However, indicators are also developed by international organisations outside the U.N.O., for example the OECD introduced indicators of environment and in the frame of the EU, the environment is monitored by the EUROSTAT. From the international NGOs, we should mention the International Union for Nature Conservation aimed at the biodiversity and sustainability indicators. Important is also the project Indicators of Sustainability of the SCOPE with the aim to support the development and research of sustainability indicators. The most important output was the publication Sustainability Indicators. Further, also the World Bank, the World Resources Institute and the UNEP are interested in the indicators (Worldwatch Institute 2009).

World Bank

The WB issues every year an extensive yearbook, the World Development Report, the orientation of which changes with regard to the U.N. activities. One of the WB sessions is actively oriented at the sustainability indicators. In its report, it analyses the indicators, describes the present state and indicates the values which should be reached in future. It regards e.g. natural resources and their use, poverty indicators, air and water pollution, loss of biodiversity etc. (JPAC 2010).

World Resources Institute

The institute has its seat in Washington. The WRI is regarded as a place where a high attention is paid

Table 3. Human Development Index

Sequence	Country	
	2006	2011
1.	Iceland	Norway
2.	Australia	Australia
3.	Ireland	Netherlands
4.	Sweden	USA
5.	Canada	New Zealand
6.	Japan	Canada
7.	USA	Iceland
8.	Switzerland	Lichtenstein
9.	Netherlands	Germany
10.	Luxembourg	Sweden

Source: UNDP (http://hdr.undp.org/statistics)

to indicators and their development. Every year, it publishes an extensive report called the World Resources, which includes sustainability indicators.

U.N. Environmental Program

The UNEP is oriented namely at the support of health and education. Every year, it publishes the Human Development Report. Since the beginning of the 90s, there is published the Human development Index – HDI), which is computed from the data on the human health, the education level and the level of living. In the human health sphere, decisive is the average life expectancy at birth and the new born and infant mortality. The education level is evaluated by illiteracy and the number of children attending school. The level of living is computed as the per capita GDP (in PPP). The final index reaches values 0–1, the higher the value, the more developed the country (Gallangher et al. 2002) (Table 3).

It is necessary to note that the indicators are not developed on the global level only; many countries have defined their own ones. Among them, there belongs the Great Britain, the USA, Canada, the Netherlands and other. The sustainability indicators set for the Czech Republic was created according to the interna-

Table 4. Sustainability indicators set for the Czech Republic

Environmental indicators

International agreements	greenhouse gases emissions
Acid emissions	solid pollutants emissions
Air quality index	water use intensity
Yearly water samples	biochemical consumption of oxygen in water, sewage water cleaning
Phosphorus and nitrogen in water	use of fertilisers
Agricultural land area and organic agriculture	mining of non-renewable resources
Pesticides consumption	forest area and structure of species
Built-on area	timbering intensity
Calamity timbering	dangerous refuse production
Production and disposing of refuse	protected areas acreage
Endangered species	environment protection expenditures

Social indicators

Unemployment rate	level of non-economically active population dependence
Share of urban population	population density
Average life expectancy	health care expenditures
Registered crimes	communication infrastructure
Household expenditures	research and development expenditures

Economic indicators

Gross domestic product	inflation rate
Public debt	foreign trade balance
Foreign debt	yearly consumption of energy
Direct material consumption	material consumption intensity
Foreign tourists	freight and personal transport volumes

Source: Environment Portal (http://indikatory.env.cz)

tional patterns and it was published in the collected papers "To the Czech Republic Sustainability: Forming Conditions". It includes in total 63 groups of indicators divided further into the key and derived ones (Table 4).

From the above, it is obvious that there exist many indicators at present which differ more or less. Some of them include more than 100 items, other only about 10. However, it is always necessary that they express the given phenomenon and that they are accommodated to the local needs. If they are to be compared, then they have to be really comparable. However, the primary aim is not to compare countries but to supply information on the strengths and weaknesses as well as the possibilities of further improvement (Vošta 2010).

ECOLOGICAL FOOTPRINT

Human consumption grew rapidly in past and people took still more resources from the nature. Their demands on food, energy, services and goods increased. The Ecological Footprint (EF) was created to be able to evaluate to which extent people are living inside the sustainable ecological capacity. The EF does not say what should be done, but only to which extent are our lifestyles sustainable. Through the comparison of the EF and the biological capacity of the Earth, it can be evaluated whether people are using forests, fields, energy and waters in a sustainable way (Cosbey et al. 2004).

The first concept of ecological footprint was presented in 1996 by William Reese and Mathias Wackernagel and it was published in the book Our Ecological Footprint (Reese and Wackernagel 1996). It the following years, Wackernagel cooperated with other scientists on the 1st ecological footprint report. During time, the popularity of the EF grew and the concept was further improved.

According to Reese, the EF expresses the area necessary to secure the complex resources needed for the present lifestyle and the disposal of all refuse produced by it. The EF of the given country includes all farmed land, pastures, forests and waters necessary for the food production, the production of fibres and timber, the absorption of refuse and supplying the space for industry. From the following graph, it is visible which elements the ecological footprint consists of and how they contribute to the main demands on the planet. The biggest and most quickly growing element is the carbon dioxide, the volume of which multiplied enormously between the years 1961 and 2003. The increase of other elements is relatively constant or with a slight increase.

Computation

The ecological footprint aggregates many factors into one indicator and because of it, it is rather favoured by the public and refused by its critics. There exist two main ways how to compute the EF. One is based on searching the resources taken from the nature and subsequently transformed into goods. This approach is used if we want to compute the EF of the Earth as a whole. The second is oriented at the research of the final goods consumption and it serves for the expression of the individuals EF. In practice, both approaches might be combined.

To come to the EF computation, certain facts have to be respected:
– The amount of goods has to be measurable, as well as the produced refuse
– Most of these resources can be recalculated on the relevant areas of the biologically productive land
– These different areas can be expressed in the same units (hectares or acres) and put into sequence according to the biomass production, i.e. each hectare can be transferred into the relevant area with the globally average productivity
– Even if each area has a specific use, every standardised hectare corresponds to the same amount of biological activity and thus the hectares can be added together
– The total demand of the society can be compared with the natural supply of ecological services.

Ecological footprint is expressed in global hectares. One global hectare is a hectare with the average ability to produce resources and to absorb refuse. The advantage of the ecological footprint is that it can be compared with the biological capacity. The planet the ecological footprint of which is bigger than its biological capacity lives at an ecological deficit. That means that we would need at present more Earths than just the one we have really got.

From the Figure 1, it is obvious that the ecological deficit emerged for the first time in the second half of the 80s and it is growing ever since. In 2002, we thus needed not only 1, but 1.2 planets. This deficit is called the ecological overreach.

The individual countries contribute to the ecological deficit in a different way. The following map shows the countries with the highest share in it (Figure 1).

It is obvious from the map, that the countries with a high ecological footprint and therefore deficit are India and China, where it is caused by the high population density. An excessive consumption of resources is a typical reason of the deficit in North America, and the combination of both factors is typical for Europe.
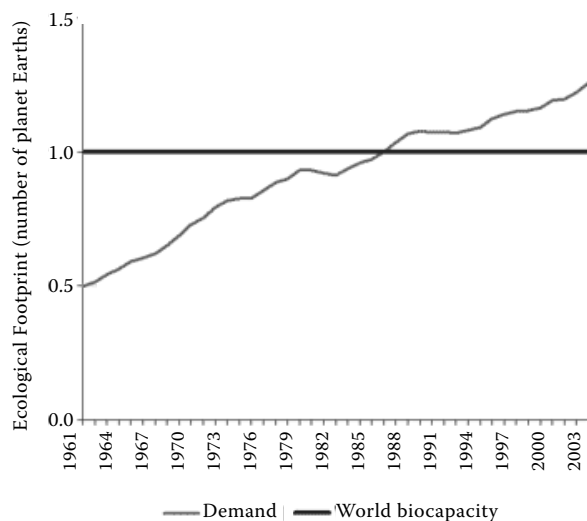
Figure 1. Global demand and supply

Source: Global Footprint Network (http://www.footprint-network.org)

On the contrary, the ecological footprint of Australia and basically also of South America is much lower.

From this viewpoint, countries can be divided into ecologically debtors and creditors, i.e. those who live in the sustainable ecological capacity frame and those who do not. Usually, developing countries belong among the ecological creditors and developed countries among the debtors, the ecological footprint developed in a different way in these groups of countries. The Table 5 presents the EF development in these two groups of countries in the period 1961–2001.

The CR ecological footprint is not among the lowest ones. In the EU, it belongs rather into the higher values group. In 2001, our EF was 5 global hectares per capita. At present, there exist web pages enabling everyone to compute his/her own ecological footprint, which can be compared with the EF of his/her country or with other countries to find out whether he/she contributes to sustainable development.

Also in the Living Planet report, the EF is followed according to the regions. The Earth is divided into 7 regions: North America, the EU, European non-EU states, Middle East and Central Asia, Latin America and Caribic, Asia and Pacific and Africa.

In the practice, the EF computations are often simplified, so that the estimates of biological capacity are overestimated and the human demands underestimated. The reasons are that:

– Each area is counted only once even if it secures several ecological services at the same time
– In doubt, the more conservative estimate is preferred
– It is supposed that the present industrial harvest methods are sustainable, i.e. not causing any losses of yields in future
– the EF does not include some human activities with insufficient data
– There are excluded the activities continually damaging the natural ecosystems regeneration capacity, like the use of materials not sufficiently assimilated by nature, the processes irreversibly damaging the biosphere (extinction of species, deforestation, desertification)

In 2006, a new concept of ecological footprint was created, the so-called EF 2.0. According to it, the

Table 5. Ecological footprint according to income

	Population (mill.)	Complex EF (bill. gha)	Per capita EF (gha/inhabitant)
High income countries			
1961	670	2576	3.8
1971	744	3828	5.1
1981	805	4369	5.4
1991	860	5097	5.9
2001	920	5893	6.4
Low and middle income countries			
1961	2319	3303	1.4
1971	3006	4323	1.4
1981	3685	5762	1.6
1991	4463	7099	1.6
2001	5197	7602	1.5

Source: http://hraozemi.cz

situation is much worse than estimated before. To this new concept, the whole Ecological Footprint of Nations report published in the frame of the Redefining Progress Society was dedicated.

Lowering of ecological footprint

There exist certain recommendations how to decrease the EF value. The individuals can contribute if they change their lifestyle. People should consume more plant than animal proteins, to grow or buy foodstuffs without pesticides and chemicals, to learn to utilise food remains and to dispose efficiently of refuse. They also should walk or to ride bicycles instead of cars. It is understandable that this cannot be done always as we need to travel to longer distances. In such a case, we should use public transport, i.e. trams, trains and buses. To lowering of the EF, there also contributes the renewable energy resources utilisation. It is recommendable to use the energy saving appliances, i.e. washing machines and refrigerators with a low energy demand, heat isolated etc. (CEC 2004).

CONCLUSION

The principles of sustainable development have to be reflected also into the generally used indicators – namely the macro-economic indicators, since the present methodology of their computation does not allow evaluating of the real impact of economic activities on environment and the welfare of the society. It is necessary to introduce new indicators which would clearly signal whether the society is approaching sustainability or not and if there does not occur a considerable endangering of any of the environment elements. The environmentally adapted SNA should therefore be supplemented by the set of physical indicators supplying the qualitative characteristics of the reached economic level of the society in connection with the environment quality. Such a system would lead to more transparent relations between the data on production, consumption and investments and the data on the changes of the individual environment segments, and which would be at the same time usable in the political practice: for example for introduction of the limits, standards and other tools of the environmental policy (CEC 2005).

The common feeling of the necessity to solve global problems has not increased very much during the last decade and the world progress towards its stainable development was very slow. The negative unsupport-

able trends are continuing and even deepening. Even if the humankind has got the necessary knowledge and technologies to its disposal, the financial means and often also the political will, these are often insufficient to stop the further deterioration of the global problems and to direct the necessary means just to the questions of the development and environment which must be solved without a further delay. Understanding of global problems as the long-term, cumulative and mutually interdependent ones, which bring about serious global and security implications, is still limited (CEC 2009).

The real policy of most developing as well as developed countries is still oriented at the classical economic growth and the necessary sustainable development has thus not yet begun on the world level.

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