

## **Chapter 1 – Sustainability and Sustainability Indicators**

Concept of sustainability is extremely complex and this feature can be seen even at the stage of formulation the definition. For each person it can mean something different, depending on prior experiences and core values. The keynote of this ideology can be expressed by the following sentence: “don’t cheat on your kids”. Moreover, sustainable system can be compared to “situation where quality remains the same or increases. If quality declines, then the system can be regarded as unsustainable”. Despite the fact, that above definitions may sound simple, their assumptions are extremely hard to implement in real world. A sustainable society should deliberately use available resources, take care about the environment and at the same time try to ensure good social conditions and maintain economic development.

We can also divide sustainability into strong and weak factions. Strong one implies, that “environment is critical for our and our children’s survival, and any damage will have negative repercussions”. While the weak one assumes, that environment can be treated as additional component, which can enrich the economy.

The above considerations can be summed up with the words of As Kidd, who argues, that “there is not, and should not be, any single definition of sustainability that is more logical and productive than other definitions”. But not only the definition of this concept arises problems. Troublesome is also its reasonable measurement.

While analyzing sustainability we have to realize, that it depends on huge amount of different factors. Problematic is also measurement of each of them. For example, we cannot clearly distinguish boundaries of one ecosystem from another, because they overlap each other and can contain many smaller ones. We can also ask question “over what time we want to achieve sustainability”? Different systems can require different time samples, differing from 10 to even 1000 years. Finally, measurement of quality of system can depend on variables such as employment, personal income, crimes, migration etc. and attributing them inadequate weights can lead to wrong conclusions.

In practice, organizations have to create sustainability indicators basing on huge amount of incoming data. Those indices must be operational in specific fields (like agriculture) and allow to create methods, to achieve sustainability over a given period of time. They can take different shapes, like tables or calculated values (for example ESI), but they all share a common goal.

Other way to make predictions is not basing on the holistic approach, but only on part of reality. But how we simplify is crucial for the obtained results. We have to remember, that wrong conclusions may be drawn not only from too complex picture, but also from this, that is careless simplified.

## **Chapter 2 – Sustainability Indicators in Practice**

This chapter presented two kinds of sustainability indicators, that are used in industry (presented mainly on the example of fishing): MSY and AMOEBA.

MSY stands for Maximum Sustainable Yield. It was created in 1930s and its main purpose is to measure the number or amount of biomass of representatives of given species, that can be removed from an ecosystem without driving the population down. It bases on the carrying capacity of environment, which represents the maximum amount of individuals of given species, which ecosystem can sustain. It is extremely hard for population of concerned species to exceed this boundary, because it is limited by the lack of resources and occurrence of other organisms.

Unfortunately, there are concerns about the MSY. Some people point out, that it bases on model of population growth (the exponential growth limited at given level), the correctness of which has not been proven. Moreover, it does not take into account relationships between given species, differences between representatives in one population (like age and size) and influence of

human on carrying capacity of environment. It is also hard to establish proper start point of measurements and calculate necessary constants, which depend on current environmental conditions. MSY, thanks to its simplicity of calculation and lack of expertise requirements, is often overused. Because of its imprecision, it can also lead to unsustainable acts (example of the collapse of Peruvian anchovy fishery). Currently, MSY is considered as a start point in further predictions.

Another example of sustainability indicator is AMOEBA. It is acronym of Dutch “general method for ecosystem description and assessment”. It is a visual way of representing the abundance of species in given area. It is intuitive and was created to help in decision-making in environmental management. But it also has disadvantages. AMOEBA shows only the amount of species in ecosystem, but no pressure factors. It also mixes all incoming data into one diagram, which can be misleading. Finally, it is hard to properly choose good reference condition of environment, for creation of diagram.

### **Chapter 3 - Indicators, Cities, Institutions and Projects**

Usage of sustainability indicators in proper development and management of cities and institutions has marked a significant progress in recent years. Cities, in order to become sustainable, should remember about three main goals: protection of environment, economical development and improvement of social structures. Proper indicators should take into account factors such as governance, transport and connectivity, services, environment, equity, economy and housing. To get proper data for creation of sustainability index it is a good practice to conduct surveys in society to collect the most authentic data. But we also have to remember, that citizens are subjective in their convictions and can diminish the importance of some factors (for example preservation of environment).

Sustainable management of company may appear to be easier, because it is not as complex as city or state. It may reflect in institutions probability of survival on the market without incoming funds from outside, or introduction of sustainable product to the market.

Two SIs were created in order to properly manage companies and projects. Those are Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA). CBA measures the proportion between cost of the project and benefits, which it can bring. Other approach to create this gauge would be to calculate the cost of restoration of system to sustainable state or expenditures needed to maintain this state. CBA is easy in use, but it also has faults. Not every factor can be presented in the monetary form (for example environmental indices). MCA is far more flexible than CBA. It can incorporate multiple criteria (even previously created CBA). Bearing in mind, that each factor must be chosen wisely and should have appropriate weight in final calculations, this indicator can lead us to much better results than CBA.