

# KEY PERFORMANCE INDICATORS FOR MEASURING SUSTAINABILITY

## KLÍČOVÉ UKAZATELE VÝKONNOSTI PRO MĚŘENÍ UDRŽITELNOSTI

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### **Abstrakt:**

Hlavním cílem tohoto článku, jak je patrné z názvu, je ukázat udržitelnost jako hlavní a rozhodující faktor výkonnosti pro každou firmu. V první řadě článek hledá definici udržitelnosti prostřednictvím trvale udržitelného rozvoje a později ukazuje způsob, jak tuto udržitelnost měřit. Tento článek staví na reálné podnikové praxi.

### **Abstract:**

The main aim of this article as seen from the name is to show sustainability as the main and crucial factor in performance for any company. First of all it is needed to find the definition for sustainability through sustainable development and later find the ways how to measure it. The article will build on the real company practice / case study.

### **Klíčová slova:**

Udržitelnost; Udržitelný rozvoj; Výkonnost; Měření.

### **Key words:**

Sustainability; Sustainable Development; Performance; Measurement.

**JEL:** Q01

## **1 Introduction**

Sustainability is something, what we can hear almost every day. A lot of managers are calling for sustainable development, sustainable business or sustainability in every steps firm takes. But what does it mean in real? Are these just empty words? How can company cope with sustainability and is it something they really need to focus on?

According the Google AdWords every month there are more than 1 million people searching for the word "sustainability" in Google search. More than 1.5 million per month search for the word "sustainable" and 360,000 needs "sustainable development". "How to be sustainable" – which is more specific than other search words – is still searching online more than 880 people monthly. [10]

It is not a coincidence that world companies have focused more and more on the future and not only the present financial welfare. They are aware that there will be no future if they won't have any resources they can draw from. Let's move to the definitions.

## **2 Objective**

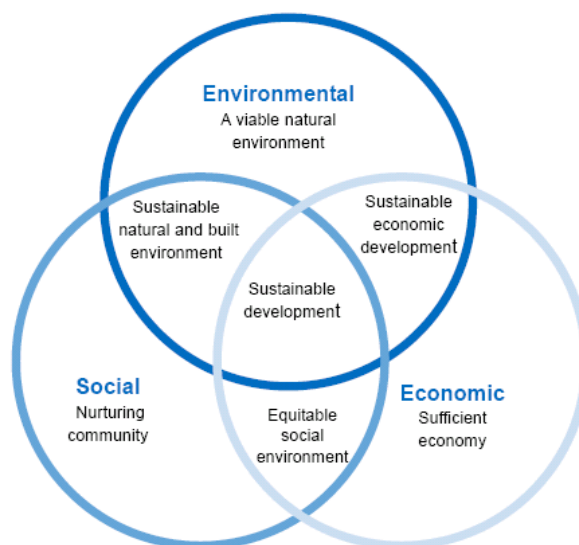
The definition of sustainability depends on who is speaking. Still, common topics run through most definitions of sustainability. They usually deal with the economy or nature. They are about the rate

of change, and about equity between generations. Many see sustainability as a continually process of development. As sustainability is a new trend, many come with own definitions.

United Nations and EPA (Environmental Protection Agency) [18] defines the "Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs." Robert Gillman, editor of the In Context magazine, extends this goal oriented definition by stating "sustainability refers to a very old and simple concept (The Golden Rule)...do onto future generations as you would have them do onto you." [21]

Triple Bottom Line is often used in business definitions. One approach to sustainability is focusing on the impact of decisions on the environment and the community in addition to profit (traditional single bottom line). The diagram below illustrates this idea and supports the idea of measurable definition.

**Fig. 1: Triple Bottom Line. Source: 16.**



Business Dictionary [3] defines the sustainability as an "ability to corroborate or substantiate a statement" and "ability to maintain or support an activity or process over the long term". There is also definition for Economics: "Continued development or growth, without significant deterioration of the environment and depletion of natural resources on which human well-being depends. This definition measures income as flow of goods and services that an economy can generate indefinitely without reducing its natural productive capacity. See also sustainable development."

The concept of sustainable development was described in a 1981 White House Council on Environmental Quality report: "The key concept here is sustainable development. If economic development is to be successful over the long term, it must proceed in a way that protects the natural resource base of developing countries." [18]

Many companies are now pursuing the goal of sustainability, realizing that protecting the environment makes good business sense.

In review of the plurality of these definitions, the site or the environmental context is an important variable to most working definitions of sustainability. This emphasis is expressed in the following composite definition:

Sustainable developments are those which fulfill present and future needs (WCED, 1987) while [only] using and not harming renewable resources and unique human-environmental systems of a site: [air], water, land, energy, and human ecology and/or those of other [off-site] sustainable systems (Rosenbaum 1993 and Vieria 1993). [21, 19, 14]

From the last definition we can get some basic areas of measurement. We will get to them back in next chapters:

- Air - Air quality is a critical indicator to human and planetary health.
- Water - Modeling the input and output of water resources of a site provides another challenging indicator for sustainability.
- Land - The three R's -- reduce, reuse, recycle -- are a useful model for sustainability.
- Energy - Full sustainability would require a site or society to completely shift to renewable energy systems.
- Human ecology - Human ecology can and often does include the other four more biological indicators. The biological variables are separated for clarity and emphasis with the conviction that they are more ecologically fundamental to society's ability to define, model, and measure sustainable development.

### **3 Methodology**

For this article was used a descriptive research – the major purpose is description of the state of affairs as it exists at present. It is a report of current state.

The research is based on following steps [13]:

- Formulating the research problem.
- Literature Survey and Data Collection.
- Case Study Analysis.
- Interpretation and Conclusion.

### **4 Results**

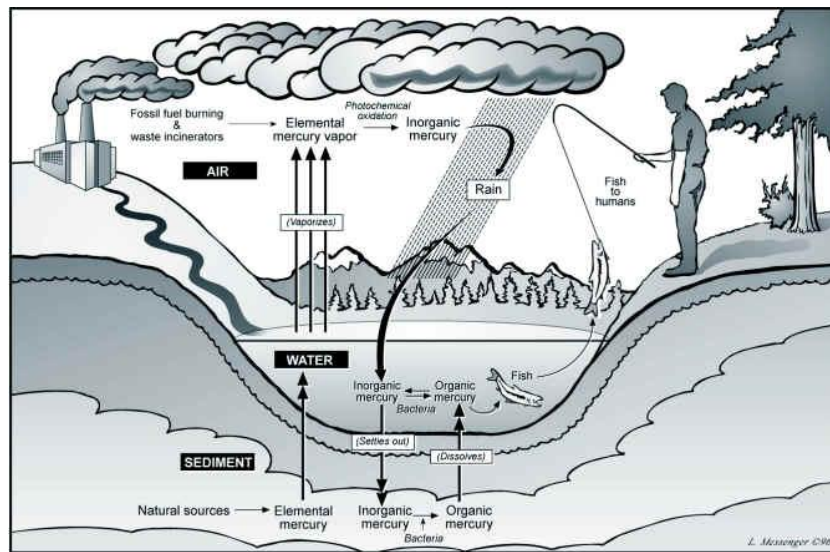
All high-performance organizations whether public or private, should be interested in developing and deploying effective performance measurement and performance management systems. This is the only way they can remain high-performance organizations. According Dr. Robert S. Kaplan from Harvard Business School each organization must create and communicate performance measures that reflect its unique strategy.

As company's performance is meant firm's ability to make most of resources into its business activities. This is why can company measure its performance in different ways and for different stakeholders.

Sustainability is key factor for success in the future. Climate change is emerging as a key factor expected to transform the way we manage resources. Impacts of climate change on resources are likely to affect all regions of the world, but will manifest themselves in different ways. The uncertainty regarding the severity, timing, and frequency of events — and their subsequent impacts - is the main challenge. Having robust and adaptive resource management plans will help prepare company for the uncertainty and risks that lie ahead. [4]

With resources management is connected also the resource pollution problem. Pollution is the introduction of a contaminant into the environment. It is created mostly by human actions, but can also be a result of natural disasters. Pollution has a detrimental effect on any living organism in an environment, making it virtually impossible to sustain life. Companies (and basically all the people) depend on the environment for certain ecosystem services such as water, energy etc. As a result, pollution is a public health threat, because when pollution accumulates in the environment, it contaminates ecosystems, so different sources that depend on these ecosystems are contaminated as well. As an example we can use mercury pollution, which usually companies produce (see figure 2). But this all is about output.

Fig. 2 – Mercury Pollution Cycle. Source: 16.



The sustainability has to be part of every strategy company takes in the future. It is no more about empty words. Every company needs to use resources wisely and has to be responsible for society. This is why sustainability should be crucial factor in company’s performance.

So the question is easy. How can a company use resources in sustainable way? The basic idea is coming from measurement system and indicators of sustainability.

#### 4.1 Indicators of sustainability

Let’s go through some basic indicators of sustainable utilization of resources. This article is focused only on suggestion of some indicators in area of water, air and land pollution.

Indicators are statistics and are used to measure current conditions as well as to forecast. They can be used extensively in analysis to predict changes. In industry conditions can be used to provide insight into the company reality.

#### 4.2 Water

In order to ensure the economic sustainability of the natural resource sectors, water use must be managed with the maintenance of ecosystem integrity as a core principle. Freshwater is vital to ecosystems, biodiversity, and human well-being. Water is essential for all living things. Ecosystems cannot function properly and deliver ecosystem services without adequate, reliable, and clean sources of freshwater. Water is a common good and governments (as well as companies) have a duty and a responsibility to protect it and manage it for future generations. [4]

The basic indicators of sustainability in water resources are stated in the table 1.

Indicator	Unit
Last inspection of septic system	Every year
Pesticides and fertilizers used near water system	None or small amount
Non-toxic materials used by cleaning	None or small in number/liters
Trash separation of chemicals and solvents into sewer drains	Number of drains

Water used during year	Liters / oz
Number of cleaners of sewage	Number
Utilization of ground water	Percentage
Wastewater treatment plant	Yes/no/Number

### 4.3 Air

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere. Air quality management is not simply a euphemistic synonym for air pollution control; rather it represents a well defined process or rationale for establishing and enforcing regulations governing emissions of a wide array of pollutants from diverse urban and rural sources.

Particulate pollution is a term that covers a broad spectrum of specific pollutant types, including smoke and aerosols, which permeate the atmosphere. The effects of such pollutants on human health have prompted a great deal of research effort in recent years, with the establishment of PM10 (particulate matter having an aerodynamic diameter of  $<10 \mu\text{m}$ ) as the definition for the health-damaging fraction of the total suspended mass of particles in the atmosphere [6]. There have been a number of important medical studies that have linked high concentrations of PM10 with adverse human health effects (the first being by [7]), and more recently concern has moved to the finer PM2.5 ( $<2.5 \mu\text{m}$ ) and ultrafine particle fractions ( $<1 \mu\text{m}$ ). The sources of these particles are many and varied in the urban atmosphere, including both naturally and anthropogenically produced matter. However, the most significant source in many urban areas comes from the exhaust fumes of road traffic [20]. As discussed by Beckett et al. (1998), trees provide many beneficial characteristics that enable them to capture pollutant particles and hence reduce their concentration in the air. [1]

Trees can capture significant quantities of health-damaging particles from the atmosphere with the potential to improve local air quality. There are marked species differences in the ability of trees to capture pollutant particles, such that conifers may be the best choice for pollution-control plantings. Among the broad-leaved species studied, those with rough leaf surfaces are most effective at capturing particles. [2]

Some of the main contributors to air pollution are [18]:

- Automobile emissions
- Tobacco smoke
- Combustion of coal
- Acid rain
- Noise pollution from cars and construction
- Power plants
- Manufacturing buildings
- Large ships
- Paint fumes
- Aerosol sprays
- Wildfires
- Nuclear weapons

**Tab. 2 – The basic indicators of sustainability in air area. [own processing]**

<b>Indicator</b>	<b>Unit</b>
Number of cars in the company (fuel/electric)	Number
Last date of replacement of car's air filter	Every year
Percentage of business trips made by car/plane/train/...	Percentage
Number of plants/trees in the company and around	Number
Percentage of aerosol spray cans	Percentage
Number of harsh chemical cleaners	Number/Percentage
Number of gas-powered/electric lawnmowers	Number
Last date of car's maintenance	Every year
CO <sub>2</sub> concentration in the air (in the area of company)	Ppm
NO <sub>2</sub> concentration in the air (in the area of company)	mg/m <sup>3</sup>
Way, how employees go to work (car, bus,...)	Means of transport

#### **4.4 Land**

Land pollution is the result of human misuse of soil. Poor agricultural practices, digging up of important resources and dumping of garbage underground can cause land pollution. Urbanization, the growth of rural lands into urban areas and industrialization that results in the formation of an industrial society are regarded as the two main causes of land pollution.

The EPA [18] defines land pollution and non-point land pollution as "...unlike (land) pollution from industrial and sewage treatment plants, (non-point pollution) comes from many diffuse sources...caused by rainfall or snow melt moving over the ground...depositing (different pollutants) into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water."

How does land pollution affect the environment? One of the major consequences of land pollution is the imbalance in nature, resulting from the harm caused to the wildlife and vegetation on the land. It adversely affects the human respiratory system and results in various skin problems if the toxic materials of the soil come in contact with the skin. The consumption of fruits and vegetables that are grown in contaminated soil can lead to several health hazards in human beings.

Some of the main contributors to land pollution are [18]:

- Chemical and nuclear plants
- Industrial factories
- Oil refineries
- Human sewage
- Oil and antifreeze leaking from cars
- Mining
- Littering
- Overcrowded landfills
- Deforestation
- Construction debris

**Tab. 3 – The basic indicators of sustainability in land area. [own processing]**

Indicator	Unit
Percentage of items reused	Percentage
Percentage of material recycled	Percentage
Percentage of biodegradable products	Percentage
Liquid chemicals storage usage	Yes/no
Packaging of products – minimum packaging materials policy	Yes/no
Usage of organic food	Percentage
No pesticide policy	Yes/no
Number of trash bins used for separation	Number/Perc
Green policy standards	Yes/no
Danger waste	Percentage
Nuclear waste	Percentage
Plan for resources sustainable utilization	Yes/no
Usage of electricity from sustainable resources	Percentage

All indicators are based on every company needs. That is why it is really hard to create overall indicators examples.

## 5 DISCUSSION

For the discussion and support of sustainable management, there is a case study from one Canadian company, which is called by many people as agent of change. This company's name is Calstone and it is a winner of the Canadian Council of Ministers of the Environment Pollution Prevention Award for overall pollution prevention achievements by small business.

Calstone is a Canadian family-owned business that creates and manufactures high-quality metal furniture products in Scarborough, Ontario. The company was established in 1985 and today employs 28 people. [8]

Calstone prides itself on being a "green" company. They have discovered that selling green furniture products provides a valuable competitive advantage, one that has expanded its market to include responsible purchasing programs and conscientious consumers.

To reduce harmful emissions, an efficient vapor spray degreaser was installed to purify chemicals for reuse in the degreasing process of metal components. Also, throughout the facility, golden pothos plants improve air quality by filtering out toxins. To reduce the facility's water use, a 2000 gallon stainless steel water tank was installed to reuse water for the cooling of spot welding equipment, and rainwater is collected for the flushing of all toilets in the facility. [8]

To reduce energy use and support green electricity, the facility installed a heat exchanger made from an old car radiator, hung large pieces of polystyrene foam from the facility ceiling to reduce the amount of air space that needs to be heated and cooled, and currently operates the facility with a provider of green electricity.

Calstone also takes measures to green the supply chain. The Calstone Re-Manufacturing Program, launched in 2007, invites customers to sell their used metal furniture back to Calstone

for a nominal fee. Calstone then uses the recycled steel to create new furniture. Meetings are held with all Calstone suppliers, outlining Calstone's commitment to the environment and business philosophy, encouraging the suppliers to initiate recycling and re-manufacturing programs of their own. All Calstone employees are provided with take-home manuals of easy green actions they can incorporate into their everyday lives, and customers are given environmentally friendly cleaning kits and brochures with eco-living tips to raise awareness about environmental issues related to consumption. [8]

There are currently more results and findings on sustainable indicators at companies. One of them agrees with this article findings. That is Graham Hubbard from Australia [11], who has in his article demonstrated the multifaceted nature of organization. He states the Dow Jones Sustainability Global World Index has been developed to help an increasing number of investors find socially responsible investment opportunities. One example for measuring other performance factors of company is tripple bottom line from Elkington (1997), where he suggests indicators from social area – Reliability of supply, Responsiveness, Overall customer satisfaction, etc. and from environmental area – Nitrogen discharge, Wastewater reuse, Spillages, EMS plants certified, ... It is based on the idea that a firm should measure its performance in relation to stakeholders including local communities and governments, not just those stakeholders with whom it has direct, transactional relationships (such as employees, suppliers and customers). He writes there are many competing frameworks for measuring and reporting social and environmental performance. Some are in rudimentary form; others are more sophisticated.

Hubbard also writes about special tool called Social Balanced Scorecard. The same tool is described in the paper of Gates and Germain [9]: Integrating Sustainability Measures into Strategic Performance Measurement Systems. They use data from 79 larger companies and compared results across companies. They found out that presence of sustainability measures is not related to strategy and companies' nationality. Sustainability measures can provide valuable feedback for double-loop learning that could aid in the process of strategy formulation based on the external environment.

The similar results are also state by Dickson, Tanzil, Beth R. Beloff or Robert B. Polasek and many others.

## **6 CONCLUSION**

Looking at sustainability is going to be very important trend in the future of every company. From the critical point of view it is sure that this concept cannot be ignored by companies, which want to be successful in the future. It is not only about costumers, who will be more interested in sustainability of resources used in the process of production, but as we live in the planet with limited resources, only companies with reuse – recycle politic will be able to use resources again.

Responding to societal concerns is very important to businesses, not only from a public relations perspective but also as a means to address customer and shareholder expectations. Financial markets are also starting to examine the way in which companies address water-related risks, adding to this public pressure to sustainably manage natural resources. Many people are not aware of the impact that such industrial pollution can have on the earth. By helping to make it known, you can be one of the voices that will draw attention to the issue thus helping to inspire change.

Pollution prevention is about anticipating and preventing pollution instead of reacting to it after the fact. Pollution prevention does not stand alone; it is part of an ongoing pollution management approach that is comprised of prevention, control and clean-up.

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating them, or cleaning them up after they have been created. This approach, called "pollution prevention", is needed to secure a safe and healthy environment and a sound and prosperous economy. It is a key component of environmental protection and sustainable development.



The world's population is experiencing unprecedented growth and, for many, living standards are increasing too. The demands being placed on our environment are relentless – accelerated use of natural resources, increased production, and spreading urbanization – and the result is more waste and pollution. It is sure, that sustainability will be one of the company's future trends. It is up to every firm, if they start with resource management right now or wait for the governmental law and request.

## 7 Resources

- [1] Beckett, P.K., Freer-Smith, P. and Taylor, G. (1998) Urban woodlands: their role in reducing the effects of particulate pollution, *Environmental Pollution*, 99, 347-360.
- [2] Beckett, K. P., Freer-Smith P., Tazlor G. Effective tree species for local air-quality management. [online]. 2010, [cit. 2011-01-05]. Dostupný z WWW: <[http://eprints.soton.ac.uk/159959/1/Effective\\_Tree\\_Species.pdf](http://eprints.soton.ac.uk/159959/1/Effective_Tree_Species.pdf)>.
- [3] Business Dictionary. [online]. 2011, [cit. 2011-01-15]. Dostupný z WWW: <<http://www.businessdictionary.com/definition/sustainability.html#ixzz187LIMfQ8>>
- [4] Changing Currents / Water sustainability in Canada. [online]. 2010, [cit. 2011-02-05]. Available at: <<http://www.nrtee-trnee.com/eng/publications/changing-currents/changing-currents-water-report-eng.pdf>>.
- [5] Community Sustainability. [online]. 2011, [cit. 2011-02-05]. Dostupný z WWW: <http://www.arch.wsu.edu/09%20publications/sustain/home.html>>.
- [6] Department of Environment (1995) Expert panel on air quality standards: particles, HMSO, London.
- [7] Dockery, D.W., J. Schwartz and J. Spengler (1993). An association between air pollution and mortality in six U.S. cities. *New England Journal of Medicine* 329(4), 1753-1759.
- [8] Environment Canada. [online]. 2010, [cit. 2011-01-21]. Dostupný z WWW: <<http://www.ec.gc.ca/p2/default.asp?lang=En&n=36EB925F-1/>>.
- [9] Gates, Stephen, Germain, Christophe. Integrating Sustainable Measures into Strategic Performance Measurement Systems: An Empirical Study. *Management Accounting Quarterly*. Spring 2010. Vol. 11, No. 3.
- [10] Google AdWords [online]. 2011, [cit. 2011-01-10]. Dostupný z WWW: <<http://www.google.com/AdWords>>.
- [11] Hubbard, Graham. Measuring Organizational Performance: Beyond the Triple Bottom Line. *Business Strategy and the Environment*, 19, 177-191 (2009). Published online 2006.
- [12] OECD Documents, 1994, Towards Sustainable Agricultural Production: Cleaner Technologies, Organisation for Economic Co-operation and Development, Paris.
- [13] RANJENDAR KUMAR. Research Methodology: Step-by-Step Guide for Beginners. Hardcover: 276 pages, Sage Publications Ltd; ISBN-13: 978-0761962137.
- [14] Rosenbaum, 1993. "Sustainable Design Strategies," *Solar Today*, March/April.
- [15] Serving the American Public: Best Practices in Performance Measurement. [online]. 2011, [cit. 2011-02-07]. Dostupný z WWW: <<http://govinfo.library.unt.edu/npr/library/papers/benchmrk/nprbook.html>>.
- [16] The Conservation Report/Mercury Pollution. [online]. 2010, [cit. 2011-01-05]. Dostupný z WWW: <<http://conservationreport.com/2009/08/20/mercury-pollution-federal-government-study-finds-that-mercury-contamination-in-fish-widespread/>>.
- [17] Town of Eagle – Colorado. [online]. 2010, [cit. 2011-01-05]. Dostupný z WWW: <<http://www.townofeagle.org/index.aspx?NID=254>>.
- [18] U.S. Environmental Protection Agency. [online]. 2011, [cit. 2011-01-05]. Dostupný z WWW: <<http://www.epa.gov/sustainability/basicinfo.htm#sustainability>>.
- [19] Viera, 1993. "A Checklist for Sustainable Developments" in a resource guide for "Building Connections: Livable, Sustainable Communities, American Institute of Architects, Washington, DC.

- [20] Watkins, L.H. (1991) State of the Art Review 1: Air Pollution from Road Vehicles, HMSO, London, England.
- [21] WCED, 1987. Our Common Future. World Commission on Environment and Development, United Nations, Oxford University Press.