CHAPTER 1, Sustainability and sustainability indicators

One could say that sustainability is in fashion at the moment. What they mean is that sustainability issues are today probably more popular than what they have ever been before. Companies and communities are therefore constantly looking for ways to measure their impact on environment, or so to say try to proof that they are sustainable. The view of how to be sustainable also differs depending on who is doing the talking. For example some say that as agriculture has a high impact on environment, and the solution to that would be organic farming. The opposition says that organic farming is actually less sustainable than high-yield farming that can utilize economies of scale. This problem is due to a fact that the definition of sustainability isn't always universal and therefore some parties might use a definition that suits their agendas. Comparability is also an issue since different geographical and other factors can affect one's sustainability indicators even though they couldn't affect them at all. For example in urban areas the pollution levels are automatically higher than in the countryside. Also export and import ratio affects country's pollution levels very much. Some geographical sustainability indicators could be water level, air pollution, soil erosion, soil acidity and alkanity, crop yield, and biodiversity. Other indirect indicators are for example employment, income, crime, travel, migration and housing price levels. One popular indicator that is used to compare purchasing power between citizens of different countries is so called Bic Mac index that tells the price of a Big Mac burger in a country. Indicators are very difficult to choose, since an ecosystem might consist thousands if not millions different components. It's not possible or even rational to measure everything. Usually some key components are picked which are then taken for a closer look. For example United Nation measures 132 different sustainability indicators. Simplification often leads to better results since holistic view can be made more effectively, but careless simplification might lead to misleading conclusions.

CHAPTER 2, Sustainability indicators in practice

Maximum sustainable yield describes the carrying capacity of an ecosystem. In practice for example in fishery management the maximum number of animals that can be removed from an ecosystem without reducing the size of the population is the number of individuals that is born after reduced the number of deaths. If one wants to maximize the fishing quantities then the population should be raised to its maximum sustainable yield where the ecosystem couldn't carry any more individuals anyway. This way the population is maintained in a healthy level while the catch quantity is also on its maximum level. Of course in reality the maximum sustainable yield level as well as the ratio between births and deaths might be difficult to figure out, so there are some simplified equations that can be used to figure these variables out in order to maximize the fishing efforts. These equations are however very vulnerable and they assume a lot of things that aren't really constants in nature. For example, the fish that are caught are supposed to be fish that are no longer reproductive. In the late 60s there was an anchovy fishery that was supposed to be optimal and sustainable but due some unfortunate events the population collapsed anyway. The AMOEBA approach is another way to measure sustainability. It was created as a decision making tool and thus its highly visual and very informative to non-specialist

viewers. Being so simple, it of course has its disadvantages. It doesn't provide any information on mechanisms behind it, since it only gives visual signal of the change to a reference point. Both MSY and AMOEBA are trying to simplify very complex ecosystems and while they might give the viewers some clue about the subject, they can never be 100 % accurate.

CHAPTER 3, Indicators, cities, institutions and projects

The cities and communities are constantly competing against each other in many things. Sustainability makes no exception. In Europe there is a Sustainable City Award, the UN has selected some cities on its Sustainable Cities Programme and in UK there is a smaller scale Academy for Sustainable Communities. The indicators measured that should be obtained to reach the nomination vary. Some indicators that are measured are for example protection and enhancement of the ecosystem and recourses, economic productivity, provision of social infrastructure. Also some indicators are well structured governance, transportation, services such as health, security issues, education and culture, environment, equity, economy, housing, tranquility and community spirit. Obtaining these indicators will in no doubt increase the wellbeing of the citizens of the city and thus simultaneously increase the attractiveness of the city as well. Happy citizens are more likely to also be more productive so the investment on sustainability indicators may turn out to be even more profitable than it was originally intended. There are two ways to determine whether or not the projects to increase sustainability have achieved its goals. One is Cost-benefit analysis (CBA) and the other is Multi-criteria analysis (MBA). The Cost-benefit analysis measures the ratio between the costs and benefits of the project. CBA requires that the benefits can be expressed in financial terms, and that is also the core problem with the analysis as not all measures can be transformed in to financial terms and also some effects can be hard to estimate and predict as the effect might take place in after very long periods of time. The Multi-criteria analysis is more complex than the Cost-benefit analysis, but it's also more flexible. The MBA can measure quantitative indicators just as the CBA, but it can also take in effect some qualitative indicators. The use of CBA might be very tempting since it's very easy to use and understand, but the use of MBA will probably end up with better results. The problem might arise if the analysis methods are just taken into use to prove the sustainability and not actually to improve it. The projects might not be carried out by experts since the analysis methods are so simple, and the time scale to measure the effects might be way too short as results are wanted quickly. Sustainability however isn't achieved in a matter of days of weeks but in decades and centuries.