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Contemporary challenges in military logistics especially for measuring and managing the carbon footprint

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ABSTRACT
The major aim of the paper is to delineate categories, definitions and principles of the international sustainability of military logistics and operational supply chain. Paper deals with the trends and tendencies of global, European and Hungarian connections of sustainable logistics management, especially impacts and aspects of the contemporary developments and its consequences for public service. The paper provides proposals necessary to understand how to make efficient solutions in the business and in the military.

Keywords: Sustainability, Military Logistics, Carbon Footprint

INTRODUCTION

The structure of the article is the following. A first part gives a survey about the use of different (ecological, carbon and water) footprints to measure and evaluate the level of sustainability. A next part deals with the use of those tools in evaluating military activity, especially military logistics. The following part introduces the center and the project that began to deal with this topic, aiming at a comparative, international cooperation to deepen the knowledge about the details.

1. FOOTPRINTS AS A MEASURE OF SUSTAINABILITY

Susan Murcott (Murcott 1997) collected 57 different definitions of sustainability from publications prepared between 1979 and 1997 and, presumably, at least this amount could be collected from the nearly identically long period having passed since then. This phenomenon draws the attention primarily to the fact that it is worth being very careful when taking any definition over, as practically every author construes the phenomenon of sustainability in his own way and among these approaches there are many deficient, one-sided or even erroneous, false, distorted or trying to conceal or to hush up the substance of sustainability.

Two major procedural trends have developed for solving the methodological issue. One of the procedures keeps the different partial indexes measuring their own dimension instead of an aggregated single-dimension index and by that produces a multi-dimension index system, while the other one tries to find unifying dimensions other than money for preparing the aggregated value, such as the ecological footprint, the carbon footprint or the water footprint. Our paper addresses these latter ones, with the focus on the carbon footprint, in connection with military operations.

While generally the procedures use existing indicators, originally developed for other purposes, the ecological footprint created a new type of index based on the idea of sustainability. Its clarity, relative simplicity and applicability ensure an outstanding place for it among the different indicators of sustainability.

1.1 The concept and usage of the ecological footprint

From the early 90's Mathis Wackernagel and William Rees developed a procedure and a method to measure and compare the impact of different activities on the terrestrial ecosystem and also to rank the countries from this aspect. In the following we primarily refer to the first book of the authors (Wackernagel – Rees 1995) but the updated country rankings published each year on the website of Global Footprint Network operated by them (http://www.footprintnetwork.org/) are also of the same importance. (Global Footprint Network 2014)

The ecological footprint measures, to which extent the satisfaction of human needs make demands on the ecosystem of the Earth. It compares this level of needs with the bio product and ecological capacity available and renewing on the Earth. The ecological footprint measured in hectares represents the biologically fertile land and water surface necessary for the regeneration of the resources consumed by the population and also for the absorption of the related quantity of waste. This way it can be stated that e.g. in 2013 1.54 times more surface of the globe would have been required for reproducing the annual consumption of mankind of those year, than available on the Earth; i.e. mankind exceeded the allowable extent of the sustainable use of the planet already by 54%. The clarity of the procedure lies in the fact that it converts the components of the multi-dimensional human consumption (energy, raw materials, food and biomass, construction materials, water, waste disposal and neutralisation of carbon dioxide) into a single dimension, i.e. the required piece of land and this way it makes it comparable. At the same time, in respect of the surface of the Earth we can quite easily accept that these resources are finite and we can only use the quantity given.

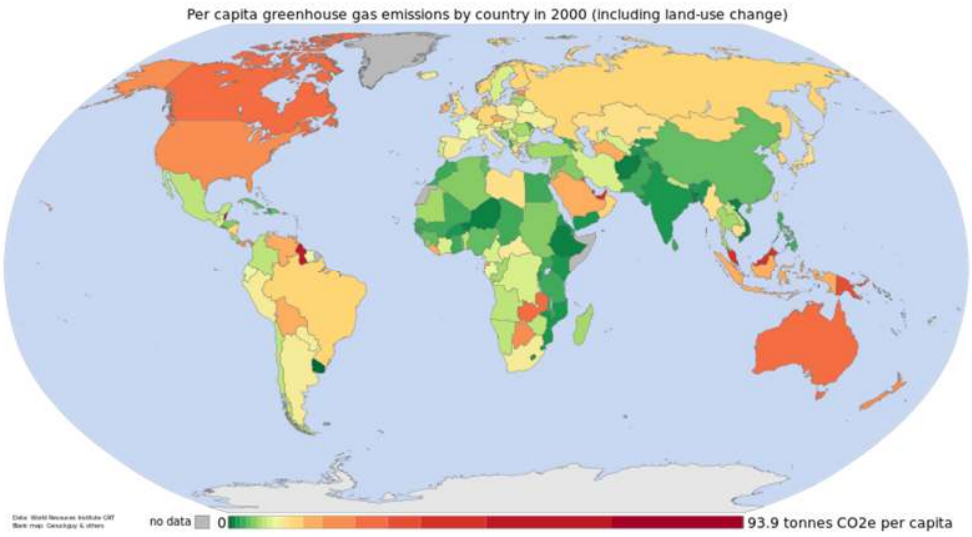
The footprint per capita is suitable for representing the lifestyle and consumption pattern of different people, groups or nations. Two other use of the per capita footprint calculated is to compare it to the per capita average area available on the Earth (so called global hectare. gha) or, likewise, also with the area available in the given country.

In 2009 the global average of land per capita was 1.8 gha.

1.2 Carbon and water footprint

The ecological footprint shows that instead of just grouping the existing statistical indexes such new indicator can also be created as start out from the specific logic of a newly emerged scientific phenomenon (in our case sustainability) to reflect its peculiarities. Following the example of the ecological footprint, there have been other attempts to develop specific indicators and indexes.

The literature started to use the term "carbon footprint" approximately in 2005. Its development reflects the obvious need that in relation to the issue of the climate change coming more and more to the fore and parallel with the growing focus on the emission of greenhouse gases and carbon dioxide within, an indicator qualifying exactly this phenomenon is available. The popular name was actually spreading faster than its precise meaning could have been comprehended and many created their own definition. Geoffrey Hammond draws the attention to the fact (Hammond 2007) that what is mentioned by the term carbon footprint is, in fact, not a footprint in such sense related to an area as it is in the case of the ecological footprint, but is rather carbon-weight kilogram or ton projected to a person or to certain activities.



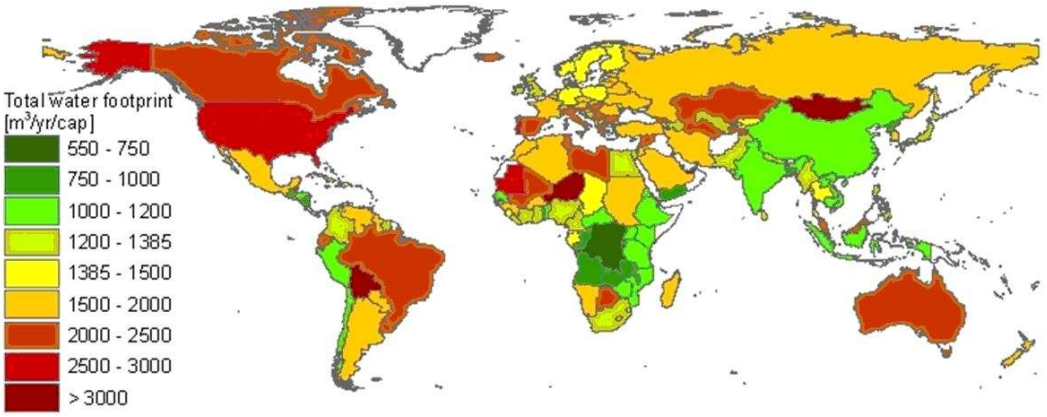
Source: Wikipedia based on World Resources Institute data and a blank map by Canuckguy and others

Figure 1 – Per capita greenhouse gas emission by country in 2000

In their study reviewing the issue, Wiedmann and Minx defined the carbon footprint as the extent of the total carbon dioxide emission caused, whether directly or indirectly, by certain activities or accumulating during the life cycles of a product (Wiedmann – Minx 2008). The definition can be further specified and can be related to the value of the carbon footprint converted to every carbon dioxide equivalent of the greenhouse gas emitted, where the basis of the conversion is the extent of the greenhouse effect created. This short description is only intended to show the way in which a designated, climate-change related indicator has been developed.

While the carbon footprint is evidently related the emission of carbon dioxide (greenhouse gas), i.e. to the phase when nature is loaded, the water footprint addresses the other end of the activity, i.e. using the resources.

The water footprint summarises the water quantity related to manufacturing a product, taking into account the waters utilised or polluted in each work phase of the supply chain. (Hoekstra et al 2011 and Water Footprint)



Source: Mekonnen and Hoekstra (2011)

Figure 2 – Annual average per capita water footprint by country in the period from 1996 to 2005 (m^3)

As it can be seen in Figure 2, the water footprint can also be summed up by country and a specific value (per capita) can be figured from it. In the countries indicated in green the water footprint is smaller that the global average, while in those marked in yellow and red it exceeds the global average.

1.3 Use of footprints in evaluating the sustainability of military / humanitarian actions

Based on the general experiences learnt about footprints in the past decade, National University of Public Services established a frame for using the same tools for measuring sustainability in the case of military / humanitarian activities.

2. ESTABLISHING THE MILITARY ECOLOGICAL FOOTPRINT CENTRE (MEFC)

Upon the initiative of the Military Logistics Institute a research centre was established supported by a tender announced by the rector of the National University of Public Service (NUPS) in January 2014 within the Military Ecological Footprint Centre (MEFC) at the base of the Faculty of Military Sciences and Officer Training of the NUPS.

Objectives of the MEFC: problems of modern armed fight; examination of its technical-technological development and its social aspects in terms of sustainability. More detailed goals are (1) researching the military ecological footprint and (2) using the collected experiences in certain fields for confronting new challenges, such as:

- global and cosmic effects of the climate change;
- defining the ecological footprint of humanitarian missions and military operations;
- evaluation of the sustainability consequences of disasters; preventive proposals.

In the future the NUPS will prepare reports on sustainability and social responsibility assumption and perform military carbon footprint calculations involving the international network of researchers. The objective of the researches is to evaluate the humanitarian and military missions in terms of sustainability.

The Military Ecological Footprint Centre (MEFC) has set the objective of researching certain fields of the above strategic topics and partial topics, more precisely the military ecological footprint. For this it has assumed:

- to prepare the textbook titled Public Service and Sustainability by 30 June 2014,
- to establish an East-European research network in the interest of which it will organise the international Public Service and Sustainability Workshop to be held in February 2014 in Budapest with the cooperation of the Hungarian Logistics Association.

Achievements of the international workshop in the light of the strategic developments of the University:

- They contributed to forming the students' approach to being committed to responsible sustainability;
- They promoted the strengthening of civil public service relationships;
- Through a methodology developed and provided for conducting international surveys (Visegrád Countries, NATO, UNO), it will mean acknowledgement both for the NUPS and Hungary.

Later on, the Military Ecological Footprint Research Centre will, involving the international research network, prepare reports on sustainability and assumption of social responsibility and will make military carbon footprint calculations. The objective of the researches is to evaluate the humanitarian and military missions from sustainability point of view. Dr. Péter Lakatos, as head of the research workshop, was responsible for the activity of the research workshop all the way through the implementation of the „Military Ecological Footprint Research Centre (MEFRC)" Project and was also responsible for the successful implementation of the Project. First lieutenant László Szeker, teacher of NKE HHK KLI HKKT, and student Dávid Verbényi, officer candidate, as demonstrator, also participated in the work of the research workshop.

It could be managed to sign an international cooperation agreement with Prof.

Sebastian Kummer, Director of the Viennese WU Transport und Logistik Insitute and signing such an agreement is also in process with the Brno University of Defence. The 223-page textbook titled Public Service and Sustainability has been prepared on time and its chapters excellently serve the purpose of handing the actual knowledge related to sustainability over to the students, their approach to be developed and applying such approach on a daily basis in the course of their work later on. On 4 June 2014 the NUPS held its scientific conference with the title "Public Service and Sustainability". The location was provided by the Bólyai room of the Zrínyi Miklós University Campus and Barracks of the NUPS, where the Hungarian Logistics Association also represented itself, contributing this way to strengthening the civil relationships of the event and conducting it successfully. 50 people, including 31 NUPS HHK students, participated in the conference. The conference contributed to forming the students' approach to being committed to responsible sustainability and promoted the strengthening of civil public service relationships. Together with the students' research group we calculated with the calculator the carbon footprint of the NUPS for 2013 based on the electric energy consumed, which equals 1,028 tons of CO^2. Based on the nationally consumed energy (natural gas and electricity), the carbon footprint of the police is 15,860 tons. The calculations have to be further specified and extended according to the requirements of the official and certified calculator.

2.1 NATO SMART ENERGY project-Capable Logistician 2015-Hungary

„Allied Heads of State agreed at the Chicago Summit in 2012 and the Wales Summit in 2014 that NATO should work "towards significantly improving the energy efficiency of our military forces."

To this end, NATO's Emerging Security Challenges Division (ESCD) has facilitated briefings, conferences and exhibitions with the aim to exchange information and lessons learned and to advance knowledge on technologies and best practices. Many activities have been supported by NATO's Science for Peace and Security (SPS) Programme.

A special SPS funded activity was the "Smart Energy Team" (SENT), comprised of eight experts from Allied and partner countries. During the period of January 2013 to May 2015, the experts screened national and NATO documents and visited defence agencies to identify practical Smart Energy solutions to provide recommendations for NATO's standards and best practices. The comprehensive SENT report will be presented to NATO nations in autumn 2015.

Reducing fuel consumption in the military is an operational imperative. Smart energy solutions cannot only save money when less fuel is used, but can also save soldiers' lives, and help improve the mobility, as well as the resilience and endurance of military forces.

Within the frame of the ESCO integration the next milestone on the roadmap towards energy savings in the military is to implement fully functional Smart Energy solutions in the exercise "Capable Logistician 2015" (*CL15*).

During *CL15*, 14 private companies and two public *defence* agencies contribute over 50 pieces of equipment and highly trained personnel to provide Smart Energy production,

storage, distribution and consumption, as well as portable and wearable soldier power solutions. The Smart Energy equipment is connected to and interacts with other *CL15* logistic units, for example the Military Police, the Bulk Fuel Installation, the medical unit and NATO owned tents installed by the NATO Support and Procurement Agency (*NSPA*). The aim is to effectively reduce the fuel consumption and the soldier's battery burden.

Furthermore, the NATO Science for Peace and Security (SPS) *Programme* supports a workshop with public sector experts from *defence agencies and* universities to observe interoperability (how equipment will connect within a Smart Energy micro grid, as well as in connection with other logistics units). The experts will discuss what they observe, conclude and make recommendations for improving NATO standards to ensure a smooth integration of Smart Energy solutions in land operations."

SUMMARY

The indexes assigning measurement possibilities specifically to considerations related to sustainability constitute one group of the sustainability indexes. The ecological footprint measures the extent to which the satisfaction of human needs uses the ecosystem of the Earth. For this purpose, on the one hand, it determines the biological capacity available and reproducing on the given piece of land. On the other hand, it compares with this the biologically fertile land and water surface that would be necessary within a year for the regeneration of the resources consumed/polluted by the population in the given year and the absorption of the related quantity of waste. On the basis of the ecological footprint other types of single-dimension sustainability indicators, such as the carbon and the water footprints, have also been developed. The former one measures the accumulated greenhouse gas emission of activities and products, while the latter the accumulated water consumption of the same.

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