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On Adaptation in Military Operations: Tinkering and Bottom–Up Perspectives

JOBBÁGY Zoltán[1]

A biological perspective has much to offer for a better understanding of military operations. Biological evolution and military operations feature perpetual novelty and conditions far from equilibrium featuring dynamics that demand continuous adaptation. The author suggests that comprehending military operations in an evo- lutionary framework requires a shift from mechanics and engineering to biology and adaptation. Thus the emphasis moves from statics to dynamics, from time–free to time–prone reality, from determinism to probability and chance, and from uni- formity to variation and diversity, with all the consequences.

Introduction

A biological perspective on human behaviour has much to offer for a better understanding of the relationship between co-operation and conflict. Regardless whether one sees war and military operations through the eyes of Clausewitz, approach it as a complex adaptive sys- tem, or examine it along attributes that display similarities with biological evolution, there are timeless and innate characteristics. It is not difficult to conclude that both biological evolution and military operations are intrinsically complex, and primordial violence is at the heart of both. [1]

Military operations indeed can be understood as a complex adaptive system in which the system properties emerge from the interactions of the many components at lower levels. The abundance of dispersed interactions in military operations indicates a mechanism that often lacks global control, but feeds from cross–cutting hierarchical setup. Similar to biolog- ical evolution, military operations also feature perpetual novelty and far from equilibrium dynamics that demand continual adaptation. Their composition changes constantly and the interaction of the belligerents means that there is a multiplicity of feedback mechanisms that affect the further dynamics by constantly changing attributes. [2]

Military operations and biological evolution are as much about selection as about trans- formation with the consequence that adaptation appears to be a central feature. Adaptation stands for the importance of not only how to respond to perturbations properly, but also how to maintain the capacity to respond actively. [3] Evolution and military operations are full of ramifications and divergences that come as a result of constant interactions and changing environmental conditions resulting in various and often unexpected events. [4]

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Biological Evolution and Civilized Warfare

In book eight, chapter three of *On War,* Clausewitz, by detailing the interdependence of the elements of war, made it clear that scientific analysis based on logic and mathematics is of little help. War is an art and as such requires certain skills to discriminate among an infinite multitude of objects and relations to find out which is the most important and decisive. This sort of judgment stands in sharp contrast to a strict logical deduction and requires intuitive comparison. Remote and unimportant things and indirect relations must be set aside in order to discover the more immediate and important ones. [5]

Clausewitz as a theorist was aware of the fact that war has a non–quantitative and non– predictive character, which makes it impossible for fully fledged empirical or hard sciences to offer suitable descriptions, explanations or models. War exhibits structural unpredictabil- ity in which the distribution or dispersal of information suggests definite limits to what can be known at any given point in time. Given war's nature as outlined by Clausewitz, Watts argued that evolutionary biology may offer a better model for a scientific theory of war than most quantitative sciences. [6]

Darwin had neither intention nor interest in spending much time examining the nature of war. However, even he recognised in his book *On the Origins of Species* that genetic usur- pation and endemic warfare share similarities. In chapter three he drew an analogy between war, battle and natural selection and saw evolution as a "[b]attle within battle [that] must ever be recurring with varying success." This analogy made him conclude that "from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows." Biological evolution was for him a "great and complex battle of life", which together with the "Law of Battle" for survival formed a recurrent pattern also in his second epic work *The Decent of Man*. [7]

In the preface to his book titled *Adaptive Coloration in Animals* published in 1957, Hugh Cott, another biologist, observed a striking similarity between the primeval struggle of the jungle and the refinements of civilized warfare and concluded that both have very much the same story to tell. In evolution and warfare there are results of an armament race and an in- vention race, which has led to a state of preparedness for offence and defence as complex as it is interesting. The methods employed in both are, according to him, mainly similar as shown by the evolution of speed, on land, in the air, and under water, by pursuer and pursued. Both can be characterized by the employment of stealth and surprise, of deception and ambush. There is a display of warning signals and of alluring baits, the elaboration of smokescreens, traps, nets, parachutes, of electrocution and booby–traps. In both there is evidence for the adoption of fossorial and nocturnal habits, the development of poison, and of deadly appara- tus in the form of fangs or stings or arrows for its injection into the bodies of enemies or prey. Protection in both is afforded by armour–plating, spines and barbed wire. In both evolution and warfare we find the use of chemicals, which is practiced by certain insects and by crea- tures such as the skunk. [8]

Boyd, a prominent military theorist, suggested that similar to biological evolution war os- cillates on a continuum that cannot be broken into discrete points or steps in time. Therefore both soldiers and ecologists try to find a mechanism that matches the crude reality of life. He pointed out that the theory of evolution by natural selection and the conduct of war are inti-

mately related since both "treat conflict, survival, and conquest in a very fundamental way" He regarded war as a conflict between two self–organising, living and fluid–like organisms consisting of many mutually interacting and coevolving parts that form a rich interlacing tapestry of emergent possibilities. [9]

Emergence and Self–Organisation

At the heart of biological evolution there are two interrelated mechanisms such as emergence and self–organisation that require a closer examination. Emergence indicates bottom–up pro- cesses that cannot be predicted or anticipated in their fullness beforehand as they display features not previously observed. It is a holistic configuration that offers explanation into the dynamics of the system rather than explanation based on the system's parts alone. Thus emer- gence does not allow for predictions based on deduction and causality. It is not a provisional construct either, since its temporal and spatial aspects point toward greater and greater unpre- dictability. Emergence does not allow exact prediction of future states and cannot be handled by analytical rationality. It produces unexpected or counterintuitive results, which indicates that causes and effects are not only separate, but often disconnected or indirectly related in space and time. Emergence reflects attributes such as compensation and counteraction, which make most attempts to predict and plan for desired outcomes impossible, as such properties cannot be added together in a simple and system–wide way. [10]

Similar to biological evolution, in the case of military operations, despite the centralized design of military organisations, structures can also come from self–organisation on various levels. There is an abundance of spontaneous adjustments in military operations that involve complex interactions of so many factors that control becomes impossible. Self–organisation means that a species and military organisations involved in operations adjust to changes dy- namically even if those changes appear in an irregular fashion. Although self–organisation happens at all levels, the components operate on local information and general principles that have only limited content for the system as a whole. For the operational planning process of the military as outlined in official NATO publications self–organisation indicates a clear limitation as "causes and effects cannot be mapped linearly; similar causes can have different effects and different causes similar effects; small changes of causes can have large effects, whereas large changes can also result in only small effects (but, nonetheless, it can also be the case that small causes have small effects and large causes large effects)." [11]

Environment Does Matter

The dual processes of emergence and self–organisation point toward the fact that in open and dissipative systems such as biological evolution and military operations the living envi- ronment must also be taken into account. The environment is never static, but changes over time, which indicates that interactions stand more for what we do not know, and less so for the possibility to make accurate predictions regarding the system's future state. In order to get a better insight into the causal texture of the environment Emery suggested a simple matrix as depicted below. According to this matrix emergence arises as the interplay of L11 that refers to the processes found within the system, L12 and L21 both referring to interactions between the system and the environment, and L22 referring to processes and interaction within the

environment itself. The matrix indicates that the environmental interdependences of complex phenomena such as biological evolution and military operations are often incommensurate with those connecting parts of the system. In other words, the environment is not just *out there*, but constantly changes in ways no one can anticipate: [12]

L*11*, L*12*
L*21*, L*22*

Environmental factors also indicate that emergence and self–organisation stand for two sorts of unpredictability. Whereas in spatial or organisational terms they stand for the fact that properties at a certain level cannot be predicted from properties of other levels, in temporal terms they indicate unpredictability coming from the properties that constitute the preceding condition. Consequently, they create new properties regardless of the substance involved since they relate levels to each other by often denoting the very passage that connects them. Biological evolution and military operations are complex phenomena in which several levels co–exist simultaneously and interpretations based on cause–and–effect relationships often lead to mistakes. This poses a challenge to the traditional operational planning process of the military since it refers to something that disrupts the notion of causal explanation and cracks its power. The environment in which both biological evolution and military operations happen, stands for a qualitative change suggesting that causality and randomness are always interwoven in an intriguing and contingent way. Both display novelty in the form of new and random solution paths open to chance occurrences that do not allow for simple explanations. Although biological evolution and military operations might allow for the prediction of cer- tain structural features in general terms, as complex phenomena they do not help predict details of their future in terms of desired outcomes. [13]

Adaptation as Tinkering

Comprehending war in an evolutionary framework rejects classical theories and promotes complexity thinking that requires a shift from mechanics to biology. The emphasis moves from statics to dynamics, from time–free to time–prone reality, from determinism to proba- bility and chance, and from uniformity to variation and diversity. [14] However, it must also be stated that unlike in military operations adaptation in biological evolution is run in evolutionary time to build up equipment for races run in real time with a trick: for an individual gazelle it is more important to outrun the slowest gazelle than to outrun the hunting cheetah. Nevertheless adaptation is full of a heavy dose of futility that loads it down as an extremely complicated balance of compromises must be micromanaged. The optimum compromise in this trade–off is not fixed as everything is fleeting and depends on a vast array of factors. [15] In his book the *Greatest Show on Earth* evolutionary biologist Dawkins made it clear that much of biological evolution is about tinkering as adaptation is often followed by corrections to secondary problems caused by adaptation itself. Natural selection works as a sweeper–up of countless minor details that come along after a big original error occurred. Major design flaws may be corrected subsequently or go extinct with the organism, which can perfectly compensate for the initial error. Also major mutations, even if they cause improvements, almost always require some sort of subsequent tinkering. They are often followed by lots of

small mutations that have the only function to smooth out the rough edges just created. In biological evolution there is a pattern of major design flaws, compensated for by subsequent tinkering. Initial mistakes are corrected in a post hoc fashion as improvements can only be achieved by making ad hoc modifications. In biological evolution there is a wide variety of cumbersome accretion of compensatory bodges and fixes, and kludges. Biological innova- tions sometimes evolve not from old organs doing the same job, but from organs that are completely different. [15]

Similar to biological evolution there is no way to separate obvious changes occurring during the course of military operations and treat them in isolation. There are hundreds and thousands of ramifications as the interaction with the adversary tweaks and alters constantly. Changes in biological evolution initiate a complicated cascade of consequences, each of which necessitates compensatory adjustments. Even if one is overwhelmingly impressed by the elegance of some evolutionary design, there is a haphazard mess inside. Biologist Pit- tendrigh regarded biological evolution to be nothing more than a "patchwork of makeshifts pieced together, as it were, from what was available when opportunity knocked, and accepted in the hindsight, not the foresight, of natural selection." [16]

Tinkering in Military Operations

Tinkering and make–shift modifications to approved plans are of little appeal to military or- ganisations. Yet they have to except tinkering as a form of adaptation if they want to prevail. In fact, military history is full of examples of tinkering this or that way. In his book *Command in War* military historian van Creveld writes that the Battle of Jena fought in 1806 is a good example for adaptation. Although Napoleon achieved one of his biggest victories he "had known nothing about the main action that took place on that day; had forgotten all about two of his corps; did not issue orders to a third, and possibly to a fourth; was taken by surprise by the action of a fifth; and, to cap it all, had one of his principal subordinates display the kind of disobedience that would have brought a lesser mortal before a firing squad." [17]

Napoleon, one of the greatest commanders of all time was not only able to tolerate a high degree of uncertainty and still exploit the situation, but also his subordinates were willing to accept responsibility and act on self–initiative. It appears that military operations in general require a large safety margin in order to ensure that mistakes do not accumulate and develop into disasters. Similar to the emergent and self–organising mechanisms of biological evo- lution, military operations also contain a lot of blunders and errors that require subsequent tinkering. This however, indicates that operational planning should often not go further than the first encounter with the enemy and the amount of information needed to act at any given level should be reduced to a minimum. [17]

Adaptation indicates that war requires only general statements to be stated in advance in order to start activities rather than a detailed plan. Thus only guidelines must be laid down in order to put the system into gear. As soon as interactions with the enemy gain momentum, details that cannot be anticipated beforehand will emerge anyway. Another good example for successful tinkering was the 1967 Arab–Israeli war in which for the Israeli side "only the first [day] was planned in any detail; the rest was pure improvisation." [17: 200]

Tinkering stands for creativity, constant change, evolving situations and limitations re- garding comprehension, prediction and control. In complex phenomena such as biological

evolution and military operations much depends on chance as possibilities always emerge and form a broad spectrum. Adaptation demands flexibility, robustness, and the ability to exploit constantly shifting opportunities. Soldiers must embrace open strategic options with various paths and try to make the best of probabilistic occurrences within the domain of their focus. Successful adaptation in military operations means that it is sometimes better to let patterns emerge than impose an artificial consistency prematurely. A peripheral vision is required to detect and take advantage of unfolding opportunities and the ability to tinker consistently to the unpredictable nature of military operations. Tinkering makes it possible to handle several different futures and stands in sharp contrast with mechanical, deductive systemic analyses aimed at detecting causality. [18]

Conclusion

Adaptation in military operations requires that soldiers evolve rapidly to handle dynamic and changing situations instead of focusing on anticipated circumstances and conditions that come as a result of single and rigid prescriptive models. Biological evolution as a basis for better understanding the dynamics of military operations certainly does good service. It helps value the many irregular processes found on the tactical level, and can find a balance between centralization and decentralization in military organisations. It can also facilitate a better un- derstanding for achieving a match between the external diversity of the environment and the internal variation of military organisations in order to help soldiers cope with the many chal- lenges present in that environment. Among others studying biological evolution can also help find a good fit between a required minimum of regularity in the form of top–down guidance and a maximum of tolerable irregularity coming from bottom–up as information.

British military theorist Liddel Hart, who cannot be regarded as a biologist at all, pointed out in a nearly perfect biological language the essence of this approach. According to him "instead of fusing individuals into a mass through the suppression of their individuality and the contraction of their thought, the lead … only has effect, lightning effect, in proportion to the elevation of individuality and the expansion of thought. For collective action it suffices if the mass can be managed; collective growth is only possible through the freedom and en- largement of individual minds. It is not the man, still less the mass, that count; but the many." [19: 356]

Regarding cause–and–effect relationships in war he also pointed out that "bad means deform the end, or deflect the course thither" and concluded that the only thing left possible is to acknowledge that in complex situations such as military operations "if we take care of the means the end will take care of itself." [19: 357] In a similar fashion also Helmuth von Moltke emphasised that "[i]n war it is often less important what one does than how one does it." [20: 33]

Then, shall we start with biology?

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The First Global War

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The 100th anniversary of the start of the First World War provides an opportunity to take stock of efforts by the international community regarding the prevention of comparable catastrophes. Rethinking the lessons learned from the first global war in the era of increasing globalisation has special significance. Many authors think that the First World War was preceded by the first era of globalisation. Mutual economic interests could not prevent war in the second decade of the 20th century. Growing hostility among states stopped the process of globalisation. Could it hap- pen again? There is no certain answer to this question. With the help of international institutions states have been able to reduce the risks of major conflict. How- ever, the fundamental roots of conflict still exist. The urgent task of establishing a more harmonious relationship among individuals, societies, governance, economy and the environment, is still ahead of us.

Drifting to the War

It might seem unusual to use the adjective "global" in connection with the war which we usually characterise as "first" or occasionally "great". In addition to the adjective "first", "global" also refers to the fact that in the middle of the second decade of the 20th century the generation of our grandfathers and great grandfathers had to face an unprecedented and dra- matically new situation never experienced before. In the year 2014, the 100–year anniversary of the beginning of the First World War our moral duty is to remember our predecessors who experienced terrible hardships either as soldiers or as civilians. Some of them might just have returned from overseas places where they had been driven in the hope of a better future, but the love of their homeland brought them back. They could not foresee the carnage, which was waiting for them.

Different sources give different numbers for the victims of the war. The most reliable esti- mate about the military casualties is somewhat more than 9.7 million. The number of civilian casualties is more than 10 million. Close to 20 million people died in the war. If we take the number of those who died, were wounded, were taken prisoner of war or were unaccounted for, the number exceeds 37 million.

Hungary had mobilised 3 million 581 thousand soldiers before the war. 1 million 492 thousand of them suffered injuries of different kinds, 833 thousand were captured and be- came prisoners of war, 530,965 thousand died, and only 524 thousand soldiers returned home safely to their families. The Habsburg Monarchy altogether mobilized 7.8 million soldiers for the war. The total losses (dead, wounded, disappeared and prisoners of war) at the end of the war were 7 million soldiers. From all participating countries taken together the ratio of

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losses compared to the total number of mobilized soldiers in the Monarchy was the largest (90%). The other great powers' ratio of losses was as follows: Russia 76.3%, France 73.3%, Germany 65%. Regarding the absolute number of fatalities the greatest losses were suffered on the side of the Entente Cordial, by Russia and France, and on the side of Central Powers Germany and the Austro–Hungarian Monarchy. [1: 1–2]

Another important element of recollection is acknowledging the consequences of the remaking of the international order following the Versailles Peace Treaty. In this regard Hun- gary, which separated from the Monarchy and became an independent state, was subject to the greatest losses by losing 2/3 of its territory and 1/3 of its population. The analysis of the historical context and the wider consequences of the Trianon Peace Treaty exceed the frame- work of this paper. However, it should be mentioned that both in Europe and in other parts of the world significant changes took place. The colonial system changed. Germany lost its former territories. New states emerged in the place of the Ottoman Empire. The League of Nations created the Trusteeship System with the inclusion of the victorious great powers which had been entrusted to prepare non–self–governing territories for independence.

Why can we use the adjective "global" to characterize World War One? The first reason is that the number of participants in that war was unprecedentedly higher than that of any other previous wars. The number of countries which were somehow involved in the war ex- ceeded 100. The greatest losses were suffered by the 15 — mostly European — countries that participated in the war from the beginning to the end. European colonial powers mobilized their colonies as well and relied on their human and material resources. In this way the entire African continent was involved in the war. There were countries which expressed solidarity with actual participants on either side of the war. The entrance of the United States to the war on 6th April 1917 was followed by the symbolic declaration of war against the Central Powers by a number of Central American countries. Denmark, Sweden and Switzerland in Europe, Argentina, Bolivia and Paraguay in South–America opted for neutrality. However, the war caused considerable economic losses to them as well. [2]

Another argument supporting the use of the adjective "global" is that by the middle of the 19th century the international system expanded and became global in a geographic sense. Technological innovations in the field of transportation and communications shortened dis- tances substantially, accelerated interactions among countries and made economic relations mutually beneficial and less expensive. According to statistical data, and their interpretation by contemporary experts, by 1913 the ratio of international trade in relation to GDP of the countries reached a level which can be compared to the level of globalisation today. Inter- national trade and finance made countries interdependent in a way never experienced be- fore. Norman Angell, British journalist, in his book "The Great Illusion" published in 1910, qualified war as irrational and impossible due to the mutually beneficial impact of economic relations among countries. In the years before the war the German commercial fleet had been insured by the British Lloyd Company. According to the legal opinion of the lawyer of the Lloyd Company, in case of war the Company would have been obliged to compensate Ger- many for the damage caused by the British Fleet. [3: 37–38]

In 19th century military strategy, first of all, the planning of military operations, was great- ly influenced by such innovations as the telegraph, telephone, radio and railways. In the military organisations the General Staff became a revolutionary new element with the func- tion of planning war in peace time against potential enemies. In the second half of the 19th

century new firearms were introduced in the armed forces, which dramatically increased the casualties of war. In the Italian war of independence the tragic consequences of the Battle of Solferino in 1859 led to the creation of the International Red Cross with the aim of offering help to the victims of war. [4: 334] Further examples of the dramatically increasing destruc- tive potential of new firearms were given by the Austro–Prussian war in 1866 and the Rus- so–Japanese war of 1904. The increasing effectiveness of military organisations, first of all the introduction of General Staff was underlined by the Franco–German war of 1871 where the Prussian forces achieved quick military success followed by the unification of Germany.

Looking at important events at the turn of the 19th and 20th centuries one could easily find convincing arguments against a future war. However, the continuation of the cycles of European history, the periodic return of massive violence proved stronger. In the course of the four centuries prior to the First World War 106 wars broke out in which European great powers participated in one or both sides. [5: 88–91] One may assume that the outbreak of the war in the summer of 1914 was an immensely destructive continuation of an unavoidable historical process.

The political realist school of international relation theory conclusion, based on lessons from experience and many centuries, assumes that actors of international relations consider the increase of national power the most important source of promoting national interests. Since power is always relational and relative, its increase unavoidably generates rivalry. Fail- ure in the management of rivalry leads to violence. [6: 60–63] At the turn of the century ri- valry for markets, territories, colonies and the control of communication lines in oceans was growing and mismanaged. After the war there was one encouraging sign to check the naval rivalry among the leading naval powers signified by the Washington Treaty of 1922, which established a ceiling on the number of battleships of the US, UK, France, Italy and Japan. However, this treaty was not sufficient to stop power rivalry on a global scale, competition continued and the scene was set again for another more destructive war in spite of warnings by economic considerations.

When the assassination of the Habsburg archduke in the summer of 1914, followed by an international crisis, foreshadowed the possibility of war, members of two opposing alliances began to calculate the possible solutions of the crisis. Austria wanted to take revenge on Ser- bia by demanding the right to investigate the circumstances of the assassination, and it also saw military action as a possible punishment. In defence of her sovereignty Serbia rebuffed the Austrian demand. Germany assured Austria of her full support. Serbia enjoyed total sup- port of Russia against Austria. After the opening up of diplomatic archives the general public learned that a short local war between Austria and Serbia would have been acceptable for a number of European countries. The fact, that the General Staff of the German armed forces had ready–made operational plans for war against France and Russia separately and also for two parallel wars underlines the assumption that Germany was ready to risk a European war. On the other hand Germany had been making tireless efforts to ensure the neutrality of Great Britain in order to avoid a world war.

Since Germany failed in her efforts the conflict arising out of the assassination in Saraje- vo led to war. The sequence of declarations of war by itself is an indication of which countries strove for a military solution in the first place. On July 28 Austria declared war on Serbia. On August 1 Germany declared war on Russia. On August 3 Germany declared war on France. On August 4 Germany declared war on Belgium and Great Britain declared war on Germany.

A number of specialists are of the opinion that the rival military blocks drifted into a war which they had not intended. [7]

This experience has served as an important starting point for the researchers of the in- ternational system. Researchers of causes of conflicts and wars extended their work to those aspects of perception and thinking of individual people which might lead to misperception of reality especially the irrational perception of animosity in the relationship of peoples and nations.

Military history concluded important lessons from the First World War. One of the most important lessons has been that military strategy must be in harmony with the technical features and operational use of weapons. In the era preceding the war the dominant military strategy favoured offensive operations as important preconditions of military success. This assumption was based on the experiences of the Napoleonic wars. Modern firearms, most im- portantly machine guns, which were available during World War One, substantially increased the effectiveness of the defender against the attacker. Military strategists did not realise this important change in time, consequently the war turned into trench warfare with the loss of mobility. The use of poisonous gases intended to find a way out of this impasse and contrib- uted to the increase of the immensely inhuman nature of the war. In the second and third year of the war aircraft and tanks increased the mobility of warfare and these new weapons also contributed to the vastly destructive nature of the next war. [8: 16–27]

After the first global war the states did not draw the proper conclusions and were not able to create international mechanisms which could have prevented the next war. The cyclical return of war was stopped after the Second World War, at least in Europe. Integration which started with economic cooperation and gradually extended to other areas of international relations played a decisive role in this development. Conflicts of interests, crises and violent conflicts have remained in the relationship of states, but efforts aimed at the management of conflicts and crises are much more efficient now than 100 years ago.

New Approach to Crisis Management

The significance of multilateral diplomacy and permanent forums of negotiations were real- ised more than 3 centuries ago during the reign of Louis XIV of France. [9: 18–19] However, this invention in diplomatic method was not efficient in the prevention of war until quite re- cently. The creation of the United Nations Organisation marks the beginning of a slow grad- ual process which helped states to develop more efficient capabilities for war prevention. On the military side nuclear weapons represented a qualitatively new capability for deterrence of aggressive behaviour by possible adversaries. On the side of diplomacy the proliferation of international regimes and institutions was the most important development. The relative peace of the past 6–7 decades can be attributed to the combined use of these two essential means of security policy by states. Throughout history military means have always been more influential and stronger than diplomacy. An international crisis had always mobilised military response more easily than the arduous negotiating efforts of diplomats. Increased interactions of representatives of states in international institutions helped to realise the im- portance of negotiations. Diplomats within this new context of interactions could easily learn more accurate information about the intentions of other states. This has been a fundamentally new opportunity to have a separate view on the military capabilities on one hand and the

intention to use those capabilities by states on the other. Misperceptions regarding these two aspects of international conflict were very often the additional causes of war beyond funda- mental conflicts of interests.

International institutions stand for a peaceful resolution of conflicts. The use of a military option is always the last resort. Individual countries however, have to face more difficult di- lemmas because of the ambiguity of the situation they find themselves in. This is the reason why governments very often have greatly diverging views on the use of force in a certain situation. There are ambiguities even in the Charter of the United Nations in connection with the permissibility of the use of force. Chapter I, article 2, section 4 requires all members of the United Nations to "refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state, or any other manner inconsistent with the purposes of the United Nations." Legal experts consider this part of the Charter as a clear prohibition of the use of force. However, diplomats in the UN very often quote article 51 of the Charter in support of the use of force in certain situations. [10: 113] This diverging understanding of the letters and the spirit of the Charter of the UN has been the source of intense debate in the Security Council especially in the era of Cold War.

In the past decades on a national level experts made attempts to develop concepts on cri- sis management relying on the combined use diplomacy and military force. These concepts emphasise the need for strict political control over the use of military force in any crisis situ- ation. Military operations must stop when signals indicate the chances for diplomatic moves. Military operations must always be strictly coordinated with diplomatic negotiations. Mil- itary moves are supposed to indicate resolve and commitment to achieve certain goals and defend ones' interests. Diplomatic moves should indicate the devotion to negotiations and a peaceful solution of conflict. The combination of diplomatic and military actions should demonstrate to the opponent that there is a way out from the crisis without endangering its fundamental interests. [11: 25]

More careful management of conflict and crisis among states contributes to a more peace- ful world in the post–World War two period. However, after the Cold War, new sources of conflict and unprecedented forms of crises have emerged in the relationship of states and within states. There is a need for a new and more complex approach to national and interna- tional security in the context of looking for a more stable and more just world. A more careful study of human behaviour has already made important contribution to better understanding of the root causes of conflict. This new approach suggests that conflict originates in the mind of people as a result of socialisation, especially regarding the satisfaction of basic human needs. According to the results of the study of human behaviour the satisfaction of individu- als regarding their needs, values and interests determines whether their actions will be driven by cooperation or conflict. [12: 32–33] This suggestion is becoming increasingly important when inequalities and gaps in material wellbeing and consequently division among people and nations are becoming dangerously deep.

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Evolution of Hungarian security policy thinking in 1989–1999, with a special view on the Hungarian Defence Forces

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Hungarian security policy thinking has gone through basic and crucial changes in the past two decades. As a result, we can see a kind of "evolution", which began from a former Soviet satellite status and continued through a role seeking period to active membership in the Euro–Atlantic community. One of the most significant security and defence policy changes can be seen with regard to the shaping and restructuring of the Hungarian Defence Forces.

This paper seeks to explain this evolution in the period of 1989–1999 with the support of the János Bolyai Scholarship awarded by the Hungarian Academy of Sciences.

Keywords: *Hungary, security policy, armed forces, regime change, Warsaw Pact, NATO*

Introduction

Nowadays Hungary has *an all–volunteer force*, which has to fulfil three fundamental tasks based on the Basic Law (see: Constitution):

- to defend Hungarian territory in case of any aggression;
- to fulfil the tasks deriving from the different collective security (United Nations – UN), collective defence (North Atlantic Treaty Organization – NATO), complex (Europe- an Union – EU), cooperative security (Organisation for Security and Cooperation in Europe – OSCE) and other (for example Visegrad Four/Group – V4) international memberships;
- to participate in "other tasks", which are basically disaster management operations. [1] In other words, the Hungarian Defence Forces (HDF) has to fulfil peace operations and collective defence operations (based on the NATO Washington Treaty, Article 5).

In order to fulfil the international tasks Hungary sets the level of ambition at 1000 military personnel, which is provided by relatively small manpower (around 29,700 persons in 2012). [2: 2] Today the Hungarian service–members serve on three continents as peacekeepers, mil- itary observers, advisors, trainers or in crisis response operations. Of course, the Hungarian national military representatives are working in administrative positions in NATO and the EU, and they are fulfilling many military diplomatic tasks as well.

The HDF operates under the political guidance and democratic control of the Ministry of Defence. The operational units are under the command of the so called "Joint Operational

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Command" which commands and controls combat, combat–support and combat service support organizational elements of both two Services: the Army and the Air Force.

Based on the above described short "snap–shot" we may raise the question: which are the steps that led to the current situation? In other words, what kind of changes, obstacles and influencing factors formed the Hungarian Defence Forces in the past, for more than two decades, especially until Hungary became a NATO member in 1999?

The Hungarian Armed Forces in the Warsaw Treaty Organization of Friendship, Cooperation, and Mutual Assistance (Warsaw Pact) era

The history of the Hungarian Armed Forces is very similar to other Eastern and Central Eu- ropean countries after WWII: they became heavily influenced by the Soviets. The Socialist countries led by the Soviet Union established the Warsaw Treaty Organization of Friendship, Cooperation, and Mutual Assistance (Warsaw Pact, WP) in 1955, which gave the political and military framework and content for each member country regarding security issues. The so called "Military Policy" (in the WP it was called Military Doctrine) started to evolve on both sides, based on the fact that in this era nuclear weapons centred military might. There was a strong fear of the final devastating clash (Nuclear World War) which helped shape the political, economic policies or even daily basic life.[2]

During these times Hungary was suffering under Soviet suppression which resulted in a short and dramatic revolution in 1956, in which the Hungarian Military played a crucial role via supporting the freedom fighters. It was a clear and dramatic message to the Soviets and therefore it was not a surprise when the Hungarian Communist government reshaped and reorganized many things in Hungary, including the Hungarian People's Army. As a result Kádár János, the General Secretary of The Hungarian Socialist Workers Party, stated in 1958 at a military conference that "the Central Committee of the Hungarian Communist Party trusts the People's Army". [3: 83]

When the Warsaw Pact started to function it did not appear, that there would be so many tensions among the partners. One of the possible reasons for that lay in the centralized, Mos- cow led politico–military directives, which — at least theoretically — had to be accepted and executed by each member state. But the problem with this "guidance" was that it was "too large" for the WP Member states who were supposed to meet all of the Soviet military expec- tations, especially those which were included in to the Five Years Armament Modernization Plan (sometimes with expectations of full rearmament and military modernization)(!). Hun- gary, for instance, tried to use every opportunity to oppose, or at least to reduce the heavy military investment pressure arriving from the Soviet — imperial level minded — party politicians and generals. [4: 51–112]

As time passed, the '80s brought many changes in international relations: the détente experienced in the '70s had disappeared and many internal and external tensions started to boil on both sides. By these years the Hungarian People's Army reached the level and char- acteristics of a "mass army": too high peacetime strength; using obsolete and new military

2 At this point it is important to add, that the term "military policy" in the Soviet (Eastern) military sciences was similar to the term "defence policy" used by Western scholars. Later this term (military policy) almost disappeared and nowadays the term "defence policy" is the closest to the original meaning.

equipment at the same time; it spent large amounts on weapon systems, materiel and service– members because the country had to follow WP (the Soviet) military doctrine; and seasonal tasks to support the national economy. [5: 6]

The high level military spending put a lot of pressure on the already suffering Hungarian economy and as a result the Hungarian Socialist Workers' Party decided to launch a military reform in order to build a more adequate military force based on the economic realities, the country's geographical location, the "real" role of Hungary in the Warsaw Pact and the quick and crucial changes that had happened in military technology. [5]

The reorganization of the Hungarian People's Army — under code name "RUBIN" — came into force on the 1st of March 1987, and the division–regiment structure was replaced by brigade organizations commanded directly by the Army HQs. The new unit structure was different from the existing Soviet military structure, who expressed their revulsion but they did not prohibit it. At this moment it is crucial to mention that this "peaceful" approach was related more to the Gorbachev launched politics called "glasnost" and "perestroika", than to the "kindness" of the Soviet generals. In the second part of the 80's we could see a series of national decisions, they were supposed to provide some relief and some change some special characteristics of the Hungarian Armed Forces (for example: national tricolour on the Buda Castle, changes in the uniforms and daily official greetings, etc.).

This "openness" led also to the breakthrough in 1989, when the Warsaw Pact forces start- ed sharing openly their force's strength: in the case of Hungary the Armed Forces consisted of 155,700 persons (including civilians) in peace time. [5: 8] In January 1989 — as a result of the changes in contemporary international relations — it was announced that the Hungarian People's Army would undergo a reduction through 1989–1990 by 9%. [5: 9] The changes were supposed to be executed in three steps: the first to be made at the end of 1989, when the political–governmental and the command and control tasks of the Ministry of Defence (MoD) were separated: a small civilian Ministry of Defence was designed for the political functions and the direct command and control of the Forces was given to the independent Command of the Hungarian People's Army led by the Commander of the Forces.

The second step was overridden by many unexpected international and social changes, because in November 1989 Prime Minister Németh Miklós declared more radical cuts in the force structure beyond the earlier planned 9%. The new reform goals were more: 20–25% cuts in manpower and the transforming of the Hungarian Military into a new, nation–defend- ing role. [5: 11] However, some experts argued that his step was more related to the expec- tations that the armed forces needed to compare to the neighbouring countries. The political decision was more "driven" by the upcoming, democratic elections (1990) and it served to support the Communist Party's political campaign efforts. [6: 2] If this is true, we can pose the question: where did the trust expressed by Janos Kadar in 1956 of the Hungarian People's Army go by the end of the 80's?

The end of the 80's was a very intensive and historical period for the Hungarian Military:

- it was necessary to solve the question of the Soviet nuclear weapons stationed in the Bakony mountains;
- Hungarian political leaders initiated the Soviet troop withdrawal which ended at the end of June 1991;
- the Hungarian Armed Forces gave assistance and support to the refugees escaping from Ceausescu–led Romania;

- at a domestically and internationally crucial moment — in May–June 1989 — Hunga- ry lifted the so called "Iron Curtain" at her western border, and in September opened it to many Eastern–German citizens, which basically gave a huge boost to the upcoming changes, such as the collapse of the Berlin Wall (November 1989).

Meanwhile significant changes were taking place in Hungarian society too: the so called "Roundtable Talks" started to evolve and created a semi–half democratic sphere; on 23rd of October 1989 Hungary became a "Republic" and on 1st of March 1990, the Hungarian Peo- ple's Army got back its old name: "Hungarian Defence Forces" (Magyar Honvédség). [5: 9] As we look back to this year, we can have a sense of "euphoria", but we should not forget that the Soviet Union and the Warsaw Pact still existed at that time…

New political system, new defence forces

The democratic transition in Hungary had a similar character to the Polish one, it was "a tran- sition through extrication", because although the leading regime participated in the system change negotiations, it did not have a decisive role in it. Everything happened differently for instance in Romania when the former communist power did not play a progressive role and the changes there are named "transition through transaction". [6: 1]

In the spring of 1990 the first democratic elections happened in Hungary after the com- munist system collapsed. As a result, the six parties in Parliament, started to build the ele- ments of a liberal democracy (rule of law, freedom, market economy, etc.). The new govern- ing party — the Hungarian Democratic Forum (Magyar Demokrata Fórum — MDF) — gave strategic importance to the Ministry of Defence. Für Lajos was the first appointed civilian defence minister. [7: 138]

Parallel, to the internal political changes, the new government used every effort to aban- don the Warsaw Pact, and some Hungarian experts argued, that it had to be eliminated by inner efforts not by jumping out. [8: 133] Finally, the WP formally ended on the 1st July 1991, but this decision was made earlier at the Political Consultative Meeting in Budapest on 25th of February 1991. [9: 6]

At this moment, the Hungarian Defence Forces became *a really national* and independent entity, which — at the same time — had to face very serious external and internal challenges. Based on the latest findings and research, it seems that when the Warsaw Pact was disband- ed, not only did a military alliance disappear, but also the support, maintenance and military industry too: as a result, many people lost their jobs and the national economies suffered heavy losses.

After these changes Hungary suddenly became alone and when the earlier security um- brella disappeared a so called "security vacuum" was generated. In this situation the country had to decide how to provide the necessary security and defence for the country. The Hun- garian politicians, civilian and military strategists faced the fact that the earlier allies became independent too, and the former commonly shared interests turned out to be not so commonly shared or in fact even opposing. Not only bilateral relations required a new beginning, but Hungary's future foreign policy priorities — which were under huge debate and many times became part of daily political debates — had to be formulated. Basically, in the years of
1989–1991 there were six possible foreign policy options:

- neutrality;

- full independence;
- regional cooperation;
- joining the European security system;
- Euro–Atlantic integration; [10]
- to continue the cooperation with the Soviet Union in a more flexible framework (but this idea was quickly dropped recognizing the international and domestic reality). [11: 12]

As we can see, in all of the above mentioned scenarios the Hungarian Defence Forces should have played a crucial role, but in the finally selected version the Euro–Atlantic in- tegration represented a huge challenge for the HDF. We should not forget that at that time the Hungarian military was still oversized, overloaded, not functioning effectively, socially under–supported and struggling with serious financial problems.

In June 1991 Slovenia — after the declaration of its independence — was attacked by the Yugoslavian forces and after this so called "10 day war" the Balkan Wars started in Croatia, Bosnia and Herzegovina, and Serbia until 1995.

Because many of these former Yugoslavian states were direct neighbours of Hungary, the Hungarian Defence Forces had to face a serious challenge: not just to secure the homeland territory but at the same time to avoid any escalation into fighting.

Under these circumstances it became more and more clear that basically four parallel external tasks should be fulfilled by the Hungarian Defence Forces:

- to establish and maintain an independent homeland defence system;
- to meet the new security and defence requirements stemming from the Euro–Atlantic integration;
- to participate in the process of conventional weapons reduction in Europe;
- to give adequate answers to the regional security challenges (including the neighbouring states, NATO, the collapse of the Soviet Union, the Balkan Wars, etc.). [9: 8]

Of course, these tasks could not be fulfilled without a strong and legitimate legal back- ground, which was laid down in the New Constitution (1989), the Law on Homeland De- fence (1993/CX) the Basic Security Policy Principles (March, 1993) and the Basic Homeland Defence Principles (April, 1993). Additionally, the Government Programme — which was accepted in September 1990 — gave some important guidelines related to the upcoming defence restructuring tasks.

One of the most remarkable changes of the Hungarian Defence Forces was visible in manpower reduction, which is shown in the following table:

Table 1. Manpower reduction in the Hungarian Defence Forces between 1989 and 1993.
Source: [5: 26]

Year	**1989**	**1990**	**1991**	**1992**	**1993**
Manpower	155,700	143,200	121,000	104,000	100,000
Reduction related to 1989	–	8%	22%	33%	36%

As we can see the level of manpower reduction by 1993 was 36% related to the size of the Hungarian Armed Forces in 1989. The most dramatic change took place in the number of the conscripts: their number dropped by 43% (from 91,900 in 1989 to 52,340 by 1993). [5: 26]

Military spending was the following between 1989–1994:

Table 2. Military spending in Hungary in GDP% between 1989 and 1993.
Source: World Bank[3]

Year	**1989**	**1990**	**1991**	**1992**	**1993**
GDP%	3.8	3.1	2.4	2.3	2.1

As we can see the defence budget was also decreasing very dramatically between 1990–1991.

During the first democratic governmental period (1990–1994) the internal changes in the HDF affected the following fields:

- organization, structure and dislocation;
- the direction of training: from offensive operations to active defence;
- de–politicizing the Military and strengthening national characteristics;
- introducing new military capabilities/components (such as an airborne battalion, an electronic warfare capable regiment);
- struggling with the decreasing quality of military equipment;
- growing morale problems due to the continuous restructuring efforts;
- creating the elements of human resources;
- growing activity in military diplomacy;
- reshaping the military educational system;
- execution of the tasks stemming from the international crisis response and peace– keeping operations (such as in the First Gulf War — 1991; operations in the Balkans; etc.);
- struggling for adequate social support;
- creating new military elements in order to fulfil the constitutional requirement related to the freedom of conscience;
- building the advocate system for military personnel;
- creating and adjusting to democratic control.

Developments in 1994–1998

After the spring elections in 1994, the Hungarian Socialist Party gained a majority in the Hungarian Parliament. The old–new socialist leadership (the government was led by Prime Minister Horn Gyula) basically continued the earlier integration procedure into the Euro– Atlantic security system. Its main and central goal was to join the North–Atlantic Treaty Organization (NATO). The first step was taken already in 1991, when the North–Atlantic Cooperation Council was created "as a forum for dialogue and cooperation with NATO's former Warsaw Pact adversaries" and Hungary became its member. [12]

3 data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?page=4, (downloaded: 27 04 2013)

In February 1994 Hungary — among many other countries — signed the framework con- tract of the Partnership for Peace Programme issued by the Heads of States and Governments at the Meeting of the North Atlantic Council on 10–11 January 1994. [13] This step, from one side, made it possible for the HDF to take a look at how the Alliance is working and what the basic requirements are, from the other side, it helped to strengthen regional security. This last effect was extremely important, especially taking into consideration, that in the surrounding countries many changes happened in those years, for example, the number of Hungary's neighbouring countries raised from five to seven.

In spring 1995 Hungary started to participate in the Planning and Review Process (PARP), the goal of which "is to provide a structured basis for identifying partner forces and capabil- ities that could be available to the Alliance for multinational training, exercises and opera- tions". [14]

On 29 January 1996 Hungary expressed its desire to join NATO and after more than one year and a series of different professional talks NATO invited the Czech Republic, Poland and Hungary to become full members at the Madrid Summit in 1997. In order to strength- en the national desire and get strong public support a referendum was held on 16th of No- vember 1997. Voter participation was 49%, and 85.33% of them supported NATO member- ship. [5: 45]

Finally, on the 4th of April 1999, Hungary together with the Czech Republic and Poland, signed the documents of accession to NATO in a ceremony in Independence, Missouri, Unit- ed States, that marked their formal entry into the Alliance.

At this point it is important to mention, that parallel to the above mentioned process many integration steps were made toward to the European Union (EU) too, and Hungary became an EU member in 2004.

During these years, the HDF had to learn, understand and apply the term "compatibility", in order to prove its ability and creditability as a NATO candidate member. At the same time NATO also wanted to get evidence regarding the development of the Hungarian Defence Forces in meeting the minimum military requirements.

In 1995 the Alliance adopted a Study on NATO Enlargement in order to give and get the necessary information about the enlargement process to all participants. [15] This study contained many important questions and requirements, however the financial cost of acces- sion remained unknown. Notwithstanding, since 1997, defence spending has started to grow again: for the first time after the communist system had collapsed. [11: 22]

The tasks mentioned for the first governmental period on the one hand became more sophisticated (such as the legal background, military diplomacy, restructuring the command and control elements, etc.) and on the other hand new elements evolved such as the active participation in the peaceful solution of the Balkan crisis. This included many different ef- forts:

- sending troops to the Implementation Force (IFOR) and afterwards to the Stabilization Force (SFOR) in 1995–1998;
- providing host nation support (for example at the airbase of Taszár);
- participating in the Partnership for Peace (PfP) exercises (for example providing engineer support in Okučani).

Parallel to the above mentioned changes the manpower reduction of the HDF continued:

Table 3. Manpower reduction in the Hungarian Defence Forces between 1994 and 1998.
Source: [16: 79]

Year	**1994**	**1995**	**1996**	**1997**	**1998**
Manpower	99,248	81,266	66,872	60,000	61,500[4]

Military spending showed the same reduction as in the earlier governmental period, but in 1997 and 1999 we could see some growth, which was related to the upcoming NATO integration.

Table 4. Military spending in Hungary in GDP% between 1994 and 1999.
Source: World Bank[5]

Year	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
GDP%	2.0	1.6	1.5	1.7	1.5	1.7

An interesting and very remarkable solution happened in the HDF's training and educa- tion system, when the Zrínyi Miklós National Defence University (ZMNDU) was established from the previous independent military institutions in 1996, following the US example in Washington DC, that is to say the National Defence University concept. The new university started to educate civilian and military students together in 1997 in order to get "experts on security and defence policy" after a five year study period.[6]

Conclusions

It is still debated how well the Hungarian Defence Forces was restructured, reshaped or re– edified in the years of the 90s. It is a fact, however, that so many changes occurred in the pe- riod of 1989–1999 that it greatly changed the basis of the Hungarian Military. Without these changes we would not have been able to create that modern HDF which we have nowadays During the analysed period the international security framework changed dramatically and deeply influenced Hungarian security and defence policy thinking. As one of the results, the HDF changed its former Eastern–Western operating directions into a nation–character- ized and NATO compatible force.

4 Accepted by the Parliament Resolution of 1997/124 (XII.18.)
5 data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?page=3, (downloaded: 27 04 2013)
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New achievements in WWII military historical reconstruction with GIS

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Recently geoinformatics has become a well–known and widely applied discipline in different human sciences. There are several interesting examples of applying geographical information systems to manage the information of various time periods in military history and archaeology. Our research topic covers modern age military history, and so it is a very sensitive topic because of the recent dates. Therefore we always used objective data acquisition techniques and an applied engineering approach. The military historical GIS database, which was created in this way, can be handled as an objective and reliable basis for further research by scientists in object or even in event reconstructions. Firstly, we had to define a strategy, a methodology, which is suitable to achieve our aims — a uniform GIS database — considering the existing and currently accessible data sources. This methodology consists of three main parts: the reconstruction of the period's environment, the military objects and finally the military historical events. According to this methodology we reconstructed particular sectors of the two major World War II defense lines (Attila– and Margit–line) in Hungary. Beside the GIS based reconstructions of the environment, the military objects and the events, we investigated further analytical and representational functions, which can also support these kinds of applications. The methods enable various spatial and attribute queries and animation possibilities that are also useful and sometimes necessary. The typical examples of these functions are also discussed in the paper.
Keywords: *geoinformatics, military history, remote sensing*

Introduction

Recently, there are many nice examples of GIS and remote sensing applications in human scientific areas, e.g. in archaeology and cultural heritage. In our prior research we investigated the possibilities of applying these technical and engineering methods in the reconstruction of various periods' military historical events and the connected objects. As the result of the research we defined a methodology which integrates the different remote sensing technologies and the GIS solutions in one procedure. Hence the archaeological and other human data can be handled in a uniform system. This engineering type approach of the archaeological problems provides objective results, which can be considered authentic and enables us to confirm or deny previous archaeological or military historical examinations, theories. [1] In our previous research we have demonstrated, that the various remote sensing methods are

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perfectly feasible for data acquisition of military historical reconstructions and other archaeological research. We have investigated the possibility of integrating cutting edge remotely sensed data into these databases, such as high resolution satellite images or LIDAR (Light Detection And Ranging) data. In addition we have also shown that an entire reconstruction process can be achieved in the unified system, provided by GIS. Hereinafter we present the short summary of this reconstruction process that has three major parts: the environmental, the object and the event reconstruction. [2]

GIS in military historical reconstruction

The environmental reconstruction

Representing the environment is reasonable and necessary in most cases. Environmental objects, as external factors, have a great influence on the location, size and other parameters of the military defense objects. In strategy, the topographic environment especially has a key role, thus the reconstruction has to be carried out for an appropriate result. In practice the digital base map of the selected area has to be created. This base map consists of the environmental objects of the researched period. The environmental reconstruction may support the basic orientation and helps when we have only relative information according to the environmental objects. (Figure 1)

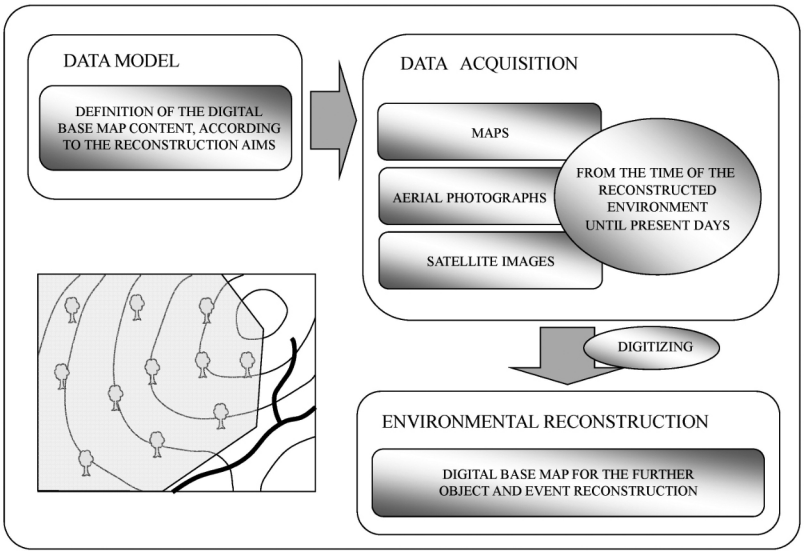

Figure 1. The environmental reconstruction process. [3]

Military object reconstruction

Environmental reconstruction is the basis of further reconstruction tasks; first of all, military object reconstruction. It is the most interesting and complex component of the whole process. The prior investigation and later the identification and integration into GIS of the various objects are achieved by diversified work. Contrary to the environmental objects, not only the geometry but the attributes of the objects are also important. The geometrical data are captured mostly from archive aerial photographs and field measurements. Before the field work it is recommended to investigate the other available data sources. It is easier to locate and identify the defense objects if it is known where and what are we looking for. There can be several data sources in this prior research; e.g. investigation of the available literature: history, military history, archaeology, warcraft, arms, geography, engineering and mapping. For example special fortification regulations (German, Hungarian and Soviet) were used in our World War II research. These regulations contain the precise and authentic geometrical and attribute data about the period's defense objects (e.g. anti–tank and infantry ditches). After this prior research the defense object identification and interpretation were carried out. The interpretation of the archive aerial photographs and the satellite images need professional expertise, especially when the ditches are already buried. In these cases we have to identify the ditches by various environmental signs, called indicator signs (in vegetation). Mostly the same data sources can be used for the attribute data acquisition as mentioned above. (Figure 2)

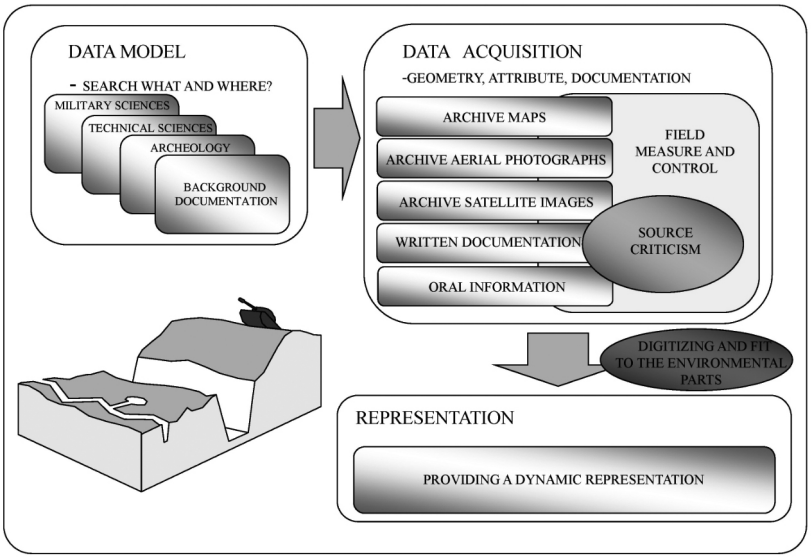

Figure 2. Military object reconstruction process. [3]

Military event reconstruction

After successful environmental and object mapping we can make an attempt to reconstruct the selected military (historical) event. There are two major factors that have a great influence on the quality of the event representation. Firstly, the time period when the particular military event happened; then the amount and the quality of the accessible data about the event. Obviously, these two factors are related to each other. As a general rule we can declare that the more we step back in time, the less we can find, considering the precise and reliable data. The three main data sources are the various maps, the written documentation, and if possible, the reminiscences. This component of the reconstruction process is the most critical one because the researcher likely has to face contradictions. The lack of accurate and reliable information makes source criticism mandatory. (Figure 3)

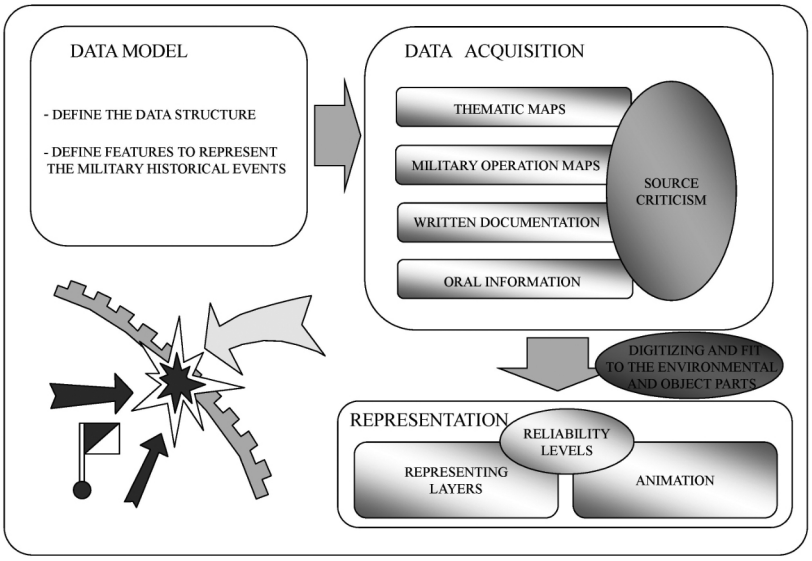

Figure 3. Military event reconstruction process. [3]

The reconstruction of the Attila– and Margit–lines

Introduction of the investigated period

The last months of World War II in Hungary were the specific selected period of our research. Our major objective was to create a GIS database representing the period's national defense system and the main military historical events. The defense system was located approximately diagonally across Hungary, starting from the eastern–north part, then going along the foreground of the Northern Mid–Mountains, Budapest, Lake Velence, and Lake Balaton and finished at the river Dráva. (Figure 4) Obviously this complex system was composed of different parts. The three major defense lines were the Karola–, Attila– and the Margit–lines. Also there were several auxiliary defense lines in the system, but the importance and impact

of these lines were irrelevant compared to the three major ones. The aim of this system was to stop the soviet attack started from the eastern–southern direction in the end of 1944; and it was partly successful.

The defense of Budapest was a major consideration in the system. Therefore in September 1944, the German commander Hans Freissner ordered the building of the Attila–line around Budapest. This horseshoe–shaped line contained three zones (Attila I, Attila II, Attila III lines) on the Pest side. The line was completed in November.

The Margaret–line was on the western part of the country (Transdanubia), it started from Budapest and ran along Lake Velence and Balaton and ended at the river Dráva. The soviet troops broke through the eastern part of the defense line when they encircled Budapest. We also investigated this part between the river Danube and Lake Velence. It is important to mention that the German and Hungarian forces tried to free Budapest several times ("Conrad" and "Spring awakening" operations) [4] and these battles also occurred in this area, thus the reconstruction and the identification of the military objects connected to the various operations, periods was very interesting. It was difficult to decide whether the German or the Soviet troops built some of the identified defense lines.

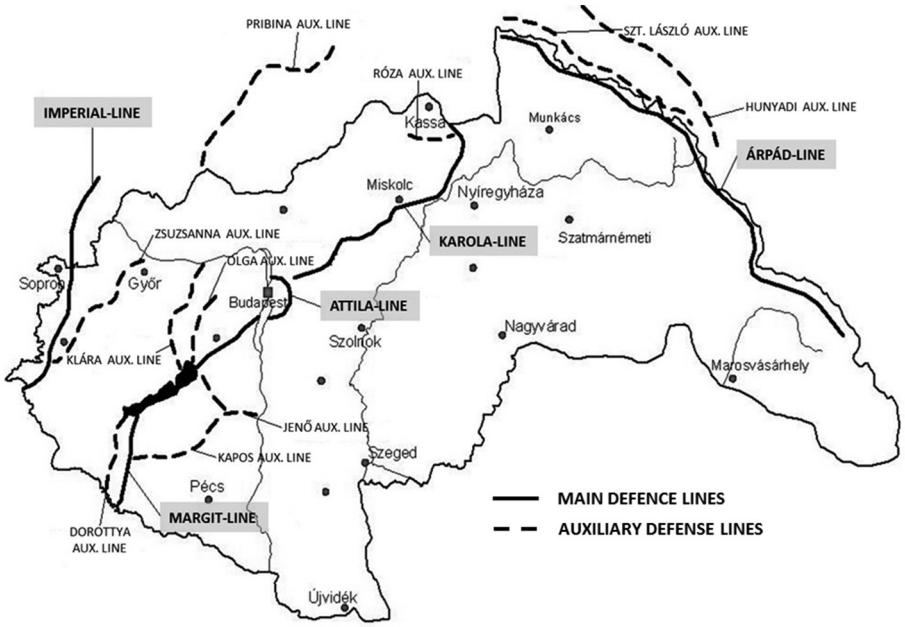

Figure 4. The defence lines of Hungary 1944–45. [3]

Data acquisition

Despite the relatively recent date of the investigated military events and objects, the precise maps and documents are missing. The original defense plans and maps were mostly destroyed during the war or taken away by the soviet troops and are hard to access. There are only short descriptions about the researched lines in the Hungarian military historical literature. These are the following:

"The *Attila–line* built from 22nd of September 1944. Its wings lean on the river Danube and connect to the Karola– and Margit–line. The Attila–line had three defense zones (Attila I. II. III.). The outer one followed the Dunaharaszti — Vecsés — Ecser — Maglód — Valkó — Gödöllő — Szada — Veresegyház — Csomád — Alsógöd line, the middle one followed the Soroksár — Soroksárpéteri — Pestszentimre — Pécel — Isaszeg — Kerepes — Mogyoród — Fót — Dunakeszi line, and the inner one was on the margin of the suburbs of Csepel — Pestszenterzsébet — Pestszentlőrinc — Rákoskeresztúr — Rákoscsaba — Cinkota — Rákosszentmihály — Rákospalota — Újpest. It did not run on the Buda side. The line was not completed because of lack of manpower, soldiers, time, tools and weapons."

"The eastern part of the *Margit–line*:

Major defense zone, 1st line: Danube — railway station Nagytétény — St. László barren — Baracska–south — Kápolnásnyék–south — Kisvelence–south — northern coast of Lake Velence.

Major defense zone, 2nd line: Kismarton–north — Martonvásár–south — railway station Baracska — Pázmánd–south." [5]

The written sources also declare that the Soviets were able to go along relatively easily without facing serious opposition in this part of the line. The serious fights occurred between the two lakes and the western part of the Margaret–line.

These short descriptions are suitable to identify the approximate position of the defense lines, but provide insufficient information to map the particular line system. Thus we used them as basic information for further data acquisition. There were various data sources applied during the investigation of the two selected areas. According to the area's extent, we chose M=1:50.000 and M=1:25.000 scale topographic maps as the basis of the environmental reconstruction. In addition we used archive aerial photographs (1950–53 from the first nationwide aerial photographic campaign in Hungary) [6] to locate and identify the defense objects. Most of these objects were anti–tank and infantry ditches and in some places artillery and flak placements. The mentioned objects were relatively well identifiable despite the low quality of the archive photographs. Indeed this photo interpretation was the most important part of the whole reconstruction task. Furthermore, if there was a chance to find and identify any significant part of the system, we looked up these spots. These field measurements have two major aims: firstly, to locate the position of new objects then secondly, to verify the previously interpreted objects. The next figure below consists of a montage of the typical data sources. (Figure 5)

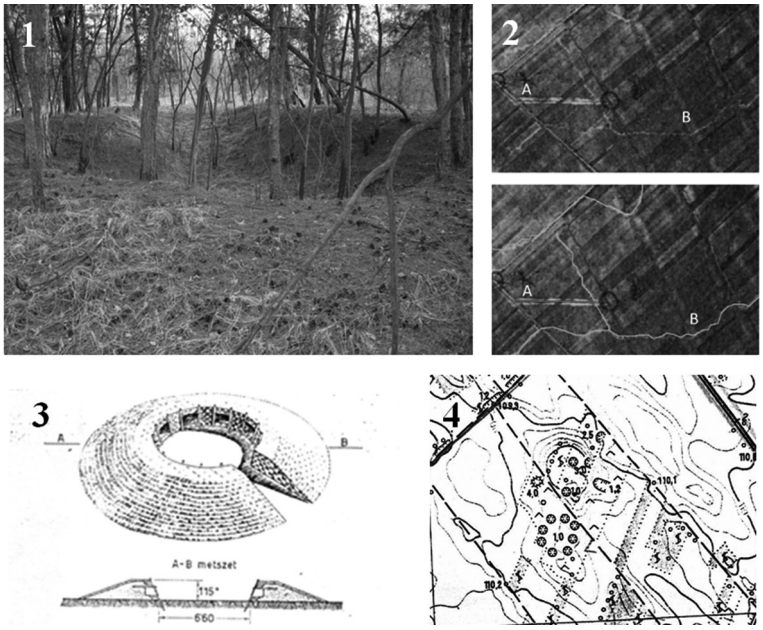

Figure 5. Data sources of the object reconstruction.
(1: Flak today, 2: Anti–tank (A) and infantry (B) ditches on archive photo, 3: Flak fortification regulation, 4: Flaks on topographic map) [7]

The results of the reconstruction

The reconstruction of the Attila–line and the eastern part of the Margit–line in the unified GIS database resulted in novel and confirmative information, too. Firstly, in connection with the Attila–line the reconstruction resulted in finding a similar structure in zone I and III (anti–tank ditches, complex, proportioned defense system), that can be found in the description in the previously mentioned documents. But there were only infantry ditches, infantry and artillery placements identified in zone II In addition, in contrast to old theories, this middle zone or line did not have a horseshoe shape. It was connected to zone I near Maglód settlement. (Figure 6)

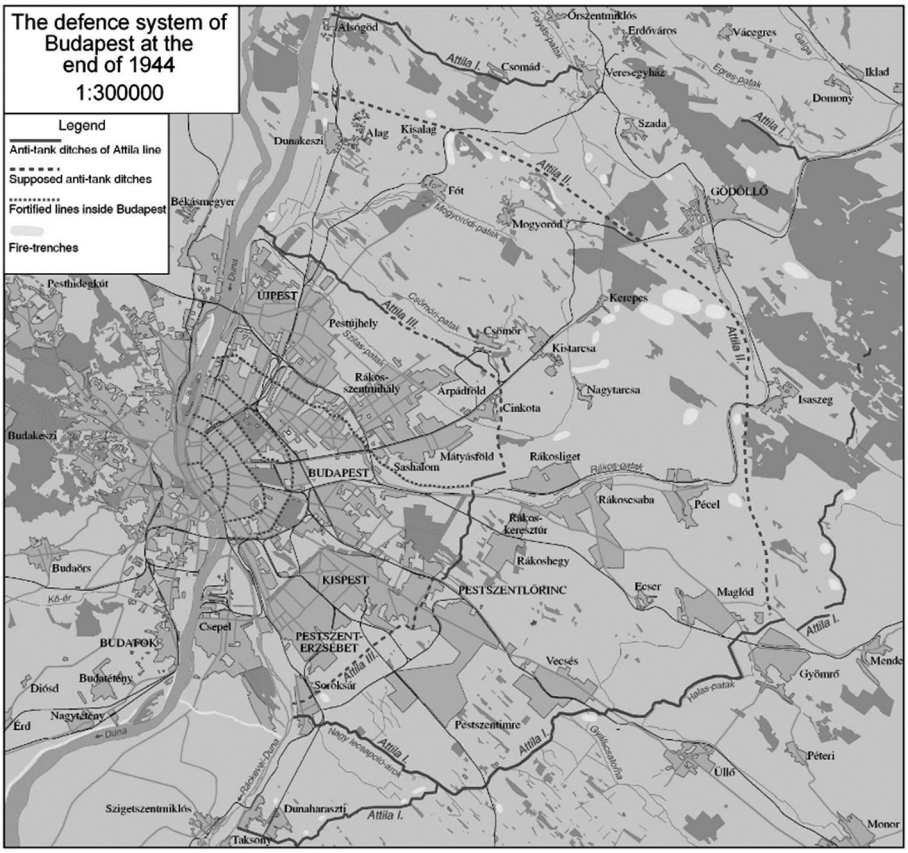

Figure 6. The reconstruction of the Attila–line. [8]

Secondly, it seems unambiguous that the Margaret–line has not got the same structure in the researched area as the other lines. Furthermore the position of the defense lines is in contradiction to earlier theories. (Figure 7 “A” and “B” line) We identified a complex system at the southern part of the investigated area. (Figure 7 “C” line) Probably, these objects are independent from the Margaret–line and built later during the “Conrad” operations’ period; our concept is also confirmed by an expert military historian. It seems that the western part of the identified system is parallel with another smaller ditch–system located south from Lake Velence (Figure 7 “D” line) and the distance between them is appropriate for the deep proportioned defense. In conclusion, we can declare that this defense system was created by the Soviets either at the same time or first the western part then later the rest. Since the Soviets expected the German counter–attack they tried to get ready to deter it and close the direction to the capital.

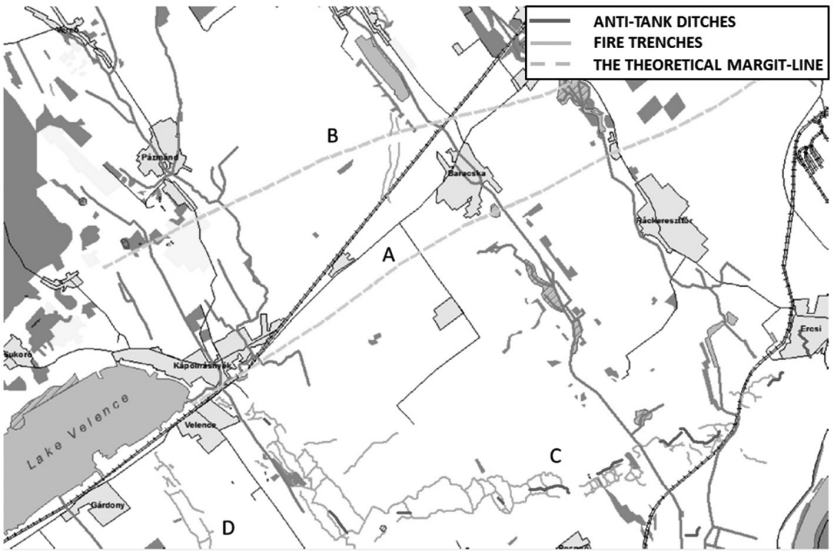

Figure 7. The reconstruction of the eastern part of the Margit–line. [9]
(A, B: the theoretical lines, C, D: the reconstructed lines)

Managing temporal data in military historical GIS databases

The possibilities of temporal data integration in GIS

As a step forward in processing archaeological data in geoinformation system, the next interesting challenge is temporal data management, considering that time has a very important role in these types of research. There are different ways to manage temporal data; first of all, the classical GIS solution, in which the temporal data is considered an attribute. However, there are special temporal databases, in which the geospatial changes in time defined as an entity or a feature (space–time composite, object oriented solutions). [10] In the latest versions of GIS software the temporal data handling is available (tracking analyst, animation); therefore we also investigated how we can use these possibilities in military historical reconstructions.

Representing the military events in GIS

On the one hand, the new possibilities of temporal data handling in GIS are useful and a significant leap forward, but on the other hand these advantages mostly improve only the data representation. In our opinion it is not necessary to apply completely new methods for symbolizing the various events and military objects. Moreover, it is recommended to use traditional military symbols. It means that we represent the front lines (line), the movements (usually arrow shaped polygons) and the fighting troops (the appropriate corps point symbol) the same way as it is represented on operational maps. The various animation possibilities have an important role in military historical reconstructions to represent dynamically the events and the connected objects after all. Hence in this chapter we discuss the three typical animated representation processes of GIS. The most important thing in connection with these

applications, that we have to work with, are time enabled data; namely the spatial objects must have an appropriate date or time attribute.

First of all, the simplest solution may be the 2D animation. In this case we use the general top–view with a topographic or a digital base map in the background for example, and only the event reconstruction's objects are animated. Naturally this type of representation is the most similar to traditional maps. However, it has a clear disadvantage: the possibility of the third dimension's visualization is not utilized. (Figure 8)

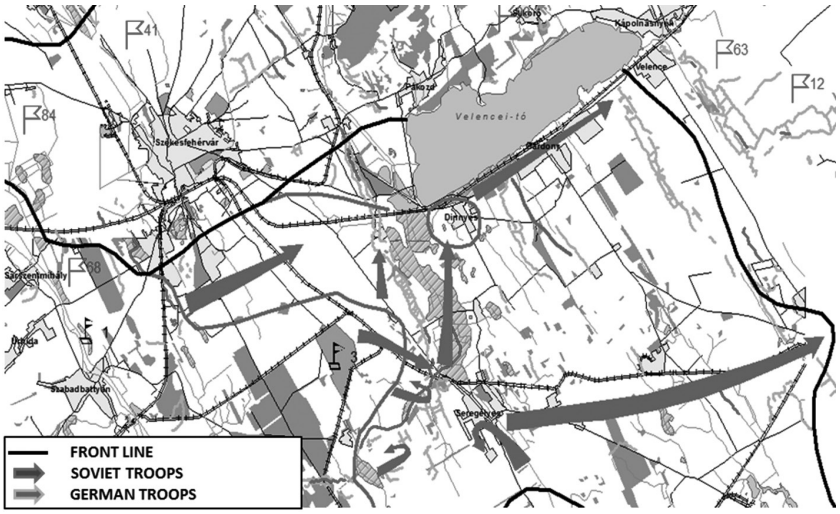

Figure 8. 2D military event reconstruction. [9]

As it is well known, the topographic surface has a very important role in strategy, so it seems obvious to create a digital terrain or a surface model and represent the military events in a 3D environment. This kind of visualization supports the research and the analysis or even the correction of the investigated events. The use of the traditional symbols can be adequate also in this case. (Figure 9)

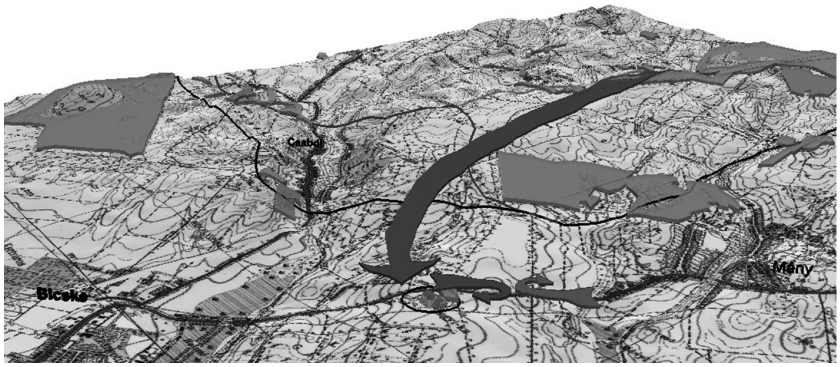

Figure 9. 3D military event reconstruction. [9]

Fortunately, there is also a possibility of 3D object integration in the latest versions of the applied GIS software. However, it is not suitable for high quality battle simulations of computer games, but we can create very useful representations of a smaller action or battle with the application of 3D tanks, cannons, trees or buildings. (Figure 10)

Figure 10. 3D military event reconstruction with 3D objects. [9]

Conclusions

Summarizing the experiences of the represented examples, we can declare the following:

- The geoinformatical methods can be effectively used in military historical process analysis and representation.
- These methods can support and complement the available operational maps and can be applied to confirm or deny previous archaeological or military historical examinations, theories.
- The results of the GIS reconstructions are authentic and convincing because of the objective data sources and the engineering type approach.
- The GIS have the potential to support archaeological and historical research.

Fortunately there is a rising claim in engineering type investigation in several human sciences that will have a beneficial effect on enhanced geospatial analysis.

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Survey on the flood–prevention of municipal governments during the Danubian flood of the century

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Given the risk of flood, inland water and local damage caused by water in Hun- gary, it is essential in most of the settlements to prepare for the protection of the inhabitants, the prevention and reduction of the damages. The protection against the damage caused by water — according to Law LVII of 1995 on water manage- ment — is the duty of the state organs and the local municipal governments. In this article I study the duties of the settlements on water damage defence according to the laws of local governments and water management. I analyse the application of the amended laws during the protective activity of settlements in Fejér County hit by the Danubian flood in 2013.

Keywords: *risk of damage caused by flood and inland water, local governmental protection, water damage defence.*

Introduction

Serious floods, inland water and local water damage has emerged in the country due to its geographical position and the remarkably extreme hydrological events of the past decade. The floods of the Danube, Tisza and in Borsod county, and the state–wide inland water and local water damage confirm that the settlements, in addition to the central state organs, have essential duties in water damage defence on behalf of the protection of human life and ma- terial goods.

Based on statistical averages in Hungary we can expect small or medium floods every two or three years, significant ones every five or six years and extraordinary floods every ten or twelve years.

While 25% of the country's territory is directly at risk to floods, overflows can emerge in any settlement of the country at any time of the year due to extreme weather conditions risking the inhabitants' life and their property's safety. [1]

Protection against water damage includes rampart construction, maintenance, operation and prevention which — according to the law on water management — are the duties of the state [3: para. 16 (1)] [3: para. 35 (1) b)], the local governments and the parties concerned with damage protection or removal.

Consequently, the accomplishment of the defence work is highly complex and it has tech- nical and administrative duties. The foundation of task execution in a unified system is the precise legal regulation which is indispensable for effective defence.

In the article I examine the alteration of municipal governments' defence activity during water damage defence based on the regulatory amendments.

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The regulatory provision of local governments' duties of water damage defence

The most essential rule regulating the operation of the municipal governments of the settle- ments was adopted after the declaration of the Supreme Law. This rule alters the relationship between the local governments and the state management. The law regarding the local gov- ernments of Hungary, 2011. CLXXXIX (Act CLXXXIX of 2011 on the local governments of Hungary — Magyarország helyi önkormányzatairól szóló 2011. évi CLXXXIX. törvény [hereinafter:] Mötv.), relies on the previous municicapl governing regulations, but the role of the government was strengthened, the former legal control was replaced by a legal supervi- sion assuring strong intervention possibilities. Concurrently the economic autonomy of the local governments was given administrative limits. Mötv has transformed the system of local governance duties, and the provision of the compulsory duties has been emphasized in the new law. The assurance of voluntary and assumed tasks has been subjected to conditions by the new rule. [2]

As opposed to the rules of the previous Constitution, the new regulation puts an em- phasis on the character of the local governments within the civil service, and its close cooperation with state management. In addition to all these state management control has become stronger. The Mötv. — as opposed to the former law — does not include an ite- mised list of duties to be accomplished compulsorily by every local government, it only gives a task "menu" and its frame is filled with content by the sectorial laws. According to the new regulation the compulsory tasks of the municipal governments have tightened significantly. [2]

The law enumerates water management and water damage defence among local public affairs and local governance tasks accomplished among the locally assured public duties. [9: para. 13 (1) 11.] The local governmental law and the law of water management also define the water damage defence, and flood and inland water drainage as a local governance duty. [3: para. 4 (1) f)]

According to the law of water management it is the duty of the local governments to establish defences on behalf of at most two settlements, to maintain and improve them and to accomplish their protection. Their further duties are building and maintaining defences in periphery and inner–city areas and to implement defence on them to prevent damage caused by floods of brooks and channels, in addition to rainfall and other water. [3]

Local governance duties in connection with defence

Period of preparation

The first and most important step of preparation for the duties of water damage defence, as defined by the regulations, is the completion of the necessary plans on behalf of prevention after the identification of the level and risk of endangerment. The water authorities provide the required data for the completion of the plans with appropriate professional content and they give the needed help for the assembly of the defensive supplies. [4: para. 9 (1–3)] The completed water damage defence drafts are approved by the water authority in its territory

of professional guidance and a copy of it is given to the mayor's office and the water authority. [5]

On the basis of what was written previously, forming the required amount of defence supplies, as predefined in the settlement, is also the duty of the settlement itself. These con- tain those instruments and technical materials that might be necessary to combat the ensuing flood. Supplies that can be minimally expected: pumps, sandbags, shovels, planks, rubber– boots, raincoats.

The technical materials are not worth much if there is no operative staff delegated to them. In the settlements, after the classification into the disaster protection departments, the obligatory civil defence organizations are established according to the level of risk.

Technical damage liquidation subunits need to be established in every settlement and water damage defence is among their duties. The mayor should organize citizens into civil defence organizations with economizing orders. After their establishment, the organizations have to obtain basic and professional training on where they can acquire the necessary knowl- edge, on the basis of which they can accomplish their duties. In the settlements, training has to be organized periodically for the civil defence organizations where they can extend their previously acquired knowledge.

Period of defence

In the settlements, the state management tasks related to the flood and inland water defence are controlled by the mayor (lord mayor) and he participates in the execution of the tasks published in the resolutions issued by the defence committee of the county. The mayor's duty in the settlement is registering and providing the workforce — including the men posted in the civil defence organization and the public workers — materials, tools and equipment for defence, furthermore the general supply of those who participate in the defence — including the men posted in the civil defence organization and the public workers.

In case of evacuation it is the mayor's duty to organise the execution of evacuation, rescue and return. He has to arrange proper measures in connection with life and property insurance and take other steps necessary for the rescue. Moreover he is responsible for the participants' health provisions, the measures for the prevention of epidemics during the procedures of evacuation, rescue and return and for the cooperation of the health administrative body. He is responsible for the arrangements taken in connection with the damage which occurred during the flood, inland water or defence, and alos the collection of the required bills and execution of the confirmations. [6]

Period of reconstruction

After finishing (or during) the defence, it is the settlements' duty to put in a claim on the basis of the relevant laws. The defence and reconstruction costs are assured by the "act of God" clause. The reconstruction process after water damage starts with disinfection. In this case the release of the properties is accomplished by the inhabitants under the professional guidance of the general health administrative department of the government office with the cleaning accessories provided by the local government. For the disinfection of the public domain and roads high–performance cleaning machines are needed which are available at the food safe-

ty and animal health board of the government. In such instances the disinfection tasks are coordinated by the county defence committee who involve the settlements in this progress.

If water related damage occurred in private real estate, buildings of the local government or roads it is necessary to estimate the damages beyond the 'act of God' clause declaration of loss. The group of experts for the assessment of damages are appointed by the chairman of the county defence committee who do the damage estimate after agreeing with the set- tlements. After the damage estimate and stating the form and extent of the mitigation of damages the mayor of the settlement makes a contract on how to relieve the damages of the injured parties. In this case the contracting is the duty of the settlements. The process of re- construction closes with the checking of the degree of the damage mitigation.

The defensive operation of the settlements in Fejér County hit by the Danubian flood of 2013

Preparation for the flood defence

Between May 30 and June 3 of 2013 there was a huge amount of rainfall, above the regional average, on the drainage area of the Danube and its effluents, in Bavarian and Austrian ter- ritories and consequently the Danube hit a new the highest water level (hereinafter: HWL). According to the forecasts they had to prepare for the highest flood protection of all time on the Hungarian parts of the Danube.

In consideration of the emerging serious situation a special meeting of the Defence Com- mittee of Fejér County (hereinafter: DCFC) was called by its chairman on 4 June. The com- mittee made decisions on starting the necessary tasks for the residents' protection. The local authorities issued the DCFC resolution to the flood–hit Dunaújváros and Martonvásár district Local Defence Committees (hereinafter: LDCs) who held their meetings as well. The mayors of the settlements hit by the flood and the representatives of the state management and local governing organizations participating in the defensive works were also invited to the meet- ings and they were given tasks by the LDC. These tasks were moving the permanent residents from the areas endangered by the flood, sectionalizing of the public utilities towards the pro- viders, orders for building temporary ramparts, ensuring protection of the empty properties and an increased degree of public safety.

According to the forecasts on the county's part of the Danube the water experts, the peo- ple participating in the defence and the affected local governments had to prepare for a cul- mination exceeding the HWL. The mayors of the settlements hit by the flood and the experts of the Central Transdanubian Water Directorate (hereinafter: CTWD) knew the area was to be exposed to the flood, and this was a great help in the preparation. Protection had to be ensured in Ercsi, Adony, Rácalmás, Kulcs, Baracs, Kisapostag and the city of Dunaújváros.

From two o'clock pm on 5 June the director of the Disaster Management Directorate of Fejér County (DMDFC) roused the Emergency Controlling Centre to action in continuous 24–hour shifts with the purpose of the coordination and control of the flood preparation tasks. Continuous duties were ordered for the guidance of the defensive tasks in the headquarters of the LDCs.

Accomplishment of the defensive duties

The system of the defence direction made the regional and local decisions in time on the basis of which the defence of the settlements started and were in progress at the arrival of the flood. For the execution of the resolutions the mayors' positive attitude in the affected areas and the defence controllers appointed from the executives of the disaster protection directorate, who were appointed by the chairman of the DCFC based on the suggestion of the disaster protection director, were needed. [7: para. 13] CTWD provided experts for every settlement to support the technical tasks of the defence beside its duties accomplished in the state line of defence (in our county it is the part of the main road 6 between Ercsi and Kulcs). This largely improved the proficiency of the defence.

The local organization and system of defence direction were new for the mayors and the defence committees as well. [8: para. 27–28] In spite of this it worked properly and the orders set in the LDCs resolutions were accomplished entirely in the settlements. The employment of disaster protection officers appointed to disaster protection leadership increased the effi- ciency of the defence work in the settlements.

On site the disaster protection officers, the mayors and the water experts accomplished their duties at a high level of proficiency and consequently the evacuation of the inhabited land properties occurred in time and the building of the line of defence was accomplished trustworthily.

The organization of the work of the professional associations, volunteers and public workers defending the settlements, the distribution of the duties and their provision and ar- rangement required a high level of coordination and organization. The number of the work- force needed for the defence and the availability of materials and tools in appropriate quantity and quality were also essential. The task of the leaders of the settlements was very significant and indispensable in this duty system. This work could be accomplished in the most effective and successful way in this form of organization and control.

Accomplishment of the defensive duties at the time of danger

The flood exceeded the HWL in the county's section of the Danube at 10 o'clock on 10 June (762 cm at the water–meter in Adony, the HWL was 739 cm till then). The Government in its order 191/2013 (VI.10.) proclaimed an emergency in Fejér county for the district of Marton- vásár and Dunaújváros from 12 o'clock on 10 June 2013.

After the proclamation of emergency the disaster protection officers took over the leader- ship of the defence [7: para. 46 (3)], the leaders of the settlements and the mayors helped and provided the necessary resources. Those settlements where the defence and reconstruction was effective were characterized by the cooperation of the disaster protection officers and the mayors of the settlements working properly and thus contributing to the efficiency.

Summary

In Hungary due to extreme weather and water movement there has been a struggle against the damage caused by floods for centuries. In the past decades defence has given continuous tasks to the water organizations, disaster protection, the local governments and the inhab-

itants as well. The defencelessness against the damages could be decreased by collective effort. For this, it is necessary for the governing bodies and the individuals to take steps in their own territory. For the successful accomplishment of the defence duties the participants are required to work in a unified system. Necessary laws were passed in the fields of defence management, disaster protection, the local governments and the duties of water damage de- fence, the legal foundations are available for the unified accomplishment of the defence.

In the article I studied the defence work of the municipal governments in the altered legal environment in the period of preparation, defence and reconstruction. As a result of the legal environment's change a unified system was established in the field of organization and con- trol. In fact water damage defence is not an isolated activity but integrally connected to the local governments, the disaster protection tasks and the defence management system.

In a later part of the document I analysed the tasks achieved by the local governments in Fejér County during the Danubian flood of 2013. I established that the system of defence management has been altered on the basis of the laws which focused on a unified system. The opportunities of the defensive system have expanded with the increase of the defence scales and a broader society can be included in the duties. Every condition of defence was available in the period of the particular law and order in the framework of the legal possibilities. Due to the forecasts that the weather is becoming more extreme in the ensuing years we can expect smaller or bigger floods. Flood protection can be successfully accomplished according to the valid laws.

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Supporting Emerging States: Kosovo — Hungary Relations after the Independence of Kosovo

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Emergence of new states is a rather complicated concept of an international sys- tem that entails political as well as legal implications. As Danilo Turk clearly points out:
"Legal issues arising from dissolution of states, emergence of new states and rec- ognition of the latter require a thorough understanding of the relevant facts. While it is obvious that any legal discourse must proceed from firm factual foundations, it is necessary to emphasize the importance of the circumstantial dimensions of the issues, given that the views on the pertinent facts usually diverge, at least during the policy making stage". [1]
Indeed, the recognition of emerging states needs a profound assessment and com- prehension of facts, historic and political circumstances, especially the factual reality; the latter sometimes supersedes eventual legal disputes. However, the fac- tual reality, if legitimate, as in the case of Kosovo is something that should not be ignored but rather supported, especially in the state building process. Hence, the paper will give a depiction of the case of the independence of Kosovo as a sui generis *case, and will continue with an outline of the Hungarian support, namely the evolvement of Kosovo-Hungary bilateral relations after the declaration of independence. The paper will tend to highlight the fact that the support of Kosovo as an emerging state, serves peace and long–term stability, regional development and other integration processes. It contributes to regional security, as well.*

Introduction

In the 1990's the political events in Europe and other parts of the world caused boarder changes in many countries. The Berlin Wall collapsed, East and West Germany were united after many years of division. These years note the dissolution of the Soviet Union and con- sequently the emergence of twelve independent states. It is this period that also marks the beginning of the disintegration of the Socialist Federative Republic of Yugoslavia[2] which due to inter–ethnic tensions and unsolved issues led to a bloody war. Peace agreements were concluded after the wars in Yugoslavia and these resulted in full international recognition of the new states. The creation of these states was legally supported by the Arbitration Commit- tee known as the Badinter Commission which was set up by the Council of Ministers of the European Economic Community (EEC) on 27 August 1991. [2] The purpose of this commis- sion was to provide legal advice and criteria for recognition to former Yugoslav republics.

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2 Yugoslavia consisted of six republics: Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro and Macedonia and two autonomous provinces Kosovo and Vojvodina

The case of recognition of Kosovo however was far more legally and politically complicated, even though both, Kosovo and Vojvodina, after the constitution of 1974 were largely equal to the republics of the Yugoslav federation. Kosovo declared its independence in 2008.

The case of Kosovo is a *sui generis* case for a number of reasons: first, Kosovo was con- fronted by systematic and contionous human righs violations for many years by the regime of Slobodan Milosevic. Second, the intervention of NATO was a humanitarian one. Third, Kosovo was under UN administration according to resolution 1244 that provided a legal and constitutional framework that created all parameters, features and preconditions for a new state. Furthermore, the International Court of Justice (ICJ) confirmed that the declaration of independence did not vioate international law. Supporting independence for the Republic of Kosovo was therefore the right step to take, and Hungary along with the majority of EU and NATO members with this support put down the cornerstone to peace and stability in the Balkans.

Declaration of independence and formal recognition

On 17 February 2008, the Parliament of Kosovo declared Kosovo an independent and sover- eign state. The Government of the Republic of Kosovo pledged to comply with the Ahtisaari Plan given that the lengthy process of negotiation and diplomatic efforts did not succeed either to bridge the gap between Kosovo and Serbia or to secure a new resolution within the UN Security Council. The declaration, the independence as such, was unilateral however; this action was taken in full consultation and accordance with international actors, namely the US and the majority of the most eminent European states. The Republic of Kosovo, up to now, has been recognised formally by 108 states out of 193 UN Members, 3 out of 5 UN Security Council (UNSC) Permanent Member States, 23 out of 28 European Union (EU) Member States, 24 out of 28 NATO Member States. [3] The Republic of Kosovo is a full member of the The World Bank, International Monetary Fund, and the International Bar Association. [3]

International Court of Justice's advisory opinion on Kosovo

The International Court of Justice, with a compelling vote of ten to four, advised on 22 July
2010 "that the declaration of independence of Kosovo adopted on 17 February 2008 did not violate international law". [4: para. 123 (3)] Basically, the court concluded that the "that the declaration of independence of 17 February 2008 did not violate general international law". [4: para. 84] Furthermore, the Court's advisory opinion was clear as far as the UN Security Council Resolution (UNSCR) 1244 was concerned, as it stated that: "the declaration of inde- pendence did not violate Security Council resolution 1244(1999)" it reaffirmed that UNSCR
1244 "was essentially designed to create an interim regime for Kosovo... [4: para. 119] The resolution did not contain any provision dealing with the final status of Kosovo." [4: para. 114] These statements of the court clearly confirmed that the Declaration of Independence is legal and legitimate. The ICJ went further on to declare that the circumstances that led to the Dec- laration of Independence of the Republic of Kosovo are exceptional; unique, therefore the case of Kosovo is *sui generis*.

The Court presented factual and legal circumstances that are unique to Kosovo and those are: non–consensual and violent break–up of former Yugoslavia; the adoption of UNSCR
1244 to put an end to armed conflict in order to resolve the humanitarian crisis in Kosovo; the period of UN interim administration; and the exhaustion, after many years, of all avenues for a negotiated solution with the Government of Serbia. [5] This pattern of facts applies only to Kosovo. The specificity of the Court's ruling cannot serve as a precedent for other situations. This means that, efforts to portray the Court's decision as "opening Pandora's Box" are mis- leading and incorrect. [5]

Kosovo-Hungary Relations after the Independence of Kosovo

Considering the status quo and the prolonged UNMIK administration in Kosovo was not sustainable anymore in relation to the newly created reality in Kosovo after the declaration of independence on 17 February, 2008, and having seen that the diplomatic efforts to attain an optimal mutually accepted solution from both sides were exhausted, the Government of Hungary, in its session of March 19, 2008, decided to recognise the independence of the Republic of Kosovo. Consequently, the Minister of Foreign Affairs, Göncz Kinga requested the presentation of the proposal to the President of the Republic of Hungary, Sólyom László to establish diplomatic relations with Kosovo. [6] This stance of Hungary was in compliance with the majority of EU countries while this foreseeable step was proclaimed even before. During the Visegrad summit in Ostrava, in the Czech Republic, the prime minister of Hun- gary at that time, Gyurcsány Ferenc stated that Kosovo's drive towards independence is irreversible, adding that independence should occur with the EU's assistance. He stressed that no peace can be maintained in the Balkans without the realistic options of autonomy and independence while Kosovo is an EU matter and should not be abandoned. The prime minister expressed his belief that there was a good chance for the European Union member states to establish a common denominator regarding the future of Kosovo. [7] The Hungarian foreign policy towards Kosovo reflected a clear position: [8] the independence of Kosovo serves peace and long term stability, regional development and other integration processes. The ICJ advisory opinion will not affect the supportive approach of Hungary towards Koso- vo. With the recognition of Kosovo, Hungary was in line with the standpoints of the majority of EU and NATO member states. The resolution of the final status of Kosovo constitutes a *sui generis* case that did not create a precedent in other unresolved situations. Hungary con- sidered the principles and values determined in the Ahtisaari Plan such as democracy, rule of law, market economy and above all the rights of ethnic communities as highly important. Hungary followed the implementation of these principles through the International Steering Group for Kosovo (ISG).[3] Hungary valued the readiness of the Kosovo leadership to closely cooperate with the International Community. Most importantly, Hungary contributed and continues to contribute to the increase of regional stability and security amongst others with its participation in KFOR and EULEX.

3 The International Steering Group for Kosovo (ISG) was an organization formed pursuant to the Ahtisaari Plan concerning the Kosovo status process. It was set up to guide Kosovo's democratic development and promote good governance, multi-ethnicity and the rule of law.

The FIDESZ[4] win of the general elections of 2010 in Hungary did not change the foreign policy towards Kosovo, on the contrary, the intensification of bilateral relations and support was deepened in the years to come. It is important to stress that the Government of Hungary was always clear in its relations with Kosovo and Serbia given the political sensitivity of rela- tions with the latter. It has always considered the relations with both countries as very import- ant but separate at the same time. Hungary is fully engaged in advancing bilateral relations with Serbia and has stated that the recognition of independence should not be an obstacle in these relations, while it considers that Kosovo issues should not affect the development of the relations between Serbia and the EU. Being a neighbouring country of Serbia, Hungary is committed to support Serbia in its EU integration path.

During the Hungarian EU Presidency, one of the most important topics of the agenda from the perspective of Kosovo, certainly was the support of EU enlargement and good neighbourly relations policy. This approach was welcomed from Kosovo as Hungary sup- ported the further enlargement process trying to ensure thus an integration perspective for the Western Balkans. In this context, the conclusion of accession negotiations for Croatia, has been highly positive and hopeful and an inspiration for Western Balkans countries. In this light, the statement of the State Secretary, Németh Zsolt, that the accession of Croatia was possible, ultimately suggests that the accession of other Western Balkans countries is possi- ble too, including Kosovo and so this was very encouraging. [9]

The deepening and advancement of bilateral relations and the continuous Hungarian sup- port have further strengthened the subjectivity of the statehood of Kosovo. The bilateral relations between Kosovo and Hungary experienced an immense intensification especially after the establishment of the Embassy of Kosovo in Budapest in early 2010. These relations marked the realization of high level bilateral visits[5], a high number of bilateral agreements[6] were signed, many more were initiated while there was a continuous exchange and cooper- ation in different projects. Hungary, being an excellent example of successful transition and integration had a lot of expertise to offer and it demonstrated this through continuous support and guidance in different projects, and other forms of collaboration.

From political cooperation towards the economic one

As it is widely known, economic diplomacy is a driving force of relations between states. Slowly but surely, the relations of Hungary and Kosovo started to pave the path in the eco- nomic direction, as well. One of the highly significant activities that marked an advancement of bilateral relations beyond a political dimension was the organization of the Economic Fo- rum under the patronage of the Prime Minister of Kosovo, Hashim Thaci, as a part of Koso- vo's Government for investment promotion.[7] The Economic Forum took place in Budapest with the presence of the Hungarian Prime Minister, Orbán Viktor. The key objective of this Forum was to promote investments in Kosovo and to boost economic and trade cooperation between Kosovo and Hungary. This event, apart from the highest political representation,

4 Federation of Young Democrats–Hungarian Civic Alliance, Fiatal Demokraták Szövetsége–Magyar Polgári Szövetség

5 See annex I for the chronological list of high level bilateral visits.

6 See annex II the list of bilateral agreements in the annex of this paper.

7 Economic Forum was facilitated and organized by the Embassy of Kosovo in Budapest in 13 June 2012

gathered a high number of business representatives from Hungary and Kosovo. In addition, in the margins of this rather big event, three important agreements in the field of trade and economy were signed:

1. Cooperation Agreement between Customs of Kosovo and Tax Administration and Customs of Hungary;
2. Cooperation agreement between Kosovo Agency for Investment Promotion and Hun- garian Agency for Trade and Investment;
3. Cooperation Agreement between Kosovo Economic Chamber and Hungarian Cham- ber of Trade and Economy.

The signing of the respective agreements is firstly important for the support of economic activities of both countries, secondly important for the encouragement of the effective coop- eration of the business community and thirdly the agreement is important for the promotion of concrete and efficient collaboration of business representatives. These factors along with strong political support, were clear indicators that Kosovo and Hungary were moving on the right track and will provide fruitful results in the economic field in the very near future. Hungary and Kosovo at the political level agreed to foster economic relations and to fur- ther explore market and cooperation possibilities. This particular economic forum gathered around 160 participants out of which around 80 business representatives were from Hungary and 30 from the Republic of Kosovo. Hungary has pledged economic cooperation with the Western Balkans, Kosovo in particular. Accordingly, in the framework the Hungarian Cham- ber of Commerce, it created the Committee for Western Balkans responsible for promoting economic relations with the countries of the Western Balkans. Consequently, in order to come to more concrete terms of economic cooperation, the Embassy of Kosovo in Budapest, on December, 2013 in cooperation with the Hungarian Chamber of Commerce and Industry supported by the Ministry of National Economy of Hungary organized the second economic forum in Budapest as a follow up of the previous economic forum with the primary aim to update the Hungarian business community and other interested parties with the privatization offers in Kosovo as well as the business climate and investment opportunities in the Republic of Kosovo. Conclusively, diplomatic relations between Kosovo and Hungary at the political level are excellent while at the economic level, more efforts should be invested in order to bring them to the mutually desired level. Hungarian investments and export is mainly on infrastructure, IT, construction and food products. According to Orosz György, director of the department for Global Economy, Ministry of National Economy of Hungary, in 2010, Hungarian export to Kosovo was 27.1 milion euro while Kosovar export to Hungary was 0.1 milion euro. [10] In 2011, Hungarian export to Kosovo was 31.8 milion euro whereas Koso- var export to Hungary was 0.2 milion euro. In 2012, Hungarian export to Kosovo was 31.4 milion euro whereas Kosovar export to Hungary was 0.15 milion euro. In 2013, Hungarian export in Kosovo was 32 million euro whereas Kosovo's export to Hungary was 0.6 (the figures of 2013 are approximate, they will be exact in 2014). Advancement through the years has been noted, however, both countries believe it should be upgraded in the future.

Conclusion

According to international law the international legal criteria of statehood are: a) a perma- nent population b) a defined territory c) government and d) capacity to enter into relations with other states. The Arbitration Commission of the European Conference on Yugoslavia in Opinion No. 1 in a similar way declares that " the State is commonly defined as a community which consists of a territory and a population subject to an organised political authority" and that "such a State is characterized by sovereignty". [11] The above mentioned criteria are clearly met in the case of Kosovo and the righteous act of recognition concords with the majority of EU and NATO member states and support only increases security, peace and stability. The best supportive approach of an emerging state such as Kosovo is luminously described through a metaphor used by Tóth Zoltán in the article: *Kosovo by the authority of ballot, not the force of the bullet*, which states that:

"After conception the new life grows in the mother's womb. The 'nasciturus' state is fol- lowed by the birth of a new person or by nothing. The newborn baby tries to adapt, forced by the new conditions. The parents are usually happy but the neighbours are not always glad with the newcomer. Once, a phrase is heard from a relative: "the baby is walking, is he…!" Can a born baby be considered non–existent? The world says clearly: someone born shall live! But, under what circumstances? Starving and in dictatorship? The minimal expectation of an idealist is starving and in a democracy. The opinion of relatives is variable. Their indi- vidual interests form their standpoint. The doctor involved in the birth, the midwife, and then the nursery and kindergarten educator, the school teacher, as EXPERTS no longer look for the cause of existence but the quality of life: what will this kid become? Will he become an ambitious useful person, or ballast that needs support and solicitude?!" [12]

As this metaphoric paragraph indicates and is described in this paper, the emergence of new states as well as their recognition need a profound understating of not only the legal as- pects, but legitimacy along with political and historic circumstances, as well. Factual reality should not be ignored but rather approached constructively with the aim of upholding the values of democracy, whilst marinating peace and stability. Therefore, the establishment of diplomatic relations between Kosovo and Hungary, is a constructive approach and with co- operation at all levels contributes to the further development of a stable, European–oriented, multi–ethnic and democratic state of Kosovo.

Annex I:

HIGH LEVEL BILATERAL VISITS [13]

- December 22, 2011 Hungarian President Mr. Schmitt Pál visited Hungarian military units within the KFOR and met with President Jahjaga;
- January 18–19, 2012 Official visit of the President of the Parliament Mr. Kövér László in Prishtina;
- April, 2012 Protection and the Rule of Law Commission of the National Assembly of Hungary visits Prishtina;
- September 10, 2012 State Secretary for Foreign Affairs Mr. Németh Zsolt took part in the completion of supervised independence by the International Steering Group (ISG);
- November 16–17, 2012 Minister for Rural Development Mr. Fazekas Sándor visits Kosovo;
- April 08–09, 2013 Political Director of MFA Mr. Sztáray Péter, visits Kosovo;
- April 10–11, 2013 Chairman of the Foreign Affairs Committee of Parliament Mr. Balla Mihály visits Kosovo;
- November 26–27, 2013 Vice President of the National Assembly of Hungary Mr. La- torcai János, visits Prishtina on the occasion of the conclusion of the twinning program with Kosovo Assembly funded by the EU;
- December 12–14, 2013 Visit of the Minister of Defense Mr. Hende Csaba to meet Hungarian soldiers serving in the KFOR;

VISIT OF SENIOR OFFICIALS OF KOSOVO TO HUNGARY

- February 20, 2010 Minister of Agriculture and Rural Development Mr. Idriz Vehapi's official visit to Hungary;
- March 29–30, 2011 Official visit of Chairman of Parliament Mr. Jakup Krasniqi in Hungary;
- June 3, 2011 Official visit of Minister for European Integration Miss.Vlora Citaku in Budapest;
- September 14, 2011 President of the Republic of Kosovo Ms. Atifete Jahjaga conducted an official visit to Budapest;
- October 11, 2011 Chairman of Parliament Mr. Jakup Krasniqi takes part in the fifth Conference of the Parliaments of the Western Balkan countries in Budapest;
- February 27–28, 2012 Visit of the Mayor of Prishtina Mr. Mustafa in the municipality of Budapest;
- June 13, 2012 Kosovo Republic's Prime Minister Mr. Hashim Thaci opens the Eco- nomic Forum "Business and Investing in Kosovo" in Budapest and met Hungarian Prime Minister Mr. Viktor Orban. The forum was also attended by the Minister of Economic Development Mr. Besim Beqaj and Minister of Trade and Industry Ms. Mimoza Kusari Lila;
- May 24–25, 2013 Minister of Public Administration Mr. Mahir Yagcilar visited Hun- gary;
- October 8, 2013 Chairman of Parliament Mr. Jakup Krasniqi takes part in the sixth Conference of the Parliaments of the Western Balkan countries in Budapest;

- October 8, 2013 Minister of Environment and Spatial Planning Mr. Dardan Gashi took part in the World Water Summit in Budapest;
- October 31, 2013 Vice Foreign Minister Mr. Petrit Selimi attended the summit of the Visegrad Group on the Western Balkans;
- November 11–12, 2013 Minister of Agriculture and Rural Development, Mr. Blerand Stavileci visited Hungary;
- 10–12 February 2013 Minister of Diaspora Mr.Ibrahim Makolli visited Hungary;

MEETINGS OF SENIOR KOSOVAR AND HUNGARIAN OFFICIALS AT MULTI- RATERAL EVENTS

- September 26, 2012 Foreign Ministers Mr. Enver Hoxhaj. and Mr. János Martonyi meet on the margins of the session of the General Assembly of the UN;
- November 23, 2012 Foreign Ministers Mr. Enver Hoxhaj. and Mr. János Martonyi meet on the margins of the Conference of the Aspen Institute in Berlin;
- April, 2013 European Integration Minister Miss.Vlora Citaku meet with Secretary of State for EU Affairs Ms. Eniko Győri in Brussels;

Annex II

KOSOVO HUNGARY BILATERAL AGREEMENTS AND THEIR STATUS[8]: Implemented:

- Repatriation Agreement;
- Agreement on cooperation between the National University Library of Kosovo and the National Library of Hungary;
- Agreement of Cooperation on Customs;
- Memorandum of Cooperation between the Chamber of Economy and Industry of Hun- gary and Kosovo Chamber of Commerce;
- Cooperation Agreement for the fight against terrorism, drug trafficking and organized crime;
- Memorandum of Cooperation between the Agency for Investment Promotion of Koso- vo and the Hungarian Agency for Investment and Trade;
- Agreement on the Elimination of Double Taxation;
- Cooperation Agreement between the Central Election Commission of Kosovo and the Association of European Election Officials ACEEEO;
- Cooperation Agreement between the University of Prishtina and the Corvinus Univer- sity of Budapest;
- Cooperation Agreement between the University of Prishtina and St. István Univeristy, Gödöllő;
- Agreement for Cooperation between the public television of Hungary and Republic of Kosovo;

8 Idem

- Cooperation Agreement between the German speaking Andrássy University and the University of Prishtina;
- Cooperation agreement between the Hungarian Office for Migration and the Depart- ment of Citizenship, Asylum and Migration of the Ministry of Interior of Kosovo;
- Cooperation agreement between the Kosovo Diplomatic Academy and the Hungarian Institute for International Relations;

EXPECTED TO BE SIGNED:

- Agreement on Mutual Legal Assistance in Criminal Matters (initiated by the Kosovo side, negotiations have begun);
- Agreement of Cooperation in the field of European integration initiated, expected sig- nature);
- Agreement on international transport of passengers and goods (expected signature);
- Agreement of Cooperation between the National Museum of Hungary and Kosovo Museum (initiated, expected signature);
- Cooperation agreement between the Kosovo Authority of Civil Aviation and Civil Avi- ation Authority of Hungary (initiated, expected signature);
- Cooperation agreement between the University of Pristina and Semmelweis Universi- ty (medicine) (initiated, expected signature);
- Cooperation between the Institute for Social and European Studies of Corvinus Uni- versity and embassy of Kosovo in Budapest (initiated, expected to formalize cooper- ation);

EXPECTED TO BE NEGOTIATED:

- Agreement on Extradition (initiated by the Kosovo side, there is a positive response from Hungary to begin negotiations);
- Agreement on Transfer of Sentenced Persons (initiated by the Kosovo side, there is a positive response from Hungary to begin negotiations);
- Visa abolition agreement by holders of diplomatic passports; (initiated by the Kosovo side, expected response from the Hungarian side);
- Agreement on cooperation between the Ministry of Defence of Hungary and the Min- istry of Kosovo Security Force (initiated);
- Cooperation agreement between the University of Prishtina and ELTE University of Budapest (initiated, expected negotiation);
- Cooperative agreement between the National Archives (initiated by Kosovo Embassy in Hungary, expected negotiation);

TO BE INITIATED:

- Economic cooperation agreement, which preceded the creation of the Joint Economic Commission (expected to be initiated soon by Kosovo Embassy in Hungary);
- Agreement for cooperation in the field of education between the Ministries of Educa- tion in both countries (expected to be initiated soon by Kosovo Embassy in Hungary);
- Cooperation between Central Office for Administrative and Electronic Public Services (MIA) and the Civil Registry Agency of Kosovo (MIA) (expected to be initiated soon by Kosovo Embassy in Hungary);

- Cooperation Agreement between the State Agency for Personal Data Protection Au- thority of Kosovo and the Hungarian National Data Protection and Freedom of Infor- mation (expected to be initiated soon by Kosovo Embassy in Hungary);
- Cooperation Agreement between Emergency Management Agency (MIA) and the Na- tional Emergency Management Hungary (MIA) ;

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Methods and principles of unified personal protective equipment during chemical industrial catastrophes

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The chemical industry plays a key role amongst the industries in the economic powers that make the world turn. The future of developing countries — taking cur- rent issues into account — is based on their chemical industry, and so it has been undergoing a development at a substantial pace.
However, in these countries security is not interpreted similarly to developed coun- tries, and cases have shown that there might be problems (Venezuela, Amuay refin- ery fire, caused by a lack of maintenance). In a domestic context, a good example is the red sludge disaster that happened on October 4 in 2010. The civilian population of the affected area had to be evacuated and a number of civilian organization, non–professional and professional rescue organizations participated in the damage control. During the implementation of damage control, civilian organizations had to be equipped personally and protectively. The aim of this article is to show the cri- teria that determine the level of necessary personal protection in terms of efficiency.

Preface

Investigating the disasters, I have come to the conclusion that the care of personal protection after a disaster can be possibly overdone in many cases. Below, I examine the factors that may be taken into consideration during a chemical disaster to provide the proper protection of the participants according to what tasks they perform and in which capacity they are at the affected area. Taking the different modes of personal protection care into account, the protective equipment complying with both the population and non–professional rescue orga- nizations and professional rescue organizations can be determined.

The chemical disasters, characteristics of accidents and their place among the types of disasters

In 2011, Hungary's unified disaster management system underwent a major transformation. During the conversion, many basic laws were altered or recreated. A new Civil Protection Act was introduced, which already included the basic principles of civil protection. According to the Hungarian Act art. para. 3 (5) of Act CXXVIII. of 2011, the definition of disaster is: "An emergency is announced in a situation when people's life, health, financial assets, basic care of population, natural environment and natural assets are threatened in a way that the dam- age, prevention and the consequences exceed the possibilities of protection. So introduction of special action is needed. Furthermore, continuous and strictly coordinated cooperation is

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needed from the local government and the state authority. In addition, international assistance has to be included." [1]

The above mentioned act determines what the definition of disaster is. However it does not classify the disasters into categories. Hence, it can be found only in literature. The classification of disasters can be defined according to the following features:

1. character (origin);
2. extension;
3. speed of procession;
4. intensity;
5. according to space and time.

In this case, classification according to the character (origin) is the most expedient. On the basis of the character (origin) three additional subcategories can be differentiated:

A) Natural disasters

1. geological;
2. hydrological;
3. meteorological;
4. biological.

B) Artificial type of disasters

1. armed conflicts;
2. economic conflicts (crisis);
3. terrorist acts.

C) Civilizational disasters:

1. chemical;
2. nuclear;
3. biological;
4. social.

The artificial kind of disasters and civilizational disasters belong together due to the fact that they are caused by human acts in most cases. So they can be combined in a group. As for the causes, in terms of chemical disasters, they may be the results of either a direct or an indirect effect of a disaster. For example: an earthquake, willful or negligent human acts or errors. This last one can occur during design, construction or operation. Industrial disas- ters may occur due to technological failures, however it is becoming less common because of the high level of industrial development and the demand for high security. Although in developing countries, industrial accidents can occur owing to technological failures, which may escalate a catastrophe. In addition, the misapplication or misoperation of technology, when the technological equipment is not properly maintained, can lead to industrial disasters (for example, Amuay refinery fire in Venezuela, 2012.).

In order to explore the characteristics of industrial disasters we need to have an over- all picture of the different kind of factories and groups. Generally, there are characteristics that are common in all types of industrial disasters but the nature of the accidents differs. The chemical industry can be grouped on the basis of two criteria:

- characteristics of the materials used, based on their nature;
- according to the type of industry.

The materials used can be classified according to the perilous features of the substance. These could be flammability (explosive), or toxicity (dangerous for the environment). Perilous

features themselves do not necessarily need specific instructions during the procedure. It is im- portant to know the state of the substance, is it a gas, liquid (whether it goes with steam forma- tion or not) or solid. The nature and quality of the prevention depends on the state of substance.

As is usual, the chemical industry is divided into the following major groups:

- petroleum establishments (facilities);
- food establishments;
- general chemicals (such as detergents);
- pharmaceutical industries;
- agricultural chemicals (fertilizers, products of biocides and pesticides);
- military chemical (toxic gases, explosive materials).

After the classification of chemical facilities, the characteristics of each facility can be determined as either unique to a particular type of plant or organization, or more likely to occur. The specific feature of each chemical accident is the rapid formation and spreading. [2] While a flood can be predictable, well defined antecedents help in the detection. However, chemical accidents — in contrast with the above mentioned disasters — occur suddenly. Owing to the rapid formation, the event as a whole, cannot be considered as a particularly serious disaster (compared with an earthquake). However, due to rapid development, the set- ting of adequate forces and equipment for effective damage control and eradication is more difficult to implement. Thus the spread of damage is much easier. In addition, of course, there are events that take on a rapid and large size in a short period of time (e.g. the red sludge disaster). Material–specific equipment is required in the damage control of plant disasters. The equipment used by the intervening forces should be separately organized in order to determine how to approach the area of damage and what kind of procedural rules to use. The extent of the damaged zones alters quickly with a gas or vapour cloud. Thus appropriate pub- lic security should be provided (the execution of evacuation and sheltering, etc.). Changes of meteorology, and the environmental (terrain) conditions have a deep influence on the dam- aged zones. Therefore the exploration of industrial disasters are special. It is done accord- ing to a uniquely structured procedure (meteorological observation, material identification etc.). Original causes should be taken into account during the damage control of industrial disasters. Certainly, the precise circumstances cannot be defined in many cases, however the management of the factory can give an explanation roughly for the original conditions. The reasons of formation can be divided into two major groups: internal and external factors. An external event may lead to an external factor that affects the normal condition of the institu- tion. Moreover, it could result in the malfunction of the establishment.

These events could be:

- domino effect, other disasters (natural disasters), the effects of accidents;
- failure of related infrastructure;
- deliberate human acts (e.g. terrorist acts).

The group of internal factors is related to certain designers or the institution itself. Errors arising during design, construction and operation have been proved to be causes of a disaster. Internal factors can be classified in the following way:

- design errors (insufficient capacity of certain structures);
- construction errors (deviation from plans, installation of low quality materials);
- violation of operational rules;
- other reasons (e.g. experimentation). [3]

Staying on the industrial damaged zone, grouping and tasks

Industrial damaged zones cover the industrial area and in many cases the harmful effects extend over the fence and threaten dwellers' lives. For effective damage control, the rescue organizations should cooperate with the factory workers and the factory management. Be- yond the mitigation and prevention of the spreading damages, inhabitants should be settled in designated safety zones.

The organization and implementation order of the emergency largely depends on the situation after damage, the environment, the state of surrounding establishments, the damage caused to public works and what type of risk should be eliminated. For instance, during a petroleum storage tank fire it is enough to order sheltering, but in case of an escape of a toxic vapor, sheltering may not be sufficient as a protective measure for the population. [4]

Based on the participation in the rescue work, attendants could be divided into three groups:

- civilians;
- factory workers, non–professional rescue agencies, organizations;
- professional rescue organizations.

Next, I will take stock of the recovery and rescue work that characterize factory damage. Then I will look into the implementation that should be done in the damaged zone. During factory disasters the following tasks need to be performed:

- alerting factory workers and the affected population;
- technical exploration, searching for victims and determination of possible perilous sources;
- saving lives, saving the wounded under the ruins;
- localization and extinction of the fire;
- localization and instant restoration of utility and power cables;
- opening gateways to the disaster zones and preparing work areas for the application of machinery;
- taking vulnerable establishments and buildings into account;
- elimination of unstable structures and perilous sources of danger;
- first aid and relocation of the population.

Hereafter, I am going to detail the obligations and tasks of those affected by the industrial catastrophes. The above mentioned enumeration implies a general task. The determination of the detailed tasks largely depends on the situation and the guiding of the damage prevention. However the execution of rescue works happen in the above mentioned logical order in all cases.

Civilian population

The task of the civilian population can easily be described. They have to collaborate with the rescue organizations and execute the tasks set by them. On an area contaminated with poisonous substance it is necessary to provide individual protective equipment for the popu- lation and supply them with relocation if it is needed. In order to perform a rescue it is nec- essary to organize the suitable modes of transportation and the itinerary has to be assigned

as well. But it is not enough merely to rescue the population. Before entering the reception area, people have to be decontaminated. The organization of this procedure belongs to the experts who are responsible for damage prevention. More alternatives can be possible but the detailed description of those are not part of this current study. The population has to execute the instructions in connection with the decontamination. Furthermore, in case of need they have to use the protective equipment properly in order to maintain their security. Moreover, when required, people have to take part in a medical examination. After transportation away from the contaminated area, the population has to be decontaminated then they can occupy the assigned reception area. As long as they are not allowed to go back, they have to live in accordance with the rules valid for the reception area.

Plant workers

As for the plant, the leaders and the workers should create — as much as possible — the suitable conditions for the execution of damage prevention for both the professional and non–professional organizations. By this, I mean the organizational events, which make dam- age prevention more effective. Leaders of the plant — on the basis of their location and technological knowledge — are obliged to supply unconditionally all information related to damage prevention for those who participate in the execution of damage prevention. Fur- thermore, the opportunities of the technology should be made use of during the rescue work. Moreover, injured parts should be sectionalised and removal of perilous chemical agents from the endangered area should be started (e.g. emptying of surrounding containers and drawing off the dangerous substance from the injured technology). In case of the harm of the operating equipment and devices used in averting damage prevention the firm's management has to maintain immediate restoration or salvage of the damaged elements. Providing that the firm has the possibility, it should prepare the road to the location of the catastrophe and open passages.

Non–professional rescue organizations, civil organizations

Those non–professional organizations, who do not have the suitable equipment for working on the damaged zone may be perfectly appropriate on the border of it — where considerable human resources are in need — so as to operate a supporting and developing boundary.

These rescue organizations might be volunteers, civilians or currently formed non–pro- fessional rescue organizations in our country (used to be called civil defence organizations). It is not necessary for the individual protective agencies to accomplish such a high protective level in order to operate the relief corridors and gates on the border.

These forms can be found at non–professional rescue organizations (in many cases orga- nizations have suitable equipment for intervention tasks as well). In addition, they have the right qualification to apply these devices. As a result, non–professional rescue organisation's major task is to accomplish support and help interventions. Obviously, there are non–pro- fessional rescue organizations who can take action in the contaminated area in case of an industrial catastrophe. So their tasks are the same as the professional rescue organizations'. Furthermore, rescuing the population from the endangered area or from the assigned evacu- ation zone is a top priority.

For rescue from the endangered zones it is necessary to organize the appropriate transport vehicles and the necessary supply for their operation (primarily fuel). The above mentioned vehicles and the population need to be decontaminated as soon as they are evicted from the perilous zone. Rescue works need to be insured on the particular route and according to the particular order.

Professional rescue organizations

Professional rescue organizations fulfill the tasks of damage prevention in the contaminated area. After exploration they start rescuing the injured and those trapped under the ruins. In line with rescuing the injured they start extinguishing fire. They have to take great care in case of an explosive and flammable environment. Sources of flame and explosion need to be eliminated as soon as possible. Public utilities, energy cables and the immediate restoration works are not beyond a professional rescue organization's range if the workers of the industry are not able to accomplish these tasks (ie they are not able to approach the location or they do not have the right safety equipment). In this case, it is practical to ask for collaboration from someone who is absolutely aware of the damage and knows how to restore it. So then professional rescue organizations with suitable vocational support can take steps in order to start immediate restoration.

To guarantee safe working conditions sources of danger must be eliminated. In many cases, weak constructions need to be pulled down. Furthermore, leakage and any sources of danger can only be ceased by the aid of the rescue organization's equipment. It is necessary to collaborate with the firm's management and the firm's workers so as to explore the sources of danger. They can recognize sources — because of the specific and technological versatility of the firm — which might be ignored by the professional rescue workers.

In conclusion, it can be clearly seen what tasks have to be done on the endangered area. As a result, requirements for the safety equipment can easily be formulated. In the following, I introduce requirements for personal protective equipment.

Requirements of personal protective equipment

Currently, a wide range of personal protective equipment is known. These items are different not only in type but the level of protection they provide. During the development of personal protective equipment the better and higher level of protection they can provide, the wider the spectrum they are suitable for, especially in case of the appearance of a lot of chemical substances. The aim of personal protection is to create the appropriate working conditions of the intervening organizations in the contaminated area and to develop the population's ability to rescue themselves. In terms of industrial catastrophes the types of personal protection can be differentiated as following:

- respiratory protection;
- skin protection;
- mechanical protection;
- radiation protection;
- protection against fire (flame effect) and thermal radiation. [5]

In case of industrial catastrophes, the major aim of protection includes respiratory and skin protection. Additionally, the prominent principle is protection from the effects of per- ilous chemical substances. As for the personal protective devices we distinguish filtering devices from insulating protective equipment. Besides, steps should be taken in order to protect oneself against other dangerous effects (e.g. mechanical protection, fire and heat pro- tection, radiation, electric shock etc.). Protection against jeopardizing effects is decided by the current situation. The method of protection for the intervening organization is defined by the leader of the rescue organization. The plant's workers — if the plant is identified as a dan- gerous one — have the appropriate personal protective devices in case of any harmful effects caused in the plant. These devices need to be included in the safety documentation by the manager (safety report, analysis, serious damage aversion plan). The manager has to provide his employees with the right training. The levels of personal protection and the requirements of the personal protective equipment are defined in the domestic legal regulation in Art. para.
4 of Act 2/2002. (II. 7.) SzCsM. (Minister of social and family affairs) order:

1st category

"The first category includes such kind of protective equipment of which the manufacturer supposes that the user is able to safely determine how protective the device is. Moreover, the user has to be aware of the proper time when to use it and how to use it. The level of protec- tiveness can be certified with an EK declaration of conformity. The user guide is essential.

According to this, protective devices belong to the first category needed to provide protection against the following effects:

- *mechanical dangers causing surface injury (e.g. gardener gloves, finger protector);*
- *cleaning supplies causing mild aggressive effects (e.g. diluent detergents);*
- *treatment of objects with less than 50 °C surface temperature;*
- *treatment of objects without dangerous kick (e.g. gloves, apron);*
- *not exceptional or extreme meteorological circumstances (head protection, clothing against weather);*
- *mild hits and vibrations, not causing enduring injuries (protection of scalp and hair, gloves);*
- *solar radiation (sunglasses).*

2nd category

Protective devices which do not belong to the first and third category belong to this category.

3rd category

Here are complex designed protective devices. They protect against the effects of lethal accidents and serious irreversible health impairment. The manufacturer supposes that the user cannot recognize the direct effects in time.

- *the filter type respiratory protective devices protect from solid substances, liquid aerosols or irritating, dangerous, toxic and radiotoxic gases;*
- *respiratory protection devices totally isolated from the atmosphere, including aqualungs;*
- *provides limited protection against chemical effects and ionizing radiations;*
- *in an environment exposed to heat where the value of the environmental air reaches/ exceeds 100 °C,*
- *protective devices against cold environmental effects, if the environmental temperature is under -50 °C,*

- *protection from falling down;*
- *they protect from the risky factors caused by electricity, in work done near voltage and help in isolating from equipment under high voltage*. [6]

On the basis of the law each protective device can be classified in the third category. However, the practical side needs to be approached as for the level of personal protection in the study.

The practical approach is as following [5]:

Protection, type A

Circumstances defining dangerousness:

- unknown chemical substance or known chemical substance in a big concentration and the airspace has an oxygen deficiency (<20%V/V);
- direct contact with the dangerous substance can cause serious health impairment. It can be absorbed through skin and causes poisoning. (e.g. toxic agents);
- work in the contaminated area can last longer.

Applicable protective devices:

- insulator type protective clothing;
- insulator type respiratory protective device (worn under the protective clothing).

Protection, type B

Circumstances defining dangerousness:

- the concentration of the air pollution is not known, or the concentration does not make filter type respiratory protection usage possible and the airspace has an oxygen defi- ciency (<20%V/V);
- being in contact with the dangerous substance, skin can be irritated or injured, but not seriously. (e.g. corrosive agents).

Applicable protective devices:

- insulator type protective clothing;
- insulator type respiratory protective device.

Protection, type C

Circumstances defining dangerousness:

- the air pollution is low and it makes possible the use of filter type respiratory protective devices;
- the suitable type of filter cartridge is available;
- the oxygen content of the airspace is at least 20% V/V;
- being in contact with the dangerous substance, skin can be irritated (e.g. irritating, stimulant substance).

Applicable protective devices:

- insulator type protective clothing;
- filter type protective clothing.

Protection, type D

Circumstances defining dangerousness:

- the concentration of air pollution is very low;
- contact with dangerous substance, skin will not be irritated.

Applicable protective devices:

- filter type protective clothing and rubber boots;
- filter type respiratory protective device;

- the above mentioned categories and levels of protection give directions for the ap- propriate mode of protection. Those who make decisions have to be aware of how dangerous the substance is and what chemical and physical features characterizes the substance. Decision makers also have to know the effects of the substance.

Requirements of the personal protective equipment [5]

Taking the conservative approach into account, after the event of damage (approaching from the safety side) the civilian population needs to be evacuated. Seclusion is not enough inside the borders of the safety zone, therefore rescuing has to be organized. To leave the contaminat- ed area and to escape securely, it is necessary to apply regular or temporary personal protective devices which provide conditions for the one seeking refuge and protect him from harmful ef- fects. The supply of the personal protective device for the population can happen in three ways:

- they have been distributed (people store them at home);
- they are stored in a central place near the firm;
- they are stored in a regional store–house and the equipment is fitting for regional dan- ger sources.

Distributed personal protective devices basically have to be simple and easily applied It is not possible to teach the whole population to use personal protective devices. The usage of a gas mask does not appear to be complicated, although in order to use it in the correct way short training is needed. Despite the fact that there is a short description on how to put the device on, and how to set the size and how to use it properly, experience shows that in real life situations problems always arise. Certain protective devices have to be universal because of the different head sizes. According to the requirements they have to be suitable for both adults and children and should be worn in a way that neither the possible stubble (harsh stub- ble worsens the suctions of gas masks) nor glasses can influence the application. Generally, rescue happens on transport vehicles. One vehicle makes the transport until the border of the contaminated area, the usage of personal protective equipment is obligatory on the vehicle. After decontamination, another vehicle transports people to the receptive area. So on the basis of the above mentioned facts, the protective devices' validity of protectiveness needs to be examined. Generally, rescue from the contaminated area and the decontamination together should not exceed the validity of the protective device.

All in all, requirements of the distributable protective equipment for the residents are the following:

- easy application;
- protective ability set to vulnerability;
- universal size;
- the possible longest protection time.

Primarily respiratory protective devices are needed to rescue the population. In addition, the protective equipment has to provide protection for mucous membranes (eyes) as well. The most suitable devices are full masks and safety hoods. It is important to take devices, which cannot protect mucous membranes, into consideration. In case of industrial catastro- phe, we might suppose that poisonous effects cause injuries not only through the air but that they can be absorbed through the eyes' mucous membranes. Dermic pollution will not have a lethal result, since the population is decontaminated on the border of the contaminated area.

I am going to list the advantages and disadvantages of gas masks (whole masks) in the following. From the list it can be clearly seen what theses protective devices are good for.

Advantages of gas masks:

- changeable insertion, variable protection ability;
- good fit, low suction factor;
- less vulnerable implementation;
- relatively comfortable;
- long–lasting protection (even up to 50 hours).

Disadvantages of gas masks:

- experience is needed;
- expensive;
- not universal in size.

From the facts above, it can be concluded that gas masks are less suitable as personal protective devices for the population. In fact, differences in size can be eliminated if the distribution is done according to names and families yet masks might not be stored and applied in the proper way. In my opinion, gas masks are much more useful for the workers in the contaminated area or people who participate in the work of decontamination than for the residents living in the area. As a consequence, civilians need a device, which is cheap, can be well–stored at their homes, universal and of course protects from dangers. Next, I am investigating the advantages and disadvantages of safety hoods.

Advantages of safety hoods:

- cheap;
- training is not needed, it can easily be applied;
- universal in size.

Disadvantages of safety hoods:

- unchangeable insertion;
- unsuitable for work;
- vulnerable;
- provides lower protection ability;
- limited protection.

In spite of the fact that safety hoods have a lower protection ability than gas masks, they are more easily applicable for the population. The most important aim after decontamination is to transport residents to the reception area as soon as possible. To my mind, the advantages of safety hoods make them suitable for the above mentioned aim because residents have to leave the contaminated area as quickly as possible.

Plant workers, non–professional rescue workers

In the event of a catastrophe plant workers are near the damaged zone. Plant workers and the leadership can give the most accurate information to people who take part in the rescue work. As chemical industries operate continuously, there are always workers on the site. In most cases they take the first steps and provide people with suitable protective equipment. Further- more, they accomplish general and professional exploration too. However, non–professional rescue organizations are not exposed to direct risks in all cases. In my opinion, their primary task is to create a stable background and support professional rescue organizations.

Firm workers know the site well and they are extremely good at technology. Averting damage can be made more effective, harmful consequences and pollution can be reduced with the use of proper technology. If it is necessary plant workers have to show the emergen- cy routes, injured people, and damaged structures to professional rescue workers. In addition, they indicate damaged technological equipment. With the help of plant workers efficiency and safety of interferers can be boosted. Plant workers need to provide protection against sources of danger, hence they need to supply people with protective equipment. Personal pro- tective equipment should be supplied according to the safety documentation. It is necessary to examine what type of toxic substance may appear at the firm (materials before and after processing and other materials coming from operation as well) according to which personal protective equipment is needed. The following aspects should be taken into consideration when selecting adequate protective devices:

- jeopardizing effects (firm specific);
- protection ability (depends on jeopardizing effects);
- work comfort.

In case of industrial accidents, plant workers are the first to intervene so work comfort is really significant. In an exceptional case, till the arrival of the ambulance an hour may pass when the first independent intervention happens. So protection ability has to be selected in a way that in case of need it should be applicable for about 2 or 3 hours. Non–professional rescue organizations join damage prevention after professional rescue organizations have fulfilled their duties. After alarming non–professional rescue organizations, they can not im- mediately be deployed. To deploy them some time is needed, it can last from a few hours up to a day. Previously tasks by professional rescue organizations have already been introduced. In Hungary *Hussar* or *"Huszár"* — in Hungarian —, is an average category rescue organi- zation, consisting of volunteers. They have the right devices to accomplish their tasks and also members have the appropriate qualification to use these devices. Fulfilling tasks in the damaged zone and along the border of it needs adequate personal protection. Devices should be selected from the aspect of jeopardizing effects. These effects are unpredictable. There are several jeopardizing factors in a damaged zone. For non–professional rescue organizations it is recommended to use universal equipment with regard to protective ability — mainly respiratory devices — what is more, they have to be versatile. Non–professional rescue orga- nizations should examine what type of damaged zones they intend to act in effectively. If a rescue organization wants to efficiently intervene in more damaged zones, universal devices are not the most adequate. This study examines the significance of requirements in regard to personal protective devices in the area of industrial catastrophes. When non–professional rescue organizations supply residents with personal protective equipment, the following fea- tures should be taken into consideration:

- universal protection ability;
- necessary and sufficient protection (depending on the task);
- work comfort.

Non–professional rescue organizations select personal protective devices according to the types of catastrophes. In addition, they can be packed in unified kits. It is essential to create a proper economic and logistic background. The latter is also important because it can lead to serious problems if the rescue organization gets unified kits for forest fires or floods in case of an industrial catastrophe.

Professional rescue organizations

From the professional rescue organizations point of view, during damage prevention they are the first interferers except for plant workers. Today, in Hungary the most suitable organiza- tion for immediate deployment is a professional fire brigade. After being alerted, the motion of the fire brigade starts within two minutes. In certain situations they can arrive within a few minutes. After contact and checking data, the fire brigade applies the systematized personal protective devices and starts intervening. If less or nothing is known accurately about the substance getting out during an industrial accident, the fire brigade uses a personal protective device of which the ability is on the highest level. In this case, it is type "A" gastight suit and pneumatic pressure respiratory device. Type "A" suits are always packed on the fireman's vehicles. Firemen have neither time nor opportunities to prognose the situation based on the information given during alerting. So they do not know what type of personal equipment is needed at the site. Since the fire brigade is one of the most special professional rescue organi- zation, they have to apply personal protective devices of which the ability is on the possible highest level. Other professional rescue organizations for whom alerting and quickness are not so strict, have the choice to select the necessary personal protective devices. I intend to examine the most complicated professional rescue organization, the official fire brigade. In general, accomplishing tasks wearing type an "A" gastight suit is a very hard task and fire- men exert themselves during work. It was essential to limit the requirements of comfort, they are inversely proportional to each other. The more comfortable a dress is, the less protective ability it has and the higher the protective ability is, the lower the level of work comfort is.
93M filter type clothing and Trellchem Super Gastight Suits are simple examples for the above mentioned facts.

Picture 1. 93 filter type clothing (side left)[2]; Trellchem Super Gastight Suit (side right)[3].

2 93M filter type protective clothing http://www.respirator.hu/?module=products&site=main&group=sajat_katonairendeltetesu&menupath=sajat_katonairendeltetesu&product=93Mvedoruha&lang=hun (downloaded: 23 11 2012)

3 Tellchem Super Gastight Suits http://protective.ansell.com/en/Products/Trellchem/Gastight-Suits/Trellchem-Super/ (downloaded: 23 11 2012)

Apart from the fire brigade, other professional rescue organizations, such as the military, HUNOR etc, can come to the site as well. However, the latter ones might arrive in hours, they have the opportunity to decide what kind of personal protective devices to use in the damage zone. The most important and basic tasks are done by the ambulance brigade. For them, it is significant to use personal devices with the highest level of ability.

Conclusion

In this article I divided people in the damage zone into three big groups. With the help of the groups I defined types of tasks of damage prevention. On the basis of the task requirements personal protective equipment are defined. When damage occurs (plant workers) or after the occurrence of damage a professional rescue organization (currently it is the fire brigade in Hungary) has to supply the highest level of protection. As for the firm workers, it is a lot easier since the firm is able to prepare for the specific sources of danger, while the fire brigade
— taking quick reaction time into consideration — is on the maximum level with regard to personal protection. The intervening ability of other professional or non–professional rescue organizations depends on their personal protective equipment.

In an ideal case, unified kits can be made specifically for industrial catastrophes. (e.g. re- lease of combustible liquid, poisonous liquid, dusting of toxic, solid substance). In Hungary, rescue organizations do not have the available resources to systematize unified kits. Mainly, they apply universal personal protective equipment, of which the protection ability is high. However, effective work is harmfully influenced by the problems arising from work comfort. Apart from the economic aspect, efficient exploration and a logistics background is necessary to organize personal protective equipment supply for a catastrophe.

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Crisis in the Central African Republic: Is it a religious war in a godforsaken country or something else?

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The Central African Republic is a landlocked country located in the centre of Afri- ca. Bordered by seven other countries in the heart of the African continent, it was ruled for most of the years after independence from France in 1960 by the self– styled "Emperor", Jean–Bédel Bokassa. A series of coups followed, with power changing hands frequently. With more than 80 different ethnic groups, a mix of Christians, Muslims and followers of indigenous faiths, the country is notoriously difficult to rule, despite having a population of only 4.6 million. Despite significant deposits of gold, diamonds and uranium, and vast troves of timber, it is among the poorest nations on Earth, sitting just seven places from the bottom of the UN's human development index. Chronic poor governance and lack of an efficient state has denied the wider population the benefits of the country's potential riches. [1] Chaos in the Central African Republic (CAR) is about power, not religion, this is neither jihad nor crusade. Fighting in CAR is over political power and money, with the capitol city Bangui as the prize.

Keywords: *Central African Republic, diamond, gold, poor governance, inefficient state, political power, rebels, anti–rebels, humanitarian crisis;*

Introduction

The Central African Republic is a landlocked country in central Africa, with a population of 4.5 million. The Central African Republic is often called a forgotten country, but that not quite right. It has had a long and substantial international presence and sizable foreign invest- ment. It is just that those efforts not made much difference. As the country rapidly descends into greater violence, the difficult truth is that more — and much better — international and regional involvement is its only hope.

The former French colony of Ubangi–Shari became the Central African Republic upon independence in 1960. [2] When the long–running civil war in the Central African Republic (CAR) ended in 2007, observers hoped that peace would usher in a new era of economic recovery and development. Instead the country, already one of the world's poorest, faces a devastating humanitarian crisis that threatens to plunge the population even deeper into misery. Despite these mineral resources, including gold and diamond, CAR remains one of Africa's poorest states. The country's history has been marked by political instability. It has seen five coups and several rebellions since independence from France in 1960. [3] Sadly

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there is nothing new about the atrocities being inflicted against civilians in the Central Afri- can Republic. What is new is the scale of the violence and widespread and arbitrary targeting of people solely because of their religion.

Illegal weapons, as Bordas has described in her work, are awash in what many describe as a failed state where weak government authority, pervasive impunity, ethnic tensions, and rebel activity have driven instability and displacement for decades. [4: 312] [5: 10] One of the world's "forgotten" crises has forced its way back into the headlines now that reb- els have swept across CAR, overthrowing the Government, forcing the president into exile and sending alarm throughout the international community. In 2013, a major security and humanitarian crisis ravaged the country. The area that is now the Central African Republic has been settled for at least 8,000 years; the earliest inhabitants were the probable ancestors of today's Aka (Pygmy) peoples, who live in the western and southern forested regions of the country. The slave state of Dar al–Kuti occupied the northern reaches until the various regions of the Central African Republic were brought under French colonial rule late in the
19th century. [6] Colonial administrators favoured some ethnic groups over others, resulting in political rivalries that persisted after independence in 1960. Following periods of civil strife and dictatorial government, including the infamous regime of the self–styled Emperor Bokassa I (who renamed the country the Central African Empire), the country embarked on a course of democracy that was threatened, at the end of the 20th century, by interethnic civil war in neighbouring countries as well as by attempted coups d'état.

Weary of social chaos and shifting allegiances among contending elements of the power elite, the country's citizens quote a regional proverb, "When elephants fight, the grass suffers; when elephants make love, the grass still suffers." [7]

Geographical situation of CAR

The Central African Republic is roughly the size of France and is bordered by Chad to the north, Sudan and South Sudan to the north and east, the Democratic Republic of the Congo (DRC), Congo–Kinshasa) and the Republic of the Congo (Brazzaville) to the south, and Cameroon to the west. The capital, Bangui, is situated on the southern bounder, formed by the Ubangi River, a tributary of the Congo River.

The Central African Republic occupies an immense rolling plateau that forms, along a crest that trends southwest to northeast, the major drainage divide is between the Lake Chad and the Congo River basins. The country is well supplied with waterways. Tributaries of the Chari River occupy the northern third of the country's territory. The remaining two–thirds of the terrain drains southward into the Ubangi River, which forms the Central African Repub- lic's southern border with Congo (Kinshasa).

The vast central plains rise gradually in the northeast to the Bongos (Bongo) Massif, extending to an elevation of 4,360 feet (1,330 meters) at Mount Toussoro, and to the Tondou Massif in the east. In the west they rise toward the high granite range of the Karre Mountains, reaching nearly 4,625 feet (1,410 meters) at Mount Ngaoui, the country's highest point, be- fore declining eastward into sandstone plateaus. In the north the most significant mountains are those of the Dar Challa range, which rise to 4,350 feet (1,326 meters) at Mount Ngaya near the border with Sudan. In the southeast is a plain cut by a number of rivers. [8]

Ethnic groups of CAR

The people of the Central African Republic range from the hunting–and–gathering forest Pygmy peoples, the Aka, to state–forming groups such as the Zande and Nzakara. Prior to the arrival of Europeans in the late 19th century, distinctions between different groups were highly fluid. Many thought of themselves as members of a clan rather than of a broader eth- nic group. Interactions with those who spoke different languages and had different cultural practices ranged from peaceful trade and intermarriage to war and enslavement.

The attempts by colonial administrators and ethnographers to divide Central Africans into definite ethnic groups have never been viable. However, French colonizers did promote ethnic and regional distinctions among their Central African subjects. Drawing from popu- lations of such southern riverine people as the Ngbaka (Mbaka), Yakoma, and Ubangi, the French helped to create an elite group, which emerged as an indigenous ruling group for the whole country and has held most political positions since independence. Regional affiliations have increased the complexity of this political terrain. Other, non-riverine Central Africans, who are far more numerous, have tended to resent this situation and have occasionally taken leadership roles themselves. Although people living in the country's northern regions have gained more political power since independence, southern peoples still remain an important presence in national politics. [9]

A minority of Greek, Portuguese, and Yemeni traders are scattered around the country, and a small French population lives in Bangui. Diamond traders from western Africa and Chad, merchants from various African countries, and refugees from nearby countries, such as the Democratic Republic of the Congo, also reside in Bangui and the hinterlands. The people belong to more than 80 ethnic groups, which are classified according to geographic location and each groups has its own language. (For the distribution of main language families see next Figure 1.)

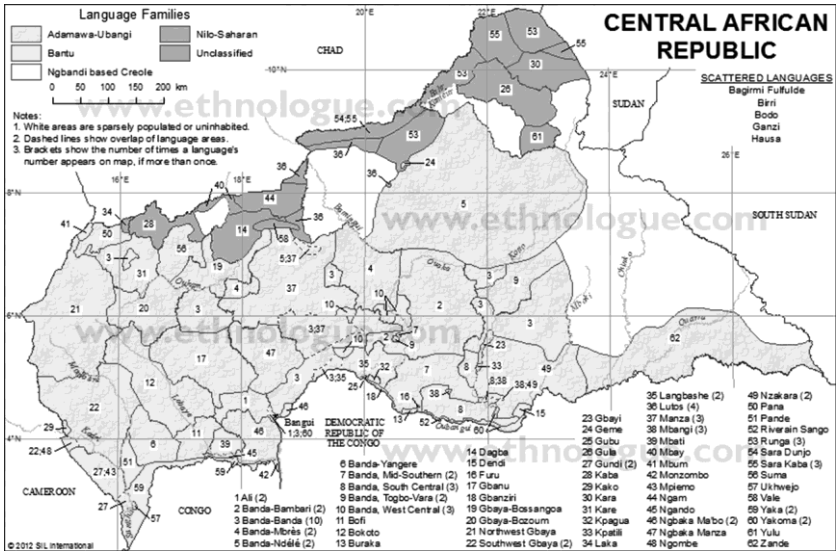

Figure 1. Language families in CAR. [9]

About 75% are Baya–Mandjia and Banda (40% are largely located in the northern and central parts of the country), and 4% are M'Baka (south–western corner of CAR). Sangho, the language of a small group along the Oubangui River, is the national language spoken by the majority of Central Africans. Only a small part of the population has more than an elementary knowledge of French, the official language. [10] The Baya (33%) to the west and the Banda (27%) in the east central region and are estimated to be the most numerous groups. In the savannah live the Mandjia, accounting for 13% of the population, the Sara, account- ing for 10%, and the Mboum, accounting for 7%, each with several subgroups. In the forest region are the Pygmies (Binga) and some Bantu groups, including the Mbaka, who account for another 4% of the population. About 4% of the population are Yakoma. (See Figure 2.) There were about 6,500 Europeans in 1998, including 3,600 French. [12] About three–fifths of the population is rural, residing primarily in the southern and western parts of the country.

The eastern and north–eastern sections of the country are less populated. Of the ur- ban population, a significant proportion lives in Bangui. Other major towns are Berbérati, Bossangoa, and Bouar in the west, Bambari and Bria in the central plains, and Bangassou and Mobaye on the Ubangi River. [13]

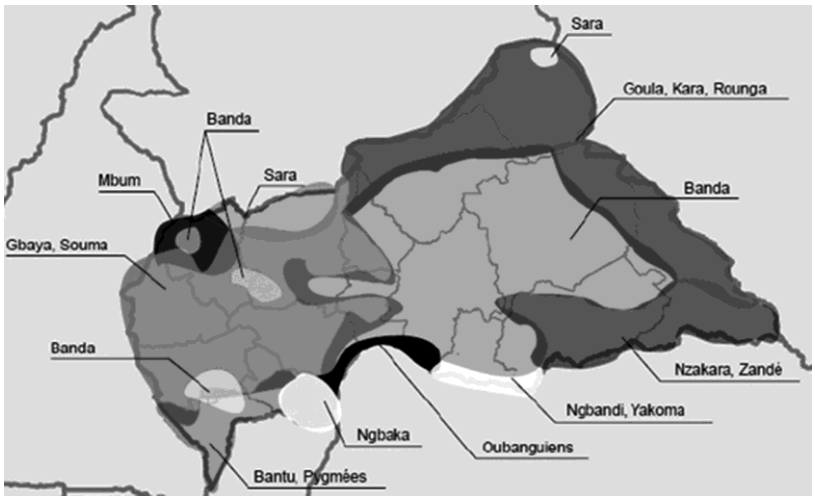

Figure 2. Main ethnic groups in CAR. [11]

There are presently no railways in the Central African Republic. [14] The country has 23,810 km (14,796 mi) of roads, of which only 429 km (267 mi) were paved.

Religion

The country has an area of 242,000 square miles and a population of around 4.3 million. According to the 2003 census, Protestants constitute 51% of the population, Catholics 29%, and Muslims 15%. The remainder practices indigenous beliefs (animism), although many indigenous beliefs are also incorporated into Christian and Islamic practice throughout the country. [15] According to other sources providing more fresh data, the Christian religion represent 71.33% of population and the Muslim part only 13.67%. (See Chart 1.)

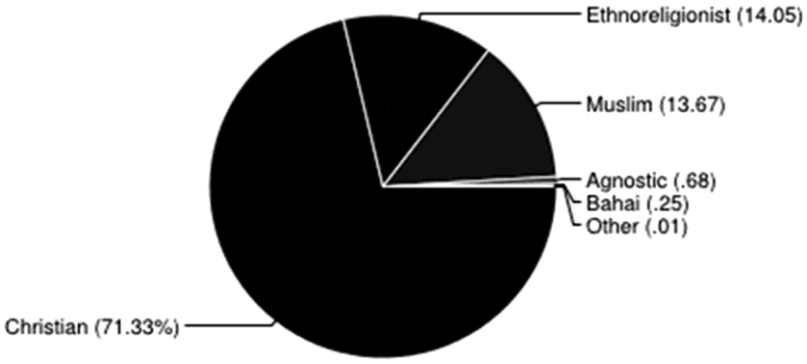

Chart 1. Chart of religion distribution in CAR. [16]

The constitution (suspended since 2003) provides for freedom of religion while prohib- iting certain forms of religious fundamentalism. This prohibition is generally considered to be directed toward Muslim fundamentalists. Christian holidays are celebrated as national holidays. All religious groups must be registered through the Ministry of Interior. The Unifi- cation Church has been banned since the mid–1980s. The practice of witchcraft is considered a criminal offence; however, prosecution is generally made only in conjunction with other criminal activity, such as murder.

Economy of CAR

Despite diamond and gold mining, agriculture is the largest sector and the basis of the Cen- tral African economy, contributing half of the gross domestic product and occupying nearly four–fifths of the workforce; diamonds and timber also contribute to the economy. Interna- tional (mostly French) capital dominates the economy, but the Central African Republic has tried since independence to attract capital and development monies from other countries, including Libya, Taiwan, China, Germany, and Japan.

Under pressure from the World Bank and the International Monetary Fund (IMF) to re- verse the growth of government spending, liberalize prices, encourage a more open invest- ment code, and provide incentives to agriculture and forestry, the Central African Republic submitted to a structural adjustment program in 1986. In the 1990s the IMF asked for fur- ther adjustments, such as devaluing the franc and privatizing various businesses, commercial banks and a petroleum distribution company. As France has reduced its financial commit- ments to its former colonies in Africa, the Central African Republic's financial standing has deteriorated.

In the 1990s a decline in international prices for cash crops, the inflated cost of imports caused by poor transportation into the country, the continued smuggling of diamonds across the border, and domestic political unrest further strained the economy. Most significant, how- ever, were corruption and financial mismanagement, which left the government unable to pay the salaries for the military and the public sector. The resulting infidelity of police, armed forces and disloyalty of public servants to running government also caused political unrest to continue into the 21st century. CAR is one of the poorest countries in African continent. The

welfare system, as we know in Europe, and it determined by dr Bordas in her essay, based on public law, or based on American mixed system (public law and market) never ever existed in CAR. [45]

Diamonds

Africa is the world's largest producer of diamonds, producing as much as 50% of global production. To date, Africa has produced over 75%, in value, of the world's diamonds with more than 1.9 billion carats worth an estimated $US 158 billion mined. Angola, Botswana and South Africa are leading producers of diamonds. Mining activities are focused on South Central Africa, with diamonds being produced primarily from kimberlitic mines (South Af- rica, Angola, DRC, Ghana, Tanzania, Lesotho and Botswana), followed by alluvial dredging operations (Angola, CAR, Namibia and South Africa) and offshore marine diamond activi- ties (South Africa and Namibia). [17: 6]

Most of West Africa's diamond production in the area originates from fluviatile placers and only on a minor scale from eluvial deposits or from altered kimberlitic pipes. Virtually all mines are relatively small–scale operations mainly run by artisanal miners, except for the Akwatia mine in Ghana and the Aredor project in Guinea. [18] (The Figure 3 representing the mineral resources of CAR.)

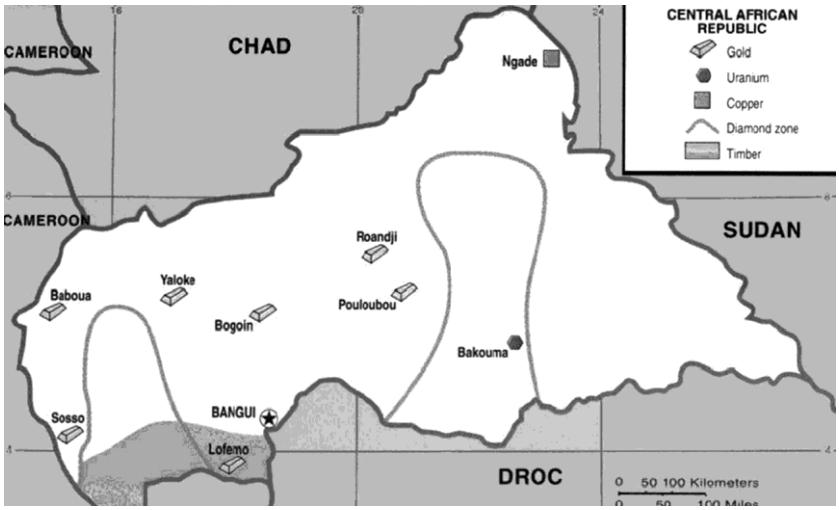

Figure 3. Mineral resources of CAR. [19]

In most cases, the primary sources of these alluvial diamonds have not been traced yet, therefore making CAR an attractive exploration target. Officially, diamonds have contrib- uted 60% to the nations export earnings. CAR is one of Africa's major diamond producers, although production is almost entirely produced by artisanal methods. CAR is well known for its good quality diamonds, ranked 5th in the world in terms of quality.

Diamonds were discovered in the early 1900's and production did increase to a maximum total of about 600,000 ct per year. It has subsequently dropped due to lack of control of the

diamond industry. CAR produces an estimated 620,000 ct each year. Some commercial mining and exploration of alluvial deposits has begun, albeit with difficulties.

The Boungou River is the largest tributary of the Kotto River, which is the eastern CAR's largest river. The Boungou River and its tributaries account for some 25% of CAR's total pro- duction, with most production being sourced from three main alluvial prospects: the Djourou, Aigbando and Trouapou–Boungou prospects that are currently being exploited by artisanal miners. Canadian Junior Vaaldiam Resources has begun evaluating this region, and is located approximately 80 km northwest of the town of Bria.

United Reef (CAR) has two exploration permits for diamonds. The permits include two alluvial deposits. Howe Centafrique has several alluvial projects in CAR, including the Ma- bala mine, which has reported declining grades. Diamond Work's Central African Mining SARL (CAMCO) claims to have the country's largest ground holding with 6 licenses in the northeast that total 11,600 km^2. Camco intends focusing on the Ouandjia and Nzako permits in the second half of 2001. Similarly, its diamond buying subsidiary CADCO (Central Afri- can Diamond Company) will resume operations in CAR. [19]

Gold

Axmin Inc. of Canada continues to explore for gold in the country. A pre–feasibility study for the Passendro Gold Project was completed by GBM Gold Ltd. of the United Kingdom in ear- ly 2006. It was followed by a feasibility study conducted by Senet (pty) Ltd. of South Africa, commissioned during the third quarter of 2006. The pre–feasibility study had envisioned an open pit operation with a gravity carbon–in–leach processing plant that would process about 3 million metric tons per year (Mt/yr) of ore with production estimated to be about 6,200 kilograms per year (kg/yr) of gold (reported as 200,000 troy ounces).

Other companies exploring for gold in the country included Prospero Minerals Corp. (formerly Corumel Minerals Corp., before 2006), and Tamija Gold & Diamond Exploration Inc. of the United States, and London–based Pan–African Resources Plc.

Illegal diamond and gold trade

The illegal mining and smuggling of diamond and gold has always been present in CAR.
However the creation of Seleka was a turning point for this illegal activity.

Seleka rebels have for several years controlled some of the diamond–producing areas in the north of CAR, allowing them to have ample financial resources for better weaponry. Even more worrisome, the Seleka members are — according to several people who fled Sangba — being aided by armed fighters from neighbouring Sudan known as the Janjaweed, (government backed militia) who were accused of committing atrocities against civilians and responsible for ethnic cleansing in Darfur. Sudan, and whose leader is wanted by the International Criminal Court, needless to say they are not part of the Kimberley Process Certification Scheme.

Observers fear many of Central African Republic's illicit diamonds are being funnelled into Sudan. [20] There are several examples that can be quoted where these very same rebel groups are allured by the country's mineral wealth. In September 2011, for example, the *Convention des Patriotes pour la Justice et la Paix* (CPJP) clashed with the Union des Forc-

es Démocratiques pour le Rassemblement (UFDR) in Bria, over the control of the area's diamond mines. In June 2012, between 70 and 100 armed men, alleged to be LRA rebels or Baba Ladé fighters, attacked AREVA's Bakouma mining project. Baba Ladé, rebel leader of the Chadian Front Populaire pour le Redressement (FPR), which operates in the centre–north of CAR, allegedly also earns income from the sale of gold in Bangui. It is rumoured that he has even bought machinery to increase the effectiveness of his gold extraction activities. Nevertheless, cattle breeding has always been a much more important source of revenues for Baba Ladé. [17: 21–23]

Since September 2012, however, FPR is retreating from CAR after a tripartite agreement was signed between Baba Ladé, Chad and CAR. Another important, if not the biggest, se- curity issue is the presence of bandits throughout the country. These gangs profit from state security services' lack of control outside of the capital and randomly attack traffic on the country's dilapidated road network. [21] Banditry is also a major problem in mining zones and on mineral trading routes, where these bandits demand diamonds and taxes from diggers and diamond traders. Since 2006, because of state inefficiency, the threat of bandits has apparently diminished in the relatively stable southwest. In the east, however, the situation remains precarious. [5: 14] Next to armed violence, including rebellion and banditry, natural resources can also give rise to friction between other, non–armed groups of society. Conflicts might, for example, arise between migrant workers and local communities over access to mining lands, or the migrants' alleged lack of respect of local social norms and customs.

Another actual issue is a tension between artisanal miners and government officials. Non–registered miners are wary of avoiding capture by mining brigade units. Furthermore, artisanal miners are often distrustful of government agents, suspecting them of rent–seeking incentives. Government agents are, indeed, often cited as perpetrators of harassment.

Central African Republic's new government insists that it intends to fully comply with the Kimberley Process, which aims to curb the trade in blood diamonds whose profits have driven some of the bloodiest conflicts in Africa over the past 20 years.

Oil

The Central African Republic did not produce mineral fuels in 2006 and depended upon imports for its energy requirements. United Reef Ltd. of Canada obtained the rights to a pe- troleum exploration permit in the country through a "farm–in agreement" with Denver–based RSM Production Corp. in 2004. It was unable to continue with its exploration activities in
2006. The company declared *force majeure* following the lack of progress in resolving a con- tract dispute between RSM and the government. The company's exploration permit was for the Doseo and the Salamat basins in the northern part of the country. In a bid to tap the coun- try's under–exploited mineral wealth, former president Bozize had awarded China National Petroleum Corp (CNPC) rights to explore for oil at Boromata, in the country's northeast near the border with Chad. South Africa's DIG oil is also prospecting in the southeast of the country, near the town of Carnot. The new president certainly will review CAR's mining and oil contracts with China, signed by the Bozizé government.

Uranium

The following companies are performing uranium prospection and/or exploration in Cen- tral African Republic: Uramin Inc., Uranio AG. (South Africa), Les Mines de Centafrique (CAR); and interested foreigner countries are: France, UK, South Africa and Switzerland.

A peculiarity of the Bakouma deposit is the great difficulty to extract the uranium. [22] A start–up of the French nuclear giant Areva's project in Bakouma was planned for 2010. Ac- cording to the plan, at full capacity, the mine will have an output of 2,000 tons per year. [23] The project was to ramp up to full production in 2014–15, but this is now delayed at least two years after an expenditure of EUR 107 million, due to low uranium prices and the need for further research on the metallurgy. Resources have been reported as 32,000 t U by Areva Resources Centrafrique, which holds a 90% interest over ten discrete deposits. [24]

During the last decade China has steadily increased their visibility and influence in CAR, a country rich in untapped natural resources. With French investments moribund and French influence in general decline, the Chinese are likely positioning themselves as CAR's primary benefactor in exchange for access to CAR's ample deposits of uranium, gold, iron, diamonds, and possibly oil. Although Chinese aid and investment was unlikely to come with trouble- some caveats regarding democratic practices and economic transparency, they are apparently interested in promoting the pacification of troubled areas in northern CAR in order to protect their own interests and personnel. [25]

Modern History (After the colonial period)

On August 13, 1960 CAR gained complete independence with David Dacko as its first Pres- ident. In 1966 Col. Jean Bédel Bokassa, Dacko's cousin, seized power. In December 1977
Bokassa made himself Emperor and his rule was extravagant as well as brutal with Amnesty International revealing he had participated in the massacre of 80 school children. The coun- try's name was changed to the Central African Empire. In September 1979 Bokassa was ousted by a coup that was supported by French paratroopers and resulted in the restoration of the republic. In 1981 the country's name was changed back to CAR and in the same year the military led by Gen. Andre Kolingba overthrew Dacko once more, taking control of the government. The new military government banned all political parties and in 1986 Bokassa returned to CAR from exile in France. In 1987 Bokassa was convicted of embezzlement and being an accomplice to several murders. He was sentenced to death, although his sentence was later commuted to life imprisonment.

After three tumultuous decades of misrule — mostly by military government — civilian rule was established in 1993 and lasted for one decade. President Ange–Felix Patasse's ci- vilian government was plagued by unrest, and in March 2003 he was deposed in a military coup led by General Francois Bozize, who established a transitional government. Though the government has the tacit support of civil society groups and the main parties, a wide field of candidates contested the municipal, legislative, and presidential elections held in March and May of 2005 in which General Bozize was affirmed as president. The government was unable to have full control the countryside, because of state inefficiency, where pockets of lawless- ness persist. [5: 16–17] Unrest in the neighbouring nations of Chad, Sudan, and the DRC has been permanently able to affect stability in the Central African Republic as well. [26: 94–95]

In June 2005, fighting between government and rebel forces in the north caused tens of thousands of people to flee across the border into Chad; this continued in the ensuing years. There were several cease–fire agreements signed between the government and various rebel groups, particularly in 2007 and 2008, but many of the agreements were not completely im- plemented. The north was also subject to violence that emanated from conflict in the Darfur region of neighbouring Sudan and spilled over the border, while in the south the population was increasingly terrorized by the Lord's Resistance Army, a Ugandan rebel group that had been using the Democratic Republic of the Congo as a base for operations before a military offensive at the end of 2008 pushed them deeper into the Central African Republic and other countries. [27: 7–11] The next presidential election, initially due in 2010, was repeatedly postponed. When it did take place, on January 23, 2011, Bozizé and Patassé were both among the candidates. Polling did not go smoothly; before the election results were announced, Patassé and other challengers to Bozizé had lodged complaints that the election was rigged. When the results were announced in early February, Bozizé was declared the winner, with 66% of the vote.

Way to the current crisis — Seleka Coup

In late 2012 a coalition of old rebel groups under the new name of Séléka renewed fighting. Two other, previously unknown groups, the Alliance for Revival and Rebuilding (A2R) and the Patriotic Convention for Saving the Country (CPSK) also joined the coalition, as well as the Chadian group FPR. [28] The group, which included factions of former rebel movements, accused Bozizé of not implementing aspects of a previous peace agreement. It demanded his ouster from the presidency and called for him to stand trial at the International Criminal Court. Seleka quickly advanced south but stopped short of Bangui in December and entered into negotiations with the government. In January 2013 Seleka and Bozizé's administration agreed to a cease–fire and a power–sharing deal that addressed several rebel demands, such as the release of prisoners and the withdrawal of foreign troops in the country. In addition, it provided for the inclusion of some Seleka members in a new unity government and allowed Bozizé to finish his term, with new elections to be held in 2016. Seleka quickly became disenchanted with the implementation of the deal, claiming that Bozizé failed to honour important aspects of the agreement. In mid–March 2013 the group issued an ultimatum for Bozizé and, despite some last–minute concessions from the president, resumed hostilities a few days later. Seleka advanced toward Bangui, seizing the capital on March 24, and Bozizé fled the country. (See Figure 4.)

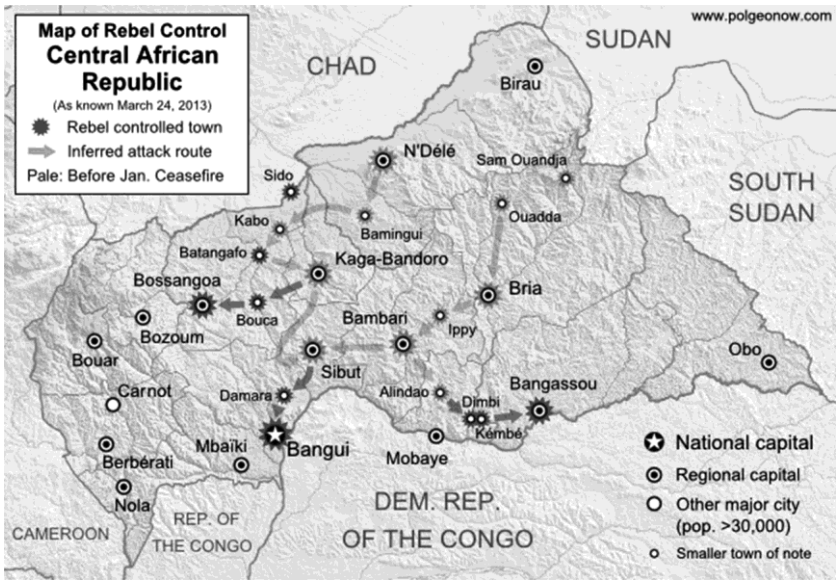

Figure 4. Rebel advance in CAR. [44]

Seleka then claimed control of the government. Seleka's actions were widely condemned by the international community, and the African Union suspended the country from the orga- nization and imposed sanctions on rebel leaders. One of the rebel leaders, Michel Djotodia, claimed to be the de facto head of state and initially promised to uphold the terms of the January power–sharing agreement. He then later announced that he was suspending the con- stitution and dissolving the National Assembly and the government. Djotodia's first attempt at forming a transitional government was rejected by the opposition as well as by the Eco- nomic Community of Central African States (ECCAS; also known by its French acronym, CEEAC) regional body, which called for the formation of a national transitional council that would administer the country until elections could be held. Djotodia accepted ECCAS's recommendations, and in April a council was formed. Soon after, Djotodia was elected pres- ident of the interim body, but he was not inaugurated until August 18, 2013. Djotodia and other Seleka leaders launched their uprising to gain access for northern peoples to resource wealth — particularly oil being exploited in their northern homeland by the China National Petroleum Corporation. [29]

The interim government struggled to restore order and perform the normal functions of state. However it was unable to fulfil the requirements of an efficient state. [30: 606–607] Meanwhile, Seleka rebels had been pillaging parts of the country and engaging in horrific acts of violence, rape, and kidnapping. The primarily Christian civilian population began to form militias, known as "anti–*balaka*" (Sango: anti–machete), to protect themselves against the mainly Muslim rebels, which in turn degenerated into a cycle of violent attacks between Christians and Muslims, even civilians, that left hundreds dead and thousands displaced. Analysts warned of the potential for the situation to further degenerate into genocide should nothing be done to stop the violence. [31]

On December 5, 2013 the UN Security Council voted to authorize the deployment of an African–led peacekeeping force that would incorporate ECCAS troops already in the coun- try, as well as the deployment of additional French troops to augment the country's existing military presence there, in an effort to protect the civilian population. Still, the humanitarian situation at the end of 2013 was bleak, with more than 800,000 people displaced and almost half of the country's population in need of aid. In January 2014, ECCAS held a summit to address the worsening situation in the country. At the end of the summit, on January 10, both Djotodia and Tiangaye announced their resignations. Later that month the transitional coun- cil elected Catherine Samba–Panza, the mayor of Bangui, to be the new interim president. She was inaugurated on 23 of January 2014.

Parties involved in the armed conflict

There are at least five main armed groups/parties involving to the conflict in CAR:

1. SELEKA (sometimes written as SÉLÉKA) — the rebels

Seleka is a reference to fighters from next groups — Union of Democratic Forces for Unity (UFDR), the Union of Republican Forces (UFR) and the Convention of Patriots for Justice and Peace (CPJP) — coming together to launch the rebellion. They are called Seleka from
2012 which in the local Sango language means alliance. Currently Seleka consist of follow- ing groups:

- Democratic Front of the Central African People (FDPC);
- Convention of Patriots for Justice and Peace (CPJP);
- Union of Democratic Forces for Unity (UFDR);
- Alliance for Revival and Rebuilding (A2R);
- Patriotic Convention for Saving the Country (CPSK).

There are many foreign mercenaries among the predominantly Muslim group, mostly from Chad and Sudan (Darfur). [32] They have been responsible for many human rights abuses and extra judicial killings since last December. The leader of the rebels, Mr Michel Djotodia proclaimed himself transitional president of the Central African Republic on March
25, 2013. Seleka fighters are mostly northerners and they were in power from March 2013 to January 2014. The number of fighters in Seleka is estimated to be around 5,000 troops however according to The International Federation for Human Rights (FIDH)[2] the correct number is between 15,000 and 20,000. [33]

2. Armed forces of CAR

The Central African Armed Forces [French: *Forces armées centrafricaines (FACA)*] are the armed forces of the Central African Republic, established after independence in 1960. To- day they are a rather weak institution, dependent on international support to hold back the enemies in the current civil war. [34] Its disloyalty to the president came to the fore during

2 Note from the author: The International Federation for Human Rights (FIDH) is a non-governmental federation for human rights organizations. Founded in 1922, FIDH is the oldest international human rights organization worldwide and today brings together 178 member organizations in over 100 countries.

the mutinies in 1996–1997, but ever since then it has faced internal problems. It has been strongly criticized by human rights organizations due to its terror, including killings, torture and sexual violence. When General Kolingba became president in 1981, he implemented an ethnicity–based recruitment policy for the administration. Kolingba was a member of the Yakoma people from the south of the country, which made up approximately 5% of the total population. During his rule, members of Yakoma were granted all key positions in the admin- istration and made up a majority of the military. This later had disastrous consequences, when Kolingba was replaced by a member of a northerner tribe, Ange–Félix Patassé. The army has hence been considered disloyal by the two northerner presidents Patassé and Bozizé, both of whom have equipped and run their own militias outside FACA. The military also proved its disloyalty during the mutinies in 1996–1997. [35]

The forces assisting Bozizé in seizing power in 2003 were not paid what they were prom- ised and started looting, terrorizing and killing ordinary citizens. Summary executions took place with the implicit approval of the government. The situation has deteriorated since early
2006 and the regular army and the presidential guard regularly execute extortion, torture, kill and commit other human rights violations. At the end of 2006, there were an estimated
150,000 internally displaced people. During a UN mission in the northern part of the coun- try in November 2006, the mission had a meeting with a prefect who said that he could not maintain law and order or control over the military and the presidential guards. The FACA conducts summary executions and burn houses. This Army cannot be seen as count as a well- equipped, trained and paid armed forces; consequently the loyalty to a new President is very questionable. Currently the Central African Army has 4,500 troops, mainly equipped with light weapons.

3. Anti–balaka militia (anti–Séléka rebels)

A new rebel group/militia, whose name means “anti–machete” in local Sango and Mandja languages, has been created in response to the Seleka terror against Christians. After Sele- ka’s overthrow of Bozizé earlier this year, the group looted and attacked many communities. Thousands fled their homes and the humanitarian crisis deepened. At the same time, a motley crew of local self–defence militias and anti–Séléka armed groups, which have come to be known collectively as the anti–balaka, emerged. In retaliation to Seleka’s rampages, these local vigilante peasants, armed with machetes, rifles and other weapons, waged an armed resistance in the north.

The group is predominantly Christian and increasingly involved in atrocities targeting the Muslim community. As Seleka torched villages and massacred entire populations, the “anti–machete”, or “anti–balaka” ― initially local militias paid to defend crops and cattle against robbers and highwaymen due to the absence of state security ― began seeking re- venge. It became a catch–all for local vigilantes armed with bows and arrows. Most of them have home–made rifles, some have machetes, knives, and clubs. (See Figure 5.) Today’s anti–balaka also includes the Association of Central African Farmers (ACP), an anti–Séléka peasant movement, as well as the Front for the Return to the Constitutional Order in Central Africa (FROCCA). [37]

FROCCA is a militia made up of ex–army officers loyal to the former president as well as
local vigilantes fed up with the Seleka’s continued violence; the group was formed in Paris

in August 2013 by former president Bozizé. The number of anti–balaka have approximately
15,000 troops. [36] Another factor often cited in the violence is the issue of religion, with the conflict sometimes framed as pitching the largely Muslim Séléka rebels against the predom- inantly Christian anti–balaka forces. [38] But while religious tension is an important factor in some instances of violence, this framing is simplistic. For instance, along with Muslims from CAR and abroad, the Séléka also includes many non–religious rebels, other bandits and opportunists who have joined in the looting and vandalism since March 2013. And while the rebels have committed some religiously–motivated atrocities against Christians, they are also driven by non–religious motivations and have attacked Muslim communities on occa- sion. [39]

4. International military presence in CAR

France

France, practically since independence, has been present militarily in CAR. In 1997, France came to adopt new strategic principles for its presence in Africa. [6] This included a reduced permanent presence on the continent and increased support to multilateral interventions. In Central African Republic, the Bouar base and the Béal Camp (at that time home to 1,400
French soldiers) in Bangui were shut down, as the French concentrated its African presence on Abidjan, Dakar, Djibouti, Libreville and N'Djamena and the deployment of a *Force d'ac- tion rapide*, based in France. (See Figure 5.)

However, due to the situation in the country, France has retained a military presence. During the mutinies, 2,400 French soldiers were patrolling the streets of Bangui. Their offi- cial task was to evacuate foreign citizens, but this did not prevent direct confrontations with the mutineers (resulting in French and mutineer casualties). The level of French involvement resulted in protests among the local population, since many sided with the mutineers and accused France of defending a dictator against the people's will. Voices were also heard in France where some blamed France for its protection of a discredited ruler, totally incapable of exerting power and managing the country. After the mutinies in 1997, the MISAB was a multilateral force, but it was armed, equipped, trained and managed by France. The Chadian, Gabonese and Congolese soldiers of the current *Force multinationale en Centrafrique (FO- MUC)* mission in the country also enjoys logistical support from French soldiers. In response to the risk of genocide, France has increased its military forces in CAR from November
2013. [40] Currently Franc has 1,600 troops in CAR. [41]

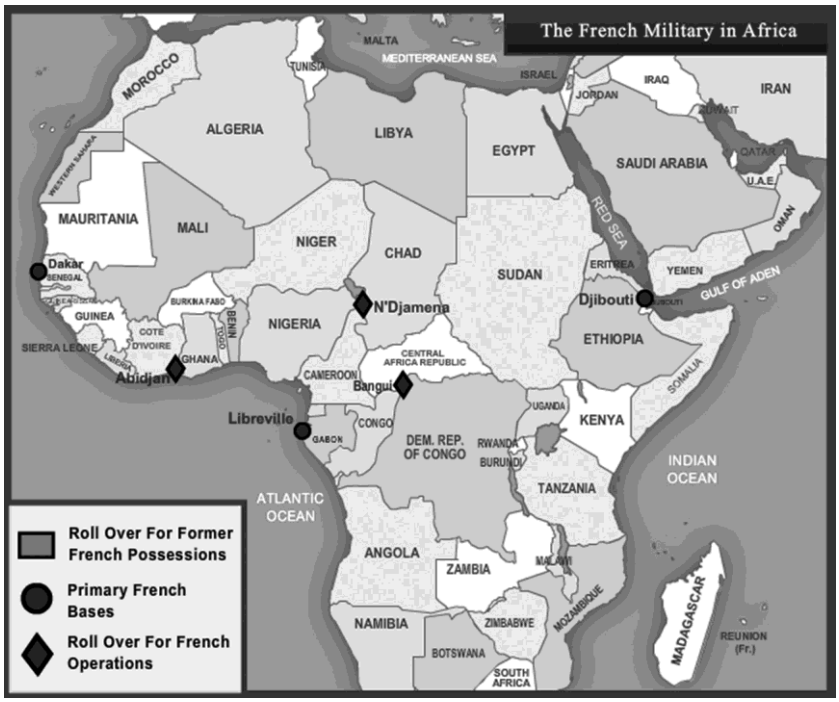

Figure 5. French military in Africa. [36]

5. MISCA (Mission internationale de soutien à la Centrafrique)

The African–led International Support Mission to the Central African Republic (MISCA, French acronym for *Mission internationale de soutien à la Centrafrique sous conduite af- ricaine*) is an African Union peacekeeping mission to the Central African Republic. MIS- CA was established on December 5, 2013 by United Nations Security Council resolution
2127 to stabilise the country as a result of the Central African Republic conflict under the Djotodia administration and following the 2013 Central African Republic coup d'état. The mission, officially backed by France and initially led by the African Union, was deployed on December 19, 2013. The resolution includes the option to transfer it to a larger mission under United Nations authority with peacekeeping forces from more countries — if needed and if appropriate local conditions are met. Troop contributing countries are: Burundi (850), Cameroon (800), Congo (850), RD Congo (850), Gabon (500), Guinea Equatorial (200), and Chad (850).

Chad

In addition to the multilateral forces, there has been bilateral support from other African countries, such as the Libyan and Congolese support for Patassé, mentioned above. Former president Bozizé is in many ways dependent on Chad support. Chad has an interest in CAR, since it needs to ensure calmness close to its oil fields and the pipeline leading to the Cam-

eroonian coast, close to the troubled northwest CAR. Before seizing power, Bozizé built up his rebel force in Chad, trained and augmented by the Chadian. President Déby assisted him actively in taking power in March 2003 (his rebel forces included 100 Chadian soldiers). After the coup, another 400 soldiers were sent. Current direct support includes the 150 non– FOMUC Chadian troops that patrol the border area near Goré, the Chadian soldiers patrolling Bangui, but most of all the Chadian soldiers within the presidential lifeguard. The CEMAC Force includes 121 Chadian soldiers. The Chadian troops in CAR are accused of pro–Seleka bias which has led to increasing anger levelled at Chad in CAR. They have been accused by locals of killing civilians as well. In January 2014 the Chadian peacekeepers have been redeployed from Bangui to try to diffuse tension in the capital of CAR.

Current situation

Since the outbreak of this most recent crisis, the situation has remained extremely volatile, with a normalization of violence, widespread human rights violations and lack of state effi- ciency, at least providing public services on a minimum level, a collapse of state structures, including the official security providers (police, gendarmerie, armed forces). [30: 609–610] The humanitarian situation is dire as the current crisis juxtaposes itself with a chronic under-development persisting throughout the country. The impact on the population is severe and multiple, and includes the lack of access to basic services, in particular to health care, lack of livelihoods and a looming food crisis. State security forces and members of non–state armed entities, including Chadian soldiers and bandits, continue to attack cattle herders, primarily members of the Mbororo ethnic group. Many observers believed Mbororo were targeted primarily because of their perceived foreign origins, relative wealth, and the vulnerability of cattle to theft. French troops are trying to disarm rival groups of vigilantes before Rwanda– style genocide can take hold. But the Central African Republic is the size of France, and there are fewer than 2,000 of these troops currently deployed — along with some 2,500 African peacekeepers. The French intervention has reduced the violence in Bangui, but the long–term danger is that sectarian brutality will perpetuate communal hatred.

While the situation in the capital, Bangui has improved slightly, the security situation out- side the capital has continued to deteriorate, with serious human rights violations reportedly being perpetrated by different armed groups. There are currently 4,000 MISCA troops, 1,600

French forces, and the EU announced last week an additional 500 soldiers. But it is clear that the crisis in CAR which almost has the same territory as Texas (or France in Europe) with very poor infrastructure (roads, railway and airports) is requires highly mobile and quite nu- merous troops. The UN Secretariat has estimated that 10,000 soldiers could be required. [43] In January 2014, there were a number of significant CAR–related developments in Bangui, Brussels and Geneva. The National Transitional Council elected Catherine Samba–Panza, the mayor of Bangui, as the new interim President of CAR. Her election was welcomed by the Secretary–General and the UN Integrated Peace–building Office in CAR (BINUCA). In Brussels, EU foreign ministers approved a peacekeeping force expected to number up to 1,000 troops, while at a conference organised by OCHA and the European Commission, donors pledged nearly $500 million in international assistance. In Geneva, the Human Rights Council (HRC) held a special session on the human rights situation in CAR. [42]

Conclusion

Despite its wealth in mineral and natural resources, CAR ranks 180 out of 187 countries in the 2012 United Nations Development Programme Human Development Index. Socio–po- litical instability is the main factor hampering development, which is the consequence of rebellions, coups and inter–ethnic fighting during the last three decades. This has resulted in a deterioration of basic social and economic infrastructure, and has forced many school–age children out of school. The national net school enrolment of primary schoolchildren is 63%. Despite vast resources, including gold, timber, diamonds and uranium, it is among the poor- est nations in the world.

The Central African Republic has been racked by five coups and numerous rebellions since independence from France in 1960 as different groups fought for control of state re- sources. That — and spill over from conflicts in neighbouring Democratic Republic of the Congo, Sudan and Chad — have destroyed the rule of law, leaving a phantom state with an ill–disciplined army, corrupt administration and a lawless interior. CAR located in an unstable triangle bordering the DRC, Southern Sudan and Chad, which requires a regional approach to the problem. Combined, these factors breed a cycle of instability which has left Central Africans among the poorest in the world.

The disasters that the Central African Republic endures are not natural or caused by ex- ternal political forces, but are rather man–made and indigenous. The numerous rebel groups compete with the government and each other not on the basis of ideological differences, but due to the personal ambitions of their leaders and competition over natural resources (diamond mines in particular). With the exception of sporadic LRA activity in the sparsely populated far east, conflict within CAR has caused extensive problems and outward refugee flows towards Chad in the north and Sudan in the northeast.

The international community has reacted as usual to such a situation, that is to say too late. They lacked the momentum to react in time before mass killing took place. However due to the French intervention, up to now they successfully avoided a Rwanda–style genocide.

It is clear that the success of any political route forward hinges on the support of the Eco- nomic Community of the Central African States and the African Union, as well as the United Nations. Central African actors need to find common ground and live up to their commit- ments. And the international community has no small role to play. Political steps should be complemented by boosting security and the rule of law. [30: 602–603] There is no shortage of priorities in this field, starting with strengthening a national army in decay and disarming, demobilizing and reintegrating thousands of rebels. One of the most important challenges on the horizon is to make sure that CAR does not slip back into obscurity at a time when continued international support will be crucial.

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Territorial Defence in the structures of the Member States of NATO defence derived from the former Warsaw Pact[1]

PASZYN, Maciej[2]

The constant reduction of defence budgets combined with a significant reduction of the armed forces of the European NATO members coming from the Warsaw Pact creates the necessity to create alternative forms of border defence. The ideal solution to the problem seems to be the creation and development structures of Territorial Defence. Components of this type are characterized by a high defence potential, low maintenance costs and high level of popularity. Despite the obvious advantages, except for the Baltic States, these structures do not exist in the coun- tries examined. Following the pattern of Scandinavian or Baltic Sea countries the analysed states should put a strong emphasis on the creation and development of this kind of component and support it by voluntary pro–defence organizations. **Keywords:** *NATO, Territorial Defence, Home Guard, restructuring of the army, pro–defence organizations*

Renal present national defence systems

The day of the 1st of July 1991 is a symbolic date, the end of pro–soviet politico–military pact named the "Warsaw Pact", and the beginning of great strategic and organizational changes in the field of security for all its former members. The final end of the bipolar division of Europe was associated with the withdrawal of offensive strategic assets and preparations for total war. It supervened a "definite change in the assessment of the nature of the threats. No mention has a high global, or even a European war, war using nuclear weapons. Non–military threats and the threat of armed conflict on a local and regional level, was rather exposed." [1] It covered the adopted changes in NATO's strategic concept. [2] For countries detaching from the Eastern Bloc it meant a restructuring of the armed forces and moving towards professionalization. Practically for all of the former European satellite countries of the USSR, as well as for the majority of the newly established Soviet republics the overriding goal was to strive to join the North Atlantic Treaty. These efforts combined with the hardships of political changes in the economy and hence the substantial decrease in funding for defence led the country for the past 22 years to a major reduction of the armed forces.

1 This article is the written form of the presentation that was shown on the Central European Forum on Higher Military Education (CEFME) International Young Scientists Conference on December 2013, NUPS, Budapest.

2 Priv. M.Sc.

Table 1. Quantitative Potential of selected Warsaw Pact Member in 1989. [3]

1989 Year	**Bulgaria**	**Hungary**	**Poland**	**Romania**	**Czechoslovakia**
Land army (all)	103,300	99,200	243,500	146,200	169,600
Air Force	4500	1600	40,900	5400	23,000
Navy	6300	0	22,200	6400	0
Supporting units	2700	6000	33,500	12,000	4000
Territorial Defence	700	0	6900	1000	3100
All armed forces	171,000	106,800	347,000	171,000	199,700
Military equipment					
Tanks	2200	1435	3330	3200	4585
AFV & APC	2365	2310	4855	5000	4900
Aircrafts	234	113	480	380	407
Helicopters	51	96	195	220	101

Table 2. Quantitative potential of selected NATO Members in 2012. [4]

2012	**Bulgaria**	**Hungary**	**Poland**	**Romania**	**Czech Rep. & Slovakia**
Land Army (all)	16,304	17,548	71,700	57,500	29,392
Air Forces	6706	5039	17,200	9500	8748
Navy	3471	0	8100	6900	0
Supporting units	0	0	0	12,000	0
Territorial Defence	0	0	0	0	8177
Gov. paramilitary units	34,000	12,000	21,400	79,000	3100
All armed forces	34,710	22,587	100,000	73,900	49,417
Reserve	303,000	44,000	0	45,000	3080
Military equipment					
Tanks	301	30	944	345	223
AFV & APC	1240	404	2116	1715	944
Aircrafts	62	14	122	70	69
Helicopters	53	29	243	64	98

Data included in Table 1 and Table 2 show that the quantitative reduction of the personnel of the armed forces ranged from 57% (Romania) to 80% (Bulgaria and Hungary — without counting the number of reservists). Secondly, it is easy to notice the fact that reduction in land combat equipment reached 95–98% of output. At the same time it is necessary to cite a well–known fact that the major quantitative restrictions did not contribute to a major im- provement of the quality. Despite the passage of two decades, the armies of the countries

described largely use equipment of Soviet origin, whose shelf life is forcibly extended by more costly modifications. One of the effects of these processes is a significant reduction of defence capabilities in the described countries, which calls into serious question the possible self–defence of its own borders against external enemies.

According to strategic foundations, the majority of decision–makers from Central and Eastern Europe's answer to the question put before them is that the threat was to join NATO structures and adduce the famous 5th article stating that "The Parties [countries] agree that an armed attack against one or more of them (…) shall be considered an attack against them all and consequently they agree that, if such an armed attack occurs to each of them, in exercise of the right of individual or collective self–defence (…) will assist the Party or Parties so at- tacked by taking forthwith, individually and in concert with the other Parties, *such action as it deems necessary*, including the use of armed force". [5] There is a need to declare of that, this document has been created in case of global conflict during which Soviet Union was a major adversary and collective help of all NATO states would profit in political and military advantages for all Treaty members. It is hard to imagine equal absorption in case of local conflict on the outskirts of the Alliance. Article 5th in its construction leaves a "back door" for member states which limits the range of help for an attacked country — "such action as it deems necessary". There is also a tendency to forget about the 3rd article which has a funda- mental importance for all member states. It states that "In order more effectively to achieve the objectives of this Treaty, the Parties, separately and jointly, by means of continuous and effective self–help and mutual aid, *will maintain and develop their individual and collective capacity to resist armed attack"*. [6] The main points of this article impose on each member state the duty of:

- having resources to maintain a self–reliant defence of the country's borders, which would be supported by allied forces if necessary;
- having mobile expeditionary forces capable of quick help for attacked member states. It is important to remember that member countries in case of aggression against one of the pact members, even when the military assistance would be necessary, would need time for such assistance to take place. According to numerous previsions, it has been estimated that time needed for real military assistance for the attacked state would be from 2 to 6 weeks. During that time the attacked member state would have to rely on its own military.

The above directives deriving from the Washington Treaty and the respective duties de- riving from it, have to be placed in an actual political and military situation in Europe. Ac- cording to the International Institute for Strategic Studies' (IISS) analysis there is a stable decrease of military and defence expenditures among European members of NATO.

Table 3. European defence spending in NATO Members as % of GDP. [4]

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
% GDP	1.93	1.89	1.86	1.81	1.78	1.75	1.72	1.62	1.74	1.58

Table 4. The budget allocated to defence by selected countries of NATO in USD bn. [4]

	Latvia	**Litvania**	**Bulgaria**	**Romania**	**Hungaria**	**Slovakia**	**Estonia**	**Czech. Rep**	**Poland**	**U.K.**	**Germany**	**France**	**Italy**
2008	0.47	0.47	1.12	2.6	1.64	1.31	0.39	2.85	7.23	60.1	44.5	60.9	34
2011	0.29	0.425	0.725	2.67	1.41	1.07	0.39	2,52	9.43	61.09*	42.33*	58.8	21

Table 4 clearly shows that the tendency concerns both, Western Europe superpowers and states of the former Warsaw Pact. An obvious consequence of this trend shows that the par- ticular countries are more interested in building and modernizing their own defence potential rather than engaging in international projects. Also it has to be added that change of priorities can be observed in documents of a major member of NATO — United States. In a document from 3rd of January 2012 concerning the "Defence Strategic Guidance of United States of America" a new path in US international policy for years 2012 to 2020 has been introduced stating "major challenges and simultaneously chances for economic and security interests seen in the development of the situation in the area extending from the Western Pacific and Eastern Asia to the Indian Ocean and Southern Asia. (…) World leadership has to be ensured with building partnerships with allied states, (…) through innovative, low–cost actions em- bracing exercises, rotation residences and extended consultancy. (…) Decrease number of personnel and change in strategic priorities will result in moving two brigades out of Eu- rope." [7] That document clearly states that the United States' involvement in Europe will be systematically reduced, limiting their involvement only to instructions, military training and consultancy.

All of the above factors and processes taking place are creating a situation where most of NATO states' defence systems deriving from the Warsaw Pact are inchoate. Determined reduction of national military forces combined with outdated equipment and budget cuts (both own and major allies) in spending on defence, creates a potential threat for the security of analysed States. Therefore, there is a situation in which armed forces of these states would not be capable of carrying out the primary task of a country's defence. The above situation creates a need for armed force's component which would be:

- relatively cheap;
- purposed to carry out land operations;
- purposed to carry out assistance, delay and defence actions;
- capable of carry out operations exclusively within state's borders;
- capable of carry out operations in an area of a state as a whole.

All cited assumptions indicate Territorial Defence (also named "Home Guard") forma- tion, the development of which seems to be ideal a solution for problems described in this chapter.

World patterns of Territorial Defence (TD)

"In most militarily significant countries in the world, have been and still are included in the structures of the armed universal 'qualities' (...) that allow to optimally build armies (apart from all different countries). One of them indicates a two–part structure of the armed forces

— consisting of 'mobile' operational troops and 'local' territorial defence forces." [8]

The first of these components can be today described as "operational" military forces. Consisting almost entirely of professional soldiers, they are characterized by relatively high mobility, offensive ability, plenty of combat vehicles and various types of military equip- ment. The maintenance and constant upgrading of this component in the force necessary for self–sufficient and effective defence of its own borders involves enormous financial costs generally in excess of the budgetary possibilities of the vast majority of countries in the world. Primarily from the necessity to pay qualified professional soldiers from the lowest to the highest levels (it is related with the increasingly high–tech combat equipment) and the cost of upkeep and permanent modernization of using equipment and armament. The current economic crisis and the resulting cut budgets for defence, as well as the rapid development of modern technologies in the armed forces of developed countries, caused a tendency to limit the size distribution of operational forces for their quality.

Undoubtedly, it is advantageous for the implementation of precise expeditionary tasks characteristic for the past two decades. On the other hand, it raises the doubt whether this kind of component would be able to accomplish the task of effectively defending the borders of its own state in the situation of a conventional, full–scale conflict. Therefore, an increasing number of countries began to develop Territorial Defence formations, as the missing element of the state defence system.

The origins of Territorial Defence formations dates back to antiquity. With the passage of centuries it has changed in nature of their character, size and structure. Taking into account the last 20 years of history and only the best developed formations of this type in the world, it can be assumed that the Territorial Defence Forces are: "a territorially formed part of the armed forces organized and used to defend (...) functioning in subordination to the territorial authority of the operational, regional and local level of command. It includes units of light infantry and types of troops formed on the basis of local material resources and reserves prepared to conduct combat operations in regular and irregular formation in constant areas of responsibility. They can carry on the fight alone, support operational forces and provide assistance to the population as part of the (...) humanitarian action". [8] TD formations gen- erally consist of volunteers with basic military training, appointed for periodic training, who usually have other gainful work. Often they are former professional soldiers or people trying to get into a professional army. The essence of these types of formation are "local performing tasks", what means military activity on the areas where TD soldiers live, among communi- ties from which they come. Excellent knowledge of the area and very strong support from the local population, they significantly increase the combat value of the sub–units of this type, forcing a potential opponent to use significant forces and resources to overcome them without guarantee of success, because the OT unit is much easier to disperse than destroy. These in turn, act on their own territory and have a very high capacity to carry out irregular warfare. In addition, formations of this type, due to the good relations with the local society,

are ideally suited to perform the tasks related to key security military facilities, logistics, anti–diversion operations, civilian control of traffic or with refugees. With the potential of armed conflict, these actions can decisively help the main force, hindering significantly the realization of tactical and operational tasks by aggressors. And all of this at a relatively low investment cost needed to maintain this type of unit. It should be remembered, that in addi- tion to a much lower payment level (caused by the duration of the service), the State budget saves on equipment, because the basic sub–units of light infantry armament are small arms weapons, expensive heavy military equipment is not used by them. In addition, these for- mations, for transport purposes, are free to use civilian vehicles. Logistics is also facilitated because the TD soldiers can make use of local civil supplies with much more success in the areas of food or medicines.

At this moment it is necessary to define the difference between Territorial Defence and Reserve Army. In many descriptions and summaries these terms are often used interchange- ably allegedly. According to the author of this article it is a factual mistake. This is due to several key similarities between the formations of those types. Reserves in fact, the same as TD units are mobilized periodically for the duration of exercise, in crisis situations such as natural disasters or in a war situation, and are intended for general tasks in support of the main forces of the regular army. However, in contrast to the TD, the Army Reserve is not characterized by local, territoriality responsibility, it is usually equipped with heavy weapon- ry (mostly older), and also has a limited (compared to the Professional Army) offensive abil- ity and manoeuvrability. Accordingly, the Reserve Army should count as a component of op- erating forces, which often performs Territorial Defence tasks (in the case of TD absence). It is possible to have a situation in which TD formations will be included in the Army Reserve, however putting an equal sign between them is impossible because of the reasons above.

In a later part of this study the author will present three TD formations from Western countries, which will be the standard reference for the analysis of the situation in NATO States from the former communist bloc.

The potential of TD is used in wide aspects in the most powerful armies in the world, led by the largest military power in present time, which is the United States Army. The history of the U.S. National Guard (NG) goes back to the beginnings of the state and is deeply root- ed in the culture of the society. With its legal powers in the constitution, its formation is a separate type of armed forces in the structure of the U.S. Army and is the strongest structure of Territorial Defence in the world. According to the Military Balance 2012, it ranks count
358 thousand soldiers, including 49.5 thousand on active duty (about 8% of all U.S. Army ground troops). In addition, the NG has its own aviation staff that counts 106 thousand people including 6641 soldiers remaining in permanent service. Despite such large manpower and overgrown command structure to the level of the 8 Divisions, the organization did not lose the regional nature of the responsibility and is still strongly rooted in local communities. The primary purpose of this formation is all kinds of actions to support regular U.S. Army at home and abroad. It is probably the only example where the component of this type carries virtually 100% of the Reserve Army task (and not vice versa as is usually). For obvious rea- sons, the level of potential NG is unreachable by any other formation of TD in the world. It is worth noting that the maintenance and development of this type of formation is an integral part of strategic planning by the greatest military power in the world and the expenditure for this purpose is 10% of the defence budget of the country.

The strongest of the European members of NATO, the United Kingdom, has in its structure Territorial Defence formations. The British Territorial Army (TA) has approximately 32 thousand soldiers and has elements of land, sea and air, where the burden of the defence budget fluctuates around 1%. The mentioned formation is noteworthy due to several organi- zational and legal solutions. 236 TA units are divided into national, territorial and sponsored.

14 national units are specialized sub–units and often support operating forces. They enable their members to acquire high–level skills (depending on specialization) in the field of com- munications, medicine, linguistics, artillery and engineering (often recruited here are those of preferred occupations in civilian life). 222 regional units are typical formations of light in- fantry that perform in common support tasks for such troops. A new idea is called "Sponsored Units". "Employees entrepreneurs who agreed to join the reserves continue to work with the scope of their civil activities under the responsibility of the TA on the basis of an agreement between the entrepreneurs and British Ministry of Defence (MoD). About 2000 sponsored reservists are serving in Iraq and Afghanistan." [9] The TA organization is a typical volunteer formation, and basic training lasts for 59 days a year (generally weekends). After passing this stage, annual commitment of a member of the territorial unit is 19 days (two weekends plus training camp). Soldiers of the formation have the rights to receive a number of tax reliefs. Days of service are well paid (about 50 pounds per day is the lowest amount), while the sol- diers are heavily protected against possible dismissal from work: "if the employer terminates the contract of employment without the consent of the Territorial, and the cause is an obliga- tion to perform military service in the reserve, it is guilty of a crime" [9] and must pay high compensation. In addition, through various support programs, there are several governmental and nongovernmental organizations aimed at strengthening cooperation between the British MoD, employers and soldiers. All these aspects make people willing to join the TA, and the formation is widely accepted by the local community.

Those two structures were examples of Home Guard components in the high–size of the armed forces budget leading powers of the world, in which the formations of this type were minor (more or less significant) elements of the total armed forces. Meanwhile, Sweden shows how a voluntary organization can be a primary defensive part of the state security system. Starting from 2008 it ensues a systematic decrease in the size of the defence budget in the armed forces of this country (2008 — 44 billion kroner, in 2014 — the planned 38.9 billion). This situation forced a reduction of the manpower of the regular army from 17 to 12.5 thousand soldiers. [10] Consequently, an increasing number of tasks are done by a defensive voluntary organization named "Hemvarnet" (Home Guard/National Guard). This formation consists of about 30 thousand members (according to the Military Balance 2012), and is a textbook example of the Territorial Defence organization. Divided into 21 battalions (this number is directly related to the number of counties) performs all types of tasks char- acteristic for territorial units. The battalions are divided into 2–5 companies, each of which carries out tasks in their own municipality (max. 2–3 commune for a company). Ultimately, it is assumed the number of 160 companies in 2014 (which also means a reduction, since before the budget cuts the figure was around 300). [11] The basic tasks of "Hemvarnet" include, among others: the defence and protection of objects, supporting crises, border monitoring, reconnaissance and anti–diversion. According to the strategic plans of the Swedish Ministry of Defence in situations of armed conflict, the Swedish army is expected to reach a size of 50 thousand mobilized soldiers in just 7 days. Over 40% of this number (22 thousand) will occur

in the described formation of the TD, which will be automatically increased to the number of 40 battalions. [12]

The system of training, wages and law–welfare facilities in "Hemvarnet" is similar to the British Territorial Army. The distinguishing factor of Swedish TD is that it gives spe- cial attention to its relationship with national youth and pro–defence organizations. The de- scribed formation has its youth counterpart — Hemvarnsungdom ("National Youth Guard"), designed for volunteers aged 15–20 years. Military training conducted in this formation, "focuses on military sports (track, overcoming obstacles, very popular in the Scandinavian countries is orienteering, throwing a grenade), safety during training, first aid and basic prin- ciples of survival, stamina marches mostly in the mountains, very popular are self–defence games and sports; members of youth organizations from Norway and Finland also take part. Combat training is implemented for youth over 18 years of age." [10] In addition, there is trainings in shooting, mainly with air guns. The whole course takes place on weekends and during summer and winter camps and their participants receive uniforms on loan from mil- itary warehouses. After completing the whole process of training in a youth organization, a young person can go then directly to the main formation "Hemvarnet" without the 85–day basic training (GMU — Grundlaggade Militar Utbildning). The second area of "Hemvarnet" activity, worth more attention, is the cooperation with a pro–defence organizations, which ac- cording to various estimates have about 600 thousand people, representing approximately 7% of the total population. In Sweden there are 19 organizations of this type, with the agreement with "Hemvarnet", and 8 of them have a special status that allows its members to become soldiers of described TD formation without having to undergo GMU. It also works in the op- posite direction, because the soldiers can be sent (to become members) to the organization for specialist training. These organizations operate in the fields of: transport (SKBR), medicine (Swedish Red Cross), Radio communication (FRO), objects Protection and Security (SLK — Association for Women), reconnaissance (FMCK), water (SVK RF) air (SBK) and rescue exploration (SBK). In addition, "Hemvarnet" works with another 10 organizations including
35 thousandth Swedish National Defence Organization. All of these support organizations are founded on a very high profile formation in the functioning of local and regional commu- nities, which significantly raises the general defence awareness of Swedish society. It can be said that any possible aggressor would have an opponent in the vast majority of the Swedish population, adapted to support the military's own army.

The example of Scandinavian TD formation perfectly shows how a limited defence bud- get can maintain a very high level of defensive potential by using social voluntary organiza- tions. All three of the above mentioned TD formations, despite substantial differences linked to the size and the target allocation, have several features in common, which are indisputable advantages characteristic of this armed forces component and should be subject to special attention. These are:

1. nationwide range of activity, enabling in a conflict case their performance of territorial tasks throughout all the country;
2. low maintenance costs due to the periodicity of paid wages, as well as co–financing by domestic private entities;
3. significant impact on the defensive awareness and basic defence training for all society;
4. decisive impact on the promotion of the Army, which increases its potential in the future.

Properly placed concerned formations of the Territorial Defence in the armed system of the country, can successfully generate uninterrupted benefits listed above. However for this to happen, it is necessary for correct promotion, development and maintenance by key de- cision–makers of the armed forces. Meanwhile, in NATO member countries formerly from the Warsaw Pact, there should be particular interest in the components of this type, yet the situation is generally completely opposite.

Baltic exception

For over 45 years all the satellite countries of the USSR and the former soviet republics were dependent in their strategic plans on the strict guidelines of Moscow. It was connected, among others, with the approach of the development of native components of Territorial Defence. Offensive strategy concepts of the Red Army, based on massive ground–air strikes and total war, required continuous maintenance of components capable of carrying tasks in support of the back of the front. The Polish People's Republic established, in the mid–60's, a component of Land Territorial Defence (LTD; Obrona Terytorialna Kraju — OTK), and so it is possible to describe the characteristics of the formation in the military structures of the Warsaw Pact.

LTD had in their structures elements of land, air and sea. The group had one brigade, 18 regiments and 67 battalions (as of 1970). [13: 213] It was an extensive formation having in its composition, among others, units of communication, transport, defence against weapons of mass destruction, engineering, pontoon boats, air defence, coastal defence, etc. Saturation of LTD units with heavy equipment and the nature of this equipment identify the described formation much more as Reserve Amy auxiliary than a typical example of Territorial De- fence. Official documents (Resolution of the National Defence Committee of 16.X.1962) determined the true task of the formation as defensive– protective and emergency– rescue, however, in practice, these troops were intended to perform support tasks for the Soviet Army moving through Polish territory towards West Germany (at that time Polish operational forc- es would be involved in the realization of offensive operations outside the western bound- ary). It should also be noted that individual LTD originated directly from the branches of the Internal Security Corps (ISC; Korpus Bezpieczeństwa Wewnętrznego — KBW) — milita- rized branches subordinate to the Ministry of Interior, used after World War II to eliminate the anti–communist underground and to pacify non–constitutional social unrest. Those units were highly politicized and often used to the detriment of its own citizens. The above origin of the LTD were a blatant disregard on the part of the soldiers for operational troops of the Polish Army. LTD formations were commonly considered second–class soldiers, fit only for the tasks behind own lines, in whose ranks were sent those soldiers whom were mediocre at best, but they were correct ideologically. As a result of these factors, a general social aversion to this military organization was born. This situation was comparable to the realities of the other members of the Warsaw Pact, where all types of territorial formations were used in addition to territorial emergency operations mainly for support tasks and prevention.

Since the disbanding of the Warsaw Pact, each of the former members took a different route to restructure their military forces and thus presented a different approach to the subject of Territorial Defence. It led to very large discrepancies in the functioning (or lack thereof) of this type of formation in the structures of the armed forces of the described countries. In
9 analysed States, only three Baltic republics have decided to develop the component units**.**

Table 5. The contribution of the components of the TD in the structures of selected NATO forces. [4]

	TD numbers	Number of all regular forces	TD% of regular army*	Reserve	Other gov. paramili-tary units
Bulgaria	0	31,315	0%	303,000	34,000
Czech Republic	0	25,421	0%	8177	3100
Estonia	12,000	5750	67.6%	30,000	2300
Hungary	0	22,587	0%	44,000	12,000
Latvia	10,666	4600	69.9%	10 666**	5000
Lithuania	14,300	10,640	57.3%	6 700	5000
Poland	0	100,000	0.0%	10,000	21,400
Romania	0	73,900	0.0%	45,000	79,000
Slovakia	0	15,799	0.0%	3080***	N/A

** Ratio determined by the percentage of the TD component in professional army structures [= (TD/(TD+ regular army)]*100)*

*** In Latvia, TD units are counted at the same time as the Reserve*

**** In Slovakia, reserve and training units count towards the total of the armed forces*

Taking into account the data in Table 5 should first focus on the Baltic States.

Lying on the outskirts of the North Atlantic Treaty, Estonia is located in a very difficult geopolitical position. With a modest defence budget ($ 393 million for the year 2011), weak domestic economy and a powerful neighbour who openly hopes to return to superpower status, this country has been forced into a concept development based on the Scandinavian model (Swedish). Due to the very high costs of modernization and maintenance, it aban- doned the expanded Operational Forces and created the Territorial Defence component. The regular army consists of 8 battalions of ground troops (3 of them together with a Signal Com- pany and a Headquarters (HQ) company are part of the only Estonian brigade), the artillery battalion, anti–aircraft squadron and small structures of Air Force and Navy. Meanwhile, in the structures of the Estonian OT formation called the "Defence League" (Kaitseliit) is 12–13 thousand soldiers (depending on the source of the data). Structurally, the formation is divided into 9 training battalions:

- 6 battalions of infantry;
- 1 anti–aircraft battalion;
- 1 artillery battalion;
- 1 battalion intended to participate in peacekeeping operations.

Equipped mainly with APC (armoured personal carrier) Sisu and BTR, as well as anti– tank and anti–personnel small arms, the Defence League is designed to perform common tasks of Territorial Defence and disaster protection. The described TD formation is a vol- unteer organization cooperating in a wide range of activities with the local community. The main elements of support are a "Women's Home Defence" (Naiskodukaitse) and two youth organizations: "Young Eagles" (Noored Kotkad) and "Home Daughters" (Kodutütred). [14] Together with support organizations the Defence League has about 21 thousand members and is a key element of the Estonian defence system.

A similar model of building a national defence system was adopted in Latvia. With an annual defence budget ranging over the past few years from 250 to 300 million USD, the country cannot afford to maintain an expanded regular army. Operating forces have in their ranks, only 4600 professional soldiers whereof "the ground army includes about 2.1 thousand soldiers grouped in one light infantry brigade with two motorized battalions, artillery squad- ron, logistics battalion and HQ company." As in the case of Estonia, in Latvia the key role in the National Defence system was delegated to the volunteer Territorial Defence organization called the "National Guard" (Zemessardze). It is a typical Home Guard organization designed to carry out the tasks of territorial defensive and disaster protection. It consists of about 10 thousand soldiers including 1.2 thousand officers and 1.9 thousand NCOs. Structurally, the Latvian GN is divided into 18 battalions, grouped into three Defensive Districts (DO):

- 1st DO has the strength of five infantry battalions and one logistics battalion;
- 2nd DO has the strength of five battalions of infantry, an artillery battalion, and a battal- ion that combats the effects of ABC weapons, and a logistics battalion;
- 3rd DO in the strength of three infantry battalions, engineer battalion, anti–aircraft squadron and logistics battalion. [14]

A characteristic feature of GN is emphasis placed on preparing its troops to conduct guerrilla operations on the rear of the enemy. Units of Latvian [14] TD do not have heavy equipment. For transport tasks they use lightly armoured Humvees and unarmoured Volvo trucks. Apart from a small amount of field artillery, the main armament of GN soldiers are small arms and mortars with a figuratively smaller calibre. The vast majority of the Latvian TD subunits can be classified as typical light infantry formations.

A more complex situation can be observed in the case of Lithuania. As in the two previ- ous cases there is a limited defence budget, ranging around the border of $400 million. This has forced the authorities of Lithuania to limit the operating component (10,640 soldiers). The main strength of the Lithuanian Land Forces is a Mechanized–Infantry Brigade "Iron Wolf" adapted to all of NATO's requirements; maintenance absorbs a significant part of the defence budget. In addition to this element the regular army consists of three independent mechanized infantry battalions, the engineer battalion, a special purpose battalion (the Grate Jaegers battalion), military police battalion, battalion logistics and minor elements of air and naval forces. Also in this case it was decided to develop a voluntary territorial formation. In contrast to Latvia and Estonia, Lithuania Territorial Defence is performed by two separate entities. The first is the National Defence Volunteer Forces (NDVF; Krašto apsaugos sava- norių pajėgos — KASP). It is a typical TD formation designed for the implementation of territorial operations, disaster protection, and for contact with local communities. Its size is approximately 4700 soldiers divided into five territorial battalions, a battalion training, and a small Air component. [15] Units of this formation consist almost exclusively of sub–units of light infantry. The second important element that can be assigned to the defence potential of Lithuania is a paramilitary organization, the "Rifle Union", which mainly consists of ba- sic military training for young Lithuanians. This pro–defence organization has in its ranks about 9.5 thousand members and has territorial units throughout the country, grouped into 10 Counties. The Lithuanian "Rifle Union" closely cooperates with the Lithuanian Ministry of Defence as well as with organizations of Police, Border Guard, Lithuanian Academy of Defence and other pro–defence entities. In carrying out the training program and patriotic ed- ucation in school (also with "difficult youth") and student youth, Union makes an invaluable

contribution to the promotions of native army forces, and for of the public preparation in the event of armed conflict.

Examples of the three described Baltic Countries are unequivocal evidence of the effec- tiveness of the Territorial Defence component in the State security system. Similarly, as in the cases mentioned earlier of Western countries, it is also possible to observe the key benefits of the proper activity of the Home Guard, such as: a significant increase in defence capability of the State, nation–wide coverage of the tasks or expanding cooperation in military–society, and all this with a relatively low cost level. Meanwhile, in other NATO countries stemming from the Warsaw Pact, these type of components are virtually non–existent, and the territorial tasks are carried out by other government formations. Frequently, these functions are distrib- uted among units:

- Border Guard (Bulgaria, Czech Republic, Hungary, Poland, Romania), in the area of border monitoring;
- Police and Special Police units (Bulgaria, Poland, Romania) in potential support oper- ations and the maintenance of public safety;
- Formation of the Reserve Army (all analysed) in the field of emergency operations and support activities;
- Regular Army units (all described functions).

If we combine this information with the data contained in Chapter I about the scale of the reduction of personnel and equipment in the analysed armed forces we get the image of incomplete defence systems of those countries. Covering a lack of potential risks of armed conflict and NATO membership, it cannot justify the failure of national military potential.

Summary and conclusions

There are a couple of causes for this discrepancy, between the three Baltic States and the rest of the analysed countries. First of all, the three above described countries were, so to speak, forced to create the TD components. As they were the ones, out of the analysed nine that had to create their military structure after the collapse of the Soviet Union practically from scratch. Not having any native military units, nor a sufficient budget necessary to create full– sized operating forces effective in defence of its own borders, they had to choose the Scan- dinavian model and base its defence system on volunteer formations. This is a characteristic of countries receiving independence (other examples being the United States after the War of Independence or Poland in the years 1918–1921). Meanwhile, the remaining six Countries came out of the Warsaw Pact with excessively powerful military structures and a huge num- ber of heavy equipment (rapidly aging but not obsolete). Excessively powerful military po- tential and economic troubles made reduction a priority. Territorial Defence Units were gen- erally badly–equipped and identified as being militarily inferior. The best example here is the process of terminating units of TD in the Polish Army, which eventually disappeared in 2008.

The second key factor causing this discrepancy is both the social and primarily mili- tary environment and attitude concerning this kind of formation. Territorial units based on volunteers always strengthen the sovereignty of the society in a newly formed State. This situation could be observed during the process of obtaining independence for Lithuania, Lat- via and Estonia in the early 1990's. Creating from scratch ones own, independent, military structures, was undoubtedly associated in those societies with the long–awaited process of

obtaining independence and thus they supported, to a significant extent, these initiatives. The growth potential that has been duly used and has enabled the creation of a sustainable national defence system, based on local voluntary formations, and raises a new generation in the spirit of patriotism and military awareness. While in the former satellite countries of the Warsaw Pact social attitude was completely different. The population interacts with the army with reluctance (especially for executives) identifying them with a tool controlled by policy makers from Moscow. More than 45 years of political interference in the military structures created a huge distance between the society and the army. It was prevented forming of territo- rial defence structures according to Western examples. Also the approach in military society crossed out the chance of the normal development of this component. Among older staff officers, brought up on Soviet offensive strategic concepts, accustomed to a huge amount of heavy equipment, they do not quite appreciate the combat value of this type of formation and are often considered absolutely unnecessary in the new geopolitical reality. Also lower man- agement staff continue to have a deep reluctance towards these TDs, believing their soldiers ill–trained and undisciplined (which, moreover, was often proved true in the armed forces of the Soviet and post–Soviet model). A period of USSR strategic thinking as well as more than 20 years of reductions and omissions in relation to the territorial component, caused a complete lack of understanding (among the most military personnel as well as society) for the idea of the functioning of this type of structures.

Meanwhile, the political–military situation has seen a major change over the past two decades. The systematic reduction of defence spending in most European NATO States, and hence the permanent reduction of the armed forces, created the necessity to seek alternative ways of supporting defensive combat abilities of the members of the Pact. In fact the excess military capacity from the beginning of the 1990's was limited to such a large extent that it has become insufficient for self–defence. Referred to in sections II and III are examples of TD units in the military systems of their countries; these clearly show the benefits of investing in this type of formation. It is a way of restructuring, which the other six analysed countries should take seriously, choosing between the Swedish model (based on about 30–40% share of TD in the national defence potential) and the Baltic model (60–70% share of the TD). Due to the number of the population, the area of the territory of a member state, and the current size of the native armed forces, the first solution seems favourable for Bulgaria, Romania and Poland, while the other model perfectly addresses the needs of a smaller Hungary, the Czech Republic and Slovakia. Today's geopolitical situation and consequently, the NATO strategic concept, imposes on its members the need to have a relatively small but highly mobile and technically advanced operating component, supported by numerous and well–organized defensive forma- tions. Based on the above analysis, it is necessary at this point to cite all the arguments proving the need to develop TD structures in those countries of Central and Eastern Europe:

- raise the overall military capability of a state;
- reduce the cost of maintaining the armed forces;
- upgrading regular components (less will translate into better quality);
- adapting to the guidance of the military structures of NATO;
- training and raising general awareness among the public defence;
- improving the quality of response activities;
- the creation of new part–time jobs for youth;
- improve the relationship of the military to society.

A list of the benefits from the development of the territorial component is long and should be thoroughly analysed by a state's policy makers.

However, it is clear that territorial defence organization structure does not arise from one day to the next. For correct development they need the convenient organizational and social conditions, and the last few decades omissions certainly did not help in the process. The most important element seems to be the persuasion of those organizations, all of society, because territorial defence units need to coexist with the local population and civil structures. To carry out this task, it is necessary to have a smart, long–term promotion campaign addressed to all generations. It should refer to patriotic values, financial–organizational benefits for local communities and remind people that the territorial service is associated with prestige and the possibility of earnings. The ideal solution would be to link a variety of voluntary services facilitating the (after a specified period of time) entrance to regular army.

The second key element should be the creation of appropriate organizational structures adequate for the task faced by the component. This would involve the necessity of territo- rial distribution of headquarters and training centres, allocating adequate equipment (which should not be a problem due to the nature of the activities of light infantry) as well as training instructors. The last issue would be the creation of appropriate regulatory concessions and benefits of law and economics enabling members of the Territorial Defence, on the model of the British Territorial Army for example. The systematic implementation of the above processes should give the first tangible results over about 5 years after their launch. For this to happen, it is essential to have a lasting conviction for the whole initiative among, decision makers, both military and political, this would be the first task of entities endeavouring to attain the described concepts.

The process of creating structures of the Territorial Defence in this situation is certainly not an easy task and is risky because it can meet with social disinterest. In the initial phase of development, this process requires a fairly significant investment of financial resources nec- essary to perform the tasks promotion, logistics (including the establishment of new regional training centres) and training. Hence, many high–ranking officers come to the matter reluc- tantly. The solution, which may compensate, to a large extent, this risk is to focus on the first phase of the process of creating TD structures for supporting the activities of pro–defence voluntary organizations. An example would be the Swedish "Hemvarnet" (along with its youth part) and the Lithuanian "Rifle Union" and it can be clearly seen how great an impact on the local social consciousness organizations of this type have. Promoting bottom–up ini- tiatives of defence should be used to create the seeds of future structures of Home Guard for- mation. It must be remembered that the activities of this kind of organization, which brings together, in general, young people, in addition to the present unquestionable advantages for the state, affects to much greater extent the defensive potential in the future by educating and shaping the patriotic spirit of potential future professional army personnel, and even more. It is therefore used as much as possible among the younger generation, "being in uniform is stylish." In summary, logistics and training supporting pro–defence organization should be the duty of every Ministry of Defence, and the activities of these associations should be used to build the foundations of Territorial Defence.

This analysis of the military structures of NATO members derived from the former War- saw Pact, and referring to selected Western countries have clearly shown the need to develop the formation of Territorial Defence by countries that do not have such structures. Undoubted

benefits of the implementation of this idea, referring to the improvement of defence capabil- ities or budget savings in the long term cannot remain unnoticed.

Being witness to the beginning of a new era of armed conflict and in pursuit of new technological solutions, we cannot forget timeless, proven ways. It must be remembered that the involvement of society in pro–defensive organizations will widen the responsibility for the fate of the country in a conflict situation. Being adequately trained and prepared for the rigors of war will give the public faith in their own abilities. And in the words of Confucius: "The leader of a great army can be defeated. A simple peasant having faith is invincible." [16]

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Non–invasive electro–gastro–intestinogram (EGIG) recording under physiological conditions

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Electro–intestinogram (EIG), together with electro–gastrogram (EGG), are non– invasive methods by which gastro–intestinal (GI) activity can be monitored contin- uously and without disturbing the patient. They also make it possible to determine whether disturbed functioning require any acute or planned intervention, and also to assess results of earlier (pharmacological or surgical) treatments.

Based on scarce literary sources and on our own experimental experiences, a new device has been developed for non–invasive recording of the electrical activity of the whole gastro–intestinal system in a continuous way.

Results of our preliminary testing revealed that the dominant frequency of the stomach is 1–5 cpm, of the small intestine 10–14 cpm, and of the large intestine 1–7 cpm, respectively. It has also been shown that changes of GI activity could be monitored by the device. **Keywords:** *electro–intestinogram, non–invasive recording, gastro–intestinal activity*

Background

The structure of different portions of the gastro–intestinal (GI) system show remarkable sim- ilarities, although differences also exist. The wall of the hollow organs usually contains 2–3 layers of smooth muscle, a circular, a longitudinal and in some places a longitudinal/diago- nal. The inner surface is always covered by a mucosal while the outer surface by a serosal layer. The latter is closely associated with the mesenteria that host blood vessels and nerves supplying the GI organs. [1]

Regulation of the GI system is at least threefold: intrinsic nervous, autonomic nervous and hormonal/paracrine. The intrinsic regulatory system consists of 4 plexi, of which the two larger — the myenteric (Auerbach) and the submucosus (Meissner) plexus represent the main structures. These plexi consist of a relatively large and rich neuronal network resem- bling that of some brain structures (hence they are frequently called “visceral brain”) and reg- ulate peristalsis as well as other motility activities. In addition, this intrinsic neural network regulates local enzyme and digestive juice production as well. [1] [2] [3]

The extrinsic nervous control is represented by the GI branches of the autonomic nervous system. The basically noradrenergic sympathetic nerves usually inhibit motility and pro-

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duction of digestive juices, whereas cholinergic dominance by the parasympathetic system enhances motility and enzyme production, respectively. The sympathetic fibers run from the spinal cord via the coeliac ganglia to the organs while the parasympathetic fibers run directly to the organs and form synapses in the GI wall. This way the extrinsic autonomic control modulates the activity of the intrinsic nervous system which in turn works in a reflexive way. The autonomic nervous system connects the visceral activity to the central nervous system, among others, to the spinal cord, medulla, limbic system and hypothalamus. [2]

GI activity is further modulated by hormones and paracrine transmitters produced mainly by endocrine glands within or closely associated with the GI tissue. These amino acid deriv- atives and neuropeptides act frequently locally as paracrine transmitters (e.g. gastrin in the stomach wall) and also as hormones (cholecystokinin, secretin, and gastrin itself) and repre- sent a feed–back/feed forward system within the gastro–intestinal structures.

In the complicated network of neuronal–hormonal regulation, the intrinsic plexi represent the final common pathway: all higher regulatory influences converge at these neurons and modulate local regulation. Although enzyme and juice production is an important feature of the operation of the GI system, motility is usually regarded as the factor representing normal activity of the stomach and the intestinal system. The myoelectric signals generated within the GI organs determine motility hence monitoring this activity may give an insight into the operation of the GI system. [4] So far, however, despite the long–known electro–gastrogram recording, very few attempts have been made to record the myoelectric activity of the whole GI system continuously and simultaneously and to get a general and detailed impression of the activity of the whole system.

Monitoring the activity of the whole GI system seems to be important for judging the intactness of the system for the gastroenterologist, and even more for the GI–surgeon follow- ing a surgical intervention. Non–invasive methods should be preferred in this respect since in this way the physician may get information without really disturbing the patient. A special application of the non–invasive GI activity monitoring using surface electrodes and mobile equipment is on the battle–field where the physician has a very short interval (the so called “golden hour”) to determine whether the wound of the soldier requires immediate interven- tion and hence a priority for transport to the hospital or a few hours may be allowed until the wounded person gets further medical help.

EGG activity seems to well correlate with gastric emptying in healthy subjects if tested with a solid test meal. [5] [7] It has also been shown that cutaneous EGG shows consequent frequency and power increase if tested with a solid meal, whereas it shows inconsistent re- sponse (power increase but frequency decrease) when tested by a large water load. [6] EGG measures seem to be fairly reproducible and relatively stable even over days or weeks. [8] Postprandial EGG may also reflect abnormal gastric functioning, like recurrent nausea and vomiting, by an increased instability, by decreased second harmonics and by tachygastria. [9] To sum it up, gastric electrography has proven to be a useful tool in the hands of gastroenter- ologists since it provides a non–invasive way by which gastric functions and malfunctions could be monitored. [4]

Despite the positive results on the EGG, due probably to technical difficulties, this meth- od has not gained much recognition in practice. It is also mysterious why electrographic methods have not been used to monitor intestinal motility. The few such studies (e.g. Brown et al., 1975) revealed that significant differences exist among the different parts of the gas-

tro–intestinal system, regarding dominant frequency, which could offer an excellent tool to get information on the operation of the whole system. [10]

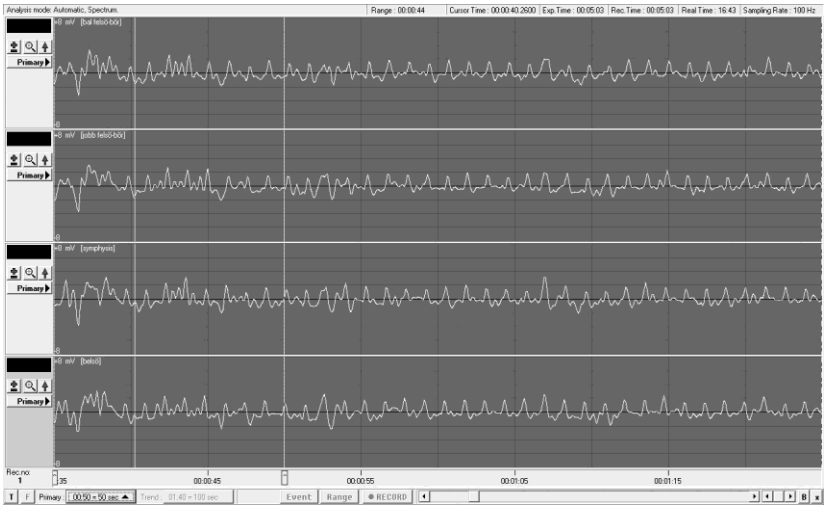
The aim of this paper, hence, was to describe a new device and method for non–invasive monitoring of the myoelectric activity of the whole GI system, continuously and simulta- neously, by combining the electro–gastrogram (EGG) with the electro–intestinogram (EIG) in one recording. As far as the authors know, up to now there has not been any diagnostic procedure that may follow the functional changes of the whole GI system and could provide valuable data on–line. [11]

Methods

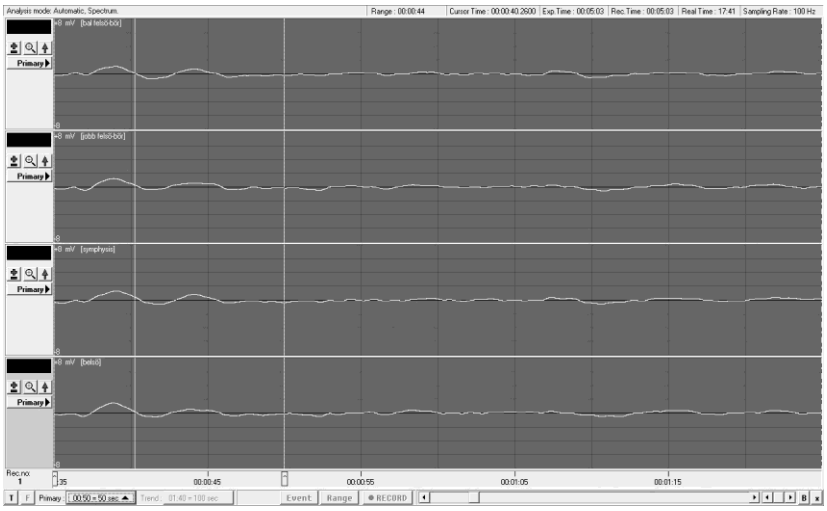
Equipment

The electric signals of the nanovolt range were properly filtered to remove the influence of the breathing and circulatory activity and to save only the GI signals. A special extracellular amplifier and special software have been developed to process the incoming electric signals (SPEL Advanced ISOSYS System, Experimetria Ltd, Budapest, Hungary). Most of the nec- essary processing has been transferred from the electronic device to the software, including filtering. Figure 1 shows screen shots of a record made during the validation process (see below) with different filter settings, whereas Figure 2 shows power spectra created form this record also with different filter settings (bottom channel). In this study, a bandpass filter was set at 1 to 14 cpm during recording.

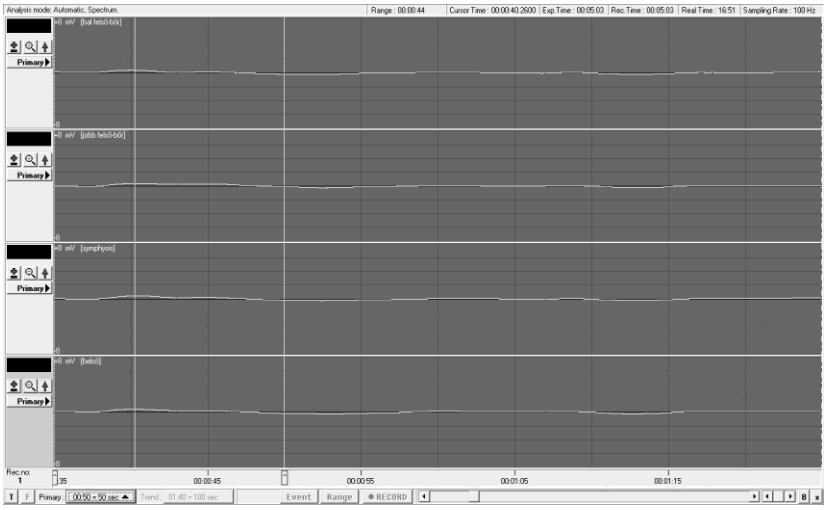
To process the signals, power spectra were created by different filter settings at the re- spective ranges of the different GI portions: 1–3 cpm for the stomach, 2–5 cpm for the colon, and 9–14 cpm for the small intestine. To compare individual records, the dominant peak frequency and the power and maximum magnitude of that peak were calculated for each part of the GI system. (See Figure 1 and Figure 2 for examples.)



1/A. Unfiltered record.

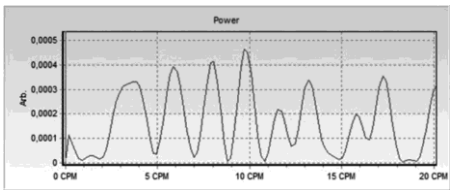


1/B. Bandpass filter set between 1 and 14 cpm (full GI activity).

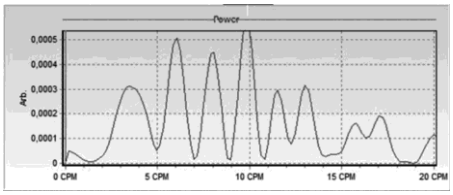


1/C. Bandpass filter set between 1 and 5 cpm (colon activity range).

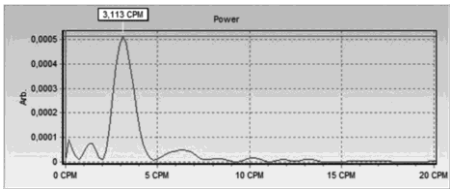
Figure 1. Record screen obtained during the surgical procedure. Channel assignment from top to bottom: upper left skin electrode,
upper right skin electrode, symphysis electrode, colon–direct electrode.



2/A. Unfiltered.



2/B. Bandpass filter set between 1 and 20 cpm (full GI activity).



2/C. Bandpass filter set between 1 and 5 cpm (colon activity range).

Figure 2. Power spectrum of Channel 4 (direct electrode on the colon) with different bandpass filter settings.

Procedure

Two experiments were run: one to validate the recording device and the measured signals, and another to demonstrate the capacity of the method in monitoring functional changes of the GI system.

Validating the method

32 subjects (11 males and 21 females, mean age 48.09 years) were tested. All subjects were prepared for a laparoscopic surgical intervention to remove the gall bladder. Subjects were intrathecally narcotised and were also given a muscle relaxant prior to the surgery. The lap- aroscopic intervention was made by keeping 12 mmHg intra–abdominal pressure. Before removing the gall bladder, a pair of non–polarizing inert electrodes was implanted into one of different portions of the gastro–intestinal system, including the gastric corpus, the intraperi- toneal portion of the duodenum, the jejunum and the transversal colon, respectively. Simulta-

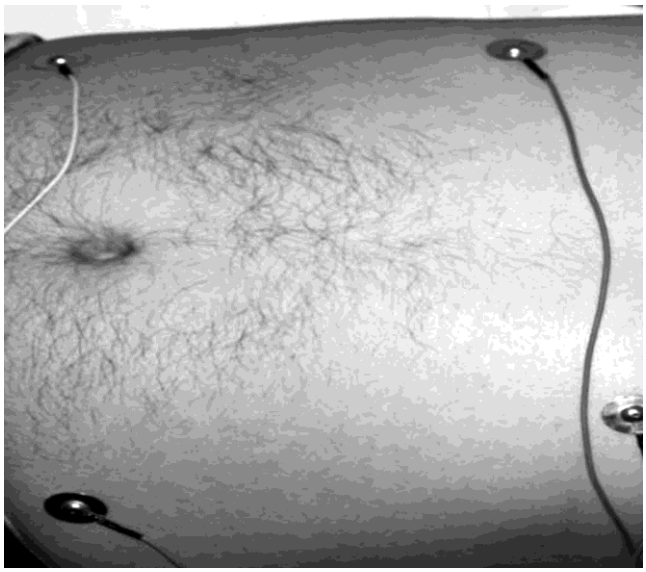
neously, 3 pairs of electrodes were attached to the abdominal skin (upper left and upper right abdomen, and over the symphysis, respectively). 10 minutes before initiating the recording, the positive intra–abdominal pressure was released.

Bipolar recording was made parallel from the four pairs of electrodes during 5 minutes without making any intervention. Finally, the electrodes were removed and the surgical pro- cedure continued.

Monitoring functional changes

45 subjects (14 males and 31 females, mean age 20.04 years, age range 18–25 years, with negative laboratory tests and a normal abdominal ultrasound record) volunteered for the ex- periment. They were not given any money or other reward for the participation. Exclusion criteria were former GI surgery, cardio–vascular diseases, absorption and motility disorders, gastro–duodenal ulcer, and inflammatory bowel disease.

Four recording cup–electrodes were attached to the carefully cleaned abdominal skin, forming a square. A pair of them were placed 5 cm below the nipples and two of them
1 cm below the navel, 10 and 15 cm apart the midline, respectively. (Picture 1 and Figure 3) A reference electrode was attached to the skin of the right thigh.



Picture 1. Electrode arrangement on the abdominal skin for recording GI activity (EGIG).

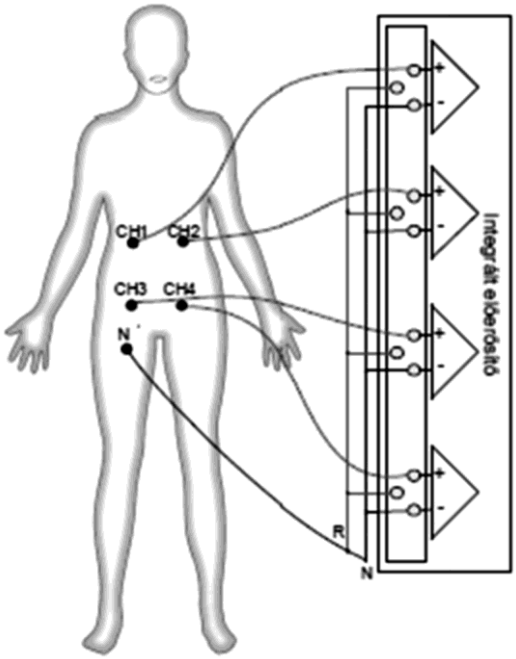


Figure 3. Sketch of the electrode connections to the recording device.

First, a 30 minute basal recording was made (preprandial phase) while the subjects were lying in a supine position without moving or talking. Then they were given 4 grams pro body- weight of 70% black chocolate to stimulate enteral CCK release. After a 5 minutes interval, another 30 minute recording was made (postprandial phase).

Data processing

Data were processed by the SPEL Advanced ISOSYS System (Experimetria Ltd, Budapest, Hungary). Results of the two periods were compared by a paired Student's t–test. A 0.05 significance level was kept throughout.

Results

Validation of the method

Records made during the surgical procedure clearly prove that the spectral distribution of the GI activity measured directly versus indirectly (superficially) have the same patterns, although, of course, the tissue signals have larger power than those recorded from the skin. Figure 4 shows power spectra of a record made with the internal electrode put on the colon. It is clear that all four electrodes record similar signals, with the symphysis electrode (i.e. the one closest to the colon) being almost identical with the colon–direct electrode and the two abdominal electrodes showing less power in the range of colonic activity.

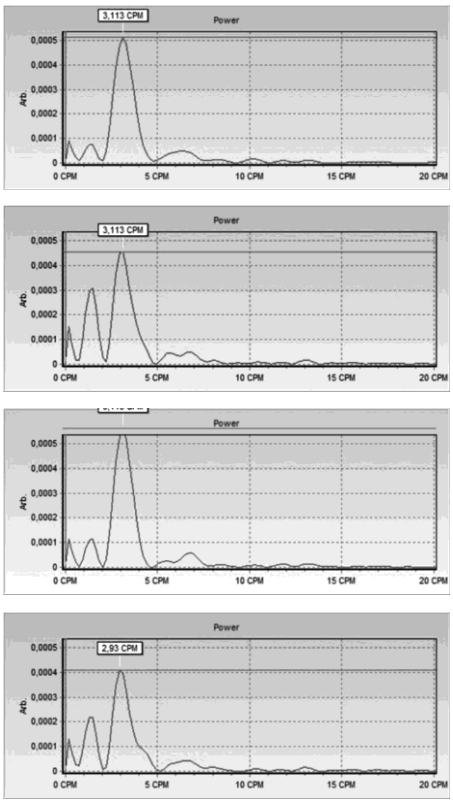
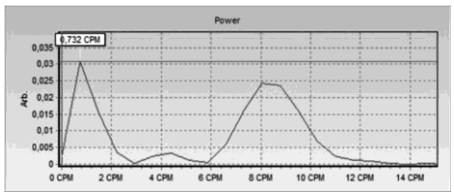
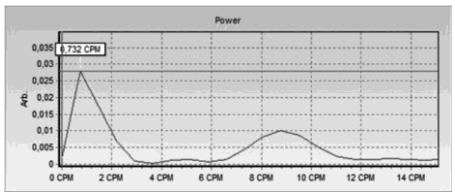


Figure 4. Comparison of the parallel records of the 4 electrodes made during the surgery.
Channel assignment from top to bottom and to right: upper left skin electrode, upper right skin electrode, symphysis electrode, colon–direct electrode.

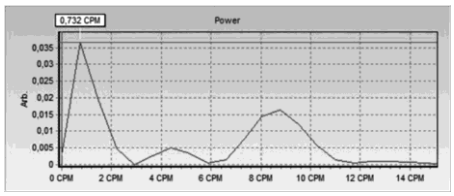
Figure 5 displays spectra specifically filtered for the stomach, the jejunum and the colon, respectively. It was found that the different electrodes mirror the internal activity pretty well, with minor differences depending on the recording site. Stomach activity peaked around 2 cpm, small intestine activity between 9 to 13 cpm and colon activity around 5 cpm, respec- tively. (Figure 6)

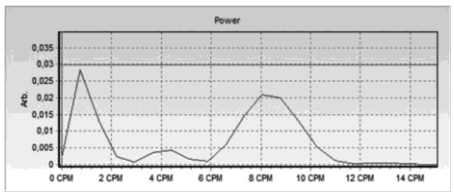


Electrode inside, on the stomach



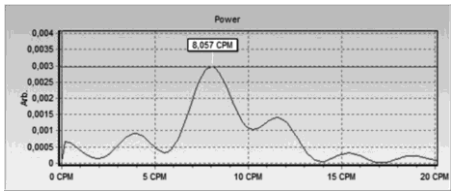
Electrode outside, close to the symphysis



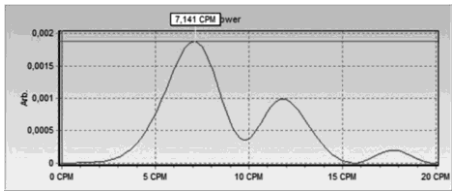


Electrode outside, on the right upper abdomen *Electrode outside, on the left upper abdomen*

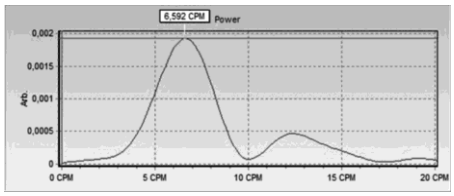
5/A. Gastric activity.

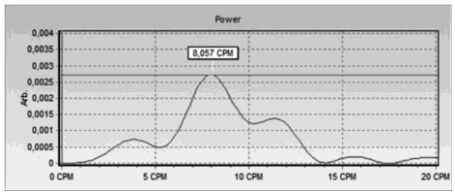


Electrode inside, on the jejunum



Electrode outside, close to the symphysis





Electrode outside, on the right upper abdomen *Electrode outside, on the left upper abdomen*

5/B. Small intestinal (jejunal) activity.

Figure 5. Power spectra of the gastrointestinal motility recorded during the surgery.

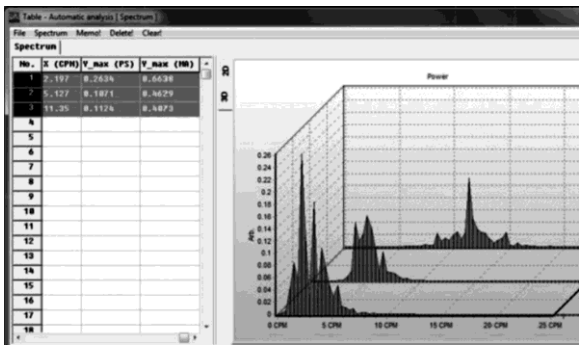
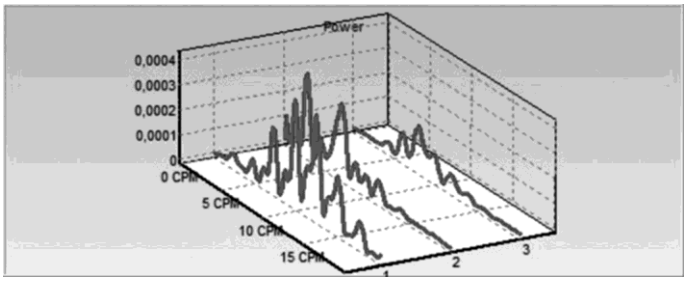


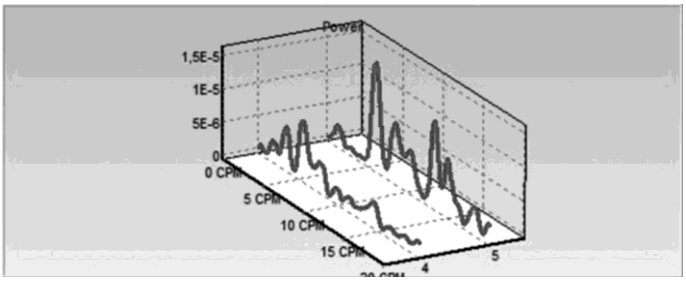
Figure 6. Comparison of the electric activity of the three portions of the GI system recorded by the combined EGIG method Power spectra from the front to the back: stomach, colon, small intestine.

Monitoring functional changes

Figure 7 shows representative spectra of a subject while lying supine quiet, talking, hyper- ventilating and after consuming chocolate, respectively. The record, obtained from the right upper electrode, clearly shows that spectra are influenced by extra–gastrointestinal events like talking (Row A2) and hyperventilation (Row A3), but if the subject is quiet in a supine position (Row B1), the spectral changes clearly reflect the motor activity of the stomach and intestine, respectively. (Row A1 vs Row B2)



7/A.
Panel B. Row 1: Lying quiet and relaxed. Row 2: After consuming 4g/bw chocolate.



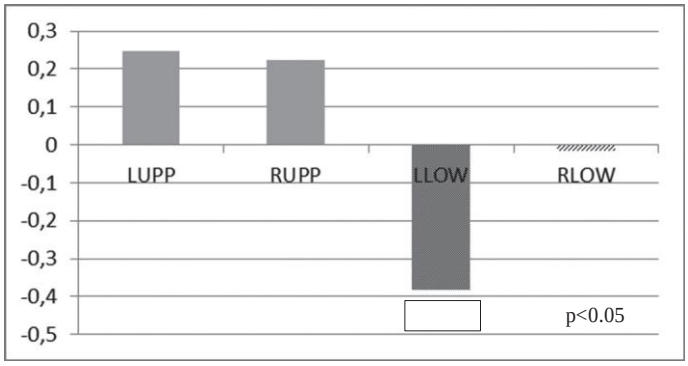
7/B.
Panel A. Row 1: lying supine, quiet and motionless, hungry. Row 2: Subject talking (still lying supine). Row 3: Forced hyperventilation.

Figure 7. Power spectra of an individual in the chocolate feeding test.

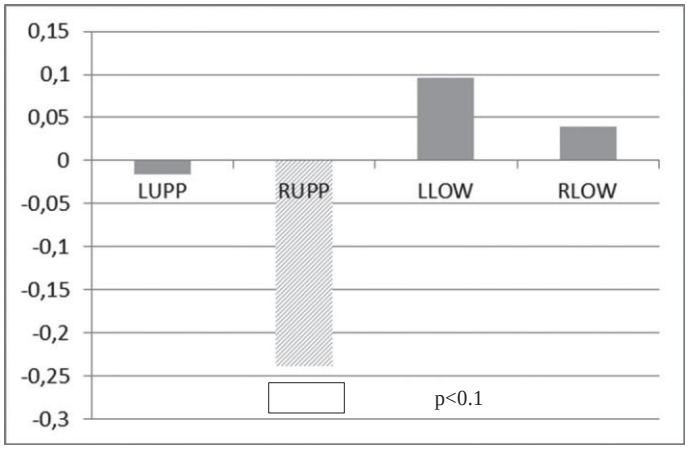
Figure 8 shows the mean frequency differences between the hungry and chocolate fed states, respectively. Although the feeding had not elicited a major frequency shift in either of the studied GI sites, stomach (low frequency range, upper electrodes) and the intestines (middle frequency range, lower electrodes) behave in a different way: whereas in the stom- ach activity range we detected slight increases of frequency on the upper electrodes (i.e. those above the stomach) and a decrease on the lower electrodes (i.e. above the intestines), on the middle frequency range it is just the other way around. One may speculate that these changes reflect that the altered motor activity: mixing movements had been replaced by peristalsis. This interpretation is supported by the power and by the magnitude data which are summa-

rized in Table 1 both power and the maximum magnitude decreased significantly in the low frequency ranges referring to the altered shape of the power spectrum.

As of the effect of chocolate consumption, the results are non–consequential (although the records exactly show all changes for each individual): about 30–40% of the participants showed an increased and another 30–35% a decrease in GI activity, the rest being essentially unchanged.



8/A. Low frequency range.



8/B. Middle frequency range.

Figure 8. Mean frequency differences between the hungry versus chocolate fed states.

LUPP: right upper electrode; RUPP: left upper electrode; LLOW: left lower electrode; RLOW: right lower electrode.

Table 1. Mean power and magnitude differences, respectively, between the hungry versus chocolate fed states.

POWER				
	LOW FREQUENCY RANGE			
	MEAN (*10^{-3})	±SE	t-value	p
LUPP	*-28,2182*	0,017879	-1,596	p<0,1
RUPP	**-40,9515**	0,0201146	-2,058	p<0,025
LLOW	**-17,2167**	0,0105915	-1,643	p<0.05
RLOW	*-26,3850*	0,017766	-1,502	p<0,1
	MIDDLE FREQUENCY RANGE			
	MEAN	±SE	t-value	p
LUPP	0,2240	0,0002346	0,9653	ns
RUPP	0,2240	0,0000957	0,7152	ns
LLOW	-0,2565	0,0002023	-1,282	ns
RLOW	0,0378	0,0001379	0,2771	ns
MAGNITUDE				
	LOW FREQUENCY RANGE			
	MEAN (*10^{-3})	±SE	t-value	p
LUPP	**-41,6002**	0,0185457	-2,268	p<0,001
RUPP	**-60,6860**	0,0213079	-2,88	p<0,001
LLOW	**-18,4661**	0,0155884	-1,198	p<0.05
RLOW	**-33,5833**	0,0187723	-1,809	p<0.05
	MIDDLE FREQUENCY RANGE			
	MEAN	±SE	t-value	p
LUPP	1,0835	0,0029376	0,3729	ns
RUPP	-0,4395	0,0016904	-0,263	ns
LLOW	*-3,8401*	0,0029461	-1,318	p<0,1
RLOW	-0,1019	0,0022887	-0,045	ns

LUPP: right upper electrode; RUPP: left upper electrode; LLOW: left lower electrode; RLOW: right lower electrode.

Discussion

The new device and software provide a non–invasive method by which the activity of the gastro–intestinal system can be monitored continuously and without much disturbing of the subject or patient. The electro–gastro–intestinogram (EGIG), obtained through superficial

extra–abdominal electrodes may be a novel instrumental aid for surgical practice. This non– invasive method might make it possible to detect dysfunctional intestinal activity and espe- cially those with decreased or stopped motor function in a very short time without placing the patient into complicated equipment, and also to decide whether an instant intervention was necessary. Due to the small size of the device and to the portable (off power) computer technology, an instant recording could also be made on the field, even under battle conditions hence providing a useful on–site tool for military doctors.

In addition, this method might be used to examine extreme states in which the visceral organs suffer big load and/or which amount to unusual stress, such as military pilots have to take when flying with a load of even 10G. Up to now, we do not know too much about the viscero–motor changes under and following flying conditions, thus the method described now may open new insight into this problem.

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