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THE PROTECTION SYSTEM OF PAKS NUCLEAR POWER PLANT AND INTERNATIONAL BEST PRACTICES IN LIGHT OF THE 2011 FUKUSHIMA DAIICHI NUCLEAR DISASTER

Örs ANTAL

Abstract: The severe disaster in the Fukushima Daiichi Nuclear Power Plant caused by a massive tsunami hit Japan's coastline, revealed the importance of periodic assessment of safety and capability to resist against external threats in the nuclear stations worldwide. This article deals with those safety solutions and international best practices – paying particular attention to Paks Nuclear Power Plant in Hungary – by which the disaster occurred in Fukushima would have been avoidable. On the other hand, it examines the vulnerability of nuclear reactors used for generating electric power with regards of the main reasons of the 2011 nuclear crisis in Japan.

Keywords: power supply, emergency, ultimate heat sink, redundant system, Fukushima

1. Introduction
11th March, 2011 is definitely a memorable day in the entire World, particularly in Japan. On this day – as the secondary effect of a massive earthquake measuring 9.0 on the Richter-scale – a devastating tsunami hit the coastline of Japan causing serious damages in the Fukushima Daiichi Nuclear Power Plant. Due to the absence of appropriate prevention measures the sequence of the disaster led to significant radioactive releases. The experiences of the disaster occurred in Fukushima demonstrate well the risk of usage and storage of radioactive substances. The effective prevention of accidents and radioactive releases is a common goal and interest of all European countries as possible nuclear power plant fatalities and accidents that result in radioactive releases would definitely affect not only the neighboring countries, but whole regions inside the continent. [1] Therefore, in the light of the devastating event in Fukushima in the member states of the European Union comprehensive safety reviews have taken place – concerning the Paks Nuclear Power Plant in Hungary as well – particularly focusing on the level of protection against external natural events like earthquakes and floods. The sequence of disaster in Fukushima Daiichi Nuclear Power Plant proved that during the examination of vulnerability and resistance special attention is supposed to be paid on the possibility of loss of emergency power supplies and ultimate heat sinks.

2. Sequence of the disaster occurred in Fukushima Daiichi nuclear power plant
On 11th March, 2011 early in the afternoon Japan was hit by a 9.0-magnitude earthquake with the epicenter approximately 70 kilometers east from the coastline of Tohoku region. This earthquake was among the most powerful ones occurred in the past one hundred
year. As the secondary effect of this powerful seismic event, the eastern coastline of Japan was hit by a devastating tsunami resulted in more than 18,000 casualties and serious damages on the infrastructure including a severe breakdown and accident in the Fukushima Daiichi Nuclear Power Plant. [2] In the earthquake-affected area five nuclear power plants were located with fifteen reactors. The seismic activity did not cause any serious failures in the power plants that could jeopardize the safety conditions and the operating reactors shut down automatically. The enormous waves of the tsunami reached the site of Daiichi plant approximately one hour after the quake shook the land. The water flooded into the facility causing the failure of diesel generators – that ensured the electric power supply for the cooling process of the three operating reactors (three out of six reactors were under maintenance at the time of the disaster) – by destroying the sea water pumps, which had provided the essential water cooling for the generators. The other function of the sea water pumps were to ensure the transfer of heat from the reactor cores to the ocean, thus cooling was no longer possible. Subsequently, the pressure inside the containment dangerously increased, which had to be released as an emergency measure. Due to the meltdown of the fuel’s zirconium cladding, hydrogen was released causing severe explosions in each operating reactor units (nr. 1, 3, and 4) four days following the tsunami. The deliberate release made by the operators after overpressure had evolved in the primary containment and the explosions together resulted in significant radiation release. More than 200,000 inhabitants were needed to be evacuated immediately from the vicinity of the Daiichi power plant. [3] Besides the severe damages of the reactor units, the heat up of fuel stored in the spent fuel pools also caused radiation releases into the environment. [4] The reconstruction and reparation of the safety and cooling system of the damaged reactor units and spent fuel pools as well as the inhibition of leakage of radioactive substances are still expensive and difficult task for the Tokyo Electric Power Company and the Japanese nuclear experts. The Fukushima Daiichi accident has put safety concerns front worldwide and led nuclear experts to inspect and re-evaluate the safety aspects of nuclear power plants according to earthquake and flood hazards in many European countries, too.

3. Safety measures throughout Europe after Fukushima Daiichi disaster

3.1. Nuclear power reactors in the World

As shown in the figure below [Figure 1] from the total number of 438, most nuclear reactors are operating in the United States, although Western Europe has also significant nuclear capacity including 107 reactors in France, the United Kingdom, Sweden, Germany, Belgium and Spain. On the eastern side of the continent numerous nuclear power plants in Ukraine and Russia are either negligible both in respect with the aspects of safety and power supply. On the other hand, data show that the number of nuclear reactors is on the rise mainly due to the fact that nuclear capacity expansion is significant in the Asian major powers like China or India. Supporting the nuclear phase-out programs has gained strength especially in the Western nations mainly based on the concerns about nuclear accidents even before the accident in Fukushima occurred 5 years ago. Since 2011 Germany gradually continues and speeds up shutting down nuclear power stations and increases the usage and efficiency of renewable energy and fossil-fuel power plants even though many surveys revealed that these efforts can cause unpredictable consequences for the output of industrial production as well as the German CO₂ emission goals can be at risk, too.
As we can see in the figure below [Figure 2] – that represents the number of reactors per one million inhabitants living in particular countries – currently European nations’ electric power supply is dependent upon nuclear energy in the highest ratio. Future construction plans on the East will definitely change this distribution by 2030.
According to the data of European Nuclear Society, most nuclear reactors are recently between 28 and 35 years of ages. [5] As the vast majority of these facilities originally had a nominal operating lifetime of 25 to 40 years, serious life extension programs had started mainly in the U.S., France and Japan in order to extend the operation time and maintain the capacity. In the Fukushima Daiichi plant the oldest reactor (unit 1) started operating in 1970 and the last one (unit 6) in 1979. Due to the severe accident in 2011, all of the damaged units were decommissioned in May 2011, furthermore the undamaged unit 5 and unit 6 were decided to permanently shut down by December 2013 as well. The plan for the extension of the power plant with units 7 and 8 was cancelled. [6]

Regarding the protection systems or safety aspects, it is necessary to distinguish between the types of nuclear reactors. The vast majority (82%) of the currently operating reactors belongs to the class of light water reactors (LWR) working with water as moderator and coolant as well [7] [Figure 3]. These systems can be boiling water reactors (BWR) or pressurized water reactors (PWR). With respect to the former solution (e.g. in Fukushima Daiichi units) only in one coolant system the reactor core heats the water into steam which drives the turbines without generating overpressure. In PWR systems (e.g. the units in Paks Nuclear Power Plant) two water coolant systems operate, in the primary circuit high pressure keeps the water liquid (without boiling), which is only converted into steam in the secondary circuit. [8]

![Figure 3: Types of operating nuclear reactors in the World](http://www.iaea.org/PRIS/WorldStatistics/OperationalReactorsByType.aspx)

In respect of safety aspects, each light water system has its own multiple layers of protection and designed to withstand reliably the external impacts and natural hazards. Regarding the fact that each nuclear reactor is custom-designed whether they are light water reactors or other type of constructions, no two reactors are alike, therefore their level of safety depends mostly on their applied technology and year of construction. The accident occurred in Fukushima Daiichi plant is either not related to its chosen reactor solution. According to the published comparisons, both reactor types have their own advantages and disadvantages, but there are no relevant differences which could
determine the general application of them. BWR provides greater thermodynamic efficiency operating at the same temperature, as it does not need steam exchanger device, although it requires a bigger pressure vessel around the reactor core. Nevertheless, BWR reactors require more frequent and additional maintenances than PWR units, and the turbine hall can get contaminated by fission products from the fuel as the water contacts with the radioactive fuel rods, while in PWR systems the fuel is isolated in the core. On the other hand the PWR’s secondary circuit ensures an additional barrier between the reactor vessel and the turbine in case of damages or accidents. [9] Definitely this one of the reasons that answers the question why PWR reactors are more popular than BWR systems, and why the vast majority of reactors under construction will operate using pressurized water systems (57 out of 67). [10]

In Central and Eastern Europe the most frequently used reactor types are the Russian made VVER series, which are PWR systems using water as coolant and moderator as well. The first generation of VVER reactors were the 440/230 types followed by VVER 440/213 units. Today the most modern Russian versions are VVER 1000 and VVER 1200 systems. These types of reactors operate in Russia, Ukraine, Czech Republic, Bulgaria Armenia, Slovakia and Hungary. The most relevant disadvantage of the Russian VVER systems in front of the reactors built in the U.S. and Western Europe is the lack of secondary containment, which would be able to prevent the radioactivity escaping into the environment in case of severe damages and accidents and to protect the reactors from external impacts. The oldest VVER 440/230 reactors have been decommissioned for today due to security concerns, but still operate in Kola nuclear station in Russia. The second generation of VVER reactors is the upgraded, most widespread 440/213 (e.g. in Paks) designed with own hermetic block, but still does not have the reinforced concrete, dome shaped secondary containment which is – for instance – compulsory overseas. Therefore, these plants are more exposed to strong external effects. [11] The VVER 1000/320 models have their own secondary containment but these are still considered less safe than the reactors made in the West. Russian 1000/320 reactors work also in Zaporizhzhia, in the largest nuclear power plant in Europe producing 5700 MW besides many others in Finland, Germany, Czech Republic, Russia etc. [12]

3.2. The protection of Paks Nuclear Power Plant against extreme natural events

The Paks Nuclear Power Plant is located in Hungary in the neighborhood of the city of Paks, along the river Danube. As I mentioned above, this power plant consists of four VVER-440/213 type pressurized water reactors, each of them with 440 MW nominal capacity providing more than 50 % of the total power supply in Hungary. The construction of the first and second units started in 1974, and the date when the power station started to operate in full capacity was 1987.

During the design of the first generations of VVER reactors, aspects of earthquake resistivity did not considered as an important factor, therefore the site and facilities of VVER-440/213 units operating in Paks were neither designed to withstand earthquakes. During the late 1980s it became obvious that the earthquake hazard of the site of the nuclear power plant was significantly higher than it had been assumed before. Subsequently, in accordance with the actual regulations, following a systematic safety re-evaluation in 1993 the design base was considered for $10^{-4}$/year probabilistic seismic events. On the basis of previous risk assessments and analyses the operator company of the nuclear power plant in Paks – with the support of the International Atomic Energy Agency – started an overall safety improvement program in order to enhance the resistivity of the facilities against earthquakes and other external hazardous events. The
following measures and reinforcements took place under the two phases of this program ended in 2002: [4]

- establishing new instruction system for breakdown-recovery plan in case of earthquakes,
- fixing cables, wires, electric devices and batteries (1994-1995),
- reinforcing the facility with 2 500 tons of steel structure built in (1998-2002),
- setting accelerometer sensors onto the base plate, these devices give signals if the vertical acceleration exceeds 0.05 g value in order to launch the safety functions,
- and installing microseismic monitoring network within 50 km from the site of the power plant in order to observe the seismic activities.

With the implementation of this safety enhancement program the requirements became established for safe shutdown of the reactors, permanent cooling and the prevention of radioactive releases into the environment in case of an earthquake with 10 000 year return period probability, too.

Based on technical and economical evaluations in 2001, the operator company decided about the life-extensions of the units. Therefore Paks-1 and Paks-2 reactors went through life-extension procedures in 2012 and 2014 which granted their operation until 2032 (Paks-1) and 2034 (Paks-2).

Regarding the Fukushima disaster, it influenced significantly the perception of nuclear power and existing nuclear energy programs, although the international reaction was different by regions. While the countries mostly on the East side of the planet still continue their plans and capacity expansions, many European major countries’ government – with strong civilian protests in the background – accelerated to close old nuclear power plants or re-evaluated their safety conditions after 2011. For instance the German government – as the impact of the Fukushima accident – decided to shut down all of the country’s nuclear units entirely by 2022. In Hungary, following the severe reactor damages in Japan, 2011 the Paks Nuclear Power Plant Ltd., as the operator company, elaborated the Targeted Safety Review (STR) on power plant paying particular attention to the following fields: [14]

- the assessment of natural origin external hazards (earthquake, flooding, extreme meteorological events),
- the inquiry of vulnerability of safety functions (electric power supply, cooling systems in case of malfunctions, systems of ultimate heat sink,
- and the possibilities for the mitigation of the consequence of severe accidents (emergency measurements, treatment of accidents).

On the other hand the STR also made proposals for further improvement measures. It is important to mention that in Hungary the Japan disaster did not influence the ongoing life-expansion plans of Paks-1 and Paks-2, furthermore in 2014 the Russian and Hungarian prime ministers signed a cooperation agreement about the capacity expansion of Paks Nuclear Power Plant, which covers two new VVER-1200 pressurized water reactor units including modern passive and active safety systems. [15]

In the Fukushima disaster the main reasons why the power plant could not withstand the tsunami without failure and radiation releases were the followings: [3]

- the underestimation of seismic and tsunami hazards; the computer modelling for flood threat was incorrect;
- the emergency power sources and diesel generators were placed on the lower level of the turbine building without spatial separation [Figure 4];
- the connections between emergency power supplies and safety devices were not watertight;
- seawater pumps and the heat transfer between the diesel generators and the sea were vulnerable due to poor solutions for protection,
- the elevation of protective sea wall built on the shore that was to provide structural defense against tsunamis was too low, therefore the huge waves (15 meters in height) could rush over easily.

![Figure 4: The cross-section of Fukushima Daiichi power plant [3](edited by James M. Acton and Mark Hibbs)](http://carnegieendowment.org/files/fukushima.pdf)

According to above mentioned risks and deficiencies, the key questions with respect to the safety of Paks were the prevention of station blackout and loss of ultimate heat sink. It is important to confirm that the Hungarian nuclear facility does not need to face to the danger of tsunamis or seismic sea waves as the country is not adjacent to sea or ocean. Furthermore, the possibility of flooding is either not identified as a threat in the baseline safety standard as in the vicinity of the power plant the highest flood level with 10 000 year return period probability is 96.07 mBf (the unit of the height of water level correlated to the medium water level of the Baltic Sea.), the levee crown of the embankments protecting the power plant is 96.3 mBf and the uploaded ground level of the site is 97.15 mBf. [16]

**3.3. The prevention of loss of electric power supply in Paks**

The cooling water systems of the emergency power supplies in nuclear power plants located in Paks and Fukushima are conceptually very similar as the diesel generators are designed with cooling water system connected to the ultimate heat sink which can be considered as a key element in accordance with the reasons caused the accident in Fukushima.

Each of the four reactor units in Paks has its own three diesel generators with physically separated installation. These redundant lines have no common elements or functions. All of the twelve emergency generators were constructed with own fuel tanks built under the surface with 100 m³ of capacity by tanks which enables the generators to operate at least 120 hours, furthermore these containers can be refueled continuously, too. [16]

In order to enhance the safety of power supply and follow the “defence-of-depth safety concept”, external AC power – as alternate electric power – can be provided in dedicated way in case of emergency or station blackout as follows: [17]
- 120 kV power supply from Százhalombatta Power Plant,
- and 400 kV from Litér Power Plant.

The establishments inside the power plant containing the systems of electric power supplies are reinforced against earthquakes with horizontal stiffening elements, joint fixations and anchorages. The canals connecting the engine houses and the water intake structures were also reinforced and their water proofing elements were restored as well. [16]

3.4. International best practices to avoid the loss of power supply

According to the database of the International Atomic Energy Agency, Germany currently has only 9 reactors in operation (at the time of Fukushima accident they had 17). [5] As I mentioned before as a consequence of the Japan disaster the German government plans total shutdown of their nuclear power plants by 2022. Furthermore, the disaster led to a comprehensive safety review of all nuclear power plants located in Germany focusing on particularly the vulnerability of power supply and flooding. Generally speaking in German nuclear power plants the emergency diesel generators are better protected against external events than in Fukushima as these devices are located in reinforced buildings which are resistant to seismic waves and flooding. On the other hand, with the availability of mobile pumps the pressure relief and water feeding systems can play important role to avoid core meltdown or dangerous pressure rise in the reactor. [18] Each pressurized water reactor operating in Germany usually has four, and boiling water reactors have five emergency diesel generators, many of which are designed to withstand external impacts. [16]

In the Leibstadt Nuclear Power Plant located in Switzerland the functioning boiling water reactor has three turbo-charged, independent, high performance V20 emergency diesel generators, and two additional V12 diesel generators in reinforced and bunkered establishments in case of the failure of general power supply. [19]

Regarding the two operating plant units in Finnish Olkiluoto Nuclear Power Station, as part of an ongoing modernization program, the replacement of currently operating four diesel generators is underway. These new devices are equipped with radiator cooling besides the seawater cooling system, thus providing higher level of safety. [20] The procurement of the total number of nine new engines is underway for the existing Olkiluoto-1 and Olkiluoto-2 boiling water units, and the Olkiluoto-3 under construction PWR unit. Finland’s other nuclear power plant, the Loviisa has the same VVER-213 pressurized water reactor units (Loviisa-1 and Loviisa-2) like Paks Nuclear Power Plant has in Hungary. In case of loss of power supply both units are equipped with four emergency diesel generators with safety switchgear systems in own establishments protected against fire and external impacts. The control system of the emergency generators starts automatically, but the devices can also be launched manually from the main control room. The capacity of fuel tanks of each machine is sufficient for 10 hours of operation, and can be refilled automatically from storage tanks. Nevertheless, it is possible to provide electric power from the generators to neighbor units. As an alternate way of power supply – if all of the dedicated emergency diesel generators are out of operation due to malfunction or breakdown – AC power can be provided from an air cooled safety diesel power plant and a hydropower plant through dedicated cable connections. [21]

One of the two currently operating nuclear power plants in Belgium, the Tihange Nuclear Power Station’s three units dispose of two levels of emergency safety systems. Each unit has at least two first level safety diesel generators built separately and further three second level emergency power generators. The devices of first level system are housed in
reinforced and bunkered buildings. [22] On the other hand, the implementation of an emergency electrical grid is already planned by 2016. [23]

Considering Belgium’s other three functioning reactors built in Doel Nuclear Power Plant, each units also disposes of two internal power supply levels operating physically separately and independently. Altogether 19 emergency diesel generators are installed, most of them equipped with air cooling system, and located physically separately and functioning independently as well. [23]

The greatest advantage of air cooling systems for diesel generators is the independent operation from the external heat sink. However, the space required for air cooling devices are very high resulting higher engineering and building costs besides the need of more complex building design. The protection of the air openings and cooling design against external impacts need to be taken into consideration as well. [24]

3.5. The loss of ultimate heat sink – the protection of Paks Nuclear Power Station

In Paks Nuclear Power Plant the capability of heat transfer from the fuels can be lost if the connection between the cooling systems of the power plant and the river Danube terminates.

The key element of the heat transfer in Paks is the safety cooling water system, which provide constant cooling for the diesel generators, the emergency core cooling system, the spent fuel pools and main circulation pumps. The triple redundancy of safety systems provide two cooling water pumps in each lines. If one of them is out of service the spare pump automatically starts operating. The establishments of pumping stations were built separately in two water intake structures for the twin units (PAKS-1; 2 and PAKS-3; 4). Increasing the level of safety it is possible to transfer water between the two demineralized water storage systems.

In case of loss of ultimate heat sink the removal of residual heat from the reactors can be implemented by using the water storage of demineralized water system. Each twin units have three demineralized water storage tanks with 900 m$^3$ of capacity.

The basic function of the emergency feedwater system is the supplement of steam generators with water. On the other hand, in case of emergency this system is necessary for the removal of residual heat from the units by delivering water to the steam generators and the containment through two pumps.

The auxiliary feedwater system – built completely independently from the emergency feedwater system – is designed to ensure the water supply from the demineralized water tanks directly to the steam generators in case of failure of the emergency feedwater system. The auxiliary system has two pumps by each unit with the same carrying capacity like the primary system has.

As alternate water supply facilities the Paks Nuclear Power Plant has nine, 30 meter deep driven wells along the river Danube which provide unlimited water sources irrespectively of water level. [16]

Similarly to the facilities of the above mentioned systems, the devices of the primer coolant circuit was also reinforced against seismic waves with hydraulic vibration dampers in order to avoid the fatalities occurred by breaks. [16]

3.6. International best practices to avoid the loss of ultimate heat sink

The severe accident in Fukushima, 2011 revealed that the absence of alternate or backup heat sinks is a significant weak point in many nuclear plants worldwide as in case of any failure of primary device, cooling the reactors cannot be provided.

In Leibstadt Nuclear Power Plant, Switzerland an additional cooling water system is installed, which is able to decrease the temperature in the reactor unit and in the turbine through two separate pipelines. This solution makes the residual heat conducted to the cooling tower water treatment plant and into the river Rhine. In case of the failure of water pumps, three emergency cooling towers are available to dissipate the heat from the
unit as part of the Essential Service Water System. On the other hand, in order to deliver cooling water into the primary circuit in case of coolant loss, redundant emergency cooling systems are available with independent, separated and reinforced elements to withstand floods or seismic waves. As another alternate emergency cooling system the Special Emergency Heat Removal is disposable in Leibstadt, which is able to ensure reactor cooling for hours in emergency situations. The elements of the system are built underground, which reduces its vulnerability against external impacts. [19]

In light of the loss of heat removal capability in Fukushima, as a consequence of flooding, German safety examinations mainly focused on the vulnerability of the heat transfer in the operating nuclear reactors. Results showed that all German nuclear power stations have adequate protection against loss of ultimate heat sink due to redundant design and proper physical separation. Nevertheless, most of the operating German units are equipped with alternate heat sink and each nuclear station are prepared with levels of emergency measures which are able to reestablish the removal of residual heat from the core independently of power supply. [25]

In Borssele Nuclear Power Station, located in the Netherlands, the elements of the emergency cooling system were built in reinforced inlet buildings (watertight to a height of 7,4 m) and the channels underground. These provisions are essentials as the station is significantly threatened by floods. Additionally, the emergency cooling devices dispose of two redundant backup pumps with redundant emergency power supplies. Increasing the level of safety – similarly to Paks – on the site of Borssele eight deep-water wells can supply emergency cooling water, which are designed to withstand earthquakes and floods. [26]

Examining international best practices for the prevention of loss of heat transfer we do not need to go too far from Hungary as in the neighboring Romania the Canadian designed pressurized heavy water units (Candu 6 reactors) operating in Cernovada Nuclear Power Plant are good examples for the multi-level of protection. The moderator and coolant of these Candu 6 units are heavy water (deuterium oxide) stored in cylindrical tanks. Similarly to PWR reactors, the primary heat transport system circulates the coolant via fuel channels carrying the heat to steam generators, where it is transferred to normal water to generate steam. The circulation is forced by the pumps of Primary Heat Transport system. Due to redundant design, both units have two independent flow paths for the water stream. The units in Cernovada dispose of alternate heat sinks in case the primary device or its components become unavailable. In emergency scenarios cooling water can be provided through a “feedwater train” or the demineralized water tanks of Boiler Make-up Water system. The elements of the alternate system are qualified and reinforced to withstand earthquakes and floods. [27]

4. Summary

Generally speaking the type of nuclear reactors, whether they are designed as pressurized or boiling water reactors, does not determine or influence decisively the level of safety against external impacts like flooding or seismic waves. However, in Europe many old-fashioned units of second generation VVER-type reactors still operate built with old construction standards which do not fulfill nowadays safety requirements. In other words, independently of method of operation these systems were less designed to withstand external impacts. On the other hand, the vast majority of these VVER units is approaching to (or already have reached) their design lifespan (usually 30 to 40 years). Besides aging of nuclear reactors and their facilities, with the increasing number of life-extension programs the European countries enter a new era of nuclear risk and technologies.
The aftermath of the disaster occurred in Fukushima Daiichi Nuclear Power Plant has revealed weak points and serious vulnerabilities of nuclear reactors independently of their types, therefore the protection of emergency power supply and the removal of residual heat became key factors as many international reviews and assessments show as well. Definitely the Fukushima accident led to significant change in approach to aging nuclear power stations and dependence on nuclear energy across Europe. Nevertheless, the increasing global terrorist threat has also significant effect on the safety systems of nuclear power facilities since the question of vulnerability to sabotage and terrorist attacks influences the basic safety concerns against environmental impacts. The redundant emergency, protection systems and measures of Paks Nuclear Power Plant with other international best practices show possible solutions by which the accident could have been prevented in Japan even if tsunamis do not pose a real threat in most cases regarding the nuclear stations in Europe.

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ECONOMIC SECURITY FROM POINT OF VIEW OF SELECTED ECONOMIC INDICATORS

Lenka Brizgalová and Zdeňka Vránová

Abstract: This article presents a new perspective on economic security, creating assumptions for ensuring national security materially. It analyzes the selected attributes of economic security in conjunction with macroeconomic indicators in the period 2000 – 2013: economic growth, currency stability and unemployment in relation to safety. During this period, the development of macroeconomic indicators has been influenced by two events. The first significant situation was the Czech Republic’s accession to the EU in 2004. The second one was the outbreak of the global economic crisis in 2008. The second analyzed attribute of economic security is monetary stability, respectively inflation rate. The largest fluctuations occurred in 2001, when the average annual inflation rate reached 4.7%, in 2008 when it reached 6.3% and in 2003 was only 0.1% due to the decline in the price level. The last examined attribute of the economic security is unemployment rate. The biggest threat to the economic security was the decline in GDP, but not in such an extent as inflation and unemployment affected it. Among the other attributes of economic security we include competitiveness, raw material sufficiency and the ability to ensure the defense force; their analysis will aim to follow-up contribution.

Keywords: security, economic security, gross domestic product, inflation, unemployment rate

1. Introduction
Safety belongs to one of the highest values in every human life, as well as in lives of national and international communities. Safety is immemorial and important interest of the state. One of the elements of the national security of the state is also economic security, which creates material conditions for ensuring all spheres of social life in the certain country. [1]. Many authors were occupied with defining the concept of economic security and their definitions are varied, but rarely we can come across a more detailed and comprehensive analysis of the term. Analysis of the economic security mentioned in this article is based on the definition of Šefčík [2], who defines the term through interconnected attributes, namely economic growth, monetary stability, low unemployment, competitiveness, raw material sufficiency and the ability to ensure the defense force. This article aims to analyze the development of selected attributes of economic security in conjunction with macroeconomic indicators, and their development is examined from 2000 to 2013. The article is devoted to the analysis of economic growth, monetary stability and unemployment. This article is the first part of the work on economic security from the perspective of selected macroeconomic indicators. Its second part deals with the analysis of other attributes of economic security.
The authors use various scientific methods. Description method is used in specification of selected macroeconomic indicators, analysis method is used in detailed breakdown of development of the individual attributes of economic security during the years 2000 - 2013. Method of collecting data via Internet is used in order to obtain the data for the analysis method. To express a sequence of values of macroeconomic indicators during the reporting period method of time series is used, especially in the form of line charts and bar graphs that allow expression of rising, falling or stable trend.

2. Development of Economic Growth in Czech Republic between 2000 - 2013

The first attribute of economic security, economic growth, is measured with magnitude of gross domestic product (GDP). To express the economic growth, we mostly use pace of real GDP growth indicator. In the last few years, Czech Republic's economy is passing through complex development, which is influenced by the development of the world economy and domestic factors as well. Developments in the annual growth rate of GDP in the Czech Republic in the period examined, is presented on following chart.

![Chart 1: Development of Real GDP in Czech Republic in period 2000-2013 (in %)](chart1.png)

The first decline in real GDP occurred in 2002 and was influenced by heavy floods in the country. Between 2005 and 2006, when GDP growth averaged 6.5%, the Czech economy went through the most favorable period. In 2008 and 2009 in developed Western countries, financial crisis preceded the crisis of the real economy and the countries in the second half of 2008 came to a recession. Therefore, there was a decline in GDP, while the downturn in economic activity was significant in euro zone countries, on which demand the Czech exports depends. Due to the fact, the foreign demand was sharply reduced and the economy of the Czech Republic was hit by strong external demand shock. As a result, there has been a decline in Czech exports of goods, which in 2009 actually fell to -9.8%. In 2010 and 2011 there was a recovery in economic activity and the annual growth of GDP rate climbed into positive values, fluctuating around 2%. Between 2012 and 2013 the Czech economy was hit by a new recession and the downturn in the economy continued. Unlike the 2009, recession in 2012 was considerably milder, but very long. Another major difference is, that while the recession in 2009 was caused by external factors, in 2012 and 2013 the influence of domestic factors dominated. They caused a fall
in domestic demand, and if the positive effect of foreign trade would not occur, the decline in GDP could be much higher. A concrete result of the decline in GDP into negative values in 2012 was particularly restrictive fiscal policy. However, to get a more detailed look at the development of GDP in the Czech Republic, it is advisable to divide it into individual components. The following chart shows an expenditure approach to GDP at constant prices in millions of CZK, which grew until 2008. Subsequently, due to the onset of the global crisis, GDP fell by 4.8%.

The graph also shows the three basic components used in expenditure method of calculating GDP: final consumption, gross capital formation and the balance of exports and imports. Final consumption expenditure exhibited until 2010 a steady growth, then fell slightly. However, from all three components, final consumption expenditure make up the largest share of GDP. Gross capital formation has grown steadily till 2008, but with the onset of the crisis also exhibited a decline. The balance of exports and services was negative till 2004, so more was imported than exported, but then (mainly due to the accession to the EU), the balance turned into positive values.
Chart 3: Development of imports and exports of goods and services in the Czech Republic (in %) between 2000 and 2013.
Source: The own processing

Source: The own processing
3. Inflation Development in Czech Republic between 2000 - 2013

Currency stability has two dimensions - internal (price stability) and external (exchange rate stability). Price stability is a slight rise in prices, especially the stability of consumer prices. Creating a low-inflation environment in the economy is an important precondition for sustaining economic growth. [4]

Development of average annual inflation rate in analyzed time period is shown in the following chart. Thus, represented inflation rate shows the percentage change in the average price level for twelve months compared to the average price level for twelve months of the previous year. These average price levels are calculated from consumer price indexes with the index basis for the year 2005. [5]
For a more detailed analysis of inflation in the Czech Republic it is needed to decipher the various components of the consumer basket, which makes up the consumer price index. The following table describes the progress of the twelve groups of the CPI, and in each group the annual change in prices as a percentage is monitored.

**Table 1 Consumer price index in the Czech Republic between 2000 and 2013.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Food and soft drinks</th>
<th>Alcoholic beverages, tobacco and narcotics</th>
<th>Clothing and footwear</th>
<th>Housing, water, electricity and fuels</th>
<th>Furnishings, household equipment; repairs</th>
<th>Health</th>
<th>Transportation</th>
<th>Postal services and telecommunications</th>
<th>Recreation and culture</th>
<th>Education</th>
<th>Catering and accommodation</th>
<th>Other goods and services</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,0</td>
<td>4,2</td>
<td>-1,9</td>
<td>8,4</td>
<td>0,5</td>
<td>2,8</td>
<td>10,9</td>
<td>7,0</td>
<td>2,5</td>
<td>4,4</td>
<td>2,7</td>
<td>2,2</td>
</tr>
<tr>
<td>2001</td>
<td>5,1</td>
<td>3,2</td>
<td>-1,7</td>
<td>9,9</td>
<td>0,1</td>
<td>3,2</td>
<td>0,3</td>
<td>5,0</td>
<td>5,1</td>
<td>2,8</td>
<td>2,8</td>
<td>4,6</td>
</tr>
<tr>
<td>2002</td>
<td>-1,9</td>
<td>1,9</td>
<td>-2,6</td>
<td>6,1</td>
<td>-0,1</td>
<td>4,7</td>
<td>-1,9</td>
<td>3,3</td>
<td>2,0</td>
<td>3,6</td>
<td>3,5</td>
<td>4,0</td>
</tr>
<tr>
<td>2003</td>
<td>-2,2</td>
<td>0,9</td>
<td>-5,0</td>
<td>2,0</td>
<td>-1,6</td>
<td>4,0</td>
<td>0,1</td>
<td>-2,0</td>
<td>-0,3</td>
<td>3,0</td>
<td>1,8</td>
<td>2,9</td>
</tr>
<tr>
<td>2004</td>
<td>3,4</td>
<td>2,9</td>
<td>-4,0</td>
<td>3,5</td>
<td>-1,9</td>
<td>3,1</td>
<td>2,2</td>
<td>12,9</td>
<td>1,0</td>
<td>2,6</td>
<td>5,9</td>
<td>4,2</td>
</tr>
<tr>
<td>2005</td>
<td>-0,3</td>
<td>1,4</td>
<td>-5,3</td>
<td>4,1</td>
<td>-2,0</td>
<td>7,6</td>
<td>1,4</td>
<td>7,6</td>
<td>1,8</td>
<td>2,3</td>
<td>4,6</td>
<td>1,0</td>
</tr>
<tr>
<td>2006</td>
<td>0,8</td>
<td>1,2</td>
<td>-6,0</td>
<td>6,3</td>
<td>-1,3</td>
<td>4,7</td>
<td>1,6</td>
<td>6,8</td>
<td>1,4</td>
<td>3,5</td>
<td>2,6</td>
<td>1,9</td>
</tr>
<tr>
<td>2007</td>
<td>4,7</td>
<td>10,2</td>
<td>-0,8</td>
<td>3,4</td>
<td>-0,1</td>
<td>3,6</td>
<td>0,4</td>
<td>-</td>
<td>-</td>
<td>2,4</td>
<td>2,8</td>
<td>2,1</td>
</tr>
<tr>
<td>2008</td>
<td>8,1</td>
<td>9,9</td>
<td>-1,1</td>
<td>10,3</td>
<td>0,5</td>
<td>31,4</td>
<td>2,3</td>
<td>-2,7</td>
<td>0,8</td>
<td>2,7</td>
<td>7,0</td>
<td>4,7</td>
</tr>
</tbody>
</table>
In 2000 an average annual inflation rate was strongly influenced by 3.9% rise in prices in the transportation group and in the group housing, water, electricity and fuels. During the year 2001, the Czech economy passed through corrections of some trends. There has been a slowdown in inflation rate, which at the end of 2001 settled at 4.7% and the annual decline in the unemployment rate of 8.1% was nearly stopped. From the perspective of items in the consumer basket, prices of recreation, food and fuel influenced the price development most significantly. In 2002, the average annual inflation declined again and at the end of the year amounted to 1.8%. The annual price decrease in food stuff and soft drinks was 1.9% and had particular contribution to the slowdown in inflation. Low-inflation economic development occurred in 2003. Annual consumer price inflation was around zero and was located deep below the target band. The most significant annual price growth occurred in the group of health (4.0%). Prices in the group of clothing and footwear declined the most. Compared to last year, in 2004 there was dynamic growth of the average annual inflation rate, which at the end of 2004 reached 2.8%. This increase influenced the rise in prices of agricultural products, as well as lagged effects of changes in indirect taxes from January 2004 and higher seasonal fluctuations for some items. In the following year 2005 inflation was most affected by the accelerating rise in fuel prices that occurred in connection with the development of oil prices on world markets. The average annual inflation rate in 2006 was found close to the inflation target, when it reached 2.5%. The main cause of the inflation rate growth at the end of 2007 was the impact of increasing excise taxes on tobacco prices - in Table 3 in this group an annual price increase of 10.2% is obvious. High inflation growth in 2008 was due to external and internal factors. High inflation was mainly influenced by development of world prices of energy resources and the implementation of some reform measures in early 2008. A significant decline in overall inflation in 2009 to 1% was due to the drop in prices of food (decrease in agricultural producer prices in the food industry and the consumer market), regulated prices or reduction of gas prices. Contrary in 2010, inflation rate was increasing. Factor that influenced the rise was increase of both VAT rates by one percentage, due to an increase in revenues to the state budget. There has also been an increase in excise duty on spirits and cigarettes. The average annual inflation rate for 2011 of 1.9% was slightly below the CNB target. The lower value of inflation was attributable to the persisting weak domestic demand, low wage growth and falling import prices of final products. In 2012 the inflation rate was 3.3% and was thus found above the CNB's inflation target, where the upper tolerance band is set at 3%. This deviation was due to rising prices of energy, regulated rentals and the impact of the VAT change, which increased the reduced rate from 10% to 14%. In the following year, 2013, inflation declined sharply to 1.4%, and was found thus significantly below the inflation target. Its fall was influenced by lower adjusted inflation excluding fuels and to a lesser extent, regulated prices. [8]

<table>
<thead>
<tr>
<th>Year</th>
<th>Clothing &amp; footwear</th>
<th>Food &amp; soft drinks</th>
<th>Housing &amp; utilities</th>
<th>Mobility</th>
<th>Recreation &amp; free time</th>
<th>Health</th>
<th>Education &amp; culture</th>
<th>Information &amp; communication</th>
<th>Tobacco</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>-3.9</td>
<td>6.5</td>
<td>-2.5</td>
<td>7.2</td>
<td>-0.6</td>
<td>-3.2</td>
<td>-5.8</td>
<td>-4.6</td>
<td>-0.9</td>
</tr>
<tr>
<td>2010</td>
<td>1.5</td>
<td>4.6</td>
<td>-2.6</td>
<td>1.7</td>
<td>-0.5</td>
<td>5.2</td>
<td>2.6</td>
<td>-2.1</td>
<td>-1.0</td>
</tr>
<tr>
<td>2011</td>
<td>4.6</td>
<td>3.1</td>
<td>-2.2</td>
<td>2.8</td>
<td>-1.5</td>
<td>2.9</td>
<td>2.8</td>
<td>-0.9</td>
<td>-1.9</td>
</tr>
<tr>
<td>2012</td>
<td>6.9</td>
<td>2.6</td>
<td>-3.1</td>
<td>5.0</td>
<td>-1.1</td>
<td>9.3</td>
<td>2.8</td>
<td>-2.4</td>
<td>-0.2</td>
</tr>
<tr>
<td>2013</td>
<td>4.9</td>
<td>3.6</td>
<td>-0.9</td>
<td>1.8</td>
<td>-1.0</td>
<td>2.4</td>
<td>-0.7</td>
<td>-8.9</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Source: [7] The own processing
4. The development of unemployment in the Czech Republic between 2000 - 2013

Unemployment is undoubtedly an unpleasant side-effect of the development of social systems based on a market economy. Unemployment is perceived by community as a significant disturbance representing a social and political problem. In modern economics, more and more attention is devoted to unemployment, which currently represents one of the most followed and discussed phenomena of market economy. [9]

Development of employment and unemployment in the Czech Republic including concrete numbers is shown at the following two charts. The first graph shows an evolution of the general unemployment rate, which is calculated based on the Labour Force Survey (based on a representative sample of companies, which in this case is carried out by the Czech Statistical Office). It expresses the share of unemployed in the total labor force as a percentage. The chart below shows the development of long-term unemployment rate as well, and is based on the number of unemployed seeking for a job for more than 1 year. Regarding the graphically shown employment rate, it shows the ratio of the employed to all persons aged 15 years and older. [10]

The employment rate in monitored period evolved quite erratically. Its development was influenced primarily by two factors - due to the high number of students in secondary schools employment rate of 15 to 19 year olds decreased and also leads to an enormous increase in the number of university students, resulting in a reduction in employment rate of 20 to 24 year olds. On the other hand, a gradual increase in the age of retirement leads to a rise of employment rate of 55 to 59 year olds. [13]

Another important factor in the development of unemployment after the 2000 was a higher increase in the number of retirements, but also this fact was dampened by extending the legal period for retirement and voluntary postponement of retirement. Consequently, marked increase in unemployment over the period 2000 to 2005 can be seen in graphs. Then in 2006 to 2008, a period of decline in the unemployment rate started. It affected mainly the industrial sector, which was freed from over-employment and then increased its productivity. During this period, even some sectors (civil engineering) showed a labor shortage, and there was quite a strong demand for lower-skilled occupations. However, this positive development in the labor market caused pressure on permitting the employment of foreigners mainly from Ukraine, Vietnam and Mongolia. The following year was a period of economic crisis, which brought a negative impact on the Czech economy. [14]

From 2000 until the end of the monitored period there was an annual increase of economically inactive population, ie the aforementioned pensioners and students. At the beginning of the millennium there was also a phenomenon known as hysteresis, even if there was GDP growth (see. Chart 1) and the unemployment rate did not decline (in 2000 and 2001, we can see a constant evolution of the unemployment rate).

Between 2002 and 2003 there was a decrease in the unemployment rate, which was influenced by the continued restructuring of the economy and privatization, as well as the integration of national economies into world economic structures. 2004 was a significant year for the country, when Czech Republic entered the EU. Thanks to this, there was the possibility of labor migration to the Member States, which resulted in positive effects on the development of unemployment in the domestic labor market. Czech Republic’s accession to the EU also brought the arrival of new foreign investors who provided new

![Chart 9: Development of unemployment rate in the Czech Republic (in %) between 2000 and 2013.](chart)

*Source: [12] The own processing*
jobs. All of these factors can be seen in the following table, where in 2004 the number of vacancies at the Labor Office increased about 11,015 and the number of registered job seekers decreased by 745 persons. [15]

Table 2 The number of registered job seekers at the employment office and the number of vacancies.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of registered job seekers</td>
<td>457369</td>
<td>461923</td>
<td>514435</td>
<td>542420</td>
<td>541675</td>
<td>510416</td>
<td>448545</td>
</tr>
<tr>
<td>The number of vacancies</td>
<td>52 060</td>
<td>52 084</td>
<td>40 651</td>
<td>40 188</td>
<td>51 203</td>
<td>52 164</td>
<td>93 425</td>
</tr>
<tr>
<td>2007</td>
<td>2008</td>
<td>2009</td>
<td>2010</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>The number of registered job seekers</td>
<td>354878</td>
<td>352250</td>
<td>539136</td>
<td>561551</td>
<td>508451</td>
<td>545311</td>
<td>596833</td>
</tr>
<tr>
<td>The number of vacancies</td>
<td>141066</td>
<td>91 189</td>
<td>30 927</td>
<td>30 803</td>
<td>35 784</td>
<td>34 893</td>
<td>35 178</td>
</tr>
</tbody>
</table>

Source: [16] The own processing

In the following year 2005 economic growth sustained again and positive was the fact that the rise in long-term unemployment rate has stopped. This positive upturn in unemployment was contributed by direct and indirect foreign investment. In 2006, in line with the further growth of the Czech economy, employment grew and unemployment fell. As in previous years, the unemployment trend in 2006 was influenced by seasonal factors. In 2007 there was quite a big turnaround in unemployment. In Table 4, it can be noted that labor offices in the Czech Republic registered 93,667 fewer job seekers in total. General unemployment rate fell to 5.3% mainly due to the large surplus of vacancies in services, mechanical and electrical engineering. The year 2008 was characterized by the lowest level of the general unemployment rate for the whole period monitored, despite the global crisis. The reason was that the Czech Republic had initially minimal impact of the crisis and the sharp rise we felt at the beginning of 2009. In 2009 there was thus a sharp decline in demand for goods and services, resulting in a reduction of production enterprises and some even concluded their production. This of course would have reflected on employment, when there were massive layoffs of employees. The global crisis in the Czech Republic mostly affected the automotive industry, electronics industry and other sectors producing the durable goods. [17]

In 2010, mainly as a result of gradually increasing performance of industries and market services, it came to increased economic performance. In 2011 there was a temporary drop in unemployment as a result of moderate economic recovery, which in 2012 was replaced by its growth continued until 2013. [18]

5. Conclusion
In the monitored period, between 2000 and 2013 two basic moments, which affected the evolution of some macroeconomic indicators to some extent occurred. The first significant moment was in 2004, when Czech Republic joined the EU, and this created the possibility for free movement of persons, services, goods and capital. Joining the EU had a positive effect, especially in the unemployment rate, when the possibility for labor migration abroad developed and a new influx of foreign investors into our country have created new jobs. The second significant moment, which occurred during the monitored period.
period was the outbreak of the global economic crisis in 2008, which was the result of the mortgage crisis in the United States. Crisis in the Czech Republic took hold in early 2009, in the form of a sharp decline in real GDP, the decline in exports and imports of goods and services, as well as the abrupt increase of state and of government debt, the rise in the unemployment rate, as well as a decline in overall labor productivity.

Besides the above mentioned two moments that occurred during the reporting period, extensive flooding in 2002 and milder recession in Czech Republic between 2012 and 2013 also affected the GDP. The recession was unlike that in 2009, due to internal factors, namely falling in final consumption expenditure of households, which were analyzed in the context of expenditure method of calculating GDP. The second attribute of the analyzed economic security was the monetary stability, respectively inflation rate. The analysis showed that the biggest fluctuations in the rate of inflation occurred in 2001, 2003 and 2008. While in 2003, disinflation was most affected by a decline in prices in the group clothing and footwear, in 2008 was the cause of accelerating inflation increase in the rate of value added tax and in particular the increase in regulated prices, especially prices of energy for households. As a result of the economic crisis, inflation declined. However, in subsequent years, when the country's economy began to recover, and the situation has improved, the rate of inflation reached relatively low values. Czech economy thus found itself at risk of deflation, which is a negative phenomenon storing household consumption expenditure and the consequent decline in GDP. This problem was solved by CNB in November 2013, when decision to intervene in the foreign exchange market to weaken the Czech crown to around 27 crowns per euro was brought.

The last explored attribute of the economic security was the unemployment rate. Between 2000 and 2006, the unemployment rate ranged typically between 7% and 8%, and was affected especially upon retirement of those born after World War 2. In this period the economy of the Czech Republic (resp. Real GDP) grew at a fast pace and there were productivity growth. From 2006 to 2008, the situation was more favorable, the unemployment rate fell, for example thanks to strong demand for less-skilled occupations. The turning point came in 2009, when the crisis broke out. Unemployment began to grow quite rapidly, companies began to lay off their employees, or even to delay contracts for fear of further economic development. In subsequent years, the unemployment rate developed relatively stable.

References


USE OF THE INDEX METHODS OF INCOME INEQUALITY FOR ASSESSING THE SECURITY LEVEL

Andrea Byrtusová

Abstract: The article briefly describes the security environment. In this paper, I describe selected methods of income inequality, which can be used for assessing the safety level. The practical example is presented, how it is possible to use the Lorenz curve and Gini coefficient to assess the level of security of the territory. The value of the index of income inequality could become an indicator of a potential security breach.

Keywords: security, methods of income inequality, Lorenz curve, Gini coefficient

1. Introduction
Climate change, social change, technological developments and other phenomena affect the scope and volume of crisis phenomena. Crisis phenomenon then means the harmful effects of forces and phenomena caused by human activity, natural effects and also accidents that disrupt or prevent the functioning of the existence or development process or system. Complexly speaking, that these changes affect the established safety level. Influence of crisis phenomena can endanger the lives and health of people, their property or the environment. Crisis events can also lead to other consequences such as endangering the safety of the population, psychological distress, disruption to businesses, etc.. For these reasons, it is necessary to implement preventive measures and to deal with crisis situations before they occur, prior to the effect of the devastating effects on the system and the surroundings.
State and local governments have an irreplaceable role in preventing, preparing for and responding to crisis event. Effectiveness of their work results from a functional structure, legal security and adequate preparedness and competence of the various actors of crisis management.

2. Security environment
Defining the term security environment is not clear, because it has complicated both vertical and horizontal structure. Security environment is an area in which human activities are carried out in terms of the risks affecting security interests, activities and values of the international community, the state, social groupings, legal entities or individuals.
According to the document security terminology Czech University of Defence is "security environment external environment affecting national security policy. It can be seen as an area located outside the national borders, which are realized and state interests clash with the interests of other actors in international relations and in which place processes that have a significant impact on the level of national security. "[5]
Since the 90s of the last century the security environment of the world has changed. The main changes in the perception of safety was to minimize the possibility of armed conflict
ended bipolar division of the world, a decrease aggression in relations between states, but also the extensive activities of international security organizations and the like. On the other hand, saw an increase in non-military threats, including international terrorism. Changes in society and lead to the result that a natural or technological disaster often do not have a company such as the impact of disasters in the economic sphere, in the territorial and social infrastructure, information technology, communications, energy and banking.

3. Security assessment using index methods of income inequality
Exist many methods and approaches to the assessment of the safety area. Among the most commonly used methods include index. Index methods can include the generic methods that are based on the examination of important determinant and other indicators that influence the development of the security situation. Index methods are used to identify sources of risk. In most cases, methods used to detect specific sources of risk. Other sources of risk using these methods cannot be identified, methods are not equipped to do.
Methods of income inequality are used because income inequality determines how the real incomes of individuals, families on social groups distinct from the situation where everyone had the same income. In every society exists a greater or lesser degree of income inequality. In essence, it is the basic yardstick for poverty or prosperity. At the same time, however, it folds as evidence the state of the public finance system and social system. Today, differences in income and societal wealth very apparent. Individual groups such differences could be seen as unfair, what can cause the emergence of conflicts that can escalate into violence or changes in the political system.
Ways to measure income inequality and then analyze it, there are many. Among the best known and most used methods include:
- Lorenz curve,
- Gini coefficient,
- Hoover Index (Robin Hood Index)
- Atkison index of inequality. [3]

3.1. Lorenz curve
Author Lorenz curve is an American economist Max O. Lorenz, who model the Lorenz curve remembered the first time in his dissertation, "The Economic Theory of Railroad Rates" in 1905.
Lorenz curve is among the most widely used models and graphic presentation of income inequality. Waveform is defined by two axes, the x-axis represents the proportion of the population and the y-axis total revenue (Fig. 1). Values of both axes are moved in the interval <0; 1>. The graph is also a shaft angle of 45 degrees (diagonal unit square). The curve represents absolute equality of income in society. In practice, this situation does not occur. The Lorenz curve describes the actual state of income distribution in a society. Generally speaking, the more the Lorenz curve approaches the diagonal, the lower the income inequality. Conversely, the more the Lorenz curve moves away from the diagonal, the greater the income inequality increased.
3.2. Gini coefficient

In 1912, an Italian statistician and demographer Corrado Gini presented a statistical model which pointed to the differences in financial income among residents. Model describing the variation in real income from absolutely equitable distribution of income among residents. Since then, the Gini coefficient (G) is used to express income inequality and the inequality drew attention to the sum of the accumulated wealth.

The starting point for determining the Gini coefficient is Lorenz curve. Gini coefficient takes values from the interval <0; 1>. If the coefficient value approaches 0, i.e. area A is zero. This situation indicates an absolutely equal distribution of income. Conversely, if the Gini coefficient takes a value of 1, i.e. area B is zero. The company then has an absolute inequality of income distribution.

The Gini coefficient can be calculated as the ratio between the size of the area A and the total area under the diagonal A + B (Fig. 2).

\[ G = \frac{A}{A + B} \]  

(1)
3.3. Hoover index (Robin Hood Index)

Hoover index is used to determine total income that should be reallocated so that it attained absolute uniformity of income distribution. This means that part of the total income should be removed richer part of the population in favor of the poorer sections of the population (the idea of Robin Hood).

Graphically Hoover index can be interpreted as the longest distance between the point F, which lies on the curve of the absolute equality of income, and point E, which lies on the Lorenz curve (Fig. 3).
Hoover index can be mathematically defined as:

$$HI = \left( \frac{\sum x_i}{\sum x_i} - \left( m \cdot \frac{1}{n} \right) \right) \times 100$$

for $$x_i \geq 0$$, \(i = 1, 2, ..., n\), \(m = \frac{1}{n}\), \(n = \text{number of income groups}\), \(m = \text{number of groups which are set off in total sum}\).

3.4. Atkinson index of inequality

British economist Anthony Barnes Atkinson presented Atkinson's index of inequality. It is a tool that quantifies the degree of income inequality by calculating the so-called fair average income \(Y_e\). This income is defined as income evenly split in the group, which will create the same level of prosperity as the existing distribution of income. The general formula for calculating the Atkinson index of inequality is defined as:

$$A_e(y_1, y_2, ..., y_n) = \begin{cases} 
1 - \frac{1}{\mu} \left( \frac{1}{N} \sum_{i=1}^{N} y_i^{1-\varepsilon} \right)^{\frac{1}{1-\varepsilon}} & \text{for } \varepsilon \in (0, 1) \cup (1, \infty), \\
1 - \frac{1}{\mu} \left( \prod_{i=1}^{N} y_i \right)^{\frac{1}{N}} & \text{for } \varepsilon = 1,
\end{cases}$$

where: \(y_i\) is the individual income (balanced intake of the ith group of people), \(\mu\) is the average income in society (to the group), \(\varepsilon\) is parameter aversion to inequality, \(N\) is the number of income groups. [2]

As is apparent from the formula (4), inequality aversion parameter can take values from the interval \(<0, \infty\). If the parameter of aversion to inequality is 0, it means that the company occupies an indifferent attitude towards the distribution of income. Conversely, the greater the value of the parameter aversion to inequality, the more the company emphasizes the transfer of income at the bottom of the income distribution and less emphasis on the transfer of income at the top of the income distribution. [3]

Atkinson index itself varies in the interval \(<0, 1>\) is true that the more the current average per capita income approaching fair average per capita income, the lower the value Atkinson index. [3]

4. Case study on use of index of methods of assessment levels of security

The case study shows how it is possible to use the selected index methods to assess the potential risks that could compromise the security of the monitored area. When examining income inequality were used two indicators - the number of private households (x) and net cash income household (y). All figures relate to the year 2013. Net cash inflows are calculated from gross cash receipts deducting income tax and compulsory personal insurance.

4.1. Use Lorenz curve

As is evident from the table (Tab. 1) between individual regions are major differences between the net cash income or the number of households. It suggests that the Lorenz curve will tend to approach the diagonal and income inequality will be of great significance.
### Table 1: Table of frequency indicators $x \times y$

<table>
<thead>
<tr>
<th>Regions of SR</th>
<th>$x$</th>
<th>$y$</th>
<th>$rel(x)$</th>
<th>$rel(y)$</th>
<th>$kum(x)$</th>
<th>$kum(y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region of Košice</td>
<td>237 454</td>
<td>328</td>
<td>0,128</td>
<td>0,110</td>
<td>0,128</td>
<td>0,110</td>
</tr>
<tr>
<td>Region of Prešov</td>
<td>261 823</td>
<td>337</td>
<td>0,141</td>
<td>0,113</td>
<td>0,270</td>
<td>0,223</td>
</tr>
<tr>
<td>Region of Banská Bystrica</td>
<td>247 712</td>
<td>354</td>
<td>0,134</td>
<td>0,118</td>
<td>0,403</td>
<td>0,341</td>
</tr>
<tr>
<td>Region of Nitra</td>
<td>240 183</td>
<td>356</td>
<td>0,130</td>
<td>0,119</td>
<td>0,533</td>
<td>0,460</td>
</tr>
<tr>
<td>Region of Žilina</td>
<td>218 788</td>
<td>362</td>
<td>0,118</td>
<td>0,121</td>
<td>0,651</td>
<td>0,581</td>
</tr>
<tr>
<td>Region of Trenčín</td>
<td>208 839</td>
<td>376</td>
<td>0,113</td>
<td>0,126</td>
<td>0,764</td>
<td>0,707</td>
</tr>
<tr>
<td>Region of Trnava</td>
<td>191 263</td>
<td>388</td>
<td>0,103</td>
<td>0,130</td>
<td>0,867</td>
<td>0,837</td>
</tr>
<tr>
<td>Region of Bratislava</td>
<td>245 997</td>
<td>487</td>
<td>0,133</td>
<td>0,163</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Σ</td>
<td>1852059</td>
<td>2988</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Statistical Office of the Slovak Republic, 2013

After calculating the relative and cumulative frequency graph was created, which can be seen as the Lorenz curve and the diagonal graph (Fig. 4). As predicted, the Lorenz curve does not deviate from the curve of the absolute equality of income. This means that between each region SR is pronounced income inequality, which could in any way compromise the security of the regions.

![Lorenz curve of income inequality](image)

**Figure 4: Lorenz curve of income inequality**

Source: Author

### 4.2. Use Gini coefficient

Gini coefficient will be used in monitoring the income inequality between selected indicators. As already written above, the statistical values of individual regions are significant differences (Tab. 2). It indicates that the Gini coefficient is rather closer to the value 0.
The value of the Gini coefficient, as previously written, it always reaches values from the interval <0; 1>. The value of the Gini coefficient can be calculated from the formula (1).

Value of the area (A + B) is always equal to the value of 0.5 (half the area of a square with edges 1 * 1).

To calculate the Gini coefficient is therefore necessary to determine the size of the area B (Tab. 3.). If we start from Lorenz curve, then we will see that the first decile in the chart resembles the shape of a right triangle, the area we are able to calculate. Second decile area can be divided into a rectangle, and again right triangle. The same applies for all other deciles in the chart. Area B thus calculated as the sum of the areas of individual deciles.

Table 3: Calculation of areas of individual deciles under the Lorenz curve

<table>
<thead>
<tr>
<th>rel(x)</th>
<th>lag(Y)</th>
<th>s_n</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,128</td>
<td>0</td>
<td>0,000</td>
</tr>
<tr>
<td>0,141</td>
<td>0,110</td>
<td>0,007</td>
</tr>
<tr>
<td>0,134</td>
<td>0,223</td>
<td>0,023</td>
</tr>
<tr>
<td>0,130</td>
<td>0,341</td>
<td>0,038</td>
</tr>
<tr>
<td>0,118</td>
<td>0,460</td>
<td>0,052</td>
</tr>
<tr>
<td>0,113</td>
<td>0,581</td>
<td>0,062</td>
</tr>
<tr>
<td>0,103</td>
<td>0,707</td>
<td>0,073</td>
</tr>
<tr>
<td>0,133</td>
<td>0,837</td>
<td>0,080</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0,122</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0,456</td>
</tr>
</tbody>
</table>

Source: Author

The calculation is thus apparent that the area B is equal to the value 0.456. The value of area A is calculated from the difference of the areas (A+B)-A, i.e. 0,044.

The Gini coefficient calculated from the formula:

\[ G = \frac{A}{A + B} \]

\[ G = \frac{0,044}{0,044 + 0,456} \]

\[ G = 0,088 \]

Since the Gini coefficient close to zero, it indicates an absolutely equal distribution of income among households counties SR. It could be concluded that, based on these two indicators should not impair the safety levels set by the monitored area.

5. Conclusion

Within the scientific-technical work we are dealing with a project entitled "Identification of factors and indicators of changes in the security environment necessary for designing prevention strategies and their financing." Monitoring of indicators that can affect safety, it is important to maintain the level of safety set by individual regions.
In the article we were approximated index methods, which are used for assessing the safety level. Methods could become the basis for developing methods to assess the safety of the Regions of the Slovak Republic, but it must be specified threshold values of changes in the level of security for the specific conditions of the Slovak Republic. Understanding of the security environment is one of the prerequisites for the proper application of the principles of security policy in practice. At all levels of the security environment may be held events that may have a primary, but also secondary effects on the safety of people, property and the environment, as well as ongoing events and processes. Therefore it is important to analyze comprehensively and permanently security environment and processes running therein, to allow timely and appropriate action in order to maintain the required level of safety.

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References


COMPARATIVE ANALYSIS OF THE CURRENT STATE OF OPINIONS AND ATTITUDES ON THE ISSUES OF EDUCATION AND DEVELOPMENT OF COMMANDERS WITHIN THE CZECH AIR AND LAND FORCES

Monika Davidová, Jiří Hodný and Petra Hurbišová

Abstract: This paper is focused on the current state of opinions and positions on issues of education and development of commanders within the Czech Air and Land Forces. The contribution presents the results of a questionnaire survey entitled „Analysis of the current state of education and development of military professionals – managers of selected subjects in the subordination of the Ministry of Defence of the Czech Republic“. The selected areas provide a current overview of the opinions and attitudes of the views of awareness and opportunities for consultation, development of managerial skills and leadership managing at the beginning effect on the function, development needs, barriers and integration of new elements to training.

Keywords: education, development, commanders, Czech air forces, Czech land forces

1. Introduction
Employee education and development are the key personnel activities of each employer who understand the importance of investment in people. J. Koubek says that human resources set in motion other resources – informational, financial and material [1]. This compact resource unit meets the established organizational goals through management techniques such as planning, organizing, leading and control. Authors, dealing with the areas of human resources management, agree on the fact that employees are the most valuable and also the most expensive resource that decides on the prosperity and competitiveness of the organization.

2. Theoretical starting points of education and development of manager
Education and development of managers assist the employer with regard to the need not only in the present, but also the in future. An employer deals with the education and development of managers with regard to current needs and future needs. This activity is followed by management and career planning. It is an ongoing process to ensure the preparation of managers, management of reserves and stabilizing the optimum number of and structure of executives. Z. Dvořáková describes the system of management and career planning at two levels. The first level represents the employer party that identifies needs, plans, selects and evaluates staff who will respond to future requirements. The second level represents the party staff – the future manager who carries out various steps to realize career goals [2].
Education and development of managers is not just about handing over general, theoretical knowledge. An emphasis is also placed on leadership and applied knowledge. This includes the need to specifically develop appropriate teaching materials.

The manager's job then develops and intends possible variants of dealing with situation, organizes, continuously trains, attends trainings, evaluates information, communicates. Working eligibility of managers can be interpreted as a measure of consistency between the requirements and prerequisites. According to V. Moricová it consists of physical, psychological, professional and moral component. Ability and eligibility of manager should be as professional (the ability to manage, organize, coordinate, flexibly and dynamically decide) and social (to lead people, motivate, stimulate, maintain the moral qualities of personality, be able to face mental stress) and conceptual (planning, implementing solutions situations, see the context and consequences of the decision) [3].

There is the claim that managers learn best while working. However, it is not possible for an employer to leave the managers to their fate and their future education and development were merely a random process. M. Armstrong recommends three basic approaches to the development of managers, i.e. non-formal education, "learning by doing", formal education, feedback, advice and support [4]. Managers face the informal approach in everyday work. The manager must be able to deal with the new situation learnt and apply it in the future. Managers may, in discussions with colleagues and superiors, reveal weaknesses that need to be further developed. Formal development approaches of managers include development while working through coaching, consulting, monitoring and response from their superiors, development through work experience, i.e. job rotation, work in project teams, „learning by doing“, formal education through courses, structured development of oneself according to individual learning programs. Managers get feedback through a mentor, an expert in the field of education of managers, who provide advice aimed at improving activities carried out.

3. Analysis of the current state of the commanders’ opinions and attitudes on education and development in the Czech Air and Land Forces

Employee education and development in the Ministry of Defence of the Czech Republic is a systematically managed process, based on the Concept of personnel preparation of Ministry of Defence for the period 2012–2018 and Journal of educational activities that specifies these activities to a particular calendar year [5] and [6]. We wondered whether the opinions and attitudes of commanders on the subject of education and development differs from the currently offered education and development activities. Through a questionnaire survey entitled „Analysis of the current state of education and development of military professionals – managers of selected subjects in the subordination of the Ministry of Defence of the Czech Republic“, there was determined a current overview of levels of satisfaction, opinions and attitudes from the perspectives of:

- the information awareness, the consultation possibilities,
- the development of management skills and leading of manager at the beginning of his working position,
- the need for the development, barriers and integrating new elements of training.
A questionnaire survey was conducted in autumn 2014, as a part of the specific research „Education and development of crisis managers in the ministry of defence of the Czech Republic 2013–2016“, Faculty of Military Leadership, University of Defence. Object of the study were Czech Air and Land Forces, in the whole structure of subordination. The questionnaire contained 71 questions and respondents were:

- members of the Czech Air Forces on positions – Commander, Deputy Commander, Chief of Staff, Deputy Chief of Staff, Chief Warrant Officer, Wing Commander and Squadron Commander. It was an comprehensive investigation. Questionnaires response rate was 89 %, (37 respondents).
- members of the Czech Land Forces on positions – Commander, Deputy Commander, Chief of Staff, Deputy Chief of Staff, Chief Warrant Officer. It was an comprehensive investigation. Questionnaires response rate was 64.8 %, (104 respondents).

The number of respondents in the survey was 142.

3.1. Awareness and consultation options

The survey revealed, that in the Czech Air Forces 81 % of the respondents have information about educational opportunities and development within the resort of Ministry of Defence of the Czech Republic. The rest of the respondents (19 %) said that they do not have such information. Is one fifth of uninformed respondents a lot or a little? At Czech Land Forces, the situation is slightly better, 84 % of respondents confirmed that they have information about education and development within the resort. The rest of the respondents (16 %) said that they do not have such information. Commanders in such high positions should be 100 % informed.

With the current range of education and development activities of military professionals – managers organized within the resort, is only 3% of respondents satisfied in the Air Forces, 27 % of respondents are rather satisfied, 38 % neither satisfied nor dissatisfied and 24% rather dissatisfied, and 8 % were dissatisfied, see graph no. 1. Paradoxical as it seems that only 5 % of the respondents submitted specific suggestions for amendments, and 14 % of the respondents submitted specific suggestions on the content of education and development activities. Only 1% of respondents of Land Forces showed satisfaction, 25 % of respondents are rather satisfied, 36 % neither satisfied nor dissatisfied and 29% rather dissatisfied, and 9 % were dissatisfied, see graph no. 2. Specific proposals for amendments submitted 14% of respondents and 17 % of the respondents submitted specific suggestions on the content of education and development activities.
On the question whether the respondents (Air Forces) consult with their nearest superior officer the individual areas of their further education and development, 72 % answered yes, 28 % no. At Land force 78 % answered yes, 22 % no. In the questionnaire survey 84 % of respondents (Air Forces) said they consult with their nearest superior officer on individual areas of further education and development of their subordinates, 16 % do not consult at all. A full 100 % of respondents of the returned questionnaires answered that they pass information about education and development to their subordinates. At Land Force 3 % of respondents admitted that they do not consult with the nearest superior the area of education and development of their subordinates.

3.2. The development of management skills and leading of manager at the beginning at his working position

To the question whether the senior employee can become a good manager only by performance at their work, 22 % of respondents of Air Forces answered yes. The larger part, i.e. 59 % of respondents said yes, but also they add that for development of managers are the courses developing managerial skills are important. The remaining 19 % of respondents said no, see graph no. 3. The respondents Land Force responded to this question similarly. Only 17 % of respondents believe that yes. The larger part, i.e. 63 % of respondents said yes, but also they add that for development of managers are the courses developing managerial skills are important. The remaining 20 % of respondents said no, see graph no. 4.

To the question whether respondents had someone at the beginning in a leading position who allowed them to learn from his knowledge and experience, at Air Forces 62 % answered yes, 38 % did not. Respondents who in the previous question answered no, they were also asked whether they needed to have access to someone like that. This question was answered with 53 % yes, I missed advice and 47 % did not need any. At Land Forces to the question whether respondents had someone at the beginnings at leading position who allowed them to learn from his knowledge and experience, 70 % of respondents answered yes, 30 % did not. Respondents who in the previous question answered no, they were also asked whether they needed to have access to someone like that. This question was answered with 52 % yes, I missed advice and 48 % did not need any.
3.3. Areas of the needs for development, barriers and integration of new elements of training

To the question in which respondents were asked to identify areas in which they need to be further developed identified the following list:

**Czech Air Forces**
1. Language skills,
2. Expertise,
3. Communication skills,
4. Vision, goal orientation,
5. Leadership skills,
6. Personal requirements,
7. Self-knowledge.

**Czech Land Forces**
1. Language skills,
2. Leadership skills,
3. Expertise,
4. Communication skills,
5. Vision, goal orientation,
6. Personal requirements,
7. Self-knowledge.

Given the focus of the Air Forces arise as the most important language skills, expertise and communication skills. At Land Forces are the priority areas for development needs at language skills, leadership skills, expertise.

An equally important area of inquiry is the area of barriers that hinder managers in further education and development. Respondents perceive barriers to further education and development, mainly in:

**Czech Air Forces**
1. The workload,
2. The little knowledge of languages,
3. Health condition,
4. Methods of courses,
5. Tiredness,
6. Commuting,
7. Family,
8. Laziness,
9. Finance,
10. Age.

**Czech Land Forces**
1. The workload,
2. The little knowledge of languages,
3. Age,
4. Methods of courses,
5. Finance,
6. Commuting,
7. Family,
8. Laziness,
9. Tiredness,

Respondents were also asked whether they would be interested in an educational activity that would have applied the Crew Resource Management methodology. Crew Resource Management (CRM) is a process and a system of training for the activities in which
human error has devastating effects. It was developed in the late seventies by NASA in order to reduce the possibility of human error in aviation. It focuses on interpersonal communication, leadership and decision-making in emergency situations. Training content created by NASA at workshop in 1979, has since been applied in various industries and organizations. CRM concept includes three basic elements, ie. basic training to reinforcing awareness, practice, feedback and recurrent training. The key to success in the use of CRM is mutual respect and trust generated among crew members and teams, as well as supporting an environment that is conducive to openness and constructive criticism. The result is a higher professional performance due to the synergy which is achieved, thereby the risk of accidents or some random incidents is decreasing. The purpose of CRM is to streamline communication crews and teams who work in hazardous environments and the consequences of their decisions can be fatal.

CRM methodology was first applied to commercial aviation. Currently is used among air rescue teams, air and navy armed forces, firefighters, police officers and hospital personnel. Statistics in the US document the decline in injuries and deaths of firefighters. After the implementation of the CRM methodology, deaths fell by 100 and injured about 100,000 cases per year [7]. Also among employees in the US Coast Guard aviation personnel accidents were reduced by 70 % [8]. Feedback revealed the cause of past accidents. Those were seen by the rescuers in the lack of accountability, communication managers, administrators, insufficient training and further education. Authors Reason, Kanki, Helmreich, Anca who were examining human error in aviation operations published statistics from the period 1959–1989. According to their studies the primary cause of the accident is caused by airline staff (70 %), further by technical error on aircraft (12 %), error in aircraft maintenance (3 %), bad weather (4 %), an error caused by airport (4 %), other errors (2 %) [9] and [10]. Marshall describes the CRM issue amongs paramedics and Okray a Lubnau examine CRM by fire brigades [11].

Complex problem solving in a dynamic environment entails open communication, respect, awareness and feedback. The methodology CRM is focused on:

- finding adequate communication,
- recognition of different opinions,
- conflict resolution,
- its monitoring,
- decisions,
- and evaluation of a situation.

By adopting these attributes it can detect the areas in which the team communication fails. The performance of employees is being protected through the methodology of CRM. Achievement of synergy is possible if all team members understand the mission, their strengths and weaknesses and its own role in the team communication.
The respondents' (Air Forces) answers showed that 65% of respondents would be interested in such an activity, 32% have no interest, 3% of respondents did not answer. Respondents of Land Forces stated that 75% of respondents would be interested in such an activity, 25% have no interest.

4. Conclusion

The survey showed that most commanders are aware of the opportunities for education and development within the Ministry of Defence of the Czech Republic. Also, most commanders transmit the information and consult them with superiors and subordinates employees. Interestingly, however, it may appear that a range of training and development activities is by Czech Air Forces totally and rather satisfied only 30% of commanders, 32% commanders is completely and rather dissatisfied with the current state – of which only 14% of the respondents submitted specific suggestions on changes or additions to the content of education and development activities.

Only 26% of commanders at Land Forces are completely and rather satisfied by a offer of education and development activities, 38% commanders are rather a completely dissatisfied as shown in the graph no. 2 above. Specific suggestions for amendments submitted 14% of respondents and 17% of them submitted specific suggestions on the content of training and development activities. Most of the commanders believe that the senior employee can become a good manager only by performance at their work, at the same time there is consensus that for development of managers are the courses developing managerial skills are important. As a positive, it appears that more than half of commanders had had someone at the beginnings at leading position who allowed them to learn from his knowledge and experience.

Given the focus of the Air Forces arise as the most important language skills, expertise and communication skills, followed by management skills. At Land Forces are the priority areas for development needs at language skills, leadership skills, expertise. The greatest barriers to further education and development commanders (Air Forces) see in workload, in a little knowledge of languages, in health, methods of courses oriented to the theory. Land Forces commanders perceive the greatest barriers in workload, in a little knowledge of languages, in age and in the courses methods.
Up to 65% commanders at the Air Forces and 75% Land Forces commanders would appreciate an implementation of new systems of training focused on the Crew Resource Management methodology and its application to the conditions of Czech Armed Forces. The results of the questionnaire survey can be used to synchronize the needs and requirements with planning and implementation of educational and developmental activities of commanders in the Czech Armed Forces.

References

CRITICAL TRANSPORT INFRASTRUCTURE PROTECTION: A RESEARCH ON THE SECURITY OF THE SUPPLY CHAINS

Attila Horváth and Zágon Csaba

Abstract: Risks associated with the supply chains belonging to the transport sector of critical infrastructure protection and require appropriate responses and preliminary measures respectively. The analysis of the focuses and objectives of the particular researches points out the needs for complex approaches and the expectations for multipurpose applicability of the results. Starting from the threats, the successful researches identified the need for advanced network analysis to reach door-to-door security along the whole length of the supply chain.

Keywords: critical infrastructure protection, door-to-door security, network analysis, supply chain security

1. Introduction
The Critical Transport Infrastructure Protection Priority Research Area was carried out as part of the Project #TÁMOP-4.2.b-11/2/KMR-001. The research team enjoyed full autonomy since the inception of the sub-programme in line with the best practices of the leading countries of the topic researchers. In the United States of America, and in the European Communities the critical traffic infrastructure researches, the development of the legislation concerning the security of the vital transport and logistics systems and their implementation forms a substantive sector within the entire critical infrastructure protection researches.

The main objectives at the submission of the application for the research programme were determined as follows:

1. Conceptualisation of critical infrastructure protection and the possible adaptations of foreign experiences respectively.
2. Analysis of the spheres, sectors, institutions and legal frameworks of the critical infrastructure protection according to international examples.
3. The role of traffic systems in the critical infrastructure protection.
4. Allocation of the assignments and methodologies for each traffic modes (air, land, rail, sea, inland waterways, pipeline and cable transports) in critical infrastructure protection.
5. Vulnerability analysis of the infrastructure elements of traffic modes and sectors (e.g. carriageways and tracks, structures, terminals, vehicles, facilities and equipment, control systems etc.) in the European Union as well as in Hungary. Possible risk areas for the analysis may be terrorism, natural and human-made disasters, technological hazards, sabotage, anomalies, incidents, accidents and global warming related environmental effects.
6. Analysis of the interactions between traffic systems from critical infrastructure protection’s point of view.
7. The interdependency of the traffic systems on the critical infrastructure protection of the energetic networks, info-communication technologies, food and water supplies, financial systems, public administrations and government sectors.

8. The interdependency of the security and defence sector on the critical traffic infrastructure protection.

9. Security and safety researches at the priority areas of the supply chains and logistics networks.

The priority area of the critical traffic infrastructure protection was not handled independently from other infrastructures due to the interdependency between the traffic networks, means of transportation, individuals, goods, services circulating in the systems and, for instance, the energetics, info-communication systems etc.

The research team were composed of nine academic researchers, four Ph.D. candidates and an M.Sc. student. Introducing the facts and figures concerning the key research indicators, we may mention two strategic and a practical research report, 17 articles published in academic journals as well as 28 conference presentations. The 15 and 8 chapters consisting books were considered as one of the main achievement of the project. Both books were issued in prints and e-book versions. These books indicate the project’s priority in talent management, because known researchers of the topics worker with young researchers and doctoral candidates side by side on publishing their results.

After obtaining the support for the researches, its priorities were supplemented with additional areas due to a quick international research trends analysis and risk assessment. These important topics were the supply chain security, the public awareness in emergency situations and their preparedness capabilities. These amendments were proven important from both the public expectations’ as well as the research objectives’ points of view. The dependency from technologies increase continuously in the postmodern age and the issue of security become more and more priority either from its economic, socio- or other approaches. [1] This study will sum up the research results of the supply chain security area.

2. The Result of a Globalised World: the Globalised Supply Chains

Probably the statement sounds like a commonplace, but we have to accept that we live in the age of a global world in which, no economy can function without the security of supply chains. A permanent barrier in the supply chain, for instance, may paralyse the production, distribution and sales processes a few thousand kilometres away. At the beginning of the research we set up the hypothesis that there is no sufficient what to discuss about the protection of the traffic systems within the greater phenomena called critical infrastructure protection. In our opinion, ‘critical infrastructure protection of the transport and logistics sector’ would be a more appropriate term.

In the recent decades, the supply chains have become a part of life for the societies and even for their individual members. For those who do not believe this fact we suggest a very simple empirical method to en-sure the statement. We do not need to do anything else just estimate the share how much of our cloths were manufactured in the Far East? The energy sources, clothing, technical equipment, a good portion of food products – consumed by everyday people – were elaborated in countries far away. These products were manufactured, distributed and sold through complicated systems until they get to the consumers. For the everyday people it is almost incomprehensible how the economics and logistics processes and the mechanism of supply chains operate.

The previously unimaginable integration could not have taken place without the spread of a global economic approach, new manufacturing techniques, improvement in
transportation modes and methods of logistics, the increased use of IT systems, etc. New economic trends appeared, certain technologic advances became integral parts of the system while consumer’s habits were also changed. These achievements led to the spread of the advanced supply chain management. [2]

2.1. Defining a Concept
However, the definition of the supply chain concept is not easy. Just as for the terms of security, terrorism and logistics, we can find hundreds of conceptual definitions for the supply chain that meet certain scientific standards. The common feature of the supply chain related concepts is that the circulation of materials and products is always associated with the flow of information – this approach appears everywhere. [3] Three main sections may be separated in the supply chain for the material and information flow related processes such as the procurement, the manufacturing and the customer services. [4] It is not necessary to be a logistics expert to imagine when a product that is developed in Europe or in the United States, manufactured in China from elements originating from almost all over the world may become a part of the global sales process if those processes are well coordinated. In such a complex and networked system the cooperation has to cross over the traditional corporate structures. [5] The supply chains are one of the occurrences of globalization. They have been created and, at the same time maintained by the internal values of this phenomenon. To be protected against the harmful effects of the global supply chain may be efficient if its operational mechanism is well considered and their opportunities are exploited. [6]

2.2. Challenges of our Times
The protection of sources of supply, manufacturing plants, warehouses, commercial facilities cannot be considered as a recent issue. Throughout the history after the formation of organized human society the protection of these facilities has always been a priority to the owners and to the states as well. It is no exaggeration to say that both the security of economy and trade became a strategic issue from public administrative and military aspects. In the Cold War period, the opposing parties were evaluated security only in military terms almost exclusively. After the disintegration of the bipolar world, security studies have become more open to other aspects of the real world then the military and foreign policy problems, which were in fact their primary focus in that time. [7] However, it would be a mistake to state that the altering ‘new security challenges, risks and threats’ (as these phenomenon are often specified by security experts), such as terrorism, the mass migration, drug trafficking and other forms of organised cross-border crime, etc. have not previously been posed threat to the societies and the states. [8] The post-modern society and the evolution of civilization entail numerous challenges that pose serious risks to the global, continental, sub-regional security. The increasing environmental burden shifting, the negative effects of the overpopulation and global warming have already impact on the food production and supply chain. This made the elaboration of strategies and action plans necessary to face such challenges.

2.3. Examinations in the Focus
Our recent time pre-eminent thinkers are preoccupied with the examination of the post-modern societal and technological improvements related phenomena. The French philosopher Jean Baudrillard who died in 2007, published several studies in the preparation to the millennium. These studies dealt with the phenomena emerged in the 1990s and the characteristics of the postmodern era. In his works the resources of security risks were also affected. He investigated the primary problem sources of the inequality in controversial political and economic relationship between the West and the Middle East, Southeast Asia, Africa and Latin America. However he broke with the geopolitical context that was traditionally interpreted as a reference model ‘North vs. South’. [9]
The author interprets the term of globalism in the opposition and the mutual interdependency between the West and the less developed parts of the world. Baudrillard’s novel approach is thought provoking in many aspects.

3. Geopolitics and General Security Contexts
You should be aware of the geopolitical contexts in relation to the security of supply chain just as of its continuous analysis. Since 1990, we have witnessed a change that amended the economic and security dimensions and most probably have reshaped the geopolitical map of the world. There is no doubt that the ‘BRICS countries’ have a decisive role in the world economic developments. The Goldman Sachs introduced the term that incorporates countries might join the group of economically developed countries in a longer perspective and includes Brazil, Russia, India, China and South Africa. [10] These countries have already proven their unavoidable role in transportation of certain groups of goods throughout the supply chains.

3.1. Mandatory Network Analysis
At this point we need to turn to the networks. Not surprisingly BRICS countries may be found among the most frequent container ports of the world and they form a vital network of supply chains with the most developed countries added with certain choke points, such as Singapore. The last mentioned type of in-between nodes as the graph theory and as the network analysis calls ‘betweenness centrality’. Since they provide not simply links between two important groups of nodes, but these types of connections quantify the number of times a node acts as a bridge along the shortest path.
If we want to ensure ‘door-to-door security’ in the networks of supply chains, we need to turn to recent achievements of the network analysis. It is absolutely necessary to define those parts of the network, where security measures would affect the most. With other words, we have to point out the most vulnerable points on the shield of defence and target our limited capabilities accordingly to protect the network as effectively as possible. From this aspect, betweenness centrality nodes have just as high relevance, if not even more, than the points of in-degree and out-degree, which are used for the most frequent input and output points of the network.
If supply chains form a scale-free network [11] the network gets a high degree of fault tolerance and may not be disrupted by random attacks with ease, because of the proven character of such network types. In order to disrupt it, targeted attacks have to be triggered at those nodes, which have the highest number of links. This knowledge has been proven to be useful for those who are committed in destroying and in protecting the network.

3.2. Global Network Patterns
The global economic character may not simply be considered, because of the capital investments and settlements of economic operators favour those areas where the necessary conditions are provided for a continuous and prosperous operation. The sources of raw materials, the repository areas, production sites, sales and distribution systems often lie thousands of kilometres away from each other. How to guarantee security along with the transportation routes between these points? Supply chain security is therefore a serious challenge for global, continental, regional, and national level. [8] Although the slogan ‘think globally, act locally’ originates from the environmental protection, it stands for the security efforts in the supply chains as well, and probably will lead us to better solutions.
A good example is the Icelandic volcano Eyjafjallajökull eruption in April 2010 to certify the above statements. In Iceland, such natural effects frequently occur and usually require no fatalities. But the secondary regional and global impact were even worst than the direct primer local consequences in that particular case, because a serious disruption occurred
in the air transport system all over Western Europe. The magnitude of the damage has not been estimated from the missing airfares happened due to the cut in air transport services. It is almost impossible to express for instance, what secondary consequences occurred from the loss of business travels, or from the delays of air consignment services. We are already aware of the damages what the Japanese *Fukushima* nuclear power plant disaster inflicted on 11 March 2011 due to an earthquake and a subsequent tsunami. It is less well known, that leading Japanese enterprises in the global IT sector were supplied with inadequate amount of electric energy and therefore they could not maintain their continuous production. If the blackout had not been solved in a relatively narrow time frame this would have caused high risk for the global IT industry, because they sustain a serious disruption. If this occurs, it would further deepen the worldwide economic crisis, because of the IT sectors’ high significance in the global economy. [8]

Even those terrorist attacks of strategic relevance, rarely occur extensive direct consequences, but their indirect effects can easily affect the security of the supply chains. Due to the closure of seaports and airports, serious disruptions supervened in the American foreign trade after the series of terrorist attacks against the United States on 11 September 2001. [12] Thus, the terror attacks deemed the most serious so far, pointed out at the same time when terrorism and the countermeasures taken against its consequences may distract the supply chain and, in severe cases, the whole economy. Of course, this stands not only for terrorism, but also for all risk factors may cause such incidents that affects a network of properly functioning supply chains. In the consequences of the interdependency with other infrastructures, the serious changes in the operation of such systems, such as the mentioned forms of shocks, will necessarily impact on other infrastructures.

### 3.3. Wave-like Diffusions

It is still an unsupported assumption that a serious impact such as a shutdown of infrastructures occurred by an unexpected event will produce a subsequent burden transfer to other infrastructures in a wave-like manner. The first event will trigger the strongest effect that is followed by another and another events repeatedly. The repeated occurrences will have declining effects. This would raise more questions in the prevention, minimization and recovery of damages if this theory were how the case develops. Moreover, this also suggests deciding how many repeated occurrences should be taken into consideration by a more precise estimation of damages, as well as at the use of countermeasures, and by the organised recovery. [13]

### 4. What Security Studies Should Cover?

As we revealed previously, pre-eminent international thinkers of the post-Cold War era had serious debate on what questions should be involved into security studies and the researches in security. In this regard, Copenhagen School researchers led by Barry Buzan, introduced an internationally acceptable recommendation. Accordingly, those threats may include the changed approach of security, which concerns existence-threatening risks and the respective risk management may take extraordinary measures as necessary. [14]

The future is not simply about ranking among the different risk factors, but the real threat assessment. By the measuring of dangers and risks we need to point out that the supply chain forms a fairly multi-player and many factor system, therefore, its vulnerability also depends on many variables. The only security of the supply chain can be understood as an overall one, which takes from the raw material yields to the consumption or recycling. This phenomenon is expressed by the neatly term ‘door-to-door security’. However, due to the large spatial differences in the supply chain such as the Far East, the West European...
ports and the Central European logistics service centres, the risks may differ enormously. The new American approach to risk management broke the primacy of terrorism among the threats that was interpreted in general at the transport and logistics sectors affecting mainly the public transport systems. Due to the appreciation of the international economic role of the supply chains we need to expect on the risks of the freight transport systems. [15] Although the attacks against logistic sites and transport vehicles were not so frequent in the history of terrorism so far, these threats must seriously be considered. The attention has been drown by the piracy caused damages in the recent years and the efforts needed to be taken to curb attacks on cargo ships.

5. Examples to Follow
There is a repeated dispute between the parties how far the freedom of entrepreneurship would go and where from the strict rules of security should be prevailed. Issues of supply chain security, the complex nature of potential risks and impacts of the possible occurrences of extreme events require close cooperation of the participant organisations. This problem goes far beyond the scope of the critical infrastructure protection in the transport sector. The cooperation should be extended to the industrial security, more precisely to the production sector. It would be necessary to introduce a clear international regulation - preferably with market and financial consequences - that would take safety aspects into account instead of driving down the expenses of production at any cost. The industrial and the agricultural sector are of those where cooperation should be ensured for the safe operation of supply chains. The food-related scandals of the recent years pointed out that the security must be interpreted for the entire food supply chain involving production facilities, processing plants, commercial units and end users. [16] The mutually agreed procedures highly facilitate the development and control of the rules concerning logistics and transportation services between the two sectors. The collaboration with the participants of food supply chain researches allows examples to follow for the entire operational sector of supply chain security. The lessons learnt accordingly would also foster the proper communication of incidents. [16] The experiences of recent years in this area abound in samples that can be and should be taken over, or also those ones that can already be ruled out. In addition to horizontal forms of co-operation between the sectors it is a major issue to organise the co-operation between the affected transport, logistics and trading companies.

Some guarantee provided for that is keeping the Act on the crucial systems, facilities and its identification, designation and protection as well as the subsidiary implementation regulations. The real step forward would be building up such security systems, which cover all activity forms of the firm comprehensively, instead of fence construction, installation of CCTV systems and the use of security wardens that companies usually do. Providing legal guarantees and the risk of market losses together would not even be sufficient motivations. We need to foster that security should become the part of the organisational culture.

In such a complex system like the supply chain, it is not appropriate to assess risk factors separately. We follow those experts who claim that the security of supply chains should be evaluated with external and internal interactions of risk factors on a complex manner. [17] The ignorance of the interdependencies of security factors occur error in the threat assessment. [18] The exaggeration of certain threat factors would also lead to serious consequences just as ignoring them. [19] The enlarged threat of terrorist attacks increased the complexity of prevention of incidents. [20] The risk of terror attacks against the supply chains may not be underestimated in peace support missions either. As we could see concerning the attacks against ISAF fuel supplies the threat has still a high probability.
6. Summary
The security of supply chains has a strong relation with the critical infrastructure protection, because they are parts of several infrastructure sectors such as energetics, food supply and traffic. The prevention and if the incidents have already occurred, the restoration plays vital role in both areas, where preparedness is always a key. Although we have seen that unpreparedness was attempted to cover by targeted PR several times, filling the gaps like that never succeeded. [21] Preparedness as a mean of security may be effective if each participant follows the rules and meets the standards. Additionally, economic operators, facility owners, governments, their respective agencies and international organisations may be found at this theatre where the entities should cooperate, if they want to achieve their objectives. Bearing in mind that supply chains often connect continents this would not be simple. [22]
We consider high responsibility of the researchers in the supply chain security, because these researches are still on going in many countries involving the EU members and the regulations and means are also developing. In the above-referred project, three researchers dealt with the aspects of supply chain security. Their primary objective was to raise awareness for the Hungarian participants of the area of responsibility and point out that the local approach will no longer provide guarantees in the risk management.

References


STRUCTURAL SIMILARITIES AND DIFFERENCES BETWEEN THE HUNGARIAN ECONOMIC SYSTEM OF STATE OF EMERGENCY PERIOD AND THE 20TH-CENTURY PLANNED ECONOMY

Dávid Kiss

Abstract: The continuity and stability of the economy is the supreme national interest during normal period and during state of emergency too. During the analysis of Hungarian defense economy, we have to examine the structural properties, features of the normal period economy and it’s historical antecedents too. The state of emergency is a special exercise of state power mechanism, with the purpose of promoting the elimination of special circumstances, which included Fundamental Law of Hungary, or to treat it. These special circumstances include the natural and social threat of the social order and functioning of the state, and threat of the security of property and life of citizens. During the examination of the pre-transition economy - the so-called planned economy period - a substantial similarity can discover between the operating mechanism of state of emergency period and the economical structure in second half of the 20th century. The centralized management of the planned economy is structurally almost identical, to the theoretical operation model of the state of emergency period, wherein the autonomous economic entities subordinate to a central governing body and form a complete, unified economical network system. This fact justifies the examination and comparison of the two models. The author would like to examine, what are the structural similarities and differences between these two economic systems, and optimizing the contemporary defense economic structure based on the mapping of the past considering past experiences.

Keywords: economic system, state of emergency, planned economy

1. Introduction
The European crisis caused by the illegal immigrants from Middle Eastern states, and the Ukraine armed struggles revealed that, Hungary and the states of Europe need a crisis scenario, in case of social and armed threats. In this tense security situation, these crisis management plans should give the State that prior knowledge needed in order to avoid unexpected, similar situations. The economy is the engine of the State. All the emergency scenarios that ignore the economy as a factor, ignore a significant risk factor, thus making their success questionable. The current Hungarian National Military Strategy [1] and the Fundamental Law of Hungary [2] does not give a satisfactory answer to what role the economy plays during the state of emergency period.
In today's modern free-market structure it provides an opportunity for operators to achieve the higher profit, in addition to meet customers’ needs. [3] This economic structure following the continuous changes in the market is considered elastic [4], but decidedly inelastic and not suitable in this form to a threatening situation, which generates
drastically changed demands. The separate, autonomous actors of economy have to be served a single purpose, which is the prerequisite of unity and cooperation.

For this cooperation the economic actors have only a marginal and limited opportunity in normal period, and in most cases their purpose is not the same. For this cooperation has to be realized as a central economic management organ, which focuses on the problems, which were generated by a particular emergency situation and bring together the actors of the economy and integrate them into a coherent whole. Theoretical analysis and investigation of the structure of this unique economic structure is essential to ensure that Hungary's economy can operate normally during the state of emergency, and give the answers for the drastically and unexpectedly distorted social and economic needs.

In view of the above basic theses we have to look out for the development history of economic and already existing principles. In the case of a centralized control system we do not need to look back far, because the so-called planned economy, the socialistic economy structure of 20th century has nearly same structural properties as we search for.

2. The planned economy

Throughout history there are many examples of centralized economic systems, when we look back up until the ancient Mesopotamian Temple-Economy[5] system. However, the structure of these are significantly different to the modern economic system and the relationship between Hungary's economic structure is difficult to identify too, therefore the best model parallels the planned economy before the change of regime in Hungarian political system.

The establishment of planned economy system in Hungary can be traced back until to the end of World War II. Damage suffered during the Second World War has exceeded 40% of the 1944’s estimated national wealth[6]. The post-war economic instability brought about one of the world's highest inflation process in Hungary, in which the Hungarian currency (named Pengő) completely devalued. Its place was taken over by the Forint, which is until now the current Hungary's currency. Considering the exchange rate at that time 1 Forint reached $4 \times 10^{29}$ Pengő[7]. The country needs to take a new and radical economic policy decisions.

After the Paris Peace Treaties was signed in 1947 the bipolar world order formed, and Hungary became among one of the countries of the Soviet sphere of influence. Against this background, it was clear that the Hungarian economy reorganization had to implement based on the Soviet model. Hungarian and Soviet leaders saw only one way out to reorganize the economy. This way was the nationalization of economic bodies, actors and the whole economic control. The Hungarian State or the Soviet Union took over the management of the partly foreign-owned companies (mostly German and Austrian owned) and almost all private companies. The nationalization process was completed by 1950 (each commercial, industrial and agricultural enterprises have been nationalized, which had more than 5 employee), and could begin the implementation of the first five-year plan.

Despite the incorrect initial decisions, the economic indicators started to grow. To the country's leaders had become clear that the territorial endowments do not allow Hungary to become to the "Country of Iron and Steel" (as included in the original plans), therefore they initiated priority investments in the light industry, chemical industry and support agriculture. Later the strict nationalizing policy started to ease in 1970, and the number of private enterprises has tripled compared to previous years. The enterprises focused on the service industry, which was almost non-existent at that time in the Hungarian economic system, so it was absolutely necessary.
However, the principle of the economic structure was based on the nationalized economic actors. The root of this operating model is not dissimilar to the basics of the free-market model. The state institutions surveyed the needs of the customers and the institutions tasked the economic actors to satisfy these needs (based on and interposed the economic policy objectives). The Regional Councils have carried out direct coordination of economic entities, whereas at state level general committees were formed and organizations and some of these formed by economic area. An example is the Heavy Industry Centre, which is responsible for the management of heavy industry or the Economics Committee with general economic analysis tasks, which included 100 economic experts. [8]

This schematic model is summarized in Figure 1. The dashed lines indicate the flow of information among the various actors, while the blue arrows symbolize the flow of material in the model. It can be seen that while the flow of information is realized between all four levels, the flow of material (products, services, goods) are formed just between economic actors and customers. The model is simplified, because information is definitely flowing between the different economy actors and customers, but this is negligible in terms of the model, since it does not affect on the value of the flow. The state's organizations determined the volume of production and its composition, whether or not the information about the needs of customers have arrived to the economic actors. Similar simplifications are in the issues of the material flow. In many cases, the state agencies oversee the sales and trading too, so the flow of material would show from them to customers (Level 2 Regional economic councils and coordinating bodies Customers). In addition, when we examine the agriculture in the 1950s, we meet mandatory crop-tax, which would be another material flow in the model. Several other processes have been simplified in the model too, because these representations would only complicate the model and undermine the understanding.
If we structurally examine this model, it is not so different from the operation of the free market. The second figure is shown a simplified structure of the free market, which is a perfect return to the philosophy of this system. The enterprises try to suffice the demand of the customers and also maximize their profits. An important component of the model is the evolving flow of information between economic actors, which allows the partial co-operation between them. Naturally this model is simplified in several respects too. The role of the State in this economic structure is not negligible either (sectoral investments, tax incentives, various subsidies), but the basic structure of the flow does not change, and the State is not a general actor in the model, only occasional. Therefore the importance of the planned economy disappeared from the heart of the model (State / executive economic policy decisions).

If we make this kind of simplification of the economy, we can see that if the State and Regional level of the planned economy model will be removed, we could receive as a result the model of the free market. Naturally the comparing of the two models is quite a difficult task, figures one and two highly simplified. The essence of differences between the two models is that; while in the first model, the foundations are the state and the economic policy decisions which serve the executive and their co-ordinating organizations, while in the other the state has only a stimulating, controlled indirect role. The study does not aim to analyze the advantages and disadvantages of the two economic systems, but nevertheless the two simplified models must be known in order to understand the economical system of the state of emergency.

The planned economy system is based on the existence of a central body, which directly controls the whole economy by regions or by economic areas, like heavy industry, agriculture, chemical industry. In a situation where an external or internal armed threat is realized, or a country-wide disaster occurs, this centralization process is inevitable. It is necessary to satisfy the basic needs of the population (food, drinking water, hygienic conditions ...) and the State has to ignore the free market generated price competition and
the sudden increased demand and price. The production of a specialized model is the key to this theoretical issue, which is similar to the planned economy system.

3. The state of emergency
The common rules for the state of national crisis and the state of emergency in the Fundamental Law of Hungary:

“Article 48
(1) Parliament shall:
(a) declare a state of national crisis and establish the National Defence Council in the event of a state of war or an imminent danger of armed attack by a foreign power (danger of war);

(b) declare a state of emergency in the event of armed acts aimed at the overturning of the constitutional order or at the exclusive acquisition of power, and of serious mass acts of violence threatening life and property, committed with arms or in an armed manner.”[2]

This state requires a special economic governance too. During the state of emergency the economic system of the free market simply can not handle the crisis, because its main operational feature is the connection between the increased price and the growing demand (constant or falling supply)[4]. Such outstanding price increases also ensures that affect the implementation of the Government's engagement in the preservation of public health and safety. To achieve this the state must intervene in the management and operation of the economy. This intervention is able to deliver a centralized system (such as at planned economy), which provide the basis for a unified economic management.

1. Figure: One theoretical alternative to the economic model of the state of emergency period
Source: own construction [9]

On the third figure is the modified supply chain for state of emergency period. If we examine the theoretical model similar flow can be observed between the economic operators, such as the former one and two figure. The dotted line symbolizes the limited
flow of information, which means that during the state of emergency the State does not require to assess the population's basic needs, because it can manage as evidence. Despite this, the State must also be aware of the necessary volumes of survey and establish the customer feedback system. Therefore the flow of information is created, but only to a limited extent.

If the contents of the third figure are converted the way the first and second model look like, it results in the fourth figure.

**Figure 4: One modified theoretical alternative to the economic model of the state of emergency period, based on figure 3.**

*Source: own construction*

It can be seen that a substantial similarities can be discovered between the fourth and the first figure. This generated the special circumstances where government involvement is essential. The significant difference between the two models is the political factor. While in the planned economy the (national and Soviet) political interests played a major role in it, while during the state of emergency period the first and most important goal is to provide for the population the necessary basic goods, irrespective of any political goals. That is why we set up this theoretical model without any reservations, because the biggest weakness of the planned economy (the distorting effect of the policy) does not prevail. The flow of information between economic actors from the second figure reduced to the minimum extent necessary (just basic communication), therefore it has been removed from the model on fourth figure. As a result, while in the free market economy system the cooperation can be established only partially between the economic actors, while during the state of emergency period while the central management is able to implement the full cooperation between the autonomous and separated actors. However, in order to handle the extremely high risk situations, another theoretical model should also be examined.
In extreme cases, economic production declines so fatally, when the market can not properly distribute equally the produced goods between the entire population, thus the State should be subject to the authority of this area too. The retailers have been removed from the models because the distribution of wealth should be conducted by the State. Sanctions regarding the distribution of wealth can be observed throughout history during the Second World War in several countries and in the second half of the twentieth century. It was called rationing or ticket system. In this system (regardless of the financial situation of certain residents) the population equally benefited from the essential goods (bread, meat, dairy products ...). The ticket was not currency, it was a possibility to access goods procurement or to purchase goods with it. This is necessary if the economy can only satisfy the minimum level of the population’s demand, but that's why it should be kept in mind and to be reckoned with.

4. Summary
The above list of economic models have shown that the government intervention is necessary during the state of emergency period, which transformed the structure of the economy from the free market system into a nearly similar planned economy system. During the state of emergency period realized a theoretical state-led model of economy, that is able to satisfy the demand of the basic goods for the population. This model combines the advantages of the centralized, planned economy system with dynamic functioning of the free market, creating a fully cooperative economy. For the separate economic actors set a single direction and thus able to handle emergencies, which were generated by a specific situation.
We must emphasize the important detail of the model that, it can only be achieved if the State consciously and "forcibly" takes over control of the whole economy. The current economic situation does not allow that this well-established model for special situations, operate in a normal period too. To this to be achieved requires a change in human nature,
society, culture and financial conception, which is not expected in the near future to be achieved. The people's demand for such a system only occurs if it is absolutely necessary. This system does not allow for the economic actors to increase their profits and market share, which is totally goes against the current market philosophy. It should be treated as a fact that the establishment of such a model is essential and absolutely necessary in order to develop the economy of preventive protection. Therefore, in order to improve the theoretical economical model of the state of emergency, we must continue to look at the history of centralized economic structures to ensure building up a more effective and more workable model in crisis based on the past experience.

References


THE AUSTRIAN TRANSPORT AND LOGISTICS STRATEGY

Péter Lakatos, Elena Ivanova, Marvin Möhle and Benjamin Konzett

Abstract: This paper investigated the national transportation and logistics strategy of Austria. The special focus was on situation analysis, conceptual goals as well as a selection of measures and the quantitative analysis of the position of Austria compared to its European peers. The country is focusing on the possibility to provide intermodal freight transportation facilities in order to maintain its position as an attractive business location. The Austrian transportation policy is based on four pillars: the transportation system of the future should be more social, safer, more environmentally friendly as well as more efficient. Major projects will provide modern infrastructure as well as a framework of regulative measures to enhance safety and reduce emissions and traffic congestion. Exchange of best practices on a European level is likely to have a positive impact on technological advancement projects.

Keywords: austria, transport, strategy, analysis, environment

1. Introduction
1.1. Geographic and economic background
Austria’s transport system is, from a geographical point of view, a central part of the European transport system. Traditionally, the country has been active in “bridge-building to the east”, increasing contacts at all levels with Eastern Europe. Due to the length of Austria’s infrastructure and the international connections through the country, the transport network is considered highly-developed and the quality of the infrastructure – high[1]. There are several specifics that need to be taken into consideration designing the Austrian Transport Policy. Firstly, the country has a relatively large capital. Vienna is much larger than the other Austrian cities and is an important urban, transport and economic center. There are several urban agglomerations around some other cities like Linz, Graz and Salzburg, which are characterized by more intense traffic. Furthermore, the morphology of the country makes the infrastructure construction more complicated and expensive. The Alps are a challenge for the connection between Italy and Northern Europe. There are also missing links to the neighboring countries. Last but not least, the Danube River is a part of a waterway that links the North Sea to the Black Sea. The main national and international transport corridors are shown in Pict. 1.
Austria is generally well integrated in the European trade and has a particularly strong position in the Eastern-European markets. According to the Federal Ministry of Transport, Innovation and Technology (bmvit), the trade with Germany accounts for the highest value of export and import. A considerable value of import and export is generated also with Switzerland and Italy, and lower levels with the Czech Republic, Hungary, Slovakia and Slovenia [2].

1.2. Transport Strategy
Mobility is identified by bmvit as an essential social need and crucially important for the development of the economy. An effective and efficient transport system is important for maintaining national and the European Union’s competitiveness, prosperity, and social welfare. Hence, states and public organizations influence the transport market in a manner favorable to the economy through transport policies. Transport policy is defined by strategic and program documents at national and European level [3]. The aim of the European Traffic Policy, described in the White Book is the modal-shift of long distance traffic. The National Transportation Strategy of Austria aims to provide the necessary mobility by environmental-friendly means of transportation. Since mobility increases dynamically, it is important that the rapid traffic growth is managed in a sustainable, environmentally and socially just manner. The development of the transport infrastructure is a priority for Austria in order for the country to establish itself as an important business location, to reduce the negative regional differences and to reduce the disparities between the federal provinces. The policies developed in this direction should consider also social and environmental aspects of the measures [4].

2. Situation analysis
2.1 Transport network analysis
Road Network
The Austrian road network is shown in Pict. 2
Austria has the ninth position in terms of length per motorway network per land area in the EU, being above the average value. As an alpine region country, the road network of Austria is characterized by many tunnels and bridges. The main alpine road crossings are constructed as motorways and expressways, their quality is regarded sufficient at the moment.

A priority is the upgrade of the national highway network with the objective to:
- Close the missing links to the eastern and northern neighboring countries (mainly to the Czech Republic and Hungary)
- Relieve bottlenecks in and around agglomerations
- Upgrade capacity in important intercity connections (Danube and Southern corridor)

**Rail network**

The Austrian railway network is a combined one – both for passenger and freight. A map is given in Pict. 3.
The investments in rail network are supported by the integration projects of the European Union and particularly the Trans-European axis. Austria has the eighth longest rail network per land area in the EU in 2008 [2] [4]. Currently, major investments in railroad network are made in order to fulfill requirements of a Trans-European high capacity railroad network, which provides a possibility for intermodal connections. The greatest challenge for the railway infrastructure development is to realize high performance tracks for the Alpine crossing. The only solution is constructing base tunnels, which require significant investments and expertise of the construction companies. There are three projects for base tunnels and another project for a high-speed line Vienna-Linz [4]. In 2007 a Brenner Corridor Platform (BCP) was set up to guarantee an integrated approach for the Brenner Corridor between Munich and Verona, which is a major bottleneck on the Scandinavian-Mediterranean Corridor. The project is part of the TEN-T policy, which supports the completion of priority projects, representing high European added value. Austria is a member of BCP and is involved in the implementation of measures that promote an efficient use of the cross-border rail connection. The main element of the Brenner Railway is the Brenner Base Tunnel, which is expected to be completed in 2025. It runs through the Alps between Austria and Italy, it will be the longest under-ground tunnel in the world [5] [6].

**Inland waterways**
The inland waterway transport has certain advantages like high reserves of capacity and low environmental impact. It is used by companies in the heavy industry for supply with materials. Compared to the other EU members, Austria has a relatively low waterway density. The Danube River is the most important inland waterway, with a length of 350 km in Austria. The most important ports along the Austrian part of the Danube are Vienna and Linz. The drought for vessels of the river varies during the year and the water level is not sufficient in some periods, some measures are planned to deal with this problem (Ministry of Transport, Innovation and Technology, 2011).

**Intermodal freight terminals**
The dynamic development of production and transportation requires adaptation of new infrastructure and logistics concepts. Intermodal freight terminals give the opportunity to switch between transport modes. There are ten bimodal (road and rail) and four tri-modal (road, rail, water) hubs in Austria. Pict. 4 provides an overview of the intermodal terminals’ locations.
Air traffic
Austria has six international airports, located in Vienna, Linz, Klagenfurt, Salzburg, Innsbruck and Graz. Vienna is by far the most important one, both in terms of passengers and air cargo volume. Important is also the proximity of the Bratislava airport and the Swiss St. Gallen Altenrhein [2].

2.2. Environmental measures
As it will be discussed later, environmental sustainability is an important part of the Austrian Transportation Strategy. Some measures have already been implemented. A specific example is the setting of Low Emissions Zones, which aim to reduce emissions from road traffic. Such zones are Vienna, Lower Austria, Steiermark and the A12 highway in Tyrol. In these areas the movement of lorries and heavy-goods vehicles (HGV), which do not conform to certain ecological standards like Euro 2 or Euro 3 is not allowed. The regulations for the A12 highway include also a night-driving ban on pre-Euro 6 HGVs over 3.5 tones, sectorial driving ban for HGV over 7.5 tones, a speed limit of 100km/h for passenger cars, dependent on emissions, a night time speed limit (all vehicles), and a ban on overtaking (lorries over 3.5 tones). These measures are estimated to reduce the level of NO\textsubscript{2} with 10%. The European Commission, however, decided to bring proceedings against the sectorial driving ban in Tyrol, because it prevents the free movement of goods within the EU [7].
3. Conceptual goals
The Austrian Transport and Logistics Strategy is based on conceptual goals. Those goals were defined by the Austrian Federal Ministry for Transport, Innovation and Technology. The conceptual goals take into consideration both national economic, social as well as environmental targets and EU legislation, such as the EU Transportation White Paper. The aims of the Austrian transportation policy are based on four pillars: the transportation system of the future should be more social, safer, more environmental friendly, and more efficient. In the following the four main dimension and the associated goals of the Austrian transportation policy will be described in more detail.

3.1. Social dimension
The social aspect of the Austrian traffic master plan is concerned with respecting the needs of the different stakeholders and users of the transportation system. Furthermore, it is strongly focused on public transportation. Four sub-dimensions should ensure achieving the goal of this, those are affordability, reachability, quality, and accessibility. It is the goal of Austria’s Transportation Ministry to design mobility in an affordable and fair way that guarantees access to public transportation also to low-income households. Price increases should not surpass inflation to guarantee basic mobility for all citizens. When it comes to reachability, ensuring good connections is key in order that public transportation can be used. Besides the urban agglomerations Vienna and the federal capitals, Austria is rather fragmented. The goal is to have also short ways to stops and stations of public transportation, such as train stations, in those areas. Together with decent intervals this is supposed to increase the attractiveness of public transportation and facilitate the shift towards environmental friendly means of transportation. Public transportation is more attractive if the offered quality is high. That is why a quality management system was introduced to monitor public transportation according to objective as well as subjective criteria. Accessibility to ensure the participation of all population groups in public transportation is a further goal of the social dimension. It concerns persons with special needs, such as parents with buggies, travelers with a lot of luggage, and elder people. By 2015, all train stations with more than 2,000 travelers per day will be barrier-free. In addition, trains and busses will be gradually redesigned or replaced with new barrier-free ones.

3.2. Safety dimension
The Federal Transport Ministry wants to make Austria’s transportation system one of the safest in the EU. This is about the safety of all its participants. The main focus lies on road transportation because of its over-proportionally high number of incidents. The number of road traffic deaths decreased steadily already from 2004 until 2012. Compared to its European peers, Austria was average in terms of traffic deaths per 1000 people in 2012. Despite the fact that railway is already one of the safest modes of transport (64 times safer than road) further investments are made to increase safety. Last but not least, the transportation of dangerous goods is in the focus. Environmental as well as indirect damage to human health are aimed to be avoided through efficient and target-oriented controls as well as improvements in the transportation infrastructure: Highways and freeways must be designed in a way that emergent liquid substance does not reach soil and phreatic water.
3.3. Environmental dimension
When it comes to the environmental goals of the Austrian traffic master plan, EU legislation plays a major role. The target is to make transportation more resource-friendly, eco-friendly, energy-efficient, and less noisy. Negative side effects of transportation are minimized by a bundle of regulative measures, financial incentives, and technological progress. In terms of climate protection goals, Austria committed itself to target values in accordance with the EU 20/20/20 plan. Until 2020, greenhouse gases should be reduced by 16%, the share of renewable energy of total energy consumption be at minimum 34%, and the share of renewable energy in the transportation sector be at minimum 10%. Besides greenhouse gas, air pollutants reductions are also targeted: NO\textsubscript{x} emissions and fine dust should be lowered. Technological progress has a big impact on reaching those goals.

3.4. Efficiency dimension
The ultimate goal in terms of efficiency is to ensure a high level of mobility with lowest possible consumption. In addition, it is the aim to maintain predictability and transparency. Predictability means that the transport policy has to be foreseeable and help to plan accordingly. This is supported by framework plans. Furthermore transparencies in infrastructure investment decisions are tackled with clear rules and a proactive information policy. These measures should help to increase the acceptance of big infrastructure projects. Concerning resource efficiency, both energy as well as space are to be used efficiently and meaningful. This means a targeted reduction in energy consumption of the total transportation system as well as only a very low increase of land requirements for transportation infrastructure. As a last goal, travel times should be shortened and become more predictable and accurate at the same time to support multimodal transportation. Investments in railway infrastructure and trains as well as intelligent traffic systems on the roads are key drivers to achieve that.

4. Programming
The following 6 sections give a brief overview on a selection of strategy implementation areas with a special focus on a comparison of Austria’s performance with those of other EU countries.

4.1. Long term infrastructure investments: Street network
For 2015, ASFINAG, a government-owned company for the construction and maintenance of high-order traffic infrastructure, has announced high investments into the new construction and the maintenance of the existing street network. These are part of the current six-year plan that includes a total investment of seven billion EUR for the high-rank street network in Austria. Those projects being in construction at the moment or commencing in 2015. As was pointed out earlier, the extension of the street network, primarily as a means to reduction of congestion in agglomeration areas is one of the highest priorities of the Austrian transport strategy, followed by enhancement of safety in road traffic. This is represented in the construction projects being currently conducted or about to start, where network extension for congestion reduction makes up 61% of the total spent, followed by safety projects amounting to 31,3% with the remainder being distributed across noise protection and general maintenance.

4.2. Spatial development
As part of the efficiency dimension of the strategy aims, space is supposed to be used more meaningful. Due to the fact that on average of 25 hectares of land are used for new
constructions and the extension of the transport network each day and are therefore lost irretrievably, this goal aims to keep land consumption to a minimum [8]. The “targeted reduction in the growth rate of permanently sealed surfaces” [8] therefore appears reasonable and fact-founded. Austria increased the length of its “other roads” by almost 9% in 2011, compared to 2010.

4.3. Noise reduction
According to ASFINAG, 80% of those noise reduction projects that were planned in 2007 have already been realized by now [9]. The percentage of people affected by noise in Austria was indeed noticeably higher than in the rest of Europe. The strategy to keep reducing noise pollution to the population thus seems well founded in comparative figures. Apart from the population being affected, the bmvit recognizes the impact of noise on the ecological environment as another motivator to reduce noise impact [10].

4.4. Advancement of electro-mobility
Measures for the achievement of climate goals comprise, among others, incentivizing the advancement of electro-mobility, which is a central point of the strategy. The amount of cars that are exclusively powered by electricity, however, amounted to only 0.04% by the end of 2013. AustriaTech (2014) has found in an analysis from August 2014 that incentive system in Austria performs significantly below international average. A study published by bmvit in 2014 stated that the percentage of electric and hybrid cars newly registered in Austria in 2013 was 0.02%. The strategy has thus embraced the advancement of electro-mobility, e.g. to become an integral part in urban logistics planning [11].

4.5. Reduction of greenhouse gases
A direct contributor to the achievement of climate change targets is the reduction of greenhouse gases (GHG). E.g. by promoting “soft” transportation means, i.e. walking and cycling, the Austrian government pursues this part of the strategy [12]. In the industry segment of transport and storage Austria has experienced a significant increase in CO₂ production from 2010 to 2011, followed by a minor reduction. The contribution of Austria’s CO₂ production to that of whole Europe has been growing since 2010. Thus, in relative terms, Austria kept increasing its CO₂ production over this time period. It can be concluded that the strategy has not yet shown full effect in the respect of GHG reduction. Even more so, the data support the importance of the ongoing efforts in its pursuit.

4.6. Reduction of Pollution
The changes in the emission of particles are smaller than 10µm between 2009 and 2012 for those European countries for which the data was available. This type of matter emission was chosen as an indicator of air pollution. While Romania experienced an increase over this time period of approximately 20% in total, Cyprus achieved the strongest reduction which amounted to 64%. The amount of pollution caused by these particles in Austria remained relatively constant with an overall reduction of 2%. In each of the three years analyzed, the percent reduction of particle emission was less than the EU28 average, even showing an increase from 2010 to 2011 while on average there was a constant decrease in the EU28 countries.
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SCENARIOS AND OPERATING CONCEPTS – A VISION FOR THE ARMED FORCES TRANSFORMATION

Ján Spišák

Abstract: The issues of scenarios and operating concepts development certainly play crucial role in the framework of the long term transformation process within the Ministry of Defense (MoD) and the Czech Armed Forced (CZ AF) as well. The primary goal of thoughts described in this paper is to reach understanding of operational scenarios and operating concepts significance, in connection with requirements for future military capabilities development. These capabilities are of the highest importance for the military force, being deployed in future military operations. Information brought by this paper may be beneficial not only for narrowly specialized experts who deal with the scenarios and operating concept development process, but also for wider management staff from all levels of command, working on those and other similar aspects, corresponding with the Armed Forces (AF) transformation and use of forces in the future.

Keywords: threat, scenario, operating concepts, operation, capabilities

1. Introduction
We have witnessed many occasions during which experts, who are being involved in this issues, discuss the security environment that may affect the security and stability of the Czech Republic. What is crucial for strategists, decision-makers and military planners, it is their look beyond the horizon to see rapid changes, complexity, unpredictability and uncertainty taking place in this security environment. Major trends and challenges, like the growth of different national (military, economic) ambitions and capabilities around the globe, emergence of future possible enemies, both states and non-states actors, decline of security and stability in Europe’s flank regions, the changing national defense posture of individual actors, and others, are usually highlighted as a source of different security threats. All of them, in a certain scale, indicate necessity for adoption of adequate national and/or international strategies to cope with them.

2. Trends, challenges and their impact on scenarios and operating concept development
The primary goal for defense planners is to design and implement some workable solution that will enable to respond quickly and effectively to the range of potential contingencies in the whole spectrum of possible scenarios and situations. This solution – how to deal with these challenges, can be brought via application of military capabilities, through the ideas described in the operating concepts. [1] Operating concept, as a possible solution of aforementioned aspects can be seen, in a broader meaning, as some kind of the future vision.

Operating Concept - the vision how the Armed (Joint) Forces will operate in future operational environment in response to security challenges with required (sufficient) capabilities.
Operating concept means the basic idea for the conduct of future military operations, the idea how the armed forces will operate in response to emerging security challenges, represented by the possible, but not precisely determined enemy. Operating concepts are the bases for defining the future capabilities, necessary to oppose those of the enemy, capabilities which enable the conduct of operations in expected or specific environment, indicated in the framework of operational scenario. That implies that development of operating concepts depends on the scenarios and has a close interconnectedness to them. To recognize this connection requires understanding of the importance of scenarios under which operational concepts can be applied. One of definition, picked up from different sources, specifies the scenario as the context dependent description of possible future (fictitious) situation, a hypothetical chain of events, leading to this state and the details of a desired situation (end state). Planners, who deal with scenarios planning, use so called “scenario method” for creating and using of different future situation, to gain insight into problems that characterize environment and challenges arising from it. So for policy making and defense planning is crucial what happens or might happen in the future. A number of situations will actually occur so planners need to look into the future and deal with unpredictability and uncertainty. As being part of long term defense planning, the scenario portrays a possible future situation in which military units are or might to be employed in an operational sense. Which characteristics of the scenario are highlighted, depends on the problem context. Depending on the use of the scenario, its description may be general or more realistic. 

Generally, there might be a wide spectrum of hypothetical scenarios which may indicate commitment of the AF either in broad international effort or just only in national environment. As portrayed on the Figure 1, scenarios in blue and yellow rectangles (scenarios 1, 2 and 3) constitute only fictitious situations that may lead to commitment of the national and/or allied AF against external threat in the framework of a broader effort. The scenario in green box indicates different situations within which the national, in this case the CZ AF, only support the Allied operational activities, e.g. HNS or support the national civilian authorities on the own state’s territory. These scenarios, better to say the official scenarios, which need to be developed within the MoD, may indicate the future minimum operational capabilities requirement. Some
of them may be similar to those of allies and applicable for all scenarios, some can be more specific, predominantly for intrastate operations. Moreover, as seen on the bottom of the Figure 1, the type of the scenario may further assume typical unit’s missions or activities, which will probably be conducted during the operations related to this scenario. This is a significant and useful finding for planners and developers of the operating concept. One of the important questions that can be raised during the process of operational concepts development may be: "How do we know which capabilities we will need in the future?"

Finding answers is usually not a simple matter; however, what could be taken into account is so called "Personification of potential enemy." What does mean? Planners may describe and to predetermine a model of a hypothetical adversary, operating in different scenarios or different situations. The most dangerous (fictitious) scenarios are very often the most challenging to be precisely elaborated. Planners might assume a wide spectrum of capabilities owning by such “almighty” adversary, like capabilities to secure its own vital and strategic interests, capabilities to conduct large-scale operations, possession of advanced conventional and unconventional weapons and, in the worst case, even Weapons of Mass Destruction. Such enemy may act asymmetrically in different ways by different means and across all its services. There also exist other capabilities, which are concurrently or gradually developed by the enemy and they finally have to be taken into the planners’ consideration.

Because of these capabilities, the enemy may pose an unacceptable threat not only on regional but also on global scale to the state, its allies and partners. Assuming such example, the planners should therefore consider planning and developing capabilities of own forces, which should react on those of the enemy and in the best case to oppose and overwhelm them.

3. From scenarios to military tasks and capabilities

Building on the framework of scenarios, planners may further predetermine own assumed activities that their AF will conduct. There is a broad spectrum of different tasks, according to the scenario and character of the specific operational environment. It is a high probability that the type of the operation will obviously respond to future scenarios and conversely, scenarios determine possible operational tasks. So there is mutual interdependence and the planners can consider own capabilities requirement connected to different combat activities.

![Diagram of future scenarios and assumed activities](image)

*Figure 2 — Framework of future scenarios and assumed activities*

*Source: Author*

Going down from scenarios to capabilities, based on these possible scenarios, planners may assume possible tasks, which will be required to be performed. With reference to
scenarios 2 and 3 (Figure 2), representing combat activities against enemy to stop its activities and violence against the population, restoring security and stability of the country and activities leading to implementation of the UN resolution, planners may determine assumed selected tasks, which may be conducted within those scenarios and which will require development of specific capabilities. To these can belong:

- Crowd control;
- Separating groups of individuals;
- Rescuing of individuals/groups;
- Removing individuals from a crowd;
- Marking individuals and groups in a crowd;
- Dispersion of a crowd;
- Denying persons from accessing to area;
- Denying ground, air and sea vehicles from accessing to area;
- Protection of individuals/groups, facilities and equipment;
- Neutralization of individuals, groups, vehicles, infrastructure and facilities;
- Neutralization of weapons and military equipment and others.

The one point is necessary to stress. It may happen and usually it will happen that capabilities requirement in scenario 1 or 2 and 3 must respond to common requirements for all capabilities. Moreover it may be occurrence of concurrent tasks which are more typical for other scenarios.

Based on meaning and determination of the operating concept, its content and the structure may be different. Nevertheless each operating concept should indicate the possible future capabilities that are to be developed and applied in the specific environment. Thus these capabilities derive logically from the operating concept itself, based on the scenario and situation they relate to. Many of these capabilities will be applied across multiple joint (operational) functions, like command and control, intelligence, fires, maneuver, protection, sustainment and information operation.

The whole unit’s activities in operation will occur dependently and in close relation to these functions. Simply told, to secure each of the specific operational functions, the unit must have appropriate capabilities to fulfill this function. Furthermore, the most of these capabilities have implications for areas of DOTMLPFI (Doctrine, Organization, Training, Materiel, Leadership & Education, Personnel, Facilities and Infrastructure) as well as for integration with interagency and foreign partners.

The list of capabilities outlined in the operating concept is neither all-encompassing nor prioritized. It depends on character of the concept and is designed merely to provide a baseline for development of follow-on interacting concept, their analysis and experimentation. Nevertheless, capabilities arranged within the operational functions should be effective enough for forcing, degradation, neutralization or elimination of the enemy capabilities assumed to be used in the future operations.

The list of required capabilities in operating concept does not answer the question of what armaments, weapons and organization the AF will have to have in the future; this information are usually not specified or are specified only generally. At the end of this stage, when capabilities are defined, it is required to use experimentation, modeling and simulations to verify the impacts of the assumed changes in the capabilities for selected scenarios and, if necessary, determine other capabilities which are to be needed.

The process of operating concept development, if properly fixed within the whole defense planning process, can be seen as prevention against waste of resources e.g. purchasing armament, weapons or prevention against unnecessary changes in organizational structures. Moreover, it is a big challenge for military and non-military organizations to
invent and implement modern armaments and technology into the AF, based on the requirements arising from the operating concepts. Nevertheless, planners should still have in mind affordability of these capabilities and continuously search for optimal solution. Not only what is viable, but also what is possible and affordable for the country.

4. What are the obstacles and what do we need to do?
There is need to continuously monitor the challenges and develop scenarios according to planners suggest and design the way the military instruments are applied in operations. Such process should work nevertheless it does not. A question is how do we think and work in practice now?

Let’s imagine a simple scale. On one side, there is a broad array of different threats that decision-makers and planners should continuously reexamine, and based on the situation, to start developing scenarios and operating concepts. On the other side of this scale there are three areas: the force structure, investment options and methods of the AF employment, the nation or Alliance use in order to remain effective across the range of different operational challenges. These three areas should work together effectively. Moreover, both bowls of the scale should remain in balance. But what is the current practice, what is reality?

We sometimes invest in weapon systems and we do change the structure of the AF, without a clear sense how the personnel and equipment will or could be used to cope with the challenges. So far there is a question if we use appropriate processes and tools, which can reduce the uncertainties in building-up, development and employment of the AF. Experience show that there are negatives which still complicate facilitation of these processes. These are organizational, procedural, managerial and others. Simply, we still do not use suitable analytical approach to guarantee balance of both bowls of the scale, based not only on pragmatism but mainly on scientific prognostic perspectives and visions. Neither had we created optimal environment within the MoD to start the process. Thus the questions, which steps are needed and in which sequence are to be conducted, are on the top of our consideration.

Despite this partly “negative point of view”, there are some useful tangible outcomes which may support not only the operating concepts development process but also other important activities included in defense planning process. These outcomes are based on Defense Research Project (DRP) OPERKON. Effort dedicated to this project was held within the Department of Lifelong Education at the University of Defense in period 2010-2012. Even though several of created documents have been offered to be more elaborated at the strategic level, it seems that the process at this level has frozen. Many questions related to scenarios and operating concepts are opened and still not resolved. So, it would be desirable to get the process into the centre of our focus and take relevant actions to guarantee the aforementioned balance.

The main idea may be raised: “What we want to achieve in the future?” aimed to find some effective solution to accelerate the defense planning process in all its aspects within the MoD. At minimum it would be desirable to reach these objectives at the beginning of the process:

• To persuade and pull politicians and decision-makers into the problem of Concept Development and Experimentation (CD&E);
• To enhance cooperation among politicians, decision-makers and SMEs from CZ MoD, GS, UoD and other scientific centers related to better conditions for following phases of the CZ AF Concept Development preparation;
To support decision makers and SMEs’ effort in elaboration of the CZ high level Operational/Operations Concept.

5. Statement and recommendation

Except these three “big ideas” we need to focus our attention to what else we need to have, or what may be or should be done. At least we should:

- We should have unified and coordinated concepts development process in disposition.
  - As a member of NATO we have this process in our hands, we can use and follow the Allied CD&E process, nevertheless we do not follow it fully in national environment.
- We should fully apply systematic and conceptual approach to this subject (CD&E); nevertheless since joining NATO we apply this approach only partially. There are some visible difficulties in the process:
  - Discontinuity of the middle and long term planning;
  - Weak knowledge of scientific methods applied;
  - Insufficient resources, and
  - Frequent organizational changes within the MoD structures dealing with the CD&E process.

Based on these difficulties we have not been able to institutionalize the CD&E process within the MoD yet.

- We should use appropriate methods within the MoD for this area (CD&E).
  - When analyzed, we generally use appropriate methods; however absence of institutionalized framework limits the organization’s capability to apply/utilize the process and its management properly and efficiently.
- We should get rid of any tangible obstacles which hinder the concept development process. We see some visible negatives, from which these three are of the highest importance:
  - Level of knowledge, awareness of importance, deeper involvement of politicians/decision-makers in the area of CD&E;
  - CD&E is not fully incorporated in the plans;
  - Experimentation, modelling and simulation (M&S) are not used effectively.
- We should have other additional sources for the AF development (except the operational concepts).
  - Operational concepts are crucial for the AF development, but it is desirable to have other complementary concepts (e.g. institutional, functional, integrating...), that should support the AF development.

Given the last period brings positive changes in the approach to the development of critical strategic documents for the building-up and transformation of the AF, it is desirable to get the process of scenario and operating concepts development into the center of our attention and to adopt appropriate measures to ensure the aforementioned balance.

To guarantee the CD&E process will be fully implemented, we need to further secure:

- Possession of clear political guidance;
- Organizational, personal, structural, financial and technological stability within the MOD;
- Institutionalization of CD&E process;
- Harmonization of national CD&E cycles with the NATO/EU planning processes.

Process of the scenarios and operational concepts development should start very soon. It may be in responsibility and under custody of the Czech General Staff, with collaboration
of other selected institution, including The Centre for Security and Military Strategic Studies, University of Defense.

5. Conclusions
Basic ideas which need to be stressed are devoted to the operating concept again. To add some specific features, apart from its general definition, the operating concept may define the time frame and the conditions in which AF operate, activities and also required capabilities. Operating concept may describe the nature of the problem or series of problems that need to be addressed, the character and interactions of individual actors involved and to offer possible solution of the problem. However, the operating concept does not talk about finance, the force structure, the types of the armaments and numbers of units. These may be a part of medium term planning but the operating concept proposes the future far beyond.

Development and application of scenarios and operational concepts are part and essential factor of defense planning process. Therefore it is necessary to set clear rules, utilize the best practices and ultimately to create the conditions for effective use of resources and military tools far beyond the medium term horizon throughout the MoD. Those are serious matters of consideration for politicians, leaders, decision-makers and other individuals thinking and working on these aspects.

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ROLE OF PEACEBUILDING IN CONTEXT OF ECONOMIC SECURITY

Balázs Taksás

Abstract: Executing good, efficient and effective governance is not an easy task even in normal peace time when no special circumstances make the daily operation of the state more difficult. In a post-conflict situation it is even more challenging. Nowadays peacebuilding is gaining more and more importance. One of the reasons is that in the case of several conflicts the peacemaking and peace enforcement efforts have been successful but enduring peace and stability have not been achieved and thus the likelihood of another conflict breaking out has not been eliminated. The economics of peacebuilding summarizes the economic challenges of peacebuilding and the tasks involved in the post-conflict restoration of the economy. This first article underlines the importance of peacebuilding and presents the dimension of economic security. In time of peacebuilding – besides humanitarian, political, military law enforcement activities acts – we have to increase the security level of these dimensions. The normal functioning of the economy includes supply, financial, labour force market, technological, market access, economic policy and economic mobilization elements. For sustainable peace we have to act on these fields.

Keywords: peacebuilding, economic security, economic recovery

1. Introduction - the role of peacebuilding

These days the area of peacebuilding receives particular attention. The main reasons for this, unfortunately, are the lack of success and the shortage of real achievements. Looking at the most recent developments in Iraq and Libya only, we can easily see that the current disastrous situation in these two countries is clearly the consequence of the unsuccessful peacebuilding process. The situation in these countries at the moment is no better, if not worse, than it was at the time of the outbreak of the conflict, and the international community is faced with the same challenge as it was in 2003 or 2011: another international intervention is becoming (was becoming) increasingly inevitable in the interest of normalizing the situation. This is no less than admitting that the situation has not improved at all, the process of peacebuilding has been a failure, or it has not even started. The future success of peacebuilding in Mali, the Central African Republic and Ivory Coast is not guaranteed either. Moreover, there are those conflicts (Somalia, South-Sudan, Yemen and Syria) where, as a result of the renewed or protracted conflicts, peace should be achieved. However, even in the case of the latter conflicts, while achieving a ceasefire and stability through peace-making and peace enforcement is the first step, it is worth thinking about and starting planning the ways and methods of putting an end to these conflicts and eradicating the underlying causes once and for all. A strategy should also be worked out to start these countries on the road to sustainable development. Obviously, there are positive examples of successful peacebuilding, such as Rwanda and perhaps Vietnam, Cambodia, Ethiopia or Cyprus(?) and if we go further back in history Western Europe and Japan, but unfortunately this number is rather small.
Peacebuilding is an important activity because through peacebuilding the roots of the conflict can be removed. Peacemaking, peace enforcement and peacekeeping can only slow the momentum of the conflict, but cannot eradicate the causes. As long as the peacekeeping force is available and there are constraints, there is peace but once this force has withdrawn and the constraints no longer exist, the conflict soon breaks out again and even escalates. The conflict has never really stopped, it has just abated due to the bigger force, and its underlying causes have never been removed. The root causes of the conflict can only be removed through peacebuilding, and thus the danger of the renewal of the conflict can be reduced. Peacebuilding is the only way of starting the country and society on the road of gradual sustainable development.

2. The content of peacebuilding
It follows from what has been said before that peacebuilding is the most complex and most difficult part of peace operations. But what exactly does peacebuilding mean? If we want to show the place of peacebuilding among other peace operations, we can use the following figure:

![Figure 1: Peace operations](made by the author)

The term "Peacebuilding" first emerged in the 1970s and was defined by Johan Galtung as „the creation of peacebuilding structures to promote sustainable peace by addressing
the “root causes” of violent conflict and supporting indigenous capacities for peace management and conflict resolution.” [1]

UN Secretary-General Boutros Boutros-Ghali’s 1992 report „An Agenda for Peace”, which is regarded as one of the basic works on the concept of peacebuilding defines peacebuilding as “action to identify and support structures which tend to strengthen and solidify peace in order to avoid a relapse into conflict.” [1]

From then on the definition of peacebuilding has appeared in almost every UN document dealing with the methods of peace operations. In 2001, for instance, the UN Security Council Presidential Statement said: “The Security Council recognizes that peacebuilding is aimed at preventing the outbreak, the recurrence or the continuation of armed conflict and therefore encompasses a wide range of political, development, humanitarian and human rights programmes and mechanisms. This requires short and long-term actions tailored to address the particular needs of societies sliding into conflict or emerging from it. These actions should focus on fostering sustainable development, the eradication of poverty and inequalities, transparent and accountable governance, the promotion of democracy, respect for human rights and the rule of law and the promotion of a culture of peace and non-violence.” [1] While in 2006 the following definition appears: “All activities necessary to assist a conflict-torn society to reach a point where violence is no longer a ready recourse, the risks of relapse into conflict are reduced, and the country can move onto a more development-oriented footing. Important parts of such an overall peacebuilding strategy include the provision of transitional security through peacekeeping and other efforts to maintain public order, support to a political process, life-saving humanitarian assistance, efforts to create a framework for economic recovery, and institutional development.” [1]

The UN’s basic document on peacebuilding (UN Peacebuilding: an Orientation) makes it clear that peacebuilding is basically a national responsibility. “Peacebuilding is primarily a national challenge and responsibility. It is the citizens of the countries where peacebuilding is underway, with support from their governments, who assume the responsibility for laying the foundations of lasting peace. National ownership is essential to success. National capacity development must be central to all international peacebuilding efforts from the very start, as part of the entry strategy, not the exit. Indeed, a core objective for peacebuilding is to reach as soon as possible the point when external assistance is no longer required, by ensuring that all initiatives support the development of national peacebuilding capacities. This is a challenge, especially in the early days when peace is fragile and national capacity is often displaced and severely limited. Nevertheless, peacebuilding must focus proactively on (re)building national capacity, otherwise peace will not be sustainable. To support this effort, a collective assessment of existing capacities should be conducted early on.”

The responsibility of „good governance” already appears in the initial phase of peacebuilding. This responsibility is enormous, since in such a fragile state mistakes can have serious consequences, i.e. relapse into conflict. Creating good governance is not an easy task even in peace time, let alone in the immediate aftermath of a conflict, when both governments and all other social and economic players are faced with the challenge of a considerable shortage of resources and trust.

This paper is concerned with the economic area of peacebuilding. Obviously, the different areas cannot be separated since they are closely linked to each other. The restoration of the economy is impossible without guaranteeing peace, ensuring the rule of law, solving the refugee issue and improving the human rights situation. This is an extremely complex system, and it would be an enormous task to deal with all these issues comprehensively,
Unfortunately, the complexity and enormity of the socio-political and institutional challenges facing post-conflict societies are often not fully taken into account when setting the reconstruction priorities, and when deciding on the logic and sequence of post-conflict operations”. [2] However, it is noteworthy that the economic tasks of peacebuilding cannot be standardized due to the fact that they are heavily dependent on the nature of the conflict, the economic structure of the country and its role in the global economy and the region. Forasmuch peacebuilding goes on in „postwar” situation; the economic handling of the situation requires both peace and war economic tools and methods. (War economic elements mainly appear in the reconstruction period which „refers to the repairing of physical and social infrastructure.” [3] Many experts say that peacebuilding starts after reconstruction [3], this is why in this article I focus on peace elements – certainly not leaving out the reconstruction ones.) However „peacebuilding focuses on long-term support of viable political, socioeconomic, and cultural institutions […]”. [3]

3. The system of economic security
The economic tasks of peacebuilding basically mean the revitalization, sustainment and development of the economic system. In a national economy the functioning of the production and service processes can be described by the following chart:

![Diagram of the national economy's production process](made by the author)

It can be seen that in order to maintain the production/service process technology, capital, workforce, material and service input as well as a market are needed. Moreover, it is also necessary that the means (reserves, capacities, legal regulations) which make it possible to maintain production/service during the crisis period (natural or industrial disaster, economic embargo, civil war, war) should be available. Consequently, the following subsystems of the economic dimension of security can be identified [4]:

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When defining the sub-systems, supply security means the security of supply chain operation, i.e. access to the material inputs and services required (including energy and communication) for the operation of the production and service processes. In addition, it means the delivery to the users (the public, producers, governmental bodies, allied forces, foreign customers) of produced goods and other assets (e.g. money) necessary for the operation of the economy, with no more than the normal level of risk, at the appropriate time and in the appropriate manner. [5]

The existence of financial security means that the national economy is able to obtain savings from capital and money markets, sufficient for financing a possible budget deficit and national debt and for maintaining the production and service processes of the national economy.

The existence and reproduction of an appropriately qualified labour force with which the output levels of the national economy can be sustained and enhanced can be regarded as part of labour market security.

Technological security is determined by the existence of a technological level required for the sustainment and stable growth of the national economy output.

The level of defence economy security (it can also be called defence resource availability) is determined by the ability of the national economy to switch over to functioning during a crisis period. [6]

The level of market access security depends on the ability of the companies of the national economy to sell their products and services on the domestic market or the world market. [5]
The level of economic policy tools security depends on how much the economic policy of a certain country is able to influence the security level of the other sub-systems of economic security with various fiscal, monetary, and other tools (for example, communication, diplomacy, etc.). Naturally, the individual sub-systems are in a close relationship with each other. A change — either positive or negative — that occurs in any of the sub-systems of economic security will have an effect on all the other sub-systems. A negative change in the security level caused by a change in one of the sub-systems can lead to an increased security risk in other sub-systems. In the same way, an increase in the security level of any of the sub-systems can have a positive effect on the security level of other sub-systems. This is shown in Figure 4.

![Figure 4: The interrelationships between the sub-systems of economic security (made by the author)](image)

Developing all the sub-systems of economic security at the same time is an almost insurmountable challenge even for the most developed countries, let alone for a country trying to get out of a conflict. Therefore, during the process of peacebuilding besides revealing the relationships between economic tasks, it is also essential to prioritize the tasks.

4. Conclusions – the economic tasks of peacebuilding
If we want to simplify the issue, we can divide the tasks into short-term, medium term and long-term tasks. In the short term the economy has to be started, and in connection with this, production and services have to be restored, the tasks of providing for the population have to be organized and the necessary financial resources and labour force have to be ensured. In the medium term the task is to maintain the functioning of the economy and ensuring its capability to function. In the interest of this, adequate economic policy leeway and a crisis response capability need to be created, and the sources of
capital need to be consolidated. In the long term the task is to achieve economic development, which will lead to the improvement of competitiveness.

Figure 5: The economic tasks of peacebuilding (made by the author)

References


EMERGENCY – A CRISIS OF SEPARATION

Radka Vaníčková and Gabriela Gabrhelová

Abstract: Czech army within the part of NATO structure fulfil the role of operating, defence and civil emergency planning. Professionalism of army was carried out for the purpose of making exercises and preparations for potential threats of military and non-military character. To ensure the conditions for dealing with extraordinary events helps process of regular workers education of public administration in the field of crisis management by obtaining knowledge, technical and technological support in coping with the crisis situations, but also the creation and updating of legislation about mutual cooperation between the EU member states. This paper is focused on rescuing people in crisis environment of military area in order to move closer the process of negotiation in such a situation, which is not known to the public.

Key words: emergency, integrated emergency system, rescue people, training alliance soldiers – a crisis of separation.

1. Introduction

The protection of the health and life of individuals, groups, but also the assets is collectively with the totality of the Czech Republic basic responsibilities and functions of the state. It provides a set of policies, procedures, methodologies and the necessary actions to minimize the negative effects and impacts of occurrences possible extraordinary events and crisis situations affecting the life and health of individuals and living conditions.

Significant position in the security of the integrated rescue system (IRS) also fulfils the Army of the Czech Republic, which earmarks within the IRS components powers and resources to carry out rescue operations during disasters or other serious adversity (situations) that threaten the health and lives of citizens causing substantial damage to property or injury the environment. By using military equipment and personnel the earmarked and specialized units has try to prevent it.

Participations of the Army of the Czech Republic in foreign missions fulfil a long-term role and tradition. Soldiers are exposed to risks and dangers resulting from military conflicts, they are separated from their families and close friends, they are prepared and professionally trained in order to the performance of assigned tasks in difficult conditions and difficult stressful situations [12] and [13].

Soldier profession is among the specific, demanding occupations, which is closely linked to the process of separation and formation of the so-called stress factor affecting the personality of the soldier, then individuals „military civilian” especially in the area of interpersonal relationships after returning to civil environment of family life, relationships with close friends [15] and [18].
2. Material and methods
This contribution aims is provide an overview about the negotiation of the Czech government, but also of NATO and the EU about the scope of the crisis staff during emergencies, approaching the system of rescue elements and their origin. Finally, recommend appropriate rescue operation during a hazardous event, aimed at saving human life and protection of health of individuals.

3. Results and Discussion

Approaching the system of rescue elements

3.1. Integrated rescue system
The term integrated rescue system means a coordinated process of services in preparing for emergencies and for carrying out rescue and liquidation operations. Integrated rescue system is understood as a group of individual component services that are involved in dealing with emergencies, such as in relation to the protection of the population before or after declaration danger state, emergency state or a state threat or declaration of a state of war, while the founders of the individual rescue services are different. IRS can be seen as part of the security system, which is used to ensure the internal security of the state.

3.2. Services classification of rescue system
According to the Act no. 239/2000 Coll. about the integrated rescue system [5] classify IRS to basic and the other component, where into the core components belongs legal rules and intended scope:
Fire rescue brigade of the Czech Republic [Act no. 238/2000 Coll.] whose main tasks and duties are held the rescue and liquidation work, saving lives, health and property of people [4].
Fire protection units (FPU) included in the district area coverage [Act no. 133/1985 Coll.] whose main task is to work during natural disasters, fires and other emergencies [3].
Medical rescue service (MRS) [Act no. 374/2011 Coll.] whose task is to provide specialized pre-hospital assistance. Also receiving an emergency call or transport of injured [7].
Police of Czech Republic [Act no. 273/2008 Coll.] whose main task is to ensure public order and safety [6].

Among other components of the integrated rescue system belong e.g. non-profit organization or recourses of SAR, i.e. the forces and resources of the armed forces, which are obliged to provide assistance on request, which is not the primary or main task of the Army of Czech Republic (ACR), (except for dislocated company, e.g. Rakovník).

4. Air forces and resources for rescue of people

4.1. SAR
Providing service SAR (Search and Rescue) regulates the provision of search and rescue in civil aviation L 12, when the service is completely different from the air rescue service [2]. ARS (aerial rescue system) is an integral part of the emergency services, including the operation, which became a component of the state-guaranteed emergency medical services. Air rescue service is used for rapid intervention by doctors and thoughtful transportation of patients, but also in cases of very serious life-threatening conditions. ACR helicopters are used for security of system SAR and HEMS. The service SAR gives priority search and rescue to aircrafts, which was in distress, the pilots and crews of crashed aircraft. In the case there is a danger of delay, SAR helicopters can be used for
security of other tasks than for which they were and are reserved, and the ensuring of the CHGS of the ACR (CHGS of the ACR of General Staff of the army of Czech Republic). In the Czech Republic, the SAR is used mainly in air accidents in securing partial assistance to crews of crashed aircrafts.

**4.2. SAR action**

SAR helicopters provide assistance to the crashed aircrafts, air crews in distress, aircrafts with an engine failure, during emergency landing, but also in the case of crew injury. In the 21st century, each aircraft is equipped with a personal radio beacons emergency (Emergency Locator Transmitter - ELT). This apparatus in the event of a plane accident or emergency transmits a distress signal transmitted on emergency frequencies that can be activated manually. On the territory of the Czech Republic is the distress signal received at the Air traffic control (ATC) in Prague - Ruzyně. ATC dispatchers has immediately displayed the exact coordinates of transmitting place of radio beacon that activates crew of SAR W-3A Sokol helicopter at Prague - Kbely for takeoff. Continuous emergency holds a five-member crew consisting of two pilots, two paramedics and flight engineers. The crew of the helicopter, carrying out search operation, according to their abilities participating in rescue operations by providing first aid with support of collaboration among the various components of the integrated rescue system. On board the helicopter SAR is equipment for work on snow and underwater, air rescuers are trained in basic first aid and for this operation have on the board of the helicopter the necessary medical equipment. The specific time from receipt of the invitation to take-off the helicopter is 10 minutes during the day and the longest 20 minutes at night.

Czech Republic's accession to NATO has 12. 3. 1999 Czech Republic incorporated into the Euro-Atlantic community of democratic countries, and became a full member of the alliance. For the Czech Republic, which with its size and population be numbered among the smallest states, is integrating into international grouping of NATO prerequisite for further stable development and harmonization of defence and protection of state. Within the transatlantic bond with the US to support measures aimed at strengthening of Article 5 of the Washington Treaty and to contribution to the development of the Alliance’s forces and resources, but also NATO's adaptation to the new security environment, NATO membership Czech Republic has strengthened the responsibility for promoting and protecting the values that the Alliance states together promote and at the same time encouraged the possibility of expanding the participation of military contingents in foreign missions, whose common denominator is and was the protection of peace [14].

In November 2010, it was designed and approved the new strategic concept of NATO, which, with respect to the overall development of the international environment point out the comprehensive approach to solution to security threats - coordination and utilization of all political, military and civilian capabilities, support the active role of the citizen and cooperation with the EU and the OSN, emphasizing the collective approach to solving common problems.

**5. European Union**

On 1st May 2004 the Czech Republic became a new membership country of the EU and complicated with long-time process of creation closer relations with the European Communities. With the accession to the EU the CR has adopted not only option, but also commitment, an obligation to take part common foreign, security and defence policy of EU (ESDP) and crisis management, which is one of its components. In addition to the obligations stemming from membership in NATO, the Czech Republic supports the
development of EU capabilities for managing of crisis and cooperation with partner countries. In consideration of the character of modern threats affected by civilian and military aspects, requires coping with emergencies and crisis situations mutual cooperation between military and civil authorities. The Czech Republic supports EU efforts about close integration of civilian and military coordination. EU seeks to strengthen the role of prevention and crisis management. In the same context, the Lisbon Treaty contains a number of functional changes that lead to an overall streamlining of foreign - security and defensive policy of EU.

It is clear that the demands on the use of civilian and military capabilities of the EU outside Europe are growing steadily. One of the main priorities of the EU is primarily to ensure the security of citizens of the member states of the European area.

6. The import of membership in NATO and the EU

The Czech Republic has through membership in NATO and the EU ranked among the community of democratic and free nations. States share common values as cultural and civilization so religious. Membership in NATO and the EU is significant amount participate in ensuring of the state defence [1].

Czech government as supporting body helps to develop skills in solving crisis management in the EU. Appropriately combines civilian and military resources and at the same time is striving for closer cooperation between the EU and NATO [21]. The ability of the EU in managing of crisis is important in accordance with the cooperation of partner member countries. Membership in NATO and the EU brings benefits to both contracting parties and contributing to a common security and defence policy of the state.

Stefan Füle in an interview: „I see alliance primarily as an organization of collective defence, as a guarantee of peace and security for states sharing and protecting certain values. I perceive it also as a guarantor of security and stability in the wider Euro-Atlantic area, where violence, terrorism, proliferation of weapons of mass destruction and instability and collapsed states should have a direct impact on the safety of allied territory and populations. The Alliance is the only organization in Europe and the world, which tries to ensure peace and security. But it is unique in that it is not just a political discussion party, but also the strongest and most effective military organization [9]“.

7. Reactions of the population in crisis situations

On 1 January 2005 the Czech Republic changed the status of the army in favour of its professionalization. Compulsory military service was abolished, conscription remained. In public dominated the view that in an emergency of state, all defensive and emergency solve professional army. According to publicly available information from abroad and the mass media cannot be argued that this view is entirely correct. It could say that this „limitation” in the case of attack civilians e.g. by chemicals, contamination of drinking water sources and others means may be insufficient [8].

Within the concept of collective security system of the state is effort about minimize potential risks, crisis management situation of military and civilian character, which can play an important role in reducing the loss of human lives. Prevention, versatile preparation of civilians is an essential prerequiste for successful crisis management, where the important parameter is acquaintance people in early childhood with education to patriotism, explaining the issues of national defence and military ability [16].

7.1. Potential emergencies – Crisis management

It is very important not to underestimate the emergency and realize that highest value of human life is life itself, rescue people, animals and property [17]. Warn other vulnerable
persons in our vicinity help to neighbours, especially elderly, ill or handicapped people and citizens, including children, do not overload the telephone network! Partial activity in sounding a warning signal, unless it is not an emergency because of flooding or earthquakes, is the subsequent:

- Immediately to hide and seek shelter in the nearest building
- If we are indoors, close windows and doors (due to contamination by toxins)
- Turn on the TV or other available means of communication (most likely the information will be disclosed to the public via radio).

Very often is the danger of flooding when the activity during the floods should be as follows:

- Identify a safe place that should not be inundated by water
- Prepare sandbags to seal for example nearness of low doors
- Ensure chemicals so as to avoid contamination of water
- Prepare evacuation means
- Abide the instructions of the municipal office or other intervening integration services.

In winter during the ski season, we often travel within leisure activities for sports especially abroad, where we can meet with the danger of an avalanche. Hitting by snow avalanche often ends in death, so we should proceed according to available opinions for the benefit of saving human life.

- Strive to maintenance on the surface of the avalanche by dilation arms and legs
- In the case of bury to protect the head by curled individual up
- Orient of the space, still breathing
- Use a mobile phone while localization.

8. S. E. R. E – Training Alliance soldiers (separation crisis)

8.1. Measure of staff

The most common problems associated with participation in the mission are the separation from loved ones, e.g. in terms of cohabitation, adultery, sexual abstinence, limited civilian contact, more intensive experience stressful and unpredictable situations and worries of insufficient rest, renunciation and unsatisfactory conditions, personal failure, prevention of supply new information, concerns of commanders and new social contacts, frustration with the staff inclusion, unwillingness to change ingrained habits and attitudes.

The most common motivating factors of exit on a foreign mission are a tendency to easily obtain financing recourses and financial independence, diversion and time delay of unchecked working, personal as well as family problems and difficulties, secure and organized professional life in terms of meeting the higher career goals and needs [19].

According to the experience of NATO is not returning into domestic family environment from a mission a simple matter, it is often linked with post-traumatic disorders, and suicidal thoughts. Offer the reintegration into civilian life, including establishing close friendships and family ties and the promotion of human relationships without using coercion and power of force [22]. The activities of military psychologists offer to soldiers options how to strengthen self-confidence in the point of mental, physical, how to survive stressful situations and offer more quality possibilities of military service, such as requirements for psychological resistance and preparation of a soldier on a mission, shaping the personality of a soldier in relation to temperament, personal character, values and attitudes, willingness and preparing soldiers to go back into civilian life, including preparations for the return of the mission.
S. E. R. E so called Personal recovery, denotes a necessary part of the preparation of soldiers before leaving on a mission. Survival, Escape/Evasion, Resistance and Extraction - it is preparing of soldiers for the purpose of survival, escape, resisting (withstand pressure), pick up and return soldier who is separated from the unit. In the past, to rescue people who have fallen into captive or became missing in armed conflict, did not pay great attention. The breakthrough came in the period of Second World War during the Battle of Britain. Britain realized that it is impossible to lose trained air crews with regard to their number and entrust air technology to inexperienced pilots. For these reasons, mainly economic, began to deal with the rescue of missing persons, where the soldier ceased to have the status of „slightly replaceable“. Experience from war in Korea and Vietnam have brought the development of people rescue system. Thanks to helicopter technology the army had the ability to pick up people from the heavily accessible terrain, the deployed military rescue teams, where the essential role played diplomatic, political and social influences. Environment current foreign missions in which it operates alliance soldiers, brings new risk for individuals and also for groups. This risk becomes a state of separation from own units. Kidnapping and holding hostages are means to satisfy the demands of the rebel forces and induce a feeling of superiority over the coalition groups. Course S. E. R. E has been in past years solely intended for aviation personnel and Special Forces. Change came in 2003, when a convoy of logistics support units drove into an ambush poised by members of the Iraqi army, 11 US soldiers were killed and six captured. Among the captives was the Jessica Lynch, who was imprisoned by the Iraqi army nine days. This experience has led to the need for an expanded prevention process and preparation among all specializations, because the danger of captivity threatens to all on active duty. During training S. E. R. E soldiers are trained how to conduct covert movement in order to avoid the enemy. They practice skills in order to survive, e.g. food preparation, making a fire or building a shelter. Independent and vital social issue is dialogue with the rescue team, establishing cooperation and the process of picking separated person [20]. Rash, hasty and erroneous actions that could endanger the rescue team, usually means death. As an example can be Starting-up (yet unidentified person) against a rescue team, helicopter, or failure to compliance with the prescribed process, procedures, not take a threatening position before the soldier was identified as a alliance soldier, is a prerequisite for a high probability that it will be shot by rescue team [23].

8.2. Origins and causes of the inception of Personal recovery - people rescue
Primordial beginnings of the rescue system were primarily for economic reasons. The biggest boom came during WW2. Battle of Britain (July 10, 1940 - October 31, 1940) is a clash between the German Luftwaffe and the British Royal Air Force over Britain and the channel La Mance. For the "Battle of Britain" is sometimes also used the name "Battle of England". It was the first major clash in the history of wars fought exclusively through the Air Forces. The purpose of the aerial battle that started German party was to destroy or at least weaken the Royal Air Force and gain air superiority over the channel La Manche and Britain, which the German command was considered for condition of implementation of the invasion to England [10].
A very important strategic concept was good training of pilots. This was a time and economic costly process, where was more effective pilots separated from the unit to bring back. With regard to this phenomenon occurs comparison process of economic reasons with weight factors of human life. Except for the British RAF and FAA pilots in Battle of Britain has participated also pilots from many countries on British side. These were mainly volunteers, elite trained pilots. The largest group of foreign pilots were mainly Poles, New Zealanders (130 pilots), Canadians (112 pilots), but also Czechoslovak pilots.
9. Conclusions

„Build trust with the local population and demonstrate professionalism and dedication to allies in the mission (it depends on the success and security of your mission); keep geographical balance in the presence of missions (experience from different territories and greater political continuity); do not look just the light, but not only the most difficult (capacity building on a wide range of security threats); remember that none of today’s crisis do not have only a military solution, and therefore cooperate and coordinate with whoever provides civilian instruments for overcoming crises (encompassing approach is the only answer to the new and asymmetric threats ). Much of this the Czech Army has been already doing, and even so in missions has a great reputation”, said Stefan Fülle [9]. Systematic preparation of a new solution to the educational process in the field of crisis management is a priority of countries and the EU [11]. The new concept of education and study programs in the field of crisis management show the needs of education in general and specialized areas of crisis management, with an emphasis on protecting of the population, the state, the economy, internal security and order, economic measures for crisis situations, fire protection, health care and integrated rescue system.

Due to the increase in the number of universities which are professionally oriented is essential to prepare a uniform system of education of target groups with minimal influence of budgetary policy of the Ministry of Defence and Ministry of Interior in balance with educational institutions university and non-university character with an accent while preserving academic freedom and the interests in solution support of personnel crisis in the Czech Republic Army with regard to the development and the migration crisis in Europe.

The aim of this paper was to explain the meaning and function of the IRS, which is used in emergency situations, but also to point out the reasons for genesis of the rescue systems, in terms of historical development, and also provide information on the activities of "proper" action during emergencies, crisis, that may occur in the ordinary civil life.
References


COMPOSTABLE PLASTIC PACKAGING IN THE ARMY

Martin Vlkovský, Tomáš Binar, Kateřina Pochobradská and Balázs Taksás

Abstract: The paper analyses the compostable plastic packaging, including identification of their advantages and disadvantages. The often incorrect description of biodegradable and even degradable packaging as a compostable is emphasized. The main goal of the paper is to consider the possibility of implementation compostable plastic packaging into the Czech Army conditions, including the identification of areas where it would be advantageous to apply them (with regard to life-cycle costs). Outputs of selected research projects focusing on high consumption supplies are analysed. The environmentally friendly and sustainable packaging is crucial not only for multinational operations, but for the peacetime as well.

Keywords: compostable plastic packaging, multinational operation, environmentally friendly, high consumption supplies, life-cycle cost, sustainability

1. Introduction
The significant development of packaging have undergone over thousands of years of its existence, nevertheless its basic function remains – the protection of the packaged product (material). The handling and information (visual and promotional) functions were gradually added in time. Currently, an aspect of environmental friendliness comes to the fore, which is closely linked to reverse logistics. Simply put, every packaging that has fulfilled its function or is at the end of its useful life (for returnable or reusable packaging) should be ecological disposed. An ideal strategy is recycling, which bring valuable option for secondary use of the packaging. The problem of recycling is limited utilization of some packaging (e.g. composite) or high costs associated with it (e.g. sorting, transportation). Unlike the civil sector, Army of the Czech Republic (ACR) is facing a further shortage of ecological disposal associated with the specifics of multinational operations. Multinational operations can be carried out in very different environments with different infrastructure and therefore environmentally friendly disposal of the packaging is often a problem. Also, the safety aspect can’t be overlooked when every waste (packaging garbage) collection to the ecological disposal may pose a potential risk to the transportation (logistics) units. The newly developed compostable plastic packaging, which are environmentally friendly and offering analogous characteristics as petroleum-based plastics (e.g. HDPE and LDPE), may offer some alternative. The easiest way, how to ecological dispose the compostable plastic packaging on logistic bases in the joint operations area (JOA), is to bury it. An ecological decomposition of compostable plastic packaging is ensured from the action of naturally occurring microorganism (soil bacteria etc.). Although the decomposition process, due to the action of a non-optimal conditions (such as for example in industrial composting plants), more time consuming, this packaging are easily biodegradable (compostable) during the multinational operation.
2. Compostable plastic packaging
Currently, the market offers a number of options of compostable plastic packaging. But what can be described as compostable plastic packaging and what cannot? According to the American Society for Testing & Materials (ASTM) is compostable plastics (packaging) is plastics which is capable of undergoing biological decomposition in a compost site as part of an available program, such that the plastics is not visually distinguishable and breaks down to carbon dioxide, water, inorganic compounds, and biomass, at a rate consistent with known compostable materials (e.g. cellulose) and leaves no toxic residue [1].

To obtain a certificate according to EN 13432:2001 Packaging – Requirements for packaging recoverable through composting and biodegradation – Test scheme and evaluation criteria for the final acceptance of packaging is required that **all the constituents and components of the packaging are compostable.** Above applies not only to the basic materials, but also for the various additives and other packaging properties.

It must also be met following 4 conditions laid down in the standard:

- **chemical composition** – the standard sets limits for volatile matter, heavy metals (Cu, Zn, Ni, Cd, Pb, Hg, Cr, Se, As) and fluorine.
- **biodegradation** – chemical breakdown of materials into CO₂, water and minerals. Pursuant to the standard at least 90 % of the materials have to be broken down by biological action within 6 months.
- **disintegration** – the physical decomposition of a product into tiny pieces. After 12 weeks at least 90 % of the product should be able to pass through a 2 × 2 mm mesh.
- **quality of the final compost and ecotoxicity** – the quality of the compost should not decline as a result of the added packaging material. The standard specifies checking this via ecotoxicity tests. This involves making examination to see if the germination and biomass production of plants are not adversely affected by the influence of composted packaging [3].

After the successful certification of a packaging, which demonstrates that all the requirements of the standard are met, the product (packaging) can be marked with the logo of compostable packaging (OK Compost), which is shown in figure 1.

![OK Compost Logo with owner of the certificate in red oval](image)

*Figure 1: OK Compost Logo with owner of the certificate in red oval Source: [3]*

Packaging that do not meet the above mentioned conditions cannot be considered as compostable, even though they are thus sometimes presented. This is mainly marketing of manufacturers and suppliers who are trying to entice potential customers by misleading advertising.
**Biodegradable plastics** is very often mentioned term, but is defined less strict than compostable plastics (packaging). Biodegradable plastics is plastics which will degrade from the action of naturally occurring microorganism, such as bacteria, fungi etc. over a period of time. Note, that there is no requirement for leaving "no toxic residue", and as well as no requirement for the time it needs to take to biodegrade [2]. A group of biodegradable plastics usually does not solve degradability various additives and other packaging properties and it may not be a completely environmentally friendly solution.

Last very wide group are **degradable plastics**, which are subject to the least strict requirements of the three groups of specific plastics. Degradable plastics is plastics which will undergo a significant change in its chemical structure under specific environmental conditions resulting in a loss of some properties. Please note that there is no requirement that the plastic has to be degrade from the action of "naturally occurring microorganism" or any of the other criteria required for compostable plastics [2]. A widespread representative is called **oxo-degradable plastics**, which are in their chemical composition closer to conventional plastics. Usually it is a plastics based on LDPE of HDPE polymers (i.e. petroleum plastics) supplemented with various additives. For a degradable plastics is a decomposition and disintegration time ensured by additive that uses chemical oxidation. The disintegration time is usually accelerated by higher temperatures and UV radiation.

The amount and type of additive (additives) allows to set the disintegration time of degradable plastics from 2 months to 6 years [5] and neither the a soil burial or controlled composting doesn’t affect it very much.

### 3. Selected packaging solution in the military

Even though compostable plastic packaging is very dynamically developing segment of the market, it getting to the army conditions very slowly. A gradual application of some BioViron product series GreenCell in North Atlantic Treaty Organisation (NATO) environment is visible. Selected BioViron products (there are OK Compost) have been gradually implemented in the US Armed Forces and British Armed Forces. Currently the compostable plastic packaging are unfortunately not an issue for the ACR, even though waste management in multinational operations is expensive and time consuming problem. As was mentioned above it is logistical and security problem as well.

The future can be in compostable plastics utilization, as evidenced by the gradual introduction of compostable plastic products in NATO, as well as research projects e.g. research project of United States Department of Defense (US DoD). The project WP-1479 US DoD indicates orientation to weight reduction of packaging of high consumption supplies, including army food rations – **Meal Ready-to-Eat (MRE)** in relation to sustainability of troops in multinational operations.

The goal was to reduce packaging weight and to verify the possibility of composting MRE packaging. The result was identification of suitable materials and weight reduction of examined packaging by 18 %. More recent research WP-201 218, which is not yet completed, was focused specifically on MRE and based on the numbers of 2011, when the US Armed Forces produced with 1,429,995 active personnel around 4,000 tonnes of waste only from MRE packaging [6]. The prerequisite is, along with technological advances in compostable plastics, use such packaging more widely – mainly for packaging **high consumption supplies**, where the volume of waste is one of the largest. Generally speaking, the use of compostable plastic products in multinational operations will enable to avoid environmentally unfriendly waste incineration as it was in the past, respectively transport costs and ecological
disposal. An increasing problem is the water supply as well, especially of drinkable water, because it’s limited storing (e.g. in the Czech Army conditions only 48 hours in cisterns or water tanks). Units operating in JOA face in relation to food supply the difficult question today, whether to use the classic dishes or disposable dishes. The classic dishes is an environmentally friendly solution, however, it is necessary to use large amount of drinkable water for washing. On the one hand the utilisation of disposable dishes from petroleum plastics does not require drinkable water for washing, on the other hand, it generates additional costs (purchase, storage, transportation, etc.) and therefore it does not represent environmental friendly solution. The compostable plastic products (not only packaging) thus offers a compromise option, when is the ecological disposal of these products resolved relatively simply and moreover, with zero water consumption. Table 1 illustrates a simple analysis and subsequent comparison of common (petroleum) plastics, oxo-degradable plastics and compostable plastics.

<table>
<thead>
<tr>
<th>Description</th>
<th>Common plastics</th>
<th>Oxo-degradable</th>
<th>Compostable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>Fossil raw materials (oil, natural gas…)</td>
<td>Fossil raw materials (oil, natural gas…) + oxo additives</td>
<td>Plant origin (corn, potatoes…)</td>
</tr>
<tr>
<td>Product</td>
<td>Polymers HDPE, LDPE…</td>
<td>Oxo materials based on HDPE, LDPE…</td>
<td>OK Compost materials</td>
</tr>
<tr>
<td>Waste</td>
<td>Almost no degradation</td>
<td>Decomposition into tiny pieces of HDPE, LDPE…</td>
<td>Decomposition into biomass, water, minerals, CO₂</td>
</tr>
<tr>
<td>Disintegration Time</td>
<td>More than 500 years</td>
<td>2-3 years</td>
<td>3-8 weeks</td>
</tr>
<tr>
<td>Environmental Impact</td>
<td>Long-term negative environmental impact</td>
<td>Soil contamination by tiny pieces of HDPE, LDPE…, “visual” ecology</td>
<td>Biomass residues enrich the soil, environmental friendly solution</td>
</tr>
</tbody>
</table>

Table 1 Comparison of selected plastics

Source: modified [8].

Table 1, which is a modification of plastics comparison of TART Company, shows that in researched areas are the compostable plastics (packaging) very advantageous. A certain disadvantage is the price, which, thanks to the so far limited use of compostable plastics, is still approximately 3-4 times higher (see the price list of TART Company). The initial economic costs not reflect the entire life-cycle costs (LCC), which would have been probably higher at least of petroleum plastics.

4. Conclusion
In the future, it can be assumed mass deployment of compostable packaging (not just plastic) in the civilian sector due to the increasing pressure on the environmental friendliness and sustainable development. Following this, the price of compostable plastic packaging would be probably reduced, thereby the attractiveness of such packaging would be increased and the environmentally friendly packaging will be gradually
implemented into other NATO armies. At the same time there is increasing of the product line in the armies which have already used those packaging. ACR won't be most likely the exception, moreover, with the development of new technologies possibilities of compostable packaging will extend. The direction of future research will go toward verification the parameters (resilience to climate effects, strength, etc.) of compostable plastic packaging available on the market and identification of areas of possible implementation into the Czech Army conditions. The multinational operations would be suitable for initial testing because there are limited possibilities for ecological disposal of packaging (waste) compared to peaceful conditions and an achievement of the benefits can be expected. Troop trials would reveal the strengths and weaknesses of compostable plastic packaging, which would then interconnect with the LCC. The tested packaging should be ones that are disposable and consumed in large quantities. This mostly determinates the high consumption supplies (food, bottled water etc.). If the above mentioned parameters are acceptable for use in the Czech Army conditions, it is crucial to perform the calculation of LCC and compare the LCC with currently used products (packaging). The prerequisite is to achieve lower LCC and thus justify the implementation of compostable plastic packaging into the Czech Army conditions based on cost advantage.

Finally, it can be assumed in collaboration with the manufacturer the development of **compostable active plastic packaging**. Such packages would protect, e.g. with use of vapour phase corrosion inhibitors (see the project in acknowledgement), military vehicles and equipment during the short- or long-term storage or transportation and could be simply composted after their usage. The compostable active plastic packaging could be more widely used not only in multinational operations, but also in peacetime, where they also offer entirely environmentaly friendly solution.

### Abbreviations and Acronyms

<table>
<thead>
<tr>
<th><strong>ACR</strong></th>
<th>Army of the Czech Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASTM</strong></td>
<td>American Society for Testing &amp; Materials</td>
</tr>
<tr>
<td><strong>CSN</strong></td>
<td>Czech State Standard</td>
</tr>
<tr>
<td><strong>US DoD</strong></td>
<td>United States Department of Defense</td>
</tr>
<tr>
<td><strong>EN</strong></td>
<td>European Standard</td>
</tr>
<tr>
<td><strong>HDPE</strong></td>
<td>High Density Polyethylene</td>
</tr>
<tr>
<td><strong>JOA</strong></td>
<td>Joint Operation Area</td>
</tr>
<tr>
<td><strong>LCC</strong></td>
<td>Life-cycle Cost</td>
</tr>
<tr>
<td><strong>LDPE</strong></td>
<td>Low Density Polyethylene</td>
</tr>
<tr>
<td><strong>MRE</strong></td>
<td>Meal Ready-to-Eat</td>
</tr>
<tr>
<td><strong>NATO</strong></td>
<td>North Atlantic Treaty Organization</td>
</tr>
<tr>
<td><strong>US</strong></td>
<td>United States</td>
</tr>
<tr>
<td><strong>UV</strong></td>
<td>Ultraviolet</td>
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</table>

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