ESTIMATION OF SUSTAINABLE DEVELOPMENT: GERMINATION ON INSTITUTIONAL LEVEL

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Abstract. The aim of the paper is to investigate approaches to measurement of sustainable development adopted by international organizations, or institutions. Organizations for sustainable development were founded to review progress at the international, regional and national levels in the implementation of sustainable development policy, to take part in legislative process, to control balance between economic development, social development, and environmental development. Valid systems and classifications of sustainable development are being juxtaposed, specific features, advantages and disadvantages revealed. The question, if the systems of indicators provided by considered institutions are applicable for practical analytical purposes, is being raised.

Keywords: sustainable development, systems, indicators, organizations.

1. Introduction

A lot of opinions related to estimation of sustainable development in scientific literature can be found. Separate group of scientists deal with issues of analysis of chosen system of indicators (e.g. Tvaronavičienė *et al.* 2008). This paper aims to trace germination process of estimation among official world known organizations. Systematisation of prevailing approaches serves as purpose of presented publication. The ultimate aim of systematisation is seen as a step towards partial unification of sustainable development estimation, which in its turn, would serve as premise of more efficient process control. Speculations about applicability of any system of currently available institutional indicators are seen as urge towards further accomplishments.

On institutional level the concept of Sustainable development was introduced in 1980 and appeared in The World Conservation Strategy. Sustainable development was defined as "maintenance of essential ecological processes and life support systems, the preservation of genetic diversity, and the sustainable utilization of species and ecosystems" (The World Conservation Strategy: 24).

The concept was developed by the World Commission on Environment and Development (WCED) in its report "*Our Common Future*", more commonly known as "the Brundtland Report" (Brundtland 1987). It was defined as "ability of humanity to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional changes are made consistent with future as well as present needs" (Brundtland 1987). Later, Sustainable development started to be treated as development of three systems: economic, ecological and social. This approach was enrooted in the 1992 UN Conference on Environment and Development in Rio de Janeiro (the "Earth Summit"). It was emphasized that "Sustainable development can be defined simply as a better quality of life for everyone, now and for generations to come. It is a vision of progress that links economic development, protection of the environment and social justice, and its values are recognised by democratic govern-

ments and political movements the world over' (UN Conference on Environment and Development 1992). The European Commission (2001), in its turn, provides detailed characteristics of sustainable development goals. Not going into discussion about various aspects of Sustainable development comprehension, we point out, that a multitude of facets of considered category has been reflected in sets of indicators composed by various institutions. Aim of the paper is to reveal similarities and, even more, differences of institutional approaches towards Sustainable development. Range of institutions tackling issue of sustainable development has been established. From analytical point of view, system of indicators is required for estimation, and, later provision of policy recommendations. Let us take a closer look at systems of indicators, suggested by considered international institutions.

2. Sustainable Development: facets being estimated

Multi-effort trials to provide definition of Sustainable development on institutional level (even more ample on scientific one, which is not being considered within framework of given paper) verify complexity of estimation task. Naturally, complex phenomenon can be characterized only by a system of indicators. The European Commission emphasizes, that "the indicators selected should not be seen in isolation but rather as different elements of the same picture" (European Commission 2000). Hence, composing of appropriate in terms of all relevant facets reflection, indicators system is seen as ultimate aim. It is worth to notice, that a question "how" to integrate extended system is not being raised.

Before going to the latter question, let us have a look at systems of indicators introduced by different institutions. European Union institutions use systems of indicators, which could be seen as three sets, reflected in Fig. 1.

Set of *Short-term indicators* is supposed to be used for assessment of cyclical situations and performing of forecasts. Most *Short-term indicators* are collected to provide frequent and up to date reflection of the economy development processes. Short-term indicators' set is considered as not suitable for comparison
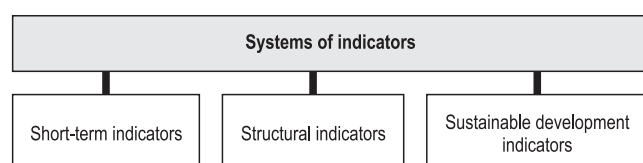
of countries' development level. Short-term indicators are divided into eight areas: balance of payments, business and consumer surveys, consumer prices, external trade, industry, commerce and services, labour market, monetary and financial indicators and National Accounts (EUROSTAT). Set of *Structural indicators* are supposed to be more suitable, and, are actually used (Tvaronavičienė *et al.* 2008), for the countries' comparisons as they embrace main macroeconomic indicators and cover such policy domains as employment, innovation, economic reform, environment and social cohesion (Commission of the European communities 2003). The European Summit in Nice attributed 42 indicators to the so-called Structural *indicators* group (European Commission 2003). Later the list due to inconvenience was cut to 14 indicators.

Set of *Sustainable development indicators* resembles *structural indicators'* set. They have the same periodicity as *Structural indicators* and are partly overlapping (include e.g. GDP per capita, unemployment, poverty rate). Impression is that indicators of sustainable development can be treated as variation of structural indicators. The main difference is that these two sets put emphasis on different aspects of development. While the indicators of sustainable development tackle social and environmental facets, structural indicators put stress on economic development. Here it is worth mentioning that some indicators attributed either to *Sustainable development indicators* or to *Structural* ones in some cases are interrelated, and performance of one affect value of other. Series of such estimations are being performed (Tvaronavičius, Tvaronavičienė 2008; Tvaronavičienė 2006). Systems of institutional indicators, as a rule, do not pay attention to factor of overlapping. On the contrary, impression is that increase in a number of facets embraced serves as ultimate goal, while issues related to any kind of analysis of provided information are not being taken into account.

3. Composition of *Sustainable Development indicators'* sets across institutions

As it was mentioned above, *Sustainable development* indicators reflect environmental, social and economic aspects of development. Nevertheless, 6 main compositions of *Sustainable Development indicators* can be distinguished:
1. EUROSTAT Sustainable development indicators;
2. United Nations indicators;
3. European Environment Agency indicators;
4. OECD indicators;
5. SIBIS indicators;
6. DG ENTR indicators.

Fig. 1. Systems of sustainable development indicators used by the European Union

Sustainable Development indicators (EUROSTAT) are divided into 10 groups (Fig. 2). In every indicator group several tracks, or sub-groups, have been distinguished. Indicators are attributed to different sub-groups taking into account their content. Some indicators characterize specifically, e.g. females, males, different age, education and other groups. The first indicator group is named *Socio-Economic development*. This group is being composed of 3 sub-groups: Economic development, Innovation, Competitiveness and Eco-efficiency and Employment. *Socio-Economic development* group contains 15 indicators.

The second group is *Sustainable Consumption and Production*. This group contains 16 indicators, which are being attributed to the following sub-groups: Resource use and waste, Consumption patterns, Production patterns. The third indicator group is *Social exclusion* that also contains 3 sub-groups that, in their turn, have 15 indicators. The fourth group's *Demographic changes* sub-groups are: Demography, Old age income adequacy and Public finance sustainability, which altogether contain 8 indicators. The fifth group is *Public health*, comprised, respectively, of Health and Health inequalities, Determinants of Health (12 indicators). The sixth group is *Climate change and energy*. Those Sustainable development facets are being reflected by 12 indicators. The seventh group is *Sustainable Transport*. Transport growth, Transport prices and Social and Environmental impact of transport (12 indicators) are seen as urgent issues. The eighth group N*atural resources* contains the following sub-groups: Biodiversity, Marine ecosystems, Fresh water resources, Land use (13 indicators). The ninth group is *Global partnership*, it embraces the following three aspects or sub-groups: Globalisation of trade, Financing for Sustainable development, and Global resource management; the group contains 13 indicators. And the last, the tenth group is *Good governance*, characterized by Policy coherence, Openness and participation and Economic instruments sub-groups, including 6 indicators. This classification adopts specific approach, when division of indicators into groups and, later, into subgroups, let rather easily perceive aspects of Sustainable development under consideration. Again, interrelationship between indicators within one group, or those, attributed to different groups (e.g. between governance and innovations, (Tvaronavičienė, Korsakienė 2007) and many other interrelations (Tvaronavičienė, Grybaitė 2007; Tvaronavičius, Tvaronavičienė 2008; Tvaronavičienė, Tvaronavičius 2006)) are not being considered.

United Nations indicators' system is divided into 4 general themes (Fig. 3). Similar approach, as in case of *Eurostat* Sustainable Development indicators, has
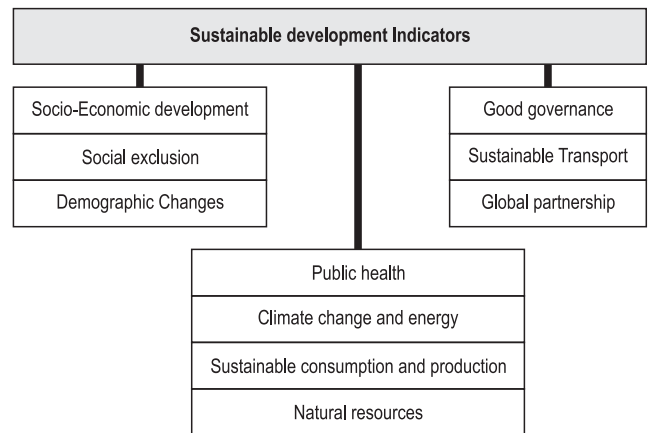

Fig. 2. Classification of Sustainable development indicators (Monitoring report of the EU Sustainable development strategy 2007)
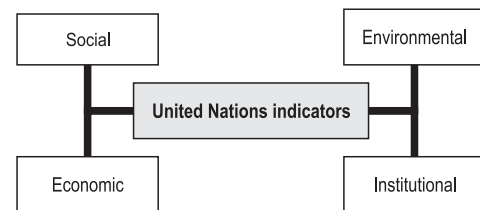

Fig. 3. *United Nations* classification of Sustainable development indicators. Source: United Nations 2007

been adopted: in each theme specific aspects or sub-themes are distinguished. The first theme, *Social* indicators, highlights the following facets: Health, Education, Poverty, Demographics, and Natural hazards. In their turn, those facets are composed of sub-themes. Poverty facet is composed of Income poverty, Income inequality, Sanitation, Drinking water, Access to energy and Living conditions sub-themes.

Health facet contains 4 sub-themes: Nutritional Status, Mortality, Health care delivery, Health status and risk. *Education* is seen as composition of Education level (4 indicators) and Literacy aspects. Demographics facet is reflected by Population and Tourism sub-themes. Natural hazards facet contains two sub-themes: vulnerability to natural hazards and Disaster preparedness and response. *United Nations Social* indicator group is very different from other classifications: *Eurostat* classification has *Poverty and social exclusion*, *Ageing society* and *Public health groups*. *United Nations* provide more information about health and about poverty than education. Distinctive feature of *United Nations* is attention to natural hazards. It is obvious that emphasis on different aspects of social side of Sustainable development is being put.

The second general group of *United Nations* Sustainable development indicators is *Environmental* indica-

tors. That group emphasizes 5 facets: Atmosphere, Land, Oceans, Seas and Coasts, Fresh water, Biodiversity. Atmosphere facet is reflected by 3 sub-groups: Climate change, Ozone layer depletion, Air quality. Land facet includes 4 sub-groups: Agriculture, Forests, Desertification, and Land use and status. Oceans facet has 3 sub-groups: Coastal zone, Fisheries and Marine environment. Fresh water facet contains 2 sub-groups: Water quantity (2 indicators), Water quality (3 indicators). Biodiversity is composed of 2 sub-groups: Ecosystem (4indicators), Species (3 indicators). To conclude, *United Nations* classification has the largest list of indicators. *Eurostat* classification introduces Climate change and Energy. Considered institutions do not divide *Environmental* indicators into sub-groups, i.e. specific aspects are not distinguished. Hence, *United Nations* Sustainable development *Environmental* indicators seem to be more extensive and thoroughly systematized.

Third general group is *Economic* indicators. The following facets of economic development are distinguished: Economic development, Consumption and Production patterns and Global economic partnership. Economic development is represented by 5 sub-themes, such as Macroeconomic performance (indicators: GDP per capita, Investment share in GDP, Gross saving, Adjusted net savings as percentage of GNI, Inflation rate (again, many theoretically grounded and quantitatively estimated interrelations (Tvaronavičienė, Grybaitė 2007; Tvaronavičius, Tvaronavičienė 2008; Tvaronavičienė, Tvaronavičius 2006)) are not being taken into account), Sustainable public finance (Debt to GNI), Employment (Employment-population ratio, Labour productivity labour costs, Share of women in wage employment in the non-agricultural sector), Information and communication technologies (Internet users per 100 population, Fixed telephone lines per 100 population, Mobile telephone subscribers per 100 population), Research and Development (Gross domestic expenditure on R&D as a percent of GDP)(impact of stare policy on the latter indicator is not being taken into account (Tvaronavičienė, Korsakienė 2007)), Tourism (Tourism contribution to GDP). The Tourism sub-theme in Social Theme, Demographics sub-theme contains different indicator- Ratio of local residents to tourists in major tourist regions and destinations. Global economic partnership contains two sub-themes: Trade and External financing. Consumption and production patterns include sub-themes: Material consumption, Energy use, Waste generation and management, Transportation. Notably, those economic indicators are being emphasized. If not consider mentioned interralations between indicators (Tvaronavičienė,

Grybaitė 2007; Tvaronavičius, Tvaronavičienė 2008; Tvaronavičienė, Tvaronavičius 2006; Tvaronavičienė, Korsakienė 2007) provided system could be characterized as rather a comprehensive one.

The last general group is *Institutional* indicators. It consists of one theme – Governance that contains two sub-themes: Corruption (Percentage of population having paid bribes) and Crime (Number of International homicides per 100,000 population). *Eurostat* classification measures good governance and global partnership. Themes distinguished by Eurostat and United Nations contain different indicators. Global partnership and public participation are not being taken into account in the United Nations system of indicators.

European Environment Agency's indicators are devoted exclusively to environmental issues. The European Environment Agency is an agency of the European Union, which started its functioning in 1994. European Environment Agency's indicators are grouped into 24 main themes. (Fig. 4). Not going into all themes, just take a look at major characteristics of the system. Hence, in this system sub-groups are not distinguished; indicators are attributed to listed facets. After considering indicator systems provided by other institutions, it would seem that approach adopted, e.g. by *United Nations* is more acceptable. Recall, that *United Nations Environmental* indicators presented facets reflected by the following sub-themes: Atmosphere (Climate change, Ozone layer depletion, Air quality), Land (Agriculture, Forests, Desertification, and Land use and status), Oceans, Seas and Coasts (Coastal zone, Fisheries and Marine environment), Fresh water (Water quantity, Water quality), Biodiversity (Ecosystems, Species). Juxtaposition of *United Nations Environmental* and *European Environment Agency's* classifications leads to a conclusion that the latter is rather poorly struc-
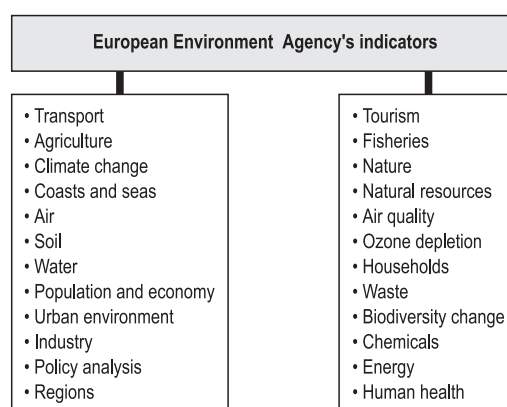

European Environment Agency's indicators

- Transport
- Agriculture
- Climate change
- Coasts and seas
- Air
- Soil
- Water
- Population and economy
- Urban environment
- Industry
- Policy analysis
- Regions

- Tourism
- Fisheries
- Nature
- Natural resources
- Air quality
- Ozone depletion
- Households
- Waste
- Biodiversity change
- Chemicals
- Energy
- Human health

Fig. 4. *European Environment Agency's* classification of Sustainable development indicators.
Source: European Environment Agency

tured. In some cases facets under consideration overlap (e.g. *Air* and *Air quality*, each related to various kinds of emissions and pollution). Distinguished facets of households, nature waste leave a vague impression about issues being tackled. Impression is that *European Environment Agency's* indicators could be better structured. This institution does not provide sufficient information for each year, what makes adopted system inappropriate for analytical purposes (Tvaronavičienė *et al.* 2008). On the other hand, advantage of this classification lies in providing given policy' issues and its' assessment for each *Environmental* facet. E.g. *Transport* indicators are related to pollution, energy, and access to services, fuel, and transport infrastructure, age of vehicle, costs of transport, freight transport, passenger transport, and traffic noise; i.e. transport theme provides a wide range of indicators. *Water* indicators embrace accidents by ships, water quality, and classification of water, pollution, drinking water, use of water, water prices.

Some indicators are attributed to Water facet, but they could be included into Coasts and seas facet equally successfully, we reckon. 13 Indicators represent Agriculture facet. Climate change, Air and Air quality (the latter two already mentioned above) are distinguished into separate facets. Climate change is being estimated by following indicators: Global and European temperature, Atmospheric greenhouse gas concentrations, Greenhouse gas emission projections, Greenhouse gas emission trends, Transport emissions of greenhouse gases by mode, North Atlantic Oscillation, The North Sea cod (Gadus morhua) stock. Natural resources indicators should be included into Nature theme, which is represented by 8 indicators. Natural resources theme has only 2 indicators and overlap with Nature theme indicators. Human health theme contains 3 indicators: Emissions of primary particles and secondary particulate precursors, Transport contribution to air quality and Transport accident fatalities. The more coherent approach would be achieved if those indicators were attributed to Transport theme. Tourism indicators are: Tourism eco-labelling, Tourism intensity, Tourism travel by transport modes, Household expenditure for tourism and recreation. Hence, given indicators, show impact of tourism on environment. Notably, some indicators from Urban environment themes (e.g. municipal waste generation, water uses by sectors, drinking water quality) overlap with Waste, Agriculture, Households themes of indicators. To conclude, environmental issues are thoroughly discussed in European Environment Agency classification, but facets and indicators attributed to each of the facet could fall under criticism.

Organization for Economic Co-operation and Development (OECD) was established in 1947. It helps its member countries to achieve sustainable economic growth and employment. *OECD,* similarly to *European Environment Agency* is concentrated on environmental issues of Sustainable development. OECD classification embraces, so-called, *Issues*, *Available* indicators and *Medium term* indicators. *Issues* are presented in Fig. 5.
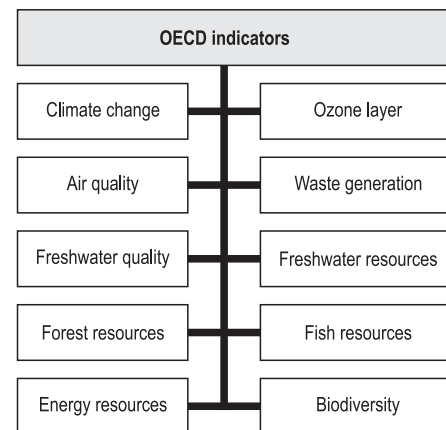

Fig. 5. *Organisation's for Economic Co-operation and Development (OECD) classification of indicators (OECD 2008)*

Available indicators are indicators for which data are available for a majority of OECD countries. These indicators are: CO_2 emission intensities index of greenhouse gas emission, Indices of apparent consumption of ozone depleting substances, SO_x and NO_x emission intensities, Waste water treatment connection rates, Intensity of use of water resources, Intensity of use of forest resources, Intensity of use of fish resources, Intensity of energy use, Endangered species. *Medium term indicators* are indicators that require further specification and development (availability of basic data sets, underlying concepts and definitions). *Medium term indicators are*: Index of greenhouse gas emission, Indices of apparent consumption of ozone depleting substances plus aggregation into one index of apparent consumption of ozone depleting substances, Population exposure to air pollution, Total waste generation intensities and indicators derived from material flow accounting, Pollution loads to water bodies, Intensity of water resources plus sub-national breakdown, Intensity of forest resources, Intensity of use of fish resources plus closer link to available resources, Energy efficiency index, Species and habitat or ecosystem diversity area of key ecosystems. All presented indicators could be divided in two major groups: natural resources and pollution. Notably, despite considered classification presents 10 facets, it looks sufficiently

comprehensive. It is a specific feature, that more attention is paid to air quality than to other environmental spheres, such as water and land (coasts, rivers, seas, soil are not being considered). *Organisation's for Economic Co-operation and Development (OECD)* classification is suitable for analytical purposes when only basic indicators are being considered. On the other hand, conciseness of this classification in some cases may be seen as advantage.

Statistical indicators benchmarking the information society's indicators (SIBIS) distinguish 9 groups (Fig. 6).
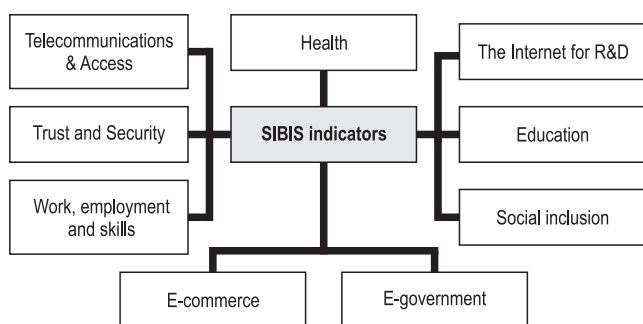

Fig. 6. *Statistical indicators benchmarking the information society's (SIBIS) classification* of indicators.
Source: Project SIBIS (2003)

SIBIS indicators are social. Each group of indicators has its facets or "sub-domains". *Telecommunications & Access* group has 7 sub-domains: Technology, infrastructure, Access – choice, Use, Access – quality, Access – cost and Market, reflected by 38 indicators related to Internet, cable TV, mobile telephones and other technologies. *The Internet for R&D* group has three sub-domains: Infrastructure, Research processes, R&D collaboration. 21 indicators are included into the group. They express the Internet importance to research and development: E-mail communication for R&D purposes, Effects of computer skills on R&D, etc. *Trust and Security* group has only one sub-domain – Trust and security – and 25 indicators. These indicators are related to computer crimes, security spending, and security controls. *Education* group does not have sub-domains, but it has 4 parts: A – Policy and strategy; B – Economy & infrastructure; C – Use and access; D – Competencies. There are 49 indicators in education group. They are related to ICT implementation in school, Internet use and access, specialist ICT teachers, expenditure on ICT, etc.

Work, employment and skills indicators embrace into thematic domain sub-domains, indicators. Every given Work, employment and skills indicator also has sub-indicators. E.g. *Labour productivity* indicator of Out-

put of employment sub-domain has 2 sub-indicators: Labour productivity (statistic) and Labour productivity growth, etc.

The sixth group of SIBIS indicators is *Social inclusion*. This group is divided into three parts:
1. Identifying the vulnerable change.
2. Access to ICTs and accessibility.
3. Rationale for participation in the IS.

This group is represented by 55 indicators. The seventh group is *E-commerce*. It has three groups: E-commerce readiness, E-commerce intensity and E-commerce impact. The eighth group is *E-government*. These indicators aim at measuring the use of government service online, the use of Internet and its access from home, consider the level of sophistication of specific online services. The last group of SIBIS indicators is H*ealth*. These indicators are divided into 2 groups: System quality and System usage. System quality has six sub-domains: Background of system developers, Purpose of the application, Content of the application, Confidentiality procedures, Design of the website, Evaluation of the website. System usage group has three sub-domains: Barriers to system usage, Patients and public usage of E-health systems, Practitioners usage of E-health systems. SIBIS indicators are specialized. They all are related to ICT, information system, so they can be used just in a specific way. They are considered as being sufficiently comprehensive.

Directorate's-General for Enterprise and Industry (DG ENTR) indicators are different from other institutional indicators' systems. Indicators differ across economic activities. E.g. for ICT industries and e-business, e-business readiness index is important. Sustainable development indicators for non-energy extractive industry are attributed to two levels: Company and Member States level. There are 13 indicators at company level and 7 indicators at Member States level (Fig. 7).

This classification has some disadvantages. At first, from the title of indicators there cannot always be judged what exactly it reflects. It was shown above, that various meaning aspects could be embodied into similarly sounding indicator groups, e.g. is employment total, males or females? Measures of indicators give hints, but, nevertheless, some indicators remain obscure. The second shortcoming is that indicators are not grouped. Classification, seems, has to be more precisely presented and, hence, clear.

To conclude, overview of institutional systems revealed a great variety of approaches, emphases, indicators grouping and number of indicators used. Despite the fact that institutional Sustainable devel-
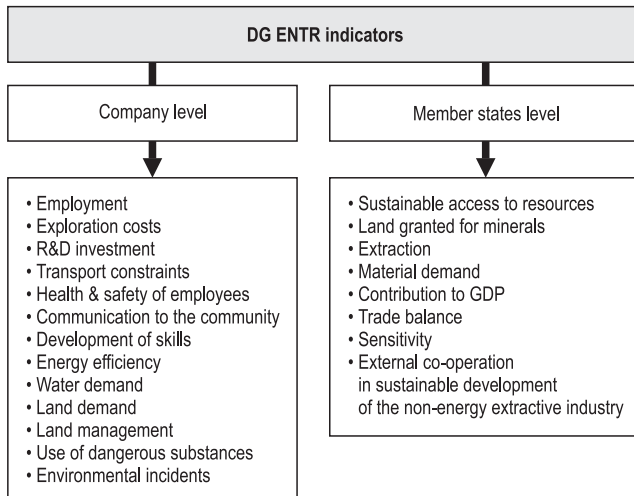
Fig. 7. *Directorate's-General for Enterprise* (*DG ENTR*) classification of Sustainable development indicators. Source: DG ENTR 2006

opment systems are supposed to be composed keeping in mind specific purposes, as it was argued above, scientific practice shows that any task-oriented analysis requires short-list of indicators, otherwise comparisons of countries based on any of provided systems are hardly performable.

4. Conclusions

The concept of Sustainable development on institutional level was introduced in 1980. Trials to define the system of indicators illustrate complicity of the task itself, no single definition could be accepted as accomplished. Despite one definition can not be provided, international organizations have introduced systems of indicators composed for Sustainable development measurement and management purposes. Despite general agreement on main aspects of Sustainable development (economic, social and environmental), main international organizations use rather differing systems of indicators.

In the paper institutional approaches towards Sustainable Development were considered, the systems of indicators juxtaposed. It appeared that each classification emphasizes different Sustainable development facets, is differently composed and, as a whole, could hardly be used for analytical purposes. Systems of institutional indicators, as a rule, do not pay attention to overlapping and interdependence of some indicators (Tvaronavičienė, Grybaitė 2007; Tvaronavičius, Tvaronavičienė 2008; Tvaronavičienė, Tvaronavičius 2006; Tvaronavičienė, Korsakienė 2007). On the contrary, impression is that increase in a number of facets embraced serves as ultimate goal, while issues related

to any kind of analysis of provided information are not being taken into account. Applicability of any system of currently available institutional indicators is seen as urge towards further accomplishments. As scientific practice witness (Tvaronavičienė *et al. 2008),* any task-oriented analysis requires short-list of indicators otherwise comparisons of countries and sustainable development management process are hardly feasible.

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