Different Faces of Security
From Knowledge to Management

Edited by
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Institute for Security &
Development Policy

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www.isdp.eu

Different Faces of Security: From Knowledge to Management is a *Conference Report* published by the Institute for Security and Development. The Institute is based in Stockholm, Sweden, and cooperates closely with research centers worldwide. Through its Silk Road Studies Program, the Institute also runs a joint Transatlantic Research and Policy Center with the Central Asia-Caucasus Institute of Johns Hopkins University's School of Advanced International Studies. The Institute is firmly established as a leading research and policy center, serving a large and diverse community of analysts, scholars, policy-watchers, business leaders, and journalists. It is at the forefront of research on issues of conflict, security, and development. Through its applied research, publications, research cooperation, public lectures, and seminars, it functions as a focal point for academic, policy, and public discussion.

ISBN: 978-91-85937-95-0
Printed in Singapore

Distributed in Europe by:

Institute for Security and Development Policy
Västra Finnbodavägen 2, 131 30 Stockholm-Nacka, Sweden
Tel. +46-841056953; Fax. +46-86403370
Email: info@isdp.eu

Distributed in North America by:

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From Knowledge to Management

Introduction

Nihil tam firmum est, cui periculum non sit etiam ab invalido.

Nothing is so steadfast as to be free of danger from even the weakest person.

The concept of security is of major interest in today's globalized world. A search on "security" on Google will return several hundred million hits. The growing interest in security has coincided with a widening of the concept in recent decades. Nowadays, security studies deal with issues in areas such as political science, sociology, economy, management, and even biology. Natural disasters, destabilization of international economic structures and the outbreak of financial crises are examples of these phenomena with consequences for security. The study of security should therefore not be limited by the classic definition of national security as a matter of military nature. Instead it should be addressed within a common, interdisciplinary academic field and its result should be made available to a wider audience.

It is futile to expect that the ever expanding threats to security would be recognized by legislators, businessmen or managers setting up global corporations alone without the help of scholars in the security field. By paraphrasing S. Henderson, we may state that conducting research in security or security management without communicating the relevant results to the rest of society is like winking an eye at a girl in a total darkness. Nobody notices what we are actually doing.

Specialists and researchers are expected to communicate their knowledge to others, thus provoking deliberations which will change people's attitudes. The communication of knowledge will be of operational and strategic value to communities both at the local and the global level. This study aims at displaying an interdisciplinary description of security, dealing with various aspects of security and the path from knowledge to management.

This report presents research results presented at the Fourth International Scientific Conference on "Different Aspects of Security," Słok narby

Bełchatów, Poland, held on June 16–18, 2010. The conference was organized by Gen. Tadeusz Kościuszko Military Academy of Land Forces, Polish National Military Gendarmerie, Terrorism Research Center Collegium Civitas in Warsaw and the University of Lower Silesia.

We hope that the extensive but also specialized thematic scope that is reflected in the contributions will have an impact on readers' understanding of security and thus of the possibilities of a successful security management.

Konrad Raczkowski
Walter Kegö
Marian Żuber

Part 1

Different Faces of Security

The Role of the European Union as Global Security Provider

Marcin Bielewicz[1]

Summary: In the contemporary world, security is independently shaped by many actors of international affairs. A lack of healthy cooperation among them hinders even the best initiatives. The United Nations, OSCE, and NATO, among others, are organizations responsible for this difficult task. The European Union with its great military, economic, and political potential, furthermore, must also accept its share of the responsibility. Indeed, it has developed capabilities to manage crisis situations and prevent conflicts as described in the Petersberg Declaration. The EU's initiatives are, however, hampered by particularism, financial issues, and the ambitions of its members, as well as by the lack of will to share the burden with other security institutions. This chapter presents the problems of Europe in assuming its unquestionable role among other organizations in dealing with global security. While highlighting the problems facing the EU, the author also discusses possible solutions and conditions that could help to resolve the EU's main difficulties. The author also presents his views on the possible future of the EU and its relationship with NATO, Russia, and the UN.

Keywords: European Union, global security, transatlantic relations

Introduction

The contemporary international situation is highly complex, delicate, and unpredictable. Today, the world is full of non-state actors, such as transnational corporations, terrorist groups, organized crime syndicates and the like, which all use the latest technology to achieve their goals. Moreover, today's world is also vulnerable against failed and rouge states that threaten the world with the use of weapons of mass destruction (WMD); and yet the world is still not free from the threat of conventional conflict either. Additionally, there are cyber attacks with the aim of destabilizing or discrediting countries, and which may even be used as a prelude to an armed invasion. The financial crisis that commenced last year has obviously not improved the situation. The aspirations of countries, such as China and India, to become

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more important players in international affairs add yet another factor to an already difficult equation. Complicating matters even further are the specific national interests of countries that are, in many cases, contradictory to the interests of the coalitions or unions to which these countries belong.

Therefore, traditional international institutions and organizations tasked with managing threats to security and stability of regions as well as the wider world, such as the United Nations (UN), the North Atlantic Treaty Organization (NATO), the European Union (EU), and the Organization for Security and Co-operation in Europe (OSCE), must rethink their role and procedures, and adapt their decision-making structures in order to face and counter these threats effectively or else risk becoming "dinosaurs" and even ceasing to exist.

The newly released National Strategy of the United States and NATO's new Strategic Concept (still under development) recognize these threats and challenges, and suggest possible solutions. Both documents call for more cooperation and burden sharing, as well as a division of labor. Therefore, under new conditions, the European Union should redefine, or at the least refine its perception of, its role in the global security system.

This chapter discusses the threats, problems, challenges, and possible solutions and scenarios for the international security system, specifically the future EU role in that system.

European Security Background

When the Second World War ended, the victorious powers[2] assembled to decide what to do to prevent another war from occurring in the future. They found a temporary solution—the partitioning of Germany into four occupation zones—until a new permanent agreement among allied powers could be made. However, the course of events after the war changed the nature of negotiations among the former allies, turning them instead into sworn enemies, which in effect hindered possible further resolution of the German problem. The arms race and escalation of hostilities divided the

[2] Considering the course of events during WWII and France's accomplishments, it is hard to understand how France became one of the Great Four—victorious powers that decided the future of post-WWII Europe and the world. Considering their lack of collaboration with Nazi Germany and their contributions to the war effort, the Australians, Canadians, or Poles deserved more than France to be among the decision-makers. On the other hand, at the beginning of WWII the Soviet Union was a strong ally of Hitler.

former allies, with Churchill's Iron Curtain creating two opposing military and political blocs.

Expansive Soviet policy led to the creation of NATO, the military pact that was to defend its members against possible aggression by the Red Army. Two German states were established based on the boundaries of the occupied zones: the Federal Republic of Germany was created from the French, British, and U.S. sectors, and the Democratic Republic of Germany from the Soviet sector. In exchange the Soviet Union, explaining the need to defend its "allies" against NATO aggression, formed the Warsaw Pact—the military organization that, in fact, was to support the Soviet Union in case it launched an attack against Western European countries.

The enduring hostility between the two blocs was manifested in events such as the Berlin Blockade (1948–49), the Korean War (1950–53), the Soviet intervention in Hungary (1956), the construction of the Berlin Wall (1961), the Berlin Crisis (1959–62), the Cuban Missile Crisis (1962), the Vietnam War (1963–75), the Czechoslovakia Intervention (1968), and the Soviet–Afghan War (1979–89). The list would not be complete without also mentioning the number of smaller wars conducted on the periphery of the superpowers' areas of influence, where the struggle to hold back the spread of communism was conducted with methods not always acceptable by democratic societies. The wars in Africa and Asia, or South America, were the substitute for the overt confrontation of the superpowers, with the United States and the Soviet Union both understanding that direct conflict between them would result in the total annihilation of the human race. This notwithstanding, it did not stop them from pursuing an arm's race and supporting warring factions around the globe.

In spite of the above, and indeed paradoxically, the bipolar world during the Cold War was relatively safe. So, why bother with the history? The answer is simple: to prevent us from committing the same mistakes. As James Townsend stated during the meeting in Warsaw with the Bureau of National Security in 2008, "we shouldn't be trapped by expecting history to continuously repeat itself in vicarious ways."[3] We have to know history, but we cannot be prisoners of it. The world as it was will not return. We must keep in mind the mistakes and victories of the past, and use the lessons

[3] James Townsend, "New Strategic Concept of NATO," lecture, Warsaw, December 2008, *National Security Collection*, Vol. 10, Warsaw 2009, p. 76.

learned to counter old and new threats. So far, unfortunately, we seem to have forgotten most of the lessons that history has taught us.

The last twenty years of the history of NATO and the EU have been marked by transformation and uncertainty. The former was looking for its place and role in the new strategic environment, now that its enemy and sole reason for existence—the Soviet Union— was no longer in the game. The latter was trying to become more important in international affairs by setting new goals for itself such as the Common Foreign and Security Policy (CFSP). Both organizations underwent internal transformations as well. NATO has changed its military structure and accepted new members. The European Union has expanded, accepting weaker economies, introducing a common currency (the Euro), and formulating its "constitution," the Lisbon Treaty; but, what is important from a security point of view, is that it started to develop its own military capabilities as delineated in the European Security and Defense Policy (ESDP).

During the past two decades, many differences between NATO and the EU, especially between the United States and its European allies, have emerged. The idea of burden-sharing when it comes to transatlantic cooperation has failed, the result of which was increasing U.S. impatience under the Bush administration with its European allies. Independent military actions of the United States, like Operation Iraqi Freedom, irritated many of NATO's "old" European members. Disagreement over leadership in the alliance and the imposition of U.S. will on other members created cleavages in the organization, thus weakening it. Some of its members (i.e., France and Germany), upset by the role of the United States and the lack of opportunities for assuming a leading position in the organization, shifted their efforts to developing EU military capabilities. In thus doing, however, they stumbled upon a harsh reality: its member states lacked the requisite military power.

Except for France, which withdrew its armed forces from NATO military structures on March 10, 1966,[4] and Great Britain, most NATO European members did not build strong armies capable of projecting their forces outside Europe. Instead, they focused on economic development, decreasing military expenditure, and entrusting their fate, in case of a Soviet attack, on U.S. military power and its nuclear arsenal. In doing so, these countries

4 *The NATO Handbook* (Brussels 2001), p. 420.

gave up their aspirations and accepted the leadership of the United States, which more or less willingly assumed that role.

The initiatives for development of European military capabilities independent from NATO, like the Western European Union (WEU) established in 1954,[5] preceded by the failed European Defense Community (EDC) idea,[6] should hold valuable lessons for the future development of European military capability. Namely, the lack of commitment and will to devote a part of each country's national forces, and transfer authority over them to the community's decision-making bodies, was the biggest reason behind the failure of the past initiatives to establish European forces.[7] Some of the decision-makers in European countries were uncertain if there was a need to double NATO structures. The same doubts are visible in today's political rhetoric. The difference is that the world has since changed, including both of these organizations.

Security Challenges

Since 1992, when the Petersberg Declaration[8] was agreed by the WEU Council of Ministers in Bonn, the European forces have, in fact, conducted operations that were described in the declaration. However, only as a result of additional arrangements with NATO—the so-called Berlin Plus Agreement—were these operations possible. The agreement described the security aspect of the relationship between NATO and the EU. It also described a sensitive issue of that relationship, that is, the priorities in dispatching forces for operations by the member countries. This was crucial, considering the fact that most NATO members are also members of the EU, and that

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5 On March 31, 2010, by the decision of the heads of states, the WEU ceased to exist. *Statement of the Presidency of the Permanent Council of the WEU on behalf of the High Contracting Parties to the Modified Brussels Treaty – Belgium, France, Germany, Greece, Italy, Luxembourg, The Netherlands, Portugal, Spain and the United Kingdom,* Brussels, March 31, 2010, http://www.weu.int/Declaration_E.pdf

6 A. Demkowicz, *Integracja Europy Zachodniej w dziedzinie bezpieczeństwa i obrony: Od EWO do WEPBiO* (Torun 2007), pp. 73–75.

7 Ibid., p. 73.

8 The Petersberg Declaration adopted in 1992 called upon the WEU (later EU) countries' forces to undertake such tasks as humanitarian and rescue tasks, peacekeeping tasks, tasks for combat forces in crisis management, including peacemaking, which are commonly known as Petersberg Tasks. See WEU Council of Ministers, "Western European Council of Ministers Petersberg Declaration," Bonn, June 19, 1992, available at: http://www.bits.de/NRANEU/docs/petersberg92.pdf

the military force that these countries might devote to either organization's operations is limited due to interoperability issues and the need to maintain a necessary reserve for national defense. These countries, like most European countries, did not increase the size of their armies in the last twenty years, because of the lack of a considerable threat of conflict and the subsequent budget cuts which followed. Aside from a division of responsibility, the agreement allowed EU forces, in support of operations, to use NATO military capabilities.

When the European Union introduced its Common Foreign and Security Policy together with European Security and Defense it seemed that finally Europe would have the appropriate tools to resolve, by crisis management and conflict prevention activity, security issues that could threaten stability and security in the area of the European Union. Although the speeches and declarations were promising, they have not been matched by reality. Factors thwarting success in four significant areas are as follows:

- Leadership
- Capabilities
- Financing
- Contradictory interests

Firstly, there is the problem of finding a country to play a leadership role in Europe. Some countries try to usurp the right to "guide" European nations, and therefore to impose their policy upon them. France has presented itself as a leading nation within the European community, since it left NATO military structures. Germany, on the other hand, although economically strong, was not able to command any European military operation, because its constitution prohibited sending its army beyond German borders. Great Britain, having a special relationship with the United States, was not interested in any military activity without U.S. involvement. Other members were, and still are, either not able to lead or are against doubling NATO capabilities. For those against mirroring alliances, the only reason to do so was to satisfy the French ego.

Secondly, European countries have problems with mustering the necessary capability to conduct military operations on a larger scale. The reasons behind this issue are simple and revolve around financing and will.

What does this mean? Throughout the Cold War, the majority of European countries did almost nothing to acquire significant military capabilities that would be easily deployable and able to operate independently. Quite the opposite, these countries placed their fate in U.S. military power and its nuclear warheads, simultaneously depriving themselves of influence in the decisions regarding the security of the region. They did of course make adjustments in order to be able to operate with other allies, but nothing beyond that. The operation in the Balkans in 1999 (Operation Allied Effort) exposed the reality—approximately 90 percent of all combat aircraft used were U.S. assets.[9] Some EU members do not have vessels, combat and cargo aircraft, or tanks, and they have not even started to pursue such capabilities. Some EU members, (i.e., Sweden and Ireland) are neutral and thus cannot participate in military operations without jeopardizing their status.

Therefore, another question should be asked: what form should the further enlargement of the European Union take? The answer is very difficult to ascertain. On the one hand, both EU and NATO have pronounced an "open-door policy," thus, in theory, every country that fulfills some kind of membership action plan would be accepted. On the other, both organizations are already so vast that their decision-making process looks sometimes like that of the United Nations General Assembly. Both organizations undertook enlargement too quickly, driven more by political than practical (pragmatic) reasons. Expansion itself has created tensions between "old" and "new" members over military and economic capabilities.

Another consequence of the capability gap among EU members is the need to rely on NATO, read U.S. assets, which further incapacitates the Union in case of emergency, and partly strips it of independence. Additionally, rapid enlargement created a diversity of military equipment, which can turn any possible military operation of the EU into a logistical nightmare.

There is another key issue connected to the capability aspect of the European military potential—the financial dimension of the problem. The situation of the last twenty years and the lack of a real threat of conventional war in Europe created a disadvantageous atmosphere for the development of armies. Most of the members preferred cuts than an increase in military

[9] Over 70 percent of the total number of aircraft (1241 aircraft), and approximately 90 percent of combat aircraft were provided by the United States. See I. H. Daalder, M. E. O'Hanlon, *Winning Ugly: NATO's War to Save Kosovo* (Washington, D.C., 2000), pp. 243–46.

expenditure; they therefore shifted saved assets to economic growth, forgetting that a strong economy is only one element of national security. The best example of balance between the military and economy aspects of security is Switzerland, which has a strong economy, and, at the same time, maintains a strong armed force deterrent that protects economic gains and development.

The problem with the military budgets of European countries lies in their structure. Although most EU members contribute two percent of Gross Domestic Product (GDP) to their military (in Poland's case it is 1.95 percent of GDP, which is still acceptable), the lion's share of the budget is devoted to so-called "social costs"—salaries, pensions, and such allowances—instead of to procurement of new equipment and Research and Development (R&D) that would significantly increase European military capabilities.

Another financial issue between EU members is the problem of burden-sharing in operations.[10] In the event of an operation conducted by the European Union, force providers would like the non-providing countries to bear instead a larger financial burden of the operation, whereas non-providers prefer equal division of the costs of any operation agreed by the EU Parliament. This potentially could create a situation where the countries capable of conducting operations would hesitate to dispatch their assets, and the countries that do not have the appropriate military or police force would block any EU action, because they would have to pay more.

Such a system of financing exists in the United Nations, when the organization decides to organize a peace mission or operation. Every member pays their contribution to the organization's treasury, but force-providing countries receive financial reimbursement for the soldiers and equipment deployed in the operation, sometimes receiving more from the organization than they pay.[11] In order to implement such a financing system in the EU, all members would have to agree to pay larger membership fees.

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[10] The burden-sharing and the burden-shifting issue between the U.S. and its European allies is dealt with in S. R. Sloan, *NATO, the European Union, and the Atlantic Community: The Transatlantic Bargain Challenged* (Lanham, 2003).

[11] As an example, Poland's reimbursements for its participation in UN peacekeeping operations in the Middle East in 1975–79 amounted to over US$67 million, which exceeded Poland's combined membership fee in that period. See *Notatka informacyjna Nr Pf-232/DMO/80 w sprawie udziału Polski w operacjach pokojowych ONZ na Bliskim Wschodzie z dnia 08.05.1980, Nowy Jork*, Archiwum Instytucji Ministerstwa Obrony Narodowej (AIMON), Sygnatura Nr 18.91.2139 k. 111.

The third point of contention is the particularism of the EU member states. The particular interests of Great Britain, France, and Germany, to name only potential European leaders, affect and often hurt other members, thus contributing to the weakness of the European Union as a whole.

France's rejection of the Pleven Plan[12] had ended, for many years, the dreams of achieving independence from U.S. and NATO European military forces. The reasons behind this decision were: sympathy among some of the French National Assembly members with the Soviet Union, and the perceived lack of necessity of doubling NATO capabilities.[13] Having special relations with the Soviet Union (later with Russia) hurt its relationship with so-called new members, especially Poland and the Baltic States (Lithuania, Latvia, and Estonia), which keep in mind the Soviet Union's atrocities committed on their soil. Wounded French pride (read Charles de Gaulle's pride) resulted in French withdrawal from NATO's military structures in 1967,[14] without due consideration given to the fact that it could endanger the integrity of the whole alliance.

Germany under Gerhard Schröder made a deal with Russia on an undersea pipeline, "Nord Stream," that would transport Russian natural gas to Europe bypassing countries—EU members—that were inconvenient for Russia. As result of that deal, Germany has weakened the energy security of these countries, instead of diversifying the sources of supply for the EU and supporting the integrity of the union. There is a danger that if Russia would like to win some concessions from those countries that have been bypassed, without jeopardizing good relations with France or Germany; it can simply cut natural gas supply when the demand is at its highest, i.e., winter. Such Russian policy has already been demonstrated, as during the dispute with Ukraine over payments for natural gas supply and transfer.

The special relationship between Great Britain and the United States, as shown in the Iraq War (Operation Iraqi Freedom), signaled to other alliance and EU members that the UK is closer to Washington than to Brussels. It also gave the impression that British policy was more convergent to George

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12 The plan to organize European standing army—the Pleven Plan—was overthrown by the French National Assembly in 1954. See Demkowicz, op. cit., p. 73; and Sloan, op. cit., p. 21.

13 Demkowicz, op. cit., p. 73.

14 R. S. Jordan, *Norstad. Cold War NATO Supreme Commander Airman, Strategist, Diplomat* (New York, 2000), p. 122.

W. Bush's neoconservative policy than to the European Union's more liberal approach to conflict prevention and crisis management. Consequently, building a stable and strong Union, one that is independent politically, economically, and militarily from the U.S., is not possible with the inclusion of the United Kingdom.

On the other hand, the French answer to the participation of member countries in the U.S.-led "coalition of the willing" against Iraq was little short of outrageous. In an outburst President Jacques Chirac of France said in February 2003:

> These countries have been not very well behaved and rather reckless of the danger of aligning themselves too rapidly with the American position. It is not really responsible behavior. It is not well brought-up behavior. They missed a good opportunity to keep quiet […] I felt they acted frivolously because entry into the European Union implies a minimum of understanding for the others. […] They missed a great opportunity to shut up.[15]

Keeping in mind the aforementioned events, when France acted in its own interests, the words of Chirac sounded simply absurd and opportunistic.

The EU's Future Role in Providing Regional and Global Security

Despite all of the deficiencies of the member countries, there is nonetheless potential for the EU to play a significant role. The combined military expenditure of all EU member states makes them, collectively, the world's second-largest spender. Accounting for 21 percent of global defense expenditure in 2009, the European Union is second only to the United States.[16] The only missing element, to become an important and strong actor in international security affairs, is the will and determination in striving to achieve that goal.

In 2005, the European Union initiated the establishment of its own rapid-reaction forces known as EU Battlegroups. Each of them is on operational standby for a duration of six months, ready to be deployed to fulfill one of the Petersberg tasks or in support of the United Nations, following

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15 "Chirac lashes out at 'new Europe,'" CNN.com, February 18, 2003, http://edition.cnn.com/2003/WORLD/europe/02/18/sprj.irq.chirac/ (accessed on June 28, 2010).

16 *SIPRI Yearbook 2010: Armaments, Disarmament and International Security – Summary* (Solna, 2010), pp. 10–11.

the decision of the EU Parliament. Battlegroups can be deployed within a 6000 km radius from Brussels within ten days after a decision has been made; they are then deployed for no more than 120 days.[17] Although the EU Battlegroup Concept reached Full Operational Capability on January 1, 2007,[18] no Battlegroup has thus far been deployed. This is an interesting fact considering that the European Union has organized and conducted already 24 civilian missions and military operations.[19]

Therefore, to come back to what is the possible place and role of the European Union in the global security system, presented below are three possible, hypothetical scenarios with one single assumption—the European Union will continue to exist.

Scenario 1

The European Union maintains the status quo with NATO, with an overlap in alliance responsibilities. This means the EU must share assets with NATO in the situation where countries are a member of both organizations, and those countries will have to choose which assets to devote to which organization. The formal leadership would fall to France and Germany as the strongest economies, but it would not be respected by disappointed members, leaving the EU weak and fragmented, with members looking externally for other opportunities. The situation of uncertainty between these organizations would contribute to the emergence of new powerful actors, not necessary democratic, that could threaten global security.

Scenario 2

The European allies decide that NATO has lost its importance and that there is no justification to keep it going; or the United States tires of the quarrels

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17 "The EU Battlegroups and the EU Civilian and Military Cell," The European Factsheet, February 2005, http://www.consilium.europa.eu/uedocs/cmsUpload/Battlegroups.pdf (accessed on June 28, 2010).

18 Press–EU Council Secretariat, "EU Battlegroups," July 2009, http://www.consilium.europa.eu/uedocs/ cmsUpload/090720-Factsheet-Battlegroups_EN.pdf (accessed on June 28, 2010).

19 Council of the European Union, "EU Common Security and Defence Policy (CSDP)," http://www.consilium.europa.eu/showPage.aspx?id=268&lang=en (accessed on June 27, 2010); International Institute for Strategic Studies, *The Military Balance 2010* (London, 2010), p. 107.

and disputes with its European partners and NATO resultantly ceases to exist.

The EU assumes the role of security guarantor for the European region, which forces all members to devote more finances to the defense sector. With limited military capabilities, EU forces must focus on providing security to its members, and thus cannot influence global security. In this scenario, the European Union cannot be an important player in international security affairs unless it convinces its members to agree on an increase in military expenditure.

Scenario 3

This scenario is similar to the first albeit with a subtle difference. There is clear division of responsibilities between NATO and EU, where the former is responsible for security, and the latter is responsible for economic and social matters. NATO operations are opened for non-NATO EU members, if they choose to participate. This scenario requires the EU to give up its military aspirations.

Considering the fact that France has returned to NATO military structures,[20] this scenario could succeed. On the other hand, the European Union Battlegroup Concept is too advanced to be reverted or dismantled; it would be better to transfer it to NATO where it could become the alliance's standing army.

Most researchers and authors that deal with European security issues point at international institutions, such as NATO, EU, UN, OSCE, and the Council of Europe, as the pillars of security for that region. Most of them tend to forget about the U.S. role in maintaining security and stability in Europe. Since the end of WWII, U.S. forces have been stationed in Western European countries to help assure peace there.

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[20] During NATO's Strasbourg/Kehl Summit in April 2009, France officially announced its decision to fully participate in NATO structures. See "Member countries," NATO official website, http://www.nato.int/cps/en/natolive/topics_52044.htm#About (accessed on June 29, 2010). On July 29, 2009, French Air Force general officer Gen. Stéphane Abrial was appointed by the North Atlantic Council as Supreme Allied Commander Transformation. He is the first European in the history of the alliance to be appointed to any NATO strategic command. See SACT official website, http://www.act.nato.int/content.asp?pageid=1265 (accessed on June 29, 2010).

Another important actor is Russia. Once the enemy of the free world, it now must understand that being influential and strong also brings with it the responsibility of being a fair and honest player in international affairs.

Concluding Remarks

There is no question that the global situation has changed. Many new threats and challenges to global security have arisen. Most of them are not military in nature and include globalization, international terrorism, transnational corporations, and cyber crime. Traditional security institutions that are military-oriented are not equipped to face such challenges. Therefore these institutions must rethink their tasks and procedures in order to successfully engage with them. NATO is working on its new strategic concept (to be published in Lisbon, in November 2010) that will address these new problems. The United States, although not an international organization, reaffirmed its policy and published its new U.S. National Strategy this year, addressing the same contemporary challenges that beset the world. The European Union published its Security Strategy on December 12, 2003, where new threats are described together with the appropriate policy to counter them.

In order to effectively fight these challenges, the international community, represented by international institutions, must cooperate more closely, dividing the responsibilities between themselves. Doubling responsibilities would only slow and weaken their actions, and would waste precious time and resources.[21]

Therefore, the European Union should decide wherein its capabilities would best be employed so as to ensure the security of its members. It should work jointly with other organizations and powers without prejudice, but it must also cooperate with non-partners. Its relations both with the U.S. and Russia must be fair but firm; because both countries perceive themselves to be superpowers and are tough negotiators. If they detect that their counterpart is weak and undecided, they will exploit his weaknesses. Russia, like the United States, deserves respect, but without servility.[22] The

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[21] Very interesting views on NATO's relevance in the contemporary world are presented in A. Gruszczak, "Czy NATO jest jeszcze potrzebne? Nieortodoksyjne spojrzenie na strategię Sojuszu Północnoatlantyckiego na przykładzie konfliktu afgańskiego," in *Rocznik Bezpieczeństwa Międzynarodowego 2009/2010* (Wrocław, 2010), pp. 37–54.

[22] The problems of U.S.–Russia, NATO–Russia, and EU–Russia relations, and the Russian effort to regain its lost position in international affairs is discussed in M. Bielewicz,

European Union must keep the above in mind in order to be treated seriously. The fragmentation of the foreign policy of the EU is another threat that must be faced and overcome. European leaders must understand that real Common Foreign and Security Policy together with strong Common Security and Defense Policy is a crucial factor in gaining rightful respect in the international arena. The outcome of ongoing operations in Afghanistan (International Security Assistance Force, ISAF), where most NATO and EU members have sent troops and representatives, is a real test for the alliance,[23] and could represent an opportunity to deploy one of the Battlegroups to credibly demonstrate the EU's commitment to global security.

Poland as a Euro-Atlantic Power: the Determinants of U.S–Polish Relations 1989–2005 (Monterey, 2005); and M. Bielewicz, "The Eastern Perspective: Russia Towards NATO Enlargement: A Case Study of 1999 and 2004 NATO Enlargements," in *Rocznik Bezpieczeństwa Międzynarodowego 2009/2010* (Wrocław, 2010), pp. 145–51.

[23] D. Kozerawski, "Zmiany charakteru działań kontyngentów Wojska Polskiego w międzynarodowych operacjach stabilizacyjnych w Afganistanie w latach 2002–2009," in J. Maciejewski, M. Bodziany, K. Dojwa, eds., *Grupy dyspozycyjne w obliczu Wielkiej Zmiany. Kulturowe i społeczne aspekty funkcjonowania w świetle procesów integracyjnych* (Wroclaw, 2010), pp. 450–53.

Safety of Local Communities in View of Threats to Public Safety

Katarzyna Sienkiewicz-Małyjurek[1]

Summary: Safety is a principal value, which enables uninterrupted coexistence and development both of the individual and social group. Each violation of a social norm, aggressive behavior, abuse of intoxicants, intrusive beggars, or neglected and inadequately illuminated regions influence the level of public safety. The lack of an effective system of ensuring public order confirms the "broken window concept" according to which one broken window encourages the breaking of another, and therefore, is the source of crimes. Ensuring order by means of preventing even the slightest dangers is the basis for creating public safety. The aspects of shaping safety and public order and the actions initiated are presented in this chapter. The results of research made in Poland in the Province of Silesia in 2009 were used to this end.

Keywords: public safety, threats, societies, behaviour.

Introduction

Order, peace, and safety are the elements which characterize a certain state, which enables an organized society to enjoy uninterrupted "coexistence and development."[2] Public safety is "all conditions and institutions which protect citizens and national assets, system, and state independence from phenomena which are dangerous to the legal order."[3] The basis and at the same time an element of public safety is public order; that is, "maintaining a proper sanitary state of public use devices, maintaining cleanness and order in public areas, following fire regulations, proper organisation of road traffic, maintaining of roads, streets, and bridges, issuing specific prohibitions and orders related to behaviour in parks, recreation areas, sports fields."[4] "The scope of this notion also includes combating alcoholism and drug addiction,

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1 Ph.D., Department of Environment and Safety Management, Faculty of Organization and Management,Silesian University of Technology,

2 J. Zaborowski, *Legal means of ensuring public safety and order* (Warsaw: Department of Training and In-service Training of the Ministry of the Interior, 1977), p. 7.

3 *PWN Great Encyclopaedia*, Vol. 3 (Warsaw: PWN, 2001), p. 511.

4 E. Ura, *Public Safety and Order: History, theory, practice* (Rzeszów, 2003), pp. 221–22.

combating the outcome of natural calamities and epidemics, observance of regulations on civil state acts, border marks, observance of specific social discipline, etc."[5] Public safety and order are the principal value both for the individual and the society. They influence the quality of life, social relations and bonds, choice of a particular place for residence or recreation; they are also one of the factors which stimulate social and economic growth.

The chapter presents the aspects of establishing public order as well as the potential actions, which may be initiated in this scope. The analysis was based on the results of research conducted in Poland in the Province of Silesia in 2009.

Safety of Local Societies: Legal Basis

Ensuring public safety and order is one of the principal tasks of a state and its bodies. The legislature introduces regulations, which establish normative conditions for the protection of safety. Acts and ordinances specify the limits of acceptable behaviors of individuals and human groups as well as the responsibilities and scope of authority of entities responsible for public safety and order.

Considering the organizational aspect, authority in Poland functions on two levels: governmental (central) and self-governmental. The central level is responsible for the continuity of actions aiming at ensuring safety; it monitors and prevents threats and their outcome. The task of the self-government, in turn, is identifying threats at their source, preventing them, and minimizing their consequences for the society and the environment.

Self-governmental administration acts on three levels: municipal, district, and provincial. According to article 16 of the Constitution of the Republic of Poland,

> all residents of the units of the principal territorial division constitute by virtue of the law a self-governmental community. The territorial self-government participates in exercising public authority. The self-government executes a significant part of public tasks, to which it is entitled, on its own behalf and on its own responsibility.[6]

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5 S. Pieprzny, *Sources of threats to public safety and order (chosen administrative and legal issues)*. Scientific Brochures of the Rzeszów Polytechnic, Management and Marketing, z. 11, Rzeszów 2007, p. 91.

6 Art. 16 of the Constitution of the Republic of Poland, April 2, 1997 (Gazette of Acts,

The provincial self-government executes tasks in the scope of public safety of a provincial nature, which include among other things spatial development, defense, and public safety.[7] The district, in turn, is responsible for public tasks in the scope of safety of citizens of a super municipality nature, as well as ensuring the execution of tasks and competences of managers of district services, inspector's offices, and guard.[8] The tasks of the districts include protection of health, public order, and safety of citizens, flood protection, and prevention of extraordinary threats. In order to realize the tasks of the district manager in the scope of authority over district services, inspector's offices, and guard, and tasks specified in acts on public order and safety of citizens, Commissions of safety and order are created. Their activity enables coordination of a safety system on a local level and it facilitates cooperation of entities in this scope. On the district level there is also the principal level emergency response, and the district joint administration is in operation.

Satisfying the collective needs of the community, including public order and safety of the citizens and protection from fire and flood, come under the municipality's responsibility.[9] These tasks are assigned to self-governments taking into consideration their wide range of possibilities of action, which include among other things supporting formations, which act to the benefit of safety, investments supporting the formation of safe public areas, and social assistance or prevention of unemployment. Moreover, the local self-governments are obligated to carry out their own tasks, which are directly or indirectly connected with public order. They include issues related to:

- Spatial order, real-estate management, environmental protection, and water management
- Municipal roads, streets, bridges, squares, and organization of road traffic

July 16, 1997).

7 Art. 14 of the Act, June 5, 1998, on provincial self-government (Gazette of Acts of 2001, No. 142, item 1590, and amendments).

8 Art. 4 passage 1 of the Act, June 5, 1998 on district self-government (Gazette of Acts of 2001, No. 142, item. 1592, and amendments).

9 Art. 7 passage 1 pt. 14 of the Act, March 8, 1990, on municipal self-government (Gazette of Acts of 2001, No. 142, item 1591, and amendments).

- Waterworks and water supply, sewage systems, removal and treatment of sanitary sewage, maintenance of cleanness and order and sanitary devices, landfills and sanitary waste disposal, electric and thermal energy and gas supply
- Local mass transportation
- Health protection
- Social assistance, including care centers and institutions
- Municipal housing construction
- Public education
- Culture, including municipal libraries and other cultural institutions and institutions of monument protection and monument care
- Physical culture and tourism, including recreation areas and sports equipment
- Marketplaces and covered markets
- Municipal green spaces and afforestation
- Municipal cemeteries
- Public order and citizen safety and fire and flood protection, including equipping and maintenance of municipal flood warehouses
- Maintaining of municipal public use facilities and devices and administrative facilities
- Pro-family policy, including assuring social, medical, and legal aid to pregnant women
- Supporting and propagating the self-governmental idea
- Promoting the municipality
- Cooperation with non-governmental organizations
- Cooperation with local and regional societies of other countries.[10]

The municipal self-governments are closest to the citizens and they have a direct possibility of evaluating their needs, among others, in the scope of public order. In this way they are capable of reacting promptly to the occurring needs and threats.

[10] Art. 7 passage 1 of the Act, March 8, 1990, on municipal self-government (Gazette of Acts of 2001, No. 142, item 1591, and amendments).

Threats to Public Order

Threats to public order include to a large extent transgressions. According to the Code of Transgressions Act dated May 20, 1971, they include, among others, the following:

- Demonstrative showing of disrespect towards the Polish Nation
- Crossing of borders in prohibited places
- Cries, noises, unjustified alarms
- Summoning or leading of prohibited gatherings
- Participation in a gathering with possession of arms, explosives, or other dangerous materials
- Inciting to commit a crime
- Begging
- Destroying, damaging, or making illegible signs or notices which warn about a danger to human life or health or a fence or other device which prevents such danger
- Neglecting or failure to illuminate places and buildings by their administrator
- Circular trade (door-to-door selling, peddling)
- Purchasing property knowing that it comes from theft or appropriation, or aid in its sale
- Committing an indecent act publicly
- Placing in a public place obscene announcements, inscriptions, or drawings
- Hindering or making impossible the use devices that are intended for public use, in particular, damaging or removing alarm devices, illumination installation, clocks, automatic machines, telephones, signs with town names, streets, squares, or real estates, devices used for maintaining cleanness or benches
- Destroying or damaging plants and lawns
- Soiling or littering of places accessible to the public, particularly roads, streets, squares, gardens, lawns or green squares, etc. [11]

[11] Cf. Act, May 20, 1971, Code of transgressions (Gazette of Acts 1971, No. 12, item 114 and amendments).

In order to eliminate threats to public order, legal regulations and penal sanctions are applied, which in case of transgressions include arrest, limitation of freedom, fines, or reprehension.

However, ensuring public order should not be considered only from the angle of penal policy and the taking of intervention actions. It also includes tasks in the scope of limiting the indirect causes, which constitute the grounds of transgressions, crimes, and social pathology; for example, actions in the sphere of education, upbringing, health protection, economic development, or spatial planning. In this aspect, the ensuring of public safety and order belongs to the tasks of many administrative bodies and units, and it also rests with social organizations and the citizens themselves.

Methods of Creating Public Order in Local Societies

An attractive environment of life is a place which is designed in a "spectacular" way, but also one which is tidy, free from crime, pathology, and signs of vandalism. Dangers emanating from crime, devastation of the natural environment, social pathologies, and civilizational threats, are the main problems of the modern world. The level of social safety is impacted in every case where a social norm is broken, for instance by violence at school and in the streets, by aggressive behaviour, abuse of intoxicants, or aggressive beggars. Neglected and inadequately illuminated areas also constitute a source for fear.

Ensuring public order is most difficult in those cities where devastation, violation of regulations, or the disturbance of peace occurs most frequently. This is caused to the largest extent by urbanization, which has an impact on weakening social control and the growth of conformism which in turn increases the level of social threats. Violence and aggression intensifies. Favorable conditions for an increase in the scale of danger to public order are, among others, loosened relations between people, anonymousness, and a variety of actions and behaviors. In addition, according to the opinion of B. Czarnecki and W. Siemiński, "in modern cities the fear of crime is the same type of problem as the crime itself. The type of information preferred by the media creates an impression that nobody and nowhere is safe. We are dealing with a growing culture of violence."[12] The modern intensification

[12] B. Czarnecki, W. Siemiński, *Creating safe public spac*e (Warsaw: DIFIN, 2004), p. 11.

of the fear of the possibility of becoming a victim of a crime is much larger than the real danger. This fear is shaped above all on the basis of an individual perception of the environment, and acts of aggression and vandalism. Maintaining an optimum level of public safety is extremely difficult, but it is very significant since society spends a lot of time in a public environment, especially in the cities. In rural municipalities, it is easier to maintain public order considering the smaller number of residents, lesser degree of social anonymousness, and a greater share of private land in the spatial structure of the municipalities. Moreover, approximately three-quarters of the European population live in cities.[13] It is estimated that by 2025 more than 60 percent of the world population will live in them.[14]

Self-government may have an influence on the level of public order by primarily the following means:

- Maintaining control of public space and elimination of the atmosphere of consent
- Cooperation and coordination of actions in the public safety system
- Shaping social awareness and building a safety culture
- Incessant adaptation of preventive actions to current, real threats

A fast reaction to every transgression, maintaining control of public space, and elimination of the atmosphere of consent is enabled by modern concepts of shaping safe public spaces. This statement results from the experience of Western European countries and the United States, which show that well designed public spaces influence both the level of danger from crime and the feeling of social safety.[15] This assumption is the basis for the CPTED (Crime Prevention Through Environmental Design) strat-

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13 *The New Charter of Athens 2003: The European Council of Town Planners' Vision for Cities in the 21st century*, Lisbon, November 20, 2003, p. 9, http://www.ceu-ectp.eu/images/files/Athens_Charters/charter2003.pdf

14 M. Herwish, R. Pengelley, "Warfire in global city," *Jane's International Defence Review,* No. 6 (1998), p. 32.

15 Cf. C. Stafford, *An evaluation of the potential use of new urbanism and CPTED in subsidized elderly housing*, M.A. thesis, Graduate School, University of Florida, 2004; C. P. Nuttall, et al., *Reducing offending: an assessment of research evidence on ways of dealing with offending behaviour* (London: Home Office, 1998).

egy and Secured by Design. These strategies consist of combining architectural design and physical protection with a social bond. Concepts of the safe designing of space are based on assumptions such as: "natural supervision, natural access control, land isolation, management, and maintenance."[16] The tools which are used to realize these assumptions are presented in Fig 1.

A number of similar features may be found in the "Broken Window" theory, which focuses on maintaining space and its management. It points to the direct relation between the state of public space and the level of danger from crime. It states that if even one window pane is broken in a building and is not replaced immediately, then the other windows will also be broken. According to this logic, such a building will seem to be neglected, deprived of supervision, and this will provoke potential criminals to act. G. Kelling and C.M. Coles ascertain that degradation arouses petty crime, which with time changes into mugging, battery, and finally into serious crimes.[17] The "Broken Window" theory assumes that the behavior of each person is dependent on the symbols of consent and prohibition. A lack of reaction to events such as vandalism, beggary, harassing of passersby, pathologies, or aggressive behavior, gives consent for further such actions. Each case of violating order must cause a reaction of bodies appointed in this aim as well as the society.

Engagement of local authorities in the process of creating public safety and cooperation with formations which act in this scope, including non-governmental organizations and the private sector, constitute an important element in solving social problems. Cooperation, coordination of action, and exchange of information between these units is the basis for the efficiency of endeavors taken up in the scope of shaping public safety and order. Such cooperation should include collective endeavors aiming at maintaining and increasing the possessed resources, mutual support according with the existing procedures, and rules of cooperation and exchange of information.

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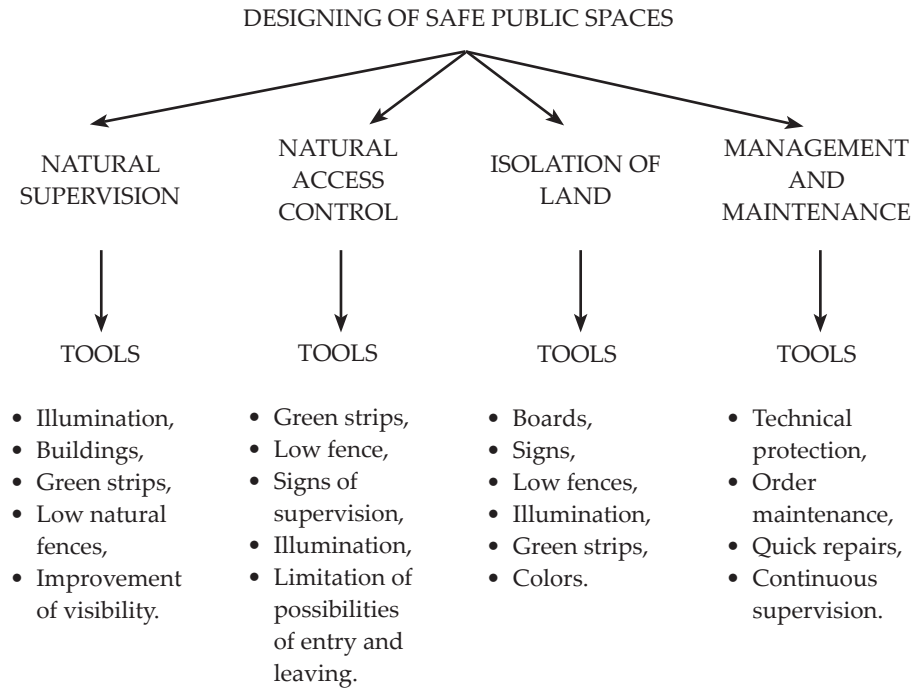
16 *Crime Prevention Trough Environmental Design, Guidebook*. (Singapore: National Crime Prevention Council, 2003), p. 3.

17 G. Kelling, C.M. Coles, *Broken Windows: Restoring Order and Reducing Crime in our Communities* (Poznań: Media Rodzina, 2000).

Fig. 1. The CPTED Tools



The need for cooperation and coordination of actions in the scope of public safety and order on a local level is indicated in the recommendations of the Council of Europe. It is recommended that national or regional levels are assigned the following functions:

- Collecting information on crimes and criminal trends, about groups exposed to a high risk of danger from crimes, and preventive experiments and their effects
- Planning and realization of preventive programs and their evaluation
- Coordinating preventive activity of the police and other agencies which prevent crime
- Ensuring active public participation in preventive activity by informing about the need and ways of acting

- Seeking support and cooperation of the mass media in preventive activity
- Initiating or propagating research on the occurrence of some of the types of crimes and other issues essential for preventive actions
- Cooperation with decision-makers in developing a national and effective anti-criminal policy
- Realization of training programs in the field of prevention[18]

Cooperation that is to the benefit of public safety and order is established on the basis of experience (both common and individual), knowledge, acceptance, and assistance of the whole society. In order to ensure an efficient realization of tasks in this scope, it is necessary to continuously educate society and make it aware of the consequences of each threat to an individual human being. Building a culture of safety, consisting in modelling habits related to competent behaviour in situations of danger, includes:

- Knowledge—ensuring the role and significance of safety, understanding the nature of threats, and the risk of their occurrence
- Fitness—attitudes during performance of different type of actions (identification, prevention, and acting in the face of dangers)
- Attitudes—actions in relation to the requirements of safety
- Attitudes—taking into consideration the threats and risks in daily activity and the need of services to the benefit of improving safety and proper behavior in emergency situations
- Habits—a change of opinion from the philosophy of reasoning "it can happen to others" to the philosophy "it can also happen to me"
- Motivation—creating a will to safe conduct and understanding of the need for pro-safe behaviours
- Orientation—knowledge of the functioning of administration, institutions, and organization responsible for safety [19]

[18] Recommendation of the Council of Europe No. 87/19 concerning the organization of crime prevention.

[19] B. Kosowski, "Emergency management in the system of training and education," in

A great role in this field is played by the school, but above all, by the family. Addictions and a lack of means to make a living are the basic problems of contemporary families. These problems block social development and generate new threats. Solid grounds for social policy, adaptation to real conditions, and most of all, education, the raising of awareness, and implementing programs and informational and warning actions, may influence the situation in this regard.

As a result of almost 20 years' experience in the scope of criminal prevention, a number of preventive programs and actions are currently being created, which are also being adapted to local needs. Registration of preventive programs run by the Chief Headquarters of the Police will facilitate their filing and coordination. Programs are divided, taking into account the issues, into five categories:

- Protection of persons and property
- Road traffic safety
- Pathologies
- Crime victims
- General safety

An important aspect of the development of preventive programs in Poland is the tendency to withdraw from implementing educational and informational initiatives, which currently dominate, and focus instead on interventional programs. However, a negative phenomenon is the low level of knowledge on the part of society about their realization. Exceptions are those people who participate in these programs, such as managers or principals and employees of banks and schools. It appears from research conducted in 2008 by the Department of Public Order of the Ministry of the Interior and Administration, that the principal effects of preventive programs realized on the local level include: "entering into cooperation between different entities responsible for public order, positive attitude of residents towards the realised endeavours, socialising the taken up actions, and activation of local societies."[20]

Emergency Management as a Challenge for Education, Post-conference materials, under the academic editing of Andrzej Urban, Higher Police School, Szczytno 2007, pp. 13–14.

[20] Cf. Report on the state of criminal prevention and tasks realized in this scope by the

In shaping local societies' safety, the self-governments play a significant role, being institutions which have the broadest range of possibilities to influence the level of public order by initiating, implementing, and managing preventive actions. Self-governments' independence in making decisions while performing tasks that satisfy the needs of society gives rise to the question: how many of these possibilities do they actually make use of? Finding answers to the above-mentioned problem were one of the aims of the conducted research.

Creation of Public Order as Exemplified by the Municipalities of the Province of Silesia

The research on the role of territorial self-governments in the creation of public safety and order was conducted in Poland in the territory of the Province of Silesia in May 2009 by employing a diagnostic method—using a questionnaire—which was prepared in cooperation with the Department of Prevention of the Provincial Police Headquarters in Katowice. The research was executed in order to analyze actions taken by municipal self-governments for the benefit of creating public safety. The questionnaire was sent to all 167 municipalities of the Province of Silesia.

The analysis was carried out based on 105 correctly filled in questionnaires (63 percent of the total number of municipalities of the Province of Silesia, including 73 percent of all municipalities with the status of a city, and 56 percent of rural municipalities). In four cases the territorial self-governments did not have sufficient information to complete the questionnaire. The analysis was carried out separately for the rural municipalities (51 percent of the total number of obtained questionnaires) and those municipalities with city status (49 percent).

This chapter presents selected results of the conducted research, which concerned the threats and tasks realized in the scope of creating public order.

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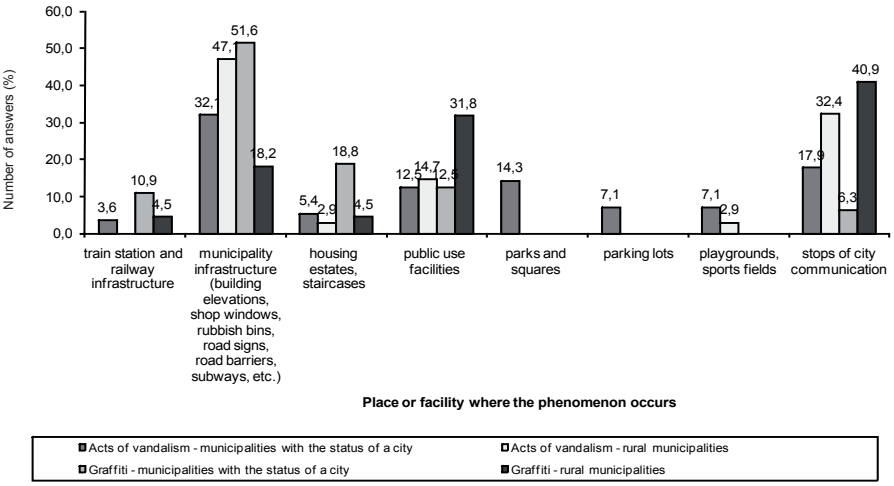
organizational units of the police in 2007, Chief Headquarters of the Police, Prevention and Road Traffic Office, Warsaw 2008.

Acts of Vandalism and Graffiti

Vandalism is destroying without cause other people's property, especially public property. It may take the form of inscriptions on buildings, graffiti on park benches, destroying bus and tram stops, rubbish bins, mail boxes, intercoms, breaking bus stop windows and destroying shelters, and many other forms of devastation of public infrastructure. Vandalism decreases the quality of life and is one of the causes behind an increasing feeling of danger. It also creates conditions for consent and other anti-social behavior.

Fig. 2. Analysis of the presence of events connected with the destruction of property



One aspect of vandalism is graffiti. This may include inscriptions and vulgarisms on walls, scribbles, and artless drawings. But while graffiti is an act of vandalism sometimes it is also considered art. However, this is dependent on the evaluation of the "work of art" and the view of the person evaluating it.

Information on cases of vandalism in the Province of Silesia provided to the territorial self-governments mainly come from the police (54.4 percent), the city guard (13.6 percent) and from residents (12.6 percent). These events are also reported by the Residential Building Institution, housing cooperatives, the Department of Public Utilities, boards of housing estates and real

estates, as well as public utility services. Places where acts of vandalism occur most often and places threatened by graffiti are illustrated in Fig. 2.

Actions taken by self-governments, which aim at preventing acts of vandalism and graffiti, include the following:

- Additional foot patrols of the police and city Guard
- Cooperation and subsidizing of police actions
- Visual surveillance system
- Preventive actions and programs
- Installation and modernization of the existing illumination of public areas
- Sensitizing residents in relation to the phenomenon of vandalism, meetings inside the community
- Propagating safe behaviors
- Community policemen's contact with the local community
- Securing public buildings
- Construction of sports fields and other facilities for active relaxation of the youth
- Cooperation with the administrators of housing resources
- Renovation of buildings and engaging local communities in overhauls and responsibility for the property
- Showing places where graffiti can be performed
- Realization of actions in the scope of building "Safe Public Space"

Disruption of Public Order by Intoxicated Persons

The consequences of drinking alcohol include both the health aspects and the social consequences, e.g., road traffic injuries, problems related to married couples and the family, aggression and violence, suicides, and crime. Alcohol may be the sole cause or it may contribute to a certain behavior or action. In some cases, alcohol is the direct cause of an event, e.g., drunk driving may lead to an accident. It indirectly increases the risk of negative consequences.

In the Province of Silesia the most common places (see Fig. 3) where alcohol is drunk in prohibited areas is the vicinity of the alcohol stores (41 percent) as well as parks and squares (32.5 percent).

The main sources of information for the municipalities related to alcohol consumption in prohibited places are the police (44.5 percent), city guard (19.5 percent), residents (18.8 percent), as well as other sources (social research, visual surveillance system, etc., 15 percent).

Fig. 3. Analysis of the threat related to crime connected with narcotics in housing estates, schools, and entertainment institutions

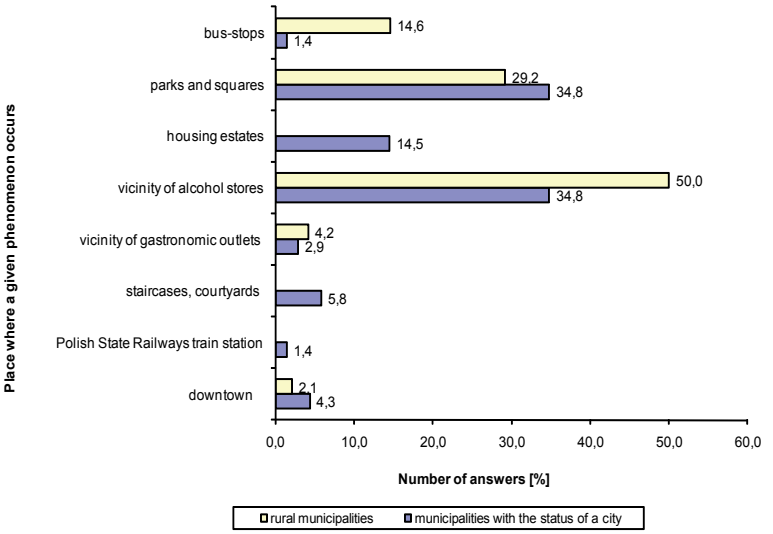
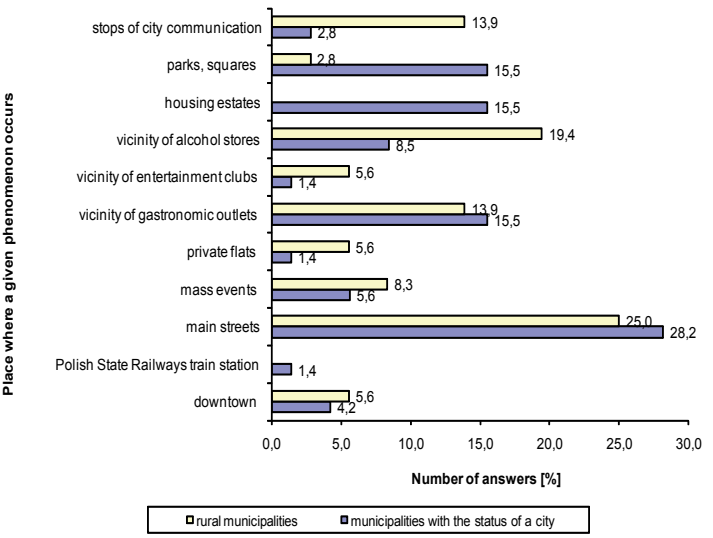


Fig. 4. Places and facilities where public order is disrupted by intoxicated adults



As a consequence of alcohol consumption, the number of cases of public order disruption in the form of accosting passers-by may increase, there may also be an increase in acts of vandalism and devastation of property, and aggressive and noisy behavior of intoxicated persons.

Disruption of public order in the Province of Silesia by intoxicated persons is present above all in the main streets (27.1 percent), in the vicinity of gastronomic outlets (15 percent), and alcohol stores (12.1 percent)—see Fig. 4.

Information on disruption of public order by intoxicated persons is obtained by the self-governments from the police (52.8 percent), city guard (17 percent), the residents (16 percent), and from own sources (11.3 percent). Such information also comes from sports and recreation centers, social assistance centres, and detoxification centers. Actions taken by the municipalities aimed at limiting sales of alcohol and eliminating public order disruptions by intoxicated persons include the following:

- Limiting the number of licenses to sell alcohol
- Developing and implementing rules for beer gardens
- Subsidizing of police actions
- Giving tasks to the police, the city guard, and organizers of events
- Penal repressions
- Preventive programs
- Visual surveillance systems
- Tightening of the conditions of selling and consuming alcohol
- Preventive inspections of threatened places
- Supplementary city guard
- Limiting alcohol sales in the vicinity of student hostels
- Activity of the Commission of Alcohol Problems
- Community meetings
- Installation of supplementary illumination in threatened places
- Cooperation with detoxification centers
- Contact of community policemen with the local community
- Exchange of information on social problems with the social assistance center, municipality office commissions, clergymen

- Directing addicted persons for detoxification treatment
- Cooperation with community policemen's beats
- Agreements with companies dealing with people and property protection and security of mass events

Aggressive Behavior and Acts of Vandalism on the Part of Pseudo Fans

Pseudo fans are currently one of the greatest social problems. Pseudo fans are characterized above all by aggressive behavior—which is further aroused by alcohol and narcotic substances—brutality, and a feeling of power in a group. They have a destructive influence on the psychic development of the younger generation.

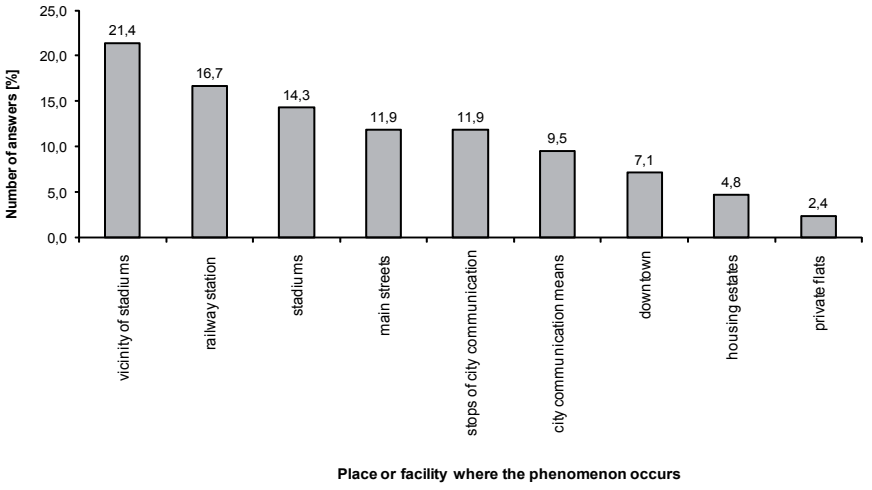
Aggressive behaviour of pseudo fans is mainly a problem in those municipalities with the status of a city. Only in seven examined rural municipalities was the sporadic occurrence of such events on sports fields reported. The self-governments derive information from the reports of the police (43.2 percent), city guard (29.5 percent), own sources (11.4 percent), from residents (8 percent), as well as from the reports of sports and recreation centers, city communication companies, and the press. The places where aggressive behaviour and acts of vandalism on the part of pseudo fans occur, in municipalities with city status, are presented in Fig. 5.

Actions taken in the municipalities of the Province of Silesia in order to eliminate aggressive behavior and acts of vandalism on the part of pseudo fans include the following:

- Developing instructions for organizers of mass events during the meetings of the Commission of Public Safety and Order
- Cooperation with soccer clubs
- Additional tasks of the police and the city guard
- Short-term preventive action of the city guard and police
- Programs and preventive action (e.g., "I can be a supporter," "Safe supporting")
- Ensuring the safety requirements of mass events
- Subsidizing of police actions

- Rental of buses transporting fans from places indicated by the police
- Increased patrols of the city guard on days when games are played
- Visual surveillance system in public places and on stadiums
- Appeals for polite behaviour
- Meetings with fan clubs
- Subsidizing of sports clubs in the scope of realizing tasks in the field of safety
- Fast removal of damages

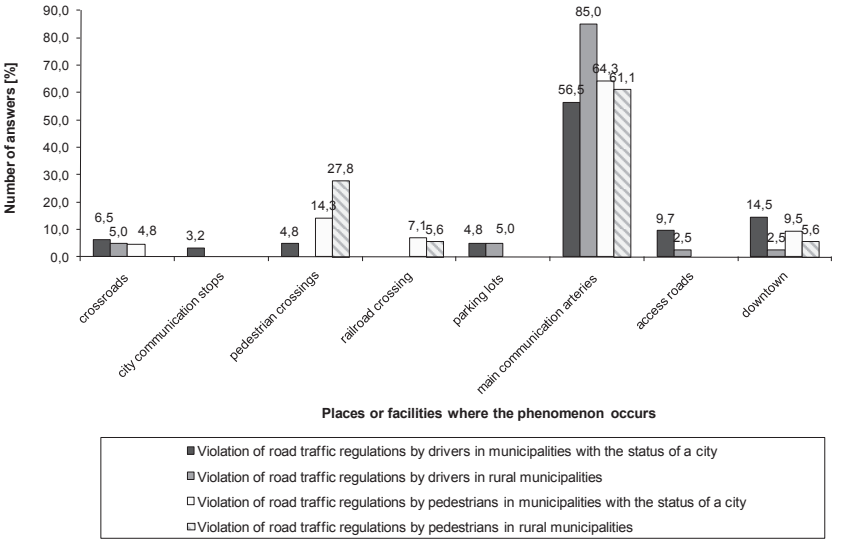
Fig. 5. Places where aggressive behaviour and acts of vandalism on the part of pseudo fans occur in municipalities with the status of a city



Failure to Observe Road Traffic Regulations by Drivers and Pedestrians

Breaking road traffic regulations most commonly occurs on the main communication routes and at pedestrian crossings (see Fig. 6). Information on the breaking of road traffic rules by both drivers and pedestrians is given to the self-governments by the police (62.2 percent) and the city guard (16.1 percent).

Fig. 6. Places where road traffic regulations are broken



Actions taken in the municipalities which aim at eliminating threats in road traffic are as follows:

Modification of drivers' behavior

- Implementing preventive actions and programs
- Implementing rules of creating safe space in road traffic, initiating and introducing changes in the organization of road traffic, visible marking of roads
- Coordinating preventive programs to the benefit of road traffic safety
- Installing fixed and movable photo radars
- Subsidizing of police actions
- Operations of the visual surveillance system
- Modernization of the road infrastructure (construction of accommodative traffic lights, reconstruction of crossroads, creation of new parking lots, modernization of old and installation of new illuminations)
- Taking of penal measures provided by the regulations

- Analysis of the rate of accidents and evaluation of the state of road traffic safety
- Control of the technical condition of vehicles in traffic
- Marketing actions timing at promoting safe conduct on roads
- Educating children and youth in relation to traffic
- Initiating common endeavors with the police
- Financing additional city guard patrols
- Indicating dangerous points on the roads

Modification of pedestrian behaviour

- Implementation of preventive actions and programs, e.g., "2009 the Year of Pedestrian Safety," "Pedestrian," "Road"
- Repressive actions
- Installation of fixed and movable photo radars
- Educating children and youth in relation to traffic
- Modernization of the road infrastructure (proper marking of roads, construction of sidewalks, construction of tourist paths and trails, installation of full illumination for the evening and night period, architectural barriers)
- Subsidizing of police actions
- Analysis of the rate of accidents and evaluation of the state of road traffic safety
- Cooperation with the police
- Functioning of the video surveillance system

Threats to Public order by Juvenile Acts

Threats to public order by juvenile acts are the result, and at the same time a manifestation, of social inadaptation of juveniles, which is characterized by repetition and continuity of negative behaviour. In literature the phenomenon of social inadaptation is called demoralization, i.e., "anarchy, especially moral one, immorality."[21] According to article 4 on procedures in cases involving juveniles, circumstances demonstrating demoralization of juveniles include the following:

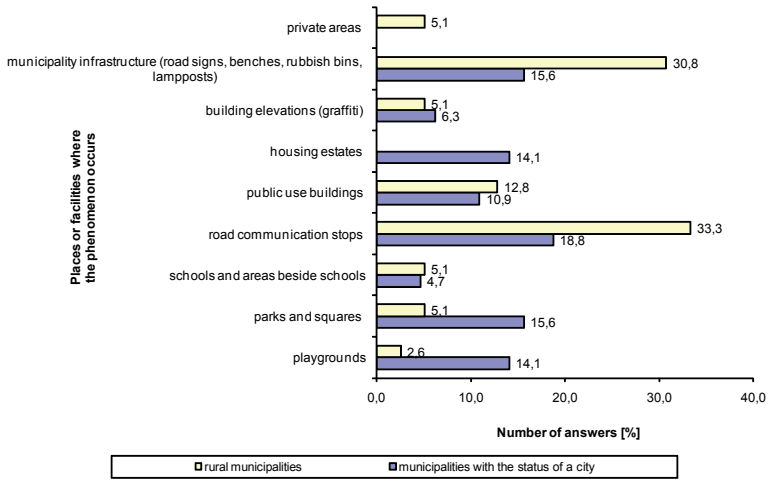
21 *Small Dictionary of the Polish Language* (Warsaw: PWN, 1993), p. 126.

- Violation of the rules of social coexistence
- Commitment of a prohibited act
- Systematic evading of school duty or vocational education
- Consuming alcohol or other substances in order to become intoxicated
- Prostitution
- Vagrancy
- Participation in criminal groups[22]

In the research, focus was placed on threats to the public order by juvenile acts, such as destruction of property and consumption of alcohol and narcotic substances.

Acts of vandalism committed by juveniles most commonly concern disruption of city communication (24.3 percent) and the infrastructure of the municipality (21.4 percent). See Fig. 7.

Fig. 7. Places in which property is destroyed by juveniles



Information concerning the existing events related to destruction of property by juveniles is given to the municipalities in the Province of Silesia by the police (49.5 percent), the city guard (14 percent), and from

[22] Art. 4 of the Act, October 26, 1982, on procedures related to juvenile cases, Gazette of Acts 1982 No. 35 item 228 and amendments.

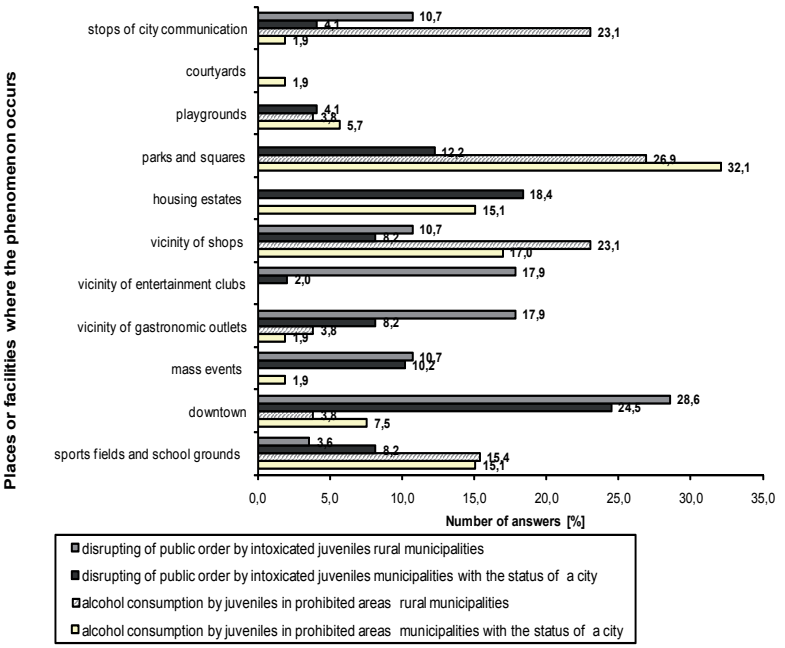
own sources (17.8 percent). Based on the obtained information, preventive actions are taken in the municipalities such as:

- Talks and lectures at schools
- Additional inspections of parks and playgrounds by the city guard
- Cooperation with the police
- Cooperation between schools and the police
- Additional, common patrols of the police and the city guard
- Functioning of the video surveillance system
- Subsidizing of police actions
- Preventive programs such as the "National Program of Preventing Social Inadaptation and Crime among Children and Youth"
- Intervention actions at schools
- Sensitising residents with the phenomenon of vandalism
- Community meetings
- Organizing of children and youths' free time

Analysis was also conducted in relation to consumption by juveniles of alcohol and other substances in order to become intoxicated. Consuming alcohol and disrupting public order by intoxicated juveniles takes place most often in parks and squares, in the downtown area, and at city communication, i.e. bus, stops (see Fig. 8).

Information related to this subject is given to the self-governments by the police (46 percent), the city guard (19 percent), residents (15 percent), schools (4 percent), social assistance centers (2 percent), and sports centers (0.5 percent). They also come from own sources (13.5%)—visual monitoring systems, social research, activity of the emergency management teams.

Fig. 8. Places where alcohol is consumed and public order is disrupted most frequently by intoxicated juveniles



Threats related to crimes by juveniles due to narcotics were noted only in the case of seven rural municipalities, mainly in entertainment clubs and at schools. In municipalities with city status, such crimes also occur most frequently at schools (24.4 percent), in parks and squares (22 percent), but also in entertainment clubs (19.5 percent) and gastronomic outlets (17.1 percent). Information on crimes connected with narcotics committed by juveniles is given to the self-governments mainly by the police (61.6 percent). Based on this information actions such as the following are taken in municipalities:

- Raising society awareness of the effects of alcohol and narcotics: brochures, municipality news
- Education of youth in terms of counteracting alcoholism and drug addiction, debates for youth in the form of a meeting with specialists
- Training of the teaching staff
- Additional patrols of the police and the city guard
- Inspections of the city guard at schools

- Purchase of drug tests for the police
- Preventive programs "Program of Counteracting against Drug Addiction in the Municipality," "Keep Your Mind Sober," issue of a booklet entitled "Drug Dilemmas"
- Education and activities of children and youth, organization of their free time: "Active Leisure," "The Closer Field," holiday play schemes, "Winter in Town Action," "Summer Action"
- Financing of travel of children from pathological families
- Development of an algorithm of behavior for teachers and brochures for parents
- Functioning of the video surveillance system
- Subsidizing of police actions
- Work of pedagogues at schools
- Meetings with parents
- Installation of supplementary illumination of dangerous places
- Activity of the Centers of Addiction Therapy, Prophylaxis, and Psychological Aid
- Employment of private companies which deal with person and property protection in order to survey order at schools
- Conditions of selling and consuming alcohol
- Inspection of the correctness of alcohol sales
- Controlling of licenses

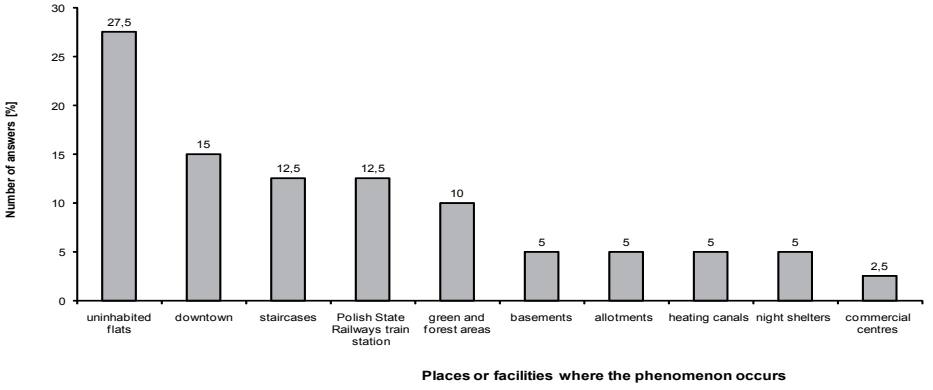
Homelessness and Begging

Homelessness is a phenomenon present in all societies. One can become homeless out of one's own choice or it may be due to other factors. Homelessness may be caused by, for example, an illness (amnesia), the necessity of leaving one's home country, deviational behavior (break with the family), and random incidents (orphanage). This may also be the effect of a decreased ability to live independently and inability to conform to the requirements of society.

In the research the phenomenon of homelessness was identified in the case of 22 percent of rural municipalities. The scale of the phenomenon in

these municipalities is minimal—these are infrequent cases which apply to only 5–8 persons in the municipality, who receive constant social assistance. This phenomenon is visible on a much larger scale in municipalities with city status, being identified in 66.5 percent of cases (see Fig. 9).

Fig. 9. Places where homeless people stay most frequently



Information on homeless people is given to the municipalities by: social assistance centers (42.1 percent), the city guard (16.8 percent), the police (24.2 percent), residents (8.4 percent), competent departments in town/municipality offices (1.1 percent), shelters and night shelters (2.1 percent), own sources (4.2 percent), as well as schools (1.1 percent). In order to decrease the number of homeless people, the following actions, among others, are taken in the municipalities:

- Running of shelters, night shelters, heat shelters
- Directing to shelters and Wight shelters
- Financial aid
- Allocation of flats to the homeless
- Ensuring shelter for mothers with children
- Monitoring of places where homeless people stay
- Ensuring hot meals and clothes according to season
- Subsidizing police actions
- Ensuring community flats
- Functioning of the video surveillance system

- Individual programs
- Education and information actions

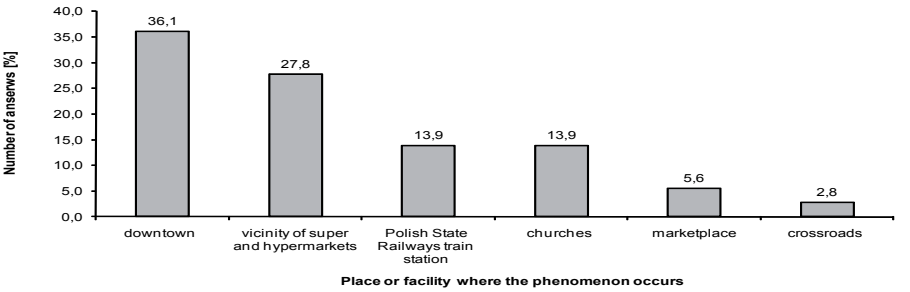
Begging is also a threat to public order. It can be generally termed as a particularly severe expression of the social degradation of an individual.

Begging is also a phenomenon which causes social dissatisfaction and which affects the general level of public safety and order. A shabby and repulsive look, suspicions concerning diseases, inclination to excessive alcohol consumption, and aggressive behavior constitute a threat to citizens' feeling of safety, decreasing the quality and value of public spaces. Begging is a controversial social problem, which requires intensive preventive actions, concentrated around assistance to the most needy.

Begging is often a conscious choice, a way to easily get money. Taking this into consideration one should be aware that the offered handout will not necessarily be used to satisfy the basic needs essential to life, but it may contribute to the persistence of abuse and/or begging for money.

In the area of the conducted research, begging was identified only in two cases of rural municipalities. In the municipalities with city status, the biggest concentration of this phenomenon is found in the downtown area and in areas of supermarkets and hypermarkets (see Fig. 10).

Fig. 10. Places where the phenomenon of begging escalates



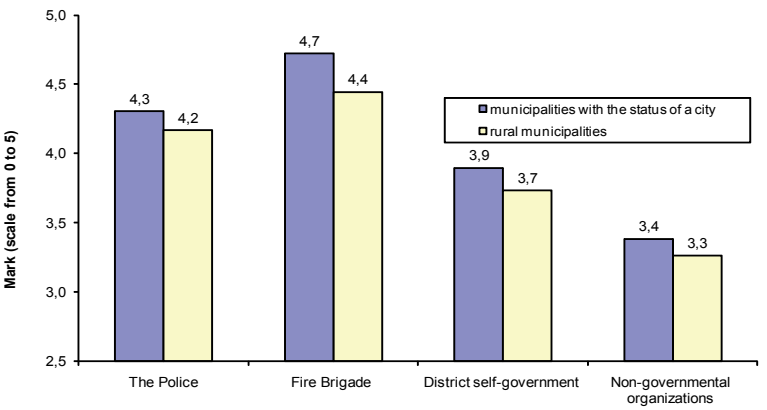
Information on begging is given to the municipalities by the police (38.9 percent), social assistance centers (25.9 percent), the city guard (20.4 percent), residents (9.3 percent), and own sources (5.6 percent). Actions taken based on the obtained information are the following:

- Giving support to the needy—free meals, material and financial aid
- Employment in the scope of public and intervention work
- Support of the activity of foundations and non-governmental institutions
- Preventive action and programs, e.g., "Children of the Street"
- Preventive actions of the police and the city guard
- Functioning of the video surveillance system
- Inspection of endangered places

Cooperation in the Scope of Public Safety and Order

The results of research related to the evaluation of cooperation for the benefit of public safety and order, conducted within the self-governments of the municipalities in the Province of Silesia, show that the best cooperation exists with the units of the National Fire Brigade and that improvement is needed, above all, when it comes to cooperation with non-governmental organizations (see Fig. 11).

Fig. 11. Evaluation of cooperation in the scope of public safety and order (scale from 0 to 5)



In the evaluation of cooperation with the police, the self-governments of the municipalities indicated the high quality of the work of the police, their full engagement in the executing of tasks, the highly specialized staff, and the immediate taking of action. However, emphasis was put on cooperating

more closely and taking actions which aim at improving the flow of information and improving coordination of actions.

The high evaluation of the activities of the National Fire Brigade was justified by very good cooperation in the scope of rescue services, securing of city events, and removal of local threats. What was also pointed out was the active participation in promoting safe behavior, and cooperation in organizing competitions and contests, professionalism, reliability, engagement, and very good use of forces and means when undertaking rescue and fire fighting actions.

In the evaluation of cooperation with the district self-governments areas considered were: financial aid, engagement in the realization of endeavors, information flows, and coordination of actions. Problems which require taking of actions as priority include:

- Cooperating more closely
- Increasing attention to the district infrastructure
- Improving information flows and coordination of actions

Concluding Remarks

The results of the conducted research and analysis are as follows:

1. The self-governments of the municipalities in the Province of Silesia included in the main threats to public order the following: failure to observe the regulations of road traffic by drivers, consumption of alcohol in prohibited places, destruction of property (acts of vandalism), and the disturbing of public order by intoxicated persons.

2. Information on threats to public order is given to the self-governments mainly by the police. The obtained information is subjected to systematic analysis, which constitute the basis of actions adapted to local needs, taken in municipalities in the scope of public safety.

3. The self-governments use a number of tools, the aim of which is the elimination of threats to public order and consequently the sources of crime. They use instruments of social policy and pro-family policy, they take actions in the area of education, upbringing, health protection, economic growth, or spatial planning. They implement preventive programs created on the basis of local threats, conduct actions which activate children and youth (e.g., contests, games, sport events), and they also make many investments (e.g.,

construction of video surveillance systems, modernization of the infrastructure of the municipalities). An essential element is also the actions taken in regard to education and attempts to shape a safety culture in local society.

4. However, not all self-governments of the municipalities are aware of the fact how broad the scope of their influence on the level of public safety is. In many of them, there is a conviction that maintaining public safety and order is the task only of the police. Changing this point of view would require cyclical training for the public administration in actions related to creating public safety and order by self-governments.

5. The level of cooperation of the self-governments of the municipalities with other units participating in creating public safety and order is on a good level. Cooperation with the National Fire Brigade was valued the most, next came cooperation with the police. In relation to the police, the self-governments have a few remarks concerning improvements that could be made, which include: self-financing, increasing activity, efficiency, and consistency in action, as well as increasing cooperation and communication with the local community. Cooperation between the self-governments and non-governmental organizations saw the lowest result. Among the causes of such a situation the most frequently indicated ones were: lack of continuity of actions, lack of coordination of actions, and a low level of initiatives to the benefit of public safety and order.

6. In order to increase the level of public safety and order, one should focus in the first place on increasing the safety culture and participation of the local society in maintaining public order; improving actions and constant raising of the competences of self-governmental authority in the scope of public safety and order; faster maintenance action in case of the acts of vandalism, usage of materials resistant to vandalism, increasing inspection of space by developing public areas according to the concepts of forming safe spaces; improving cooperation between self-governmental units and the executive and operational units and particularly non-governmental organizations.

Problems of Arms Control and Disarmament in Asia and the Pacific Region—An Overview

Przemysław Skulski[1]

Summary: The situation in Asia and the Pacific region is a key factor for international security. The threat to security comes not only in the form of open military conflicts (Afghanistan), but also potentially explosive conflicts (India–Pakistan disputes, Taiwan, Korean Peninsula). Many countries of the Asia and Pacific region possess a huge military potential. Some of them are active players on the international arms market. For these reasons, international control over armaments and arms transfers plays an increasingly significant role. The regimes apply both to conventional weapons and weapons of mass destruction. The nuclear program of North Korea, together with successful development of long-range ballistic missiles, is proof enough that the proliferation of nuclear weapons is a serious threat to global security. It seems that neither the international agreements in force at present nor the control regimes can warrant international security. They fail to eliminate both the transfer of nuclear technologies and the conventional arms trade. It appears that the main problem in the issue under study is the conflict of interests between major players in the region, namely the United States, Russia, China, India and Japan.

Keywords: arms market, arms control, disarmament, military expenditure, Asia and the Pacific region.

Introduction

Up to the end of Cold War era, international security issues were predominantly associated with military aspects. This perspective was reflected in theoretical concepts represented by the realistic school and manifested in the policies of the two superpowers of the era, the United States and the Soviet Union. To safeguard the balance of powers, both sides of the latent conflict accentuated military capabilities, while the existing dangers were inherently related to the threat of military operations. From the early 1990s, security issues began to be perceived in a broader context in order to accommodate other potential threats to the security of individual countries and regions of the world. Experts started to emphasize aspects of an economic

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(living standards, welfare, potential for growth), ecological, and social nature, as important determinants of global security. As a result, two distinct dimensions of security were defined: *hard security* involving military aspects (often correlated with economic problems) and *soft security*, with a focus on problems related to socio-cultural, ecological, humanistic, and demographic issues.[2]

The end of the Cold War was indeed an important step in reducing the level of military threat on a global scale. However, the early years of the twentyfirst century heralded a number of traumatic events (terrorist attacks in the United States, Madrid, and London, wars in Iraq and Afghanistan, a marked rise of pirate activity on the east coast of Africa). It appears that military aspects remain a major issue and continue to affect the perception of international security.

The Asia and Pacific region is one of the areas characterized by many "tinderbox" spots. The threat to security comes not only in the form of open war zones (Afghanistan), but also potentially explosive conflicts (India–Pakistan disputes, Taiwan, Korean Peninsula).

Many countries of the Asia and Pacific region rank among the top in the list of military spenders. In the first decade of the twentyfirst century, the United States is still the leading country in that category, representing nearly half of global expenditure on arms and armament. Russia, China, and India, along with the United States, are also key contenders on the international arms market.

In the light of the above observation, it seems that arms control and transfer of military technologies remains a major factor influencing international security, both on a regional and global scale.

Conflicts and Military Threats in Asia and the Pacific Region

Armed conflicts have been the bane of the Asia and Pacific region for centuries. Some of them, dating back to the second half of the twentieth century, continue to exert a great impact on the region's security up to the present. It

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2 K. Madej, *Terroryzm i inne zagrożenia asymetryczne w świetle współczesnego pojmowania bezpieczeństwa narodowego i międzynarodowego – próba teoretycznej konceptualizacji*, in R. Kuźniar, ed., *Porządek międzynarodowy w progu XXI wieku* (Warszawa: Wydawnictwo Uniwersytetu Warszawskiego, 2005), p. 489.

seems that the present situation is influenced predominantly by the Afghan war and the latent conflict between North and South Korea.

Afghanistan has been a battleground of numerous armed conflicts for several decades. The conflict of the 1980s was a result of the Soviet invasion of 1979–88. In September 2001, following terrorist attacks on U.S. soil, President George W. Bush issued an unconditional ultimatum to Afghanistan's ruling Taliban, demanding the handover of Al-Qaeda members that had taken refuge on Afghan territory, the release of foreign prisoners held in Afghan prisons, the provision of protection to foreign journalists, diplomats, and personnel of humanitarian aid organizations, as well as the immediate and permanent closure of terrorist training camps. The ultimatum was rejected and, as a consequence, on October 7, 2001, U.S. and British air forces commenced attacks on selected targets in the regions under the rule of Taliban and Al-Qaeda forces.[3] In the years to follow, despite extensive military efforts supported by ISAF, the allied forces failed to control the situation and assure security in the region. Taliban forces adopted guerilla tactics operating from mountainous regions as well as committing acts of urban terrorism. The most important aspect of this conflict is the support for guerilla forces on the part of local communities in certain regions of the country. The aversion of local communities towards ISAF forces is, to a large extent, a result of a series of tragic errors and misdirected attacks that have cost the lives of many civilians.[4]

Another important aspect of this conflict is the delicate situation on the border between Afghanistan and Pakistan. In fact, the border (the so-called Durand line) is a virtual entity, with no precise course. Adding to the situation, the northern and north-west regions of Pakistan are controlled by the Afghan Taliban and Pashtun tribal militia, serving as a base for frequent raids on Afghan soil as well as a recruitment ground. The new strategy of involvement, announced by Barack Obama in March 2009, failed to bring tangible results. The activity of Taliban forces over the first few months of 2010 has been on the rise, and the number of armed attacks on ISAF forces has increased.

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[3] J. Walczak, "Afgańska strategia: zwycięstwo," in *Stosunki Międzynarodowe*, Nos. 58–59, March-April 2009, p. 20.

[4] J. Bielecki, B. Zadura, "Atomowa gra o sukcesję," *Dziennik*, May 27, 2009; J. Pawlicki, "Korea straszy świat," *Gazeta Wyborca*, May 26, 2009.

Another serious threat to security in the region is the complex situation on the Korean Peninsula. It must be noted that the end of the Korean War in 1953 did not ease the friction between North and South Korea. The following years saw frequent escalations of tension, threatening to turn into another armed conflict. Recently, the most alarming aspect of the conflict is the nuclear armament program of North Korea, followed by the construction of long-range tactical missiles (Nodong 1 and Taepodong 2). A subterranean nuclear test explosion and missile tests conducted by Pyongyang in May 2009 resulted in the exacerbation of tensions between the two countries, putting on alert not only both armies, but also the armed forces of several other countries. Another impulse was the sinking of the South Korean corvette *Cheonan* in March 2010. Inspection of the wreckage showed that the ship was subject to a torpedo attack. Such incidents prove that the tension on both sides of the 38th parallel is real and may intensify.

Other major threats to international security in Asia and the Pacific region include:

- Tension between India and Pakistan
- Chinese occupation of Tibet
- Relations between China and Taiwan
- Border and territorial disputes—there are many contentious flashpoints in Asia and the Pacific region that may result in military conflict. The most important ones include disputes over the Paracel, Spratly, Senkaku, and Kuril Islands. Moreover, border issues between China and India have not yet been resolved (the war of 1962 between these two countries was a result of disputes over the region of Aksai Chin)
- Internal conflicts in several countries of the region (Nepal, Bangladesh, Sri Lanka, Indonesia, Solomon Islands, Burma)
- Control over sea-faring routes, particularly the South China Sea and access to the straits of Malacca and Singapore (the U.S. 7th Fleet stationed in the region as well as the navy development programs of China and Japan show the gravity and importance of this problem)
- Rivalry over areas of influence between major players of the region: China, India, Japan, Russia, and the United States. The aspirations of these countries to dominate the region may be

> perceived as a potential source of conflict, especially in the context of unresolved bilateral relations between some of the powers in the region (such as the case of relations between China and Japan). Many experts believe that the next few decades will see an aggravation of the rivalry between China and the United States over domination and spheres of influence in Asia and the Pacific region. Reaching military advantage will undoubtedly be a major element of this power play.

Military Expenditure in Asia and the Pacific region

The end of the Cold War in the early 1990s has resulted in a marked decrease in military spending in most countries of the world. However, by the end of the twentieth century, the trend had reversed. The increase in military spending was especially prominent after 2001, following the declaration of the "global war on terror." In the period 1997–2006, global expenditure on military projects increased by 37 percent. By region, the largest increase was observed in the Middle East with 57 percent, North America 56 percent, and Africa 51 percent. In Asia and the Pacific region, the increase reached 41 percent.

It must be noted in this context that, in the case of Asian countries, the increasing trend in the defense budget has been observed for more than a decade. A slight decrease was recorded only in the period of 1997–98, which may be attributed to the financial crisis in the region at the time.

With regard to the analysis of military spending per country, the marked dominance of developed countries is evident and follows the trend of past decades. The group of developed countries accounts for approximately 75–80 percent of global military spending (according to records from the early years of the twentyfirst century. The list of most active military spenders features some of the major actors influencing the security of the Asia and Pacific region—the United States (US$4528.7 billion in 2006), China (US$49.5 billion), Japan (US$443.7 billion), Russia (US$$434.7 billion), India (US$23.9 billion), South Korea (US$21.9 billion), and Australia (US$13.9 billion). Most of these countries display an increase of military spending, with the greatest dynamics of growth noted in China (12 percent increase compared to 2005), India (7 percent), South Korea (7 percent), and Australia. Japan joined the

group of countries exhibiting a decrease in the defense budget (a decrease of US$464 million). A similar trend was observed in Taiwan and Malaysia.[5]

However, figures of military spending in China are only estimates, with major discrepancies between available sources. Official Chinese records report spending of US$35 billion in 2006; Stockholm-based SIPRI estimates the level to be US$49.5 billion, while the U.S. Department of Defense suggests that it could be as high as US$80–115 billion.[6] Many experts believe that part of the army budget is concealed in the budget records of other ministries. Moreover, the official records do not include spending on research, implementation projects, nor dual-use technologies. A good example of the latter is the Chinese space exploration program, which is not included in official defense budget declarations despite their obvious military character.[7]

Countries of the Asia and Pacific Region on the Global Arms Market

The countries of the Asia and Pacific region are active players on the global arms market. Some of them rank high up on the list in terms of both exporters and importers of arms and armaments.

Table 1 presents export figures from the Asia and Pacific region for the period 2002–06. The figures show the marked dominance of two countries—the United States and Russia. Those two countries were the largest exporters of arms and armaments globally, with shares in the global arms export market of 29 and 28 percent, respectively.

According to the SIPRI report, in the period 2004–08, the United States accounted for 31 percent of arms sales globally; of the 69 countries importing arms from the United States, the most prominent countries were South Korea, Israel, United Arab Emirates, and Iraq.[8] In the latter case, arms shipments were practically dominated by the United States. In 2008 alone, the total value of arms and armaments sold by American companies to Iraq was

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5 *SIPRI Yearbook 2007: Armaments, disarmament and international security* (Oxford: Oxford University Press, 2007), p. 288.

6 Ibid., p. 289.

7 A. Woźniak, ″Chińskie siły zbrojne jako wyraz globalnych ambicji Państwa Środka,″ *Armia,* Nos. 3–4 (2009).

8 According to data published by the Russian ARMS-TASS agency, the U.S. share in global arms exports was 40 percent. Unfortunately, such discrepancies are common in relation to the arms market.

reported at US$12.95 billion, while the remaining countries accounted only for US$20 billion[9]

Table 1. Major Exporters of Arms and Armaments in Asia and the Pacific Region, 2002–06: Arms sales figures (in US$ million, prices fixed at 1990 value)

Country	2002	2003	2004	2005	2006	2002–2006
United States (1)	4 949	5 586	6 639	7 066	7 888	32 128
Russia (2)	5 655	5 442	6 485	6 449	6 733	30 764
China (8)	544	532	271	223	564	2 134
Uzbekistan (15)	73	340	170	-	-	583
South Korea (19)	-	114	20	39	89	262
Australia (27)	30	40	2	50	4	126
Kirgizstan (31)	-	92	-	-	-	92
Indonesia (32)	49	-	25	8	8	90
Singapore (36)	2	-	66	3	-	71
North Korea (37)	45	13	13	-	-	71
India (41)	-	4	22	4	11	41
Pakistan (44)	9	9	7	9	-	34

Note – global rank shown in brackets

Source: Based on SIPRI data

SIPRI data suggest that Russia's share in the global arms market was running at 25 percent, with arms shipments to 49 countries.[10] A marked majority of arms and armaments from Russia (more than 70 percent) was received by three countries: China, India, and Algeria.[11] India is, without doubt, the most important customer for Russia. In early 2009, the value of arms orders placed by India (including license agreements) reached US$17.3 billion. However, the competition on the Indian market is expected to intensify. The main area of confrontation is the announced tender on 126 multipurpose fighter aircraft. The contract, estimated at US$12–14 billion, will

9 T. Hypki, "USA zmonopolizowały dostawy do Iraku," *Raport,* No. 3 (2009), p. 44.

10 According to data published by Russian ARMS-TASS, the share of Russia in global arms exports was only 13 percent.

11 M. Bromley, P. Holtom, P. D. Wezeman, S. T. Wezeman, *SIPRI Arms Transfer Data*, SIPRI Fact Sheet, April 2009, p. 3.

put Russia (MiG-35) under pressure, not only from U.S. producers (Boeing F/A-18E/F Super Hornet and Lockheed-Martin F-16N), but also from France (Dassault Aviation Rafale), Sweden (Saab Gripen), and the European consortium EDAS (EF-2000 Typhoon). This prospect is a clear indication of the waning dominance of Russia on the market.

In this context, one should also note the growing significance of China as an exporter of arms and armaments. In the early years of the twenty-first century, annual estimates of Chinese arms sales were in the range of US$223–564 million, representing less than two percent of the total value of the global arms trade. Nonetheless, China exports a wide range of arms and armaments, from small arms and light weapons, trough military vehicles (ATV, motorcycles, trucks), combat vehicles (tanks, self-propelled artillery), to combat aircraft. It is fairly obvious that China is a very specific supplier—its products are offered at very competitive prices, but, more often than not, are based on outdated technologies. It may be expected that the assortment of export goods will be expanded upon and updated in the near future.

The specificity of the Chinese approach to the international arms market does affect the geographical structure of exports from this country. Consequently, two major directions of Chinese arms exports may be distinguished: Africa and Asia.

The African direction is a direct consequence of Chinese interest in the region, as a major source of oil and other natural resources for Chinese economy. Oil fields are, undoubtedly, the principal reason of Chinese presence in such countries as Angola, Chad, Ethiopia, Equatorial Guinea, Congo, Niger, Nigeria, and Somalia.

In respect to Asian destinations of Chinese arms exports, the most important issue is international security in the region. Major recipients of Chinese arms and armaments include Pakistan, Iran, Burma, Nepal, North Korea, and Laos. In addition, Chinese military technologies are abundant in Afghanistan and Iraq (in the 1980s, the latter purchased over US$5 billion worth of military equipment from China). The most important partner of China is Pakistan. This is a result of Chinese policy of counterbalancing the economic potential of India; not only does China have a border dispute with India, but the latter is also the most important economic and political rival in the region. Apart from being the largest purchaser of Chinese military equipment, Pakistan is also a major partner of China in research and development of new technologies.

Table 2. Major importers of arms and armaments in Asia and the Pacific region, 2002–06 (Arms import figures US$ million, prices fixed at 1990 value)

Country	2002	2003	2004	2005	2006	2002-2006
China (1)	2 636	2 068	2 853	3 791	3 261	14 609
India (2)	1 659	2 928	2 476	1 417	1 672	10 152
South Korea (5)	336	599	1 030	627	1 292	3 884
Australia (6)	711	864	558	560	768	3 461
United States (11)	394	511	510	444	417	2 276
Taiwan (12)	314	116	341	775	624	2 170
Pakistan (14)	528	592	373	236	309	2 038
Japan (15)	426	465	412	305	400	2 008
Singapore (20)	235	70	384	552	54	1 295
Malaysia (27)	139	137	81	16	654	1 027
Vietnam (31)	129	32	259	308	179	907
Indonesia (36)	66	358	155	21	54	654

Note – global rank shown in brackets

Source: Based on SIPRI data

Since the beginning of the twentyfirst century, countries of the Asia and Pacific region have assumed a dominant position on the arms market as customers to major suppliers of military equipment. Table 2 presents import data for countries of the region under study. In the period 2002–06, the twelve major consumers of the Asia and Pacific region received over 40 percent of global arms shipments. The following years (2007–08) brought only insignificant shifts in the trend. Some countries increased their orders (Australia, Pakistan, South Korea), while others displayed reductions by a small margin (China, India, and Taiwan). It must also be noted that short-term balance overviews (covering a period of one or two years) may be largely affected by isolated high-value transactions.[12] Moreover, it must be

[12] A good example here is the contract on the renovation and modernization of the

remembered that individual sources provide substantially diverse accounts of transaction values. This may result from employing different methodologies of value estimation or simply associating individual transactions with different periods.[13] However, such inconclusiveness should not obscure the fact that three countries of the Asia and Pacific region ranked top of the list of arms importers, namely: China, India, and South Korea.

Arms Control and Disarmament in Asia and the Pacific Region

Arms control and disarmament are important elements of international security, both in a global and regional perspective. Regulatory attempts in this respect were undertaken even in the Cold War period, applying mainly to mutual commitments made by the United States and the Soviet Union. The collapse of the bipolar system of global balance did not intensify disarmament endeavors, due to new security threats and the disparity in the national interests of both superpowers.

The existing system of arms control, disarmament, and arms transfer is focused predominantly on the issue of weapons of mass destruction, the means of transporting and propelling such weapons, as well as control over conventional weapons.

Weapons of Mass Destruction

The most fundamental document related to nuclear arsenal is the Treaty on the Non-proliferation of Nuclear Weapons (NPT) of July 1968,[14] with 188 countries party to the Treaty. This document sanctions the division of countries recognized as nuclear- weapon-states and those that commit themselves to withhold from any activities that may result in gaining access to nuclear weaponry. Each of the nuclear-weapon-states undertakes to restrain from transferring their nuclear weapons to other parties, including any active support or encouragement to produce or otherwise procure such weapons

Admiral Gorshkov aircraft carrier, commissioned by India in Russia, and worth US$42.9 billion. Provision of F-15K aircraft as well as jet engines and avionics by the U.S. for North Korea resulted in the latter becoming the largest importer of arms and armaments globally, both in 2007 and 2008.

13 Depending on the adopted time mark, i.e., signing of agreement, delivery or final settlement of accounts.

14 It came into force in March 1970.

on the part of non-nuclear states. Non-nuclear states commit themselves to restrain from any activities to the effect of procuring such weapons and pledge to utilize nuclear materials solely for peaceful use, under supervision of the International Atomic Energy Agency (IAEA).

Another significant document is the Comprehensive Nuclear Test-Ban Treaty (CTBT), negotiated in 1996. However, the treaty has so far not been put into force, due to the failure in satisfying the formal requirement of ratification by all 44 countries that have access to nuclear technologies. Of the group of countries, only 32 ratified the document (one of them is the United States). The Treaty imposes an unconditional ban on any nuclear weapon tests, with the aim of limiting further development of associated military technology. It also postulates establishment of a global system for controlling and supervising the resolutions of CTBT (through inspections and other means). Currently, the system is being managed by the Preparatory Commission for the Comprehensive Test Ban Treaty Organization, with the task of preparing a conclusive supervision system.[15]

International conventions apply also to chemical and biological weapons. In the former case, the fundamental document is the Chemical Weapons Convention (CWC) signed in January 1993 (in force from April 29, 1997). At present, 174 states are parties to this agreement. CWC prohibits the development, production, stockpiling, and use of chemical weapons, and demands destruction of any such weapons in stock under extensive supervision of international organizations (within ten years from the document entering into force).[16] To verify the resolutions of the Convention, an international Organization for the Prohibition of Chemical Weapons (OPCW) was established, with its headquarters in the Hague.

In the case of biological weapons, the binding international document is the Biological and Toxin Weapons Convention (BTWC), which entered into force on March 26, 1975 (three years after signing). One hundred and fifty-one states are parties to the Convention.

The above international agreements are closely related to a number of control regimes applying to weapons of mass destruction. The most important of these are:

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15 K. Żukrowska, M. Grącik, *Bezpieczeństwo międzynarodowe. Teoria i praktyka* (Warszawa: SGH, 2006), p. 210.

16 The United States, Russia, India, South Korea, Albania, and Libya have confirmed stockpiling of chemical weapons.

- **Missile Technology Control Regime** (MTCR), providing control over proliferation of missiles able to carry weapons of mass destruction. In the early years of the twentyfirst century, several programs were established to control production and proliferation of ballistic missiles. This trend is manifested, for example, in the attempt to establish The Hague Code of Conduct against Ballistic Missile Proliferation (HCOC). Negotiations over this issue were also attended by several states outside the MTCR agreement, such as China and India. The final draft of the Code was accepted by 78 countries during a meeting in Paris in February 2002. Another attempt in this context is the Russian initiative to establish a Global Control System for Non-Proliferation of Missiles and Missile Technologies (GCS). The system was meant to secure transparency in respect to missile technology tests, safety guarantees from GCD signatories towards states that express their willingness to withdraw from national missile programs, as well as multilateral consultations over the issues related to missile proliferation. The Russian project has not yet seen a final draft.
- **Nuclear Suppliers Group** (NSG) was established in 1978 as a result of negotiations between nuclear states (Canada, France, Federal Republic of Germany, Japan, Great Britain, the United States and the Soviet Union). This informal agreement between 39 states is aimed at preventing third parties from access to nuclear weapons and nuclear technologies. In the late 1990s, there were some controversies over this agreement, with several countries implying that Russia failed to fulfill its contractual obligation by providing nuclear reactors and nuclear fuel to Tarapur power plant in India. Russia substantiated its claim that the shipments were a result of earlier commitments. In April 2001, despite the fact that all NSG members (except Belarus) rejected the Russian claim, the new minister of the International Atomic Energy Agency validated the decision to carry on the Russian shipments to India. This case alone puts a shadow of doubt over the effectiveness of the NSG operation.

- **Australian Group** is an informal club of 33 states, established in 1985. The principal aims of the regime include limits to proliferation of chemical and biological weapons, warranties to effective implementation of international conventions in this respect, as well as improving the transparency of this type of export on the part of AG signatories. The export control is based on a list of 52 components that may be used in production of chemical and biological weapons.
- **Zangger Committee** was established in 1971 and is a grouping of 37 member states (mostly European, but also includes Australia, China, and Argentina).[17]

New threats to international security that emerged in the first decade of the twentyfirst century (most importantly, the threat of terrorism) have forced the international community to intensify their policy of preventing rogue countries and terrorist cells from gaining access to weapons of mass destruction. Two initiatives are worth mentioning in this context: the Global Partnership and the Cracow Initiative (Proliferation Security Initiative, PSI).

The former is involved in counteracting the proliferation of weapons of mass destruction. Its principles were established at a G-8 meeting in Kananaskis, Canada, in 2002. The initiative sanctions the funding of US$20 billion for a period of ten years to destroy parts of the existing WMD arsenal, particularly in Russia. Supervision of the initiative will lie in the hands of a Senior Official Group. The Partnership provides means for G-8 states to prevent terrorist groups and terrorism-supporting countries from gaining access to WMD. The Partnership is also interested in providing support for destruction of chemical weapons and utilization of decommissioned Russian atomic submarines. At present, the initiative seeks ways to extend the support to cover other countries that are willing to dispose of their hazardous arsenal of weapons.[18]

The Cracow Initiative was announced by George W. Bush in Cracow, Poland, in May 2003. It is aimed at counteracting the illegal trade of WMD and materials that may be used to produce weapons of mass destruction.

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17 *Komitet Zanggera*, May 12, 2009, www.wiedenun.polemb.net

18 Żukrowska, Grącik, *Bezpieczeństwo,* op. cit., p. 218; and B. Górka-Winter, "Globalne Partnerstwo Przeciwko Rozprzestrzenianiu Broni i Materiałów Masowego Rażenia," in, *Biuletyn PISM* 43(147) 2003, www.pism.pl.

The states invited to participate in the initiative (Australia, France, Canada, Germany, Norway, Italy, Japan, the Netherlands, Poland, Portugal, Singapore, Spain, Great Britain) are encouraged to join forces for the development of legal, diplomatic, economic, military, and other means, to ensure interception of such trade.[19]

Evaluation of the level of adherence to international agreements and disarmament regimes in relation to weapons of mass destruction in Asia and the Pacific region is not an easy task. The region under study is of enormous significance for international security, both on a local and global scale. At present, nine states of the world are in possession of nuclear weapons—the United States, Russia, Great Britain, France, China, India, Pakistan, Israel, and North Korea. According to 2009 reports, the combined arsenal of these states amounted to circa 8400 nuclear warheads. Almost 90 percent of global nuclear stock is stationed in Asia and the Pacific region; this is enough to annihilate global civilization several times over. In the case of two nuclear superpowers—Russia and the United States—the threat to international security has decreased considerably with the end of the Cold War. As early as the 1970s, both countries signed several agreements on the limitation of strategic weapons (SALT I and II). Subsequent years brought not only further agreements (START and SORT), but also an effective reduction of nuclear arsenals. In April 2010, the presidents of the United States and Russia signed another agreement in Prague, postulating further reduction of nuclear arsenals (warheads and carriers).[20] In the case of China and India, the predictability of both powers is improving. China is a party to all major agreements, but is not actively involved in any of the committees counteracting the proliferation of missile and nuclear technologies (except their involvement in the Zangger Committee). Nowadays, the clear and present danger is mostly associated with Pakistan and North Korea. The Democratic People's Republic of Korea (DPRK) is, at present, not bound by any international agreements in this respect. This fact alone is proof enough that the country poses a clear danger on a global scale. Estimates show that North Korea is in possession of ca. six nuclear warheads and is actively developing carrier technology (ballistic missiles).

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19 *Inicjatywa Krakowska*, February 7, 2007, www.msz.gov.pl.

20 "Rosja i USA podpisały nowy układ rozbrojeniowy," *Raport*, No. 2 (2010).

Another important element of grave significance for regional security is the U.S. decision to withdraw from the Anti Ballistic Missile Treaty, announced in June 2002. The decision primarily related to the need for constructing an anti-missile system to safeguard against potential attacks from North Korea and China. In December 2002, the president of the United States ordered the installation of anti-missile systems in Alaska and California. Also Japan, as a strategic partner to the United States, provided its own defense system to protect its territory. Controversies arise in relation to plans of building similar defense systems in South Korea, India, and Taiwan.

Events of early 2009 like the nuclear test and a series of ballistic missile test launches by North Korea show that it is not a viable solution, however, given the present situation. The most difficult obstacle to overcome in this respect is the political tension, predominantly the differences of interest between the powers active in Asia and the Pacific region.

Conventional Weapons

International agreements apply also to conventional weapons, both regionally and globally. The most important of these are the:

- Convention on Certain Conventional Weapons (CCW), signed by 90 states. The agreement applies to specific types of weaponry (non-detectable shrapnel, landmines, incendiary bombs, cluster munitions, and lasers), deemed particularly inhumane. The fundamental aim of the Convention is to protect the civilian population against conventional weapons and minimize casualties on both sides in case of any potential armed conflict.
- Ottawa Treaty of 1997, banning all anti-personnel AP landmines (the Treaty went into force two years later), with 150 states signatories to the Treaty. They undertake to withdraw from production, purchase, stockpiling, and use of any type of AP landmines as well as destroy all existing arsenal of that type within four years after ratifying the Treaty.[21]

[21] Żukrowska, Grącik, *Bezpieczeństwo,* op. cit., p. 212.

The campaign against the use of AP landmines is also actively supported by non-governmental organizations, such as the Non-State Actors Working Group of the International Campaign to Ban Landmines (ICBL NSA Working Group) and the Geneva Call. Their activities proved successful in a number of cases, such as in the Philippines.[22]

As far as the weapon transfer regimes are concerned, the most fundamental document is the Wassenaar Arrangement signed in the Hague in December 1995. At present, 33 states are parties to the arrangement. The document aims to promote responsibility and transparency of the international market for conventional weapons and dual-use technologies. A good example of a document attempting to limit the illegal arms trade is the UN Register of Conventional Arms, established in 1991, and which records import and export transactions in seven categories of conventional arms.[23] However, it must be noted that small arms and light weapons remain not only outside any international trade regulations, but also outside the control of any arrangements. Despite the attempts at regulating this issue (the UN conference of July 2001), the problem remains unresolved. Small arms and light weapons have typically been used in many local armed conflicts in Asia and the Pacific region. They are also employed in terrorist operations.

The Problem of Space Armaments

Although "Star Wars" may seem a futuristic concept, present developments suggest that the realization of such a program may be sooner than we think. The first recorded attempt at militarization of space is the concept of Strategic Defense Initiative Project prepared during Ronald Reagan's presidency. In fact, the project was more of an attempt on the part of the United States at drawing the Soviet Union into an intensified arms race, rather than a concerted effort at building a military advantage in space. The conflicts of recent years (Afghanistan 2001, Iraq 2003) make an extensive use of satellites providing reconnaissance and missile/bomb targeting capabilities.[24] At

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22 Z. Lachowski, ˝Perspektywy kontroli zbrojeń konwencjonalnych," in *Bezpieczeństwo międzynarodowe czasu przemian. Zagrożenia – koncepcje – instytucje* (Warszawa: PISM, 2003), p. 563.

23 *Transparency in Armaments: UN Register of Conventional Arms*, June 4, 2009, http://disarmament.un.org/cab/register.html.

24 M. Brzezinski, *Wschód Czerwonego Księżyca* (Krakow: Wydawnictwo Znak, 2009), p. 365.

present, several countries actively develop space militarization programs, with four— the United States, Russia, China, and Japan—having the actual potential to implement such programs.

The most advanced country in this respect—the United States—has already set precise objectives in its National Space Policy of November 2006. The document recommends the development of new technologies to secure and maintain military advantage in space and undertake operations that are of fundamental significance to the protection of U.S. interests globally. These include communication, satellite reconnaissance, and anti-missile systems. There is also evidence to support the concept of "non-contact warfare" based on offensive weaponry in the form of high-impact kinetic missiles stationed on satellites.[25] Since 2007, the United States has actively developed its Orbital Express project, aimed at the elimination of enemy satellites. Some experts believe that the collision between U.S. and Russian satellites in February 2009 was an early test of this system in action.[26]

Russia's potential in relation to military operations in space is also sizable. However, with the end of the Cold War, the country limits its involvement to activities that are aimed at restricting the process of space militarization. This approach is largely related to limited resources that can be spent on space programs. On the other hand, it would be false to assume that Russian plans of space exploration are purely pacifist. According to V. Popovkin, Deputy Minister of Defense of the Russian Federation, the country will systematically develop its space armament programs and develop modern weapons systems (predominantly anti-satellite systems).[27]

China consistently increases its space exploration budget, both in respect to civil uses (manned flights) and military applications (anti-satellite weapons and systems). According to some experts, Chinese space exploration programs are in an early phase. However, in 2007, China managed to destroy its own decommissioned satellite—a fact that clearly shows the direction of Chinese development projects.[28]

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25 R. Zięba, *Bezpieczeństwo międzynarodowe po zimnej wojnie* (Warsaw: Wydawnictwa Akademickie i Profesjonalne, 2008), p. 542.

26 "Amerykanie testują nową broń kosmiczną," March 4, 2009, http://wiadomosci.onet.pl

27 "Rosja będzie rozwijała broń do zwalczania satelitów," March 5, 2009, http://news.money.pl

28 Zięba, *Bezpieczeństwo*, op.cit., p. 543.

Concluding Remarks

The Asia and Pacific region displays a turbulent past. Many conflicts in this region have had a lasting impact on international security. One such example is the prolonged tension on the Korean peninsula, which continues to pose a clear and present danger on a global scale. The region is also home to a key conflict of the present era, namely the war in Afghanistan.

Many countries of the region, furthermore, possess a huge military potential. Some of them are active players on the international arms market. It must also be noted that the most developed countries of the region have the means and resources to join the space arms race.

For these reasons, international control over armaments and arms transfers plays an increasingly significant role. The regimes apply both to conventional weapons and weapons of mass destruction. The nuclear program of North Korea, together with successful development of long-range ballistic missiles, is testament to the fact that the proliferation of nuclear weapons is a serious threat to global security.

It seems that neither the international agreements in force at present nor the control regimes can guarantee international security. They fail to eliminate both the transfer of nuclear technologies and the conventional arms trade. It appears that the main problem in the issue under study is the conflict of interests between major players in the region, namely the United States, Russia, China, India, and Japan.

Science in the Study of Dimensions of Security: Based on Disposable Groups of the Sociology Department at the University of Wroclaw

Jan Maciejewski[1]

Security, peace and economic prosperity are not given once and forever. Their preservation is the responsibility of all of us – conscious Poles and Europeans.[2]

Summary: Military sociology defined as special sociologies in Polish society is going to change to the Sociology of the Polish Disposable Groups. In the Department of Sociology at the University of Wroclaw, among the few rapidly growing scientific establishments, a new—the seventh— establishment has been set up to deal with the sociology of disposable groups, that is, troops, police, prison workers, fire brigades, and other uniformed services. This scientific discipline builds its theory across numerous empirical investigations.

Keywords: disposable groups, security, society, knowledge

Human development implies an uncontrolled growth of various types of threats that were unknown before. The cooperation of science and business world makes it possible to undertake research in this area. A sociologist who is interested in studying the social areas of human activity faces a dilemma of choosing appropriate methods and research techniques. Therefore, it is important to explore the topic in the context of research undertaken by institutes which specialize in studying social reality. It is also important to consider available research equipment and theoretical concepts which facilitate the scientific inference of research issues.

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2 S. Konopacki, "Poland in united Europe – five years after accession," in S. Konopacki, ed., *Poland five years in the European Union* (Łódź, 2009), p. 34.

Understanding the actions taken by social actors in the area of research we are interested in—broadly speaking, security—and consequently the value of the selected scientific study of the problem, is possible only if the enthusiasm and cognitive openness of the researcher are followed by informed decisions and well-chosen methods and procedures.[3] Often, this requires innovation and courage. The research process constantly adjusts the data collection techniques and analysis methods to activities and meanings the researcher meets in the field.

In the Department of Sociology at the University of Wroclaw, among the few rapidly growing scientific establishments, a new—the seventh—establishment has been set up to deal with the sociology of disposable groups, that is, troops, police, prison workers, fire brigades, and other uniformed services. The name it adopted is the Department of Sociology of Dispositional Groups (ZSGD IS UWr). Upon the initiative of Professor Wojciech Sitek,[4] I have taken the position as a head of this establishment, both as a mentor and as an experienced coordinator in the above mentioned scientific area. The main objective of this establishment is to integrate sociologists researching disposable groups in an active construction of sociological theories using both quantitative and qualitative research methods. Quantitative research is designed to commence, rephrase, adapt the main interests, and specify scientific theory.[5] Qualitative research explores deeper into the details of particular research areas. On this assumption, the sociology of disposable groups is built on the basis of sociological theory referred to as "the first, second and third generation."[6]

The assets of the establishment, as a specialist research unit, are its employees who have an active way of teaching, and graduate students who, under the supervision of academic staff, are in the implementation phase of many innovative research projects. The methodological approach already allows a broad reflection on the ongoing projects created for the Sociology of the Polish Disposable Groups. Therefore, we create a framework

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3 I. Ślęzak, "From Editing: Sociologist in terrain. Fitting methods to studied situations," *Qualitative Sociology Review,* Vol. 3, No. 2 (2007), http://www.qualitativesociologyreview.org/PL/Volume4/PSJ_3_2_Editorial.pdf

4 "For Professor," *Echo Miasta,* No. 45 (281), Wroclaw 2008, p. 4.

5 R. K. Merton, *Sociological Theory and Social Structure* (Warsaw: PWN, 2002), p. 183.

6 *Encyklopedia socjologii* (Sociological encyclopaedia), Vol. 4 (Warsaw: Oficyna naukowa, 2002), pp. 212–13.

for theoretical and practical development of a sub-discipline of sociology of troops, whose well-known pioneer and theorist is J. J. Wiatr. He notes that "the army as a specific social institution is characterized by these phenomena and interconnections, which in this form do not occur elsewhere. The objects of such sociology are the laws governing social development and structural law of social life."[7] The work of Department of Sociology of Dispositional Groups is carried out in this context; but it also develops the concept of dispositionality as an element of power of some social actors over others.

The starting point to such an interesting topic is the sociological position, which indicates that certain social groups contribute to the survival of social systems. The literature refers to the observation that in the face of crises, the following three structures would survive: the Church in the socio-cultural system, the army in the political system, and the farmers in the economic system.[8] Nowadays, democratic societies are moving away from the mass army through the specialization of human resources and the adaptation to new technologies. The Polish Disposable Groups have developed through the integration of historical, economic, and political processes. They are a tool of social control but also guardians and service providers. They remain under control of the government because of their bureaucratic structures and functional-structural relationships. Contemporary social conditions force disposable groups to certain changes that occur parallel to or faster than those in society. This transformation demonstrates the important role of these groups. They are changing, along with society, to offer specialized services. The practice of sociology of disposable groups, particularly at the level of micro sociology, remains an interesting practice of scientific research, which is growing into a global theory of systems. Various problems of these groups give rise to multi-dimensional research in this field. Pioneering explorations in this area have already been published in the form of numerous monographs in the Department. The conceptual apparatus of this sub-discipline is currently under construction, and it will be soon presented to the scientific circles in its full form.

In a historical perspective, we notice the impact of three structures in the transformation of our country. They are still in the process of adapting

7 J. J. Wiatr, *Army and society* (Warsaw: MON, 1960), p. 8.
8 Z. Kwieciński Socio*pathology of education* (Białystok: Trans Humana, 1995), p. 234.

to the new realities of social change. It is therefore fundamental to start with a broader paradigm of the army, as part of the interconnected entities of disposable layers, and to examine and analyze the resulting military occupations and specialties.[9] The proof that the disposable groups are a broader sociological picture of the social structure is in the impact of institutionalization, the construction of its own institutions, creation of internal bonds, own symbols, and a sense of social distinctiveness.[10] Disposable structures are treated as separate systems in a wider whole, which according to N. Luhmann, operates on the principle of autopoietic systems.[11]

Active work of establishment is a continuation of international sociological work, ranging on a larger scale, among which is Morris Janowitz's monograph on the professional U.S. troops. It precedes his small but nonetheless very important role in the development of the sociology of the military, with his major work on the directions of sociological interest in the military. From then on, the sociology of U.S. troops began to develop very intensively, and the center of the discipline was created by the author in Chicago. In 1972, the bibliography of the sociology of troops was published and it consisted of 1325 items.[12] Other scholars, such as E. Goffman and E. L. Gumplowicz, developed theories of conflict key to understanding the sociology of the military and the sociology of disposable groups. Goffman shows relationships and dependencies in the reproduction of deeply embedded institutions,[13] including disposable groups. It is worth emphasizing the essential role of habitus which is created among the members of the disposable groups. It is important also not to diminish the role of contemporary sociologists of the military such as Gerhard Kümmel, Giuseppe Caforio, Christopher Dandeker, Bebler Anthon, Jean M. Callaghan, Franz Kernic, and Bengt Abrahamson.

The Department of Sociology of Disposable Groups at the University of Wroclaw was created only a few months ago; however, it already has significant academic achievements to its name in the form of several monographs

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9 J. Maciejewski, *The officers of Polish Army in period of alternatively of social structure and the army. Sociological study* (Wrocław: University of Wroclaw, 2002), p. 17.

10 J. Szczepański, "Factors formative occupation and professional structure," in A. Sparta, ed., *Sociology of occupations* (Warsaw: Książka i wiedza, 1965), p. 12.

11 N. Luhmann, *Social systems. Outline of general theory* (Kraków: Nomos, 2007).

12 J. J. Wiatr, *Sociology of army* (Warsaw: MON, 1982), p. 23.

13 A. Giddens, *Making society* (Poznań: Zysk i S-ka, 2003), p. 414.

and regular thematic conferences. These include: Officers of the Polish Army at the time of changes in social structure and in the army, Sociological Study (2002); Occupation of the Polish Army officer in the course of transformation, Sociological Study (2004); National security and the disposable groups (2005); Disposable Groups of Polish society (2006); Women in the disposable social groups (2007); Non-commissioned officers of the Polish Army (2008); Officers of disposable groups, A sociological analysis of the process of national security (2008); Social identity of disposable groups (2009); as well as numerous articles in post-conference publications: Ranks of the disposable groups, A sociological analysis of the profession and its role in society (2010). The cultural and social aspects of their function in the integration processes. Moreover, the "organism"[14] of disposable groups requires a holistic approach, in terms of methodology and theory, within a set of sociological goals for exploration and explanation, as appointed by the Department of Sociology of Dispositional Groups.

The scientific output is a part of the research on the sub-disciplines of sociology such as the army, power, military, nation, security, among many others, and it is based on their rich heritage. Using the achievements of these sub-disciplines, it is possible to see the full picture; theoretical considerations on the issues of disposable groups emerged in the late 1980s. An undoubted success is the ability (within the Faculty of Social Sciences) to award, in the field of sociology of disposable groups, doctorate and post-doctoral degrees which motivate the entire "staff" of graduate students. Masters' students are also participants in the field studies involving disposable groups. There is also the possibility of carrying out research projects on the basis of received KBN grants. The Department of Sociology of Dispositional Groups has ambitions to contribute widely to the extensive research on the sociology of dispositional groups.

Professionalization of social structures (including socio-professional groups) is a response to the emerging information society and knowledge society. Professionalization is thus a kind of imperative arising from the formation of the current knowledge society. Therefore, knowledge becomes a commodity and gains measurable value. Certainly, it should be agreed that the information society precedes the knowledge society and that it somehow

[14] See J. Maciejewski, *Disposable groups in the face of great change* (Wrocław: University of Wroclaw, 2010).

creates the conditions for a knowledge society to form. Sociological definitions describe the knowledge society as one that is not only educated and applies its knowledge in life, but also generates new knowledge more than it did in the past, and which, in the processes of upbringing, socialization, and education, promotes education and teaches the use of knowledge for the purposes of learning and for practical uses. Its main objective is to have a potential for knowledge and to use it widely and effectively.[15] Therefore, there is a translocation and transmutation of knowledge on the level of experience, through scientific knowledge and business experience of members of societies.

"The success of professionalization movements in this phase therefore, illuminates the organic relationship of professionalism—as an affirmation of expertise—with two central structures of the new social order; namely, the large business corporation and the state."[16] It is the result of the accumulation or gathering of knowledge by certain individuals who call themselves specialists. They create a new kind of social hierarchy in terms of professions. Professionalization, as a social phenomenon, modernizes our approach to the professions which are determined by the "performance of social roles [...] which results in the configuration of three aspects: technical-organizational, economic, and social."[17] J. Szczepanski also notes three fundamental characteristics: specific activities, evidence of a talent, a relative durability of the acquisition, through the exercise of their existence within the social division of labor."[18] Professionalization indicates the transfer or transit of knowledge and authority from the people who are laymen in certain areas to people called professionals in their profession. "Professionalization in the U.S., both for the traditional professions (e.g. law, medicine, and the church) and for their modern counterparts (including the Social Sciences), was an important avenue to elite status and Influence in an increased under ferential society lacking a clear-cut social stratification."[19] In Poland, this attitude to military professions and other disposable groups is visible.

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15 L. W. Zacher, *The transformations of societies from information to knowledge* (Warsaw: C. H. Beck, 2007), p. 239.

16 M. S. Larson, *The Rise of Professionalism: A Sociological Analysis* (Berkeley, CA: University of California Press, 1977), p. 144.

17 *Encyklopedia socjologii: Suplement* (Warsaw: Pub. Oficyna Naukowa, 2005), p. 433.

18 J. Szczepański, *Elementary notions of sociology* (Warsaw: PAN, 1983), p. 67.

19 A. W. Coats, *The Sociology and Professionalization of Economics* (London: Routledge, 1993), p. 73.

In the broadest historical perspective, skill revolution, professionalization, and bureaucracy are symptoms of the same secular trend in Western society, which Talcott Parsons describes as making for "rationality, impersonality, functional specificity, and universalism."[20] These actions are consistent with the times and the requirements of the twenty-first century.

The modernization of society sets new directions for its development, where professionalization is regarded by sociologists as *skill revolutions*.[21] Thus, although the process of professionalization of organizations displays an accelerating trend, most experts in large organizations have a far less dependent position vis-à-vis their employers than military men vis-à-vis the military organization.[22] Professionalization of the army as a process of transition from a traditional army, as coercion, to an army training which is based on open enrolment indicates a qualitative change. Professionalization of the army also takes place on the level of professional training. "The third wave military professionals put a huge emphasis on training and education at all levels, and the system of adjusting the appropriate training to the right person is a part of the distribution of knowledge."[23] Therefore, knowledge is a powerful weapon to fight for the current position of the military and paramilitary of countries. We can now see a growing opportunity for developing disposable groups of Polish society in the context of national and transnational security threats. This situation is both an opportunity and a challenge for these groups, but also a threat of politicization. The efficiency of these professional groups is a guarantee of a high sense of security in our country.

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20 H. Eulau, *Technology and Civility: The Skill Revolution in Politics* (Stanford, CA: Stanford University, Hoover Institution Press, 1977), p. 78.

21 Ibid., p. 93.

22 B. Abrahamson, *Military Professionalization and Political Power* (Beverly Hills, CA: Sage Publications, 1972), p. 65.

23 A. Toffler, H. Toffler, *War and Anti-War: Making Sense of Today's Global Chaos* (Poznań: Kurpisz S.A, 2006), p. 167.

Disposable Groups Ensuring the Multidimensional Micro- and Macro-scale Safety of Polish Society

Małgorzata Stochmal[1]

Summary: The disposable groups of Polish society protect citizens from the effects of unwanted and dangerous occurrences in a professional manner. Securing these safety-related activities, both in the microscale and the macrosocial scale is a necessary element of postmodern social life. For the purpose of scientific exploration into disposable groups, headed by Professor Jan Maciejewski, a specialized Department of Disposable Group Sociology was established at Wrocław University in Poland. This unit creates new trends related to the emerging subfield of disposable group sociology.

Keywords: disposable groups, safety, sociology, society

The ability to identify and prevent risks is an important sphere and one analyzed at various levels of political, economic, and social life. Hence, the question of security in the broad context is of fundamental importance for the functioning of modern societies. In a seemingly safe space of social life, individuals develop attitudes in the conviction of an undisturbed mode of life. The conviction, however, is untrue, although built on sound security domains. The reason for the diversity of domains are the different levels of social activity that can be compared to the micro, macro, or even mezzo scales. And thus, at the micro level, the domain of personal security is considered to be "an area of an individual's personal activity, which could pose a threat to them or provide protection, and dependent solely on free decision."[2] A feature of this domain is the lack of capacity for external influence on the personal safety of an individual, and therefore it is worth noting here the synchrony phenomenon.[3] The activity of individuals in the social space is a derivative of choices that are more or less safe, but remain in the

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2 J. Wolanin, *The outline of theory of safety of the citizen. Protection of population in time of peace* (Warsaw: Danmark, 2005), p. 361.

3 W. Kopaliński, *The dictionary of strange words and turns foreign language* (Warsaw: Muza, 2001), p. 483.

sphere of individual choice, or the phenomenon of duality of the security field. What is the individuals' capital is above all its "habitus."[4] Regardless of the social games between the economic capital, it is people's habitus that makes all choices (rational or not) a kind of social capital. An increase in the level of security in the individual sphere can only be obtained by permanent education, brought to a wide range of members of society.

Another area of security domains is identified at the macrosocial level in the "area of free activity, as part of a given microcommunity, that could pose a risk or protect against it."[5] The domain of microsocial security has no direct influence of systems built based on institutional state safety management systems in relation to choices of the microcommunity members. The sphere of individual activity organized in the form of local communities makes a choice, in emergency situations, whether to use the protection of disposable specialized services, such as the military, police, and fire services, or use the protection of companies performing similar services, such as in the sphere of protection of property. Note that the spheres of the different security domains have no rigid boundaries between them; these are "liquid" and a variety of decisions can be made by individuals and microsocial communities. This leads to a lot of social frustration and often leads to irrational human behaviour, particularly in individual emergencies.

Another sphere of security domains is the domain of local security defined as "an area free of activity within the local community which could pose a threat or protect against it."[6] This area protects the local community against the potential impact of threats in its territory with the help of specialized rescue services and disposable groups operating in the area of this community.

The last security domain is identified at the state level, and is built at the central level. Its purpose is to support all these domains and includes "an area of sovereign decisions of state authorities regarding the development of a security policy and their operations to ensure safety."[7] At this highest level of civil safety assurance, safety policies are created for military operations, civil operations, as well as the internal and external security of the

4 J. Szacki, *The history of sociological thought* (Warsaw: PWN, 2002), p. 897.
5 Wolanin, *The outline of theory of safety the citizen,* p. 362.
6 Ibid., p. 363.
7 Ibid., p. 364.

state. This reveals a specific role of the society's disposable groups (military, police, firefighters, municipal police, and others).

The presented levels of safety assurance from the individual domains to microsocial domains to local domains to the state level, all form a complementary set of institutions or systems that protect the areas of activity of individuals and groups. The model presented is a coherent tool for providing security that can be presented at the mezzosocial level using a function and structure model of the security system. This model helps improve the residents' quality of life, as well as being conducive to building Poland's social capital.

Democratic societies, although acknowledged as one of the higher forms of governance, also have disadvantages. The main drawback from the point of view of security is the inability to provide a full and lasting security. Alexis de Tocqueville showed that in democratic societies

> no one is forced to hurry to aid another and nobody has the right to expect such support, the people of democracy are independent and weak at the same time. Both of these states, which should not be considered separately or confused with each other, evoke in the people of democratic countries, very contradictory instincts. Independence fills them with confidence and pride, weakness on the other hand causes them to sometimes need outside help, which, however, cannot be expected from others, as powerless and indifferent as themselves.[8]

Despite shortcomings in the protection provided by the state to its citizens, it is the "democratic countries, although far from perfect, that are a great achievement of a properly conceived social engineering."[9] Therefore, due to the nature of modern life, penetrated with risk, it is worthwhile to consider the provision of security to citizens in the face of the permanent threats of everyday life.

In view of research into safety, it is cliché to say that its level is determined by human needs. In the reality of democratic societies, including in Poland, a series of formal institutions are appointed responsible for the sectoral safeguarding of their people. The selection is adequate to the number

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8 A. de Tocqueville, *Democracy in America* (Warsaw: Państwowy Instytut Wydawniczy, 1967), pp. 451–52.

9 K. R. Popper, *Open society and its enemies* (Warsaw: PWN, 1993), p. 135.

of social risks in the society's living space. These institutions, referred to by Erving Goffman as total institutions, create and also protect members of the public from adverse actions that may harm their health and even life. State services assuring the security of the territory and citizens of the Republic of Poland have evolved to carry out their tasks along with the processes of social development, creating specialized disposable groups. A scientific analysis of the services' operations requires a dismemberment of sociological theory in the constituted sociology of the military and the sociology of disposable groups, as developed by Professor Jan Maciejewski in the Department of Sociology of Disposable Groups at the University of Wroclaw in Poland (Wrocław ZSGD IS). Achievements of the department include several thematic conferences and editorial achievements of these conferences in the form of post-conference books covering a wide range of disposable groups in society. Noteworthy is Professor Jan Maciejewski, who, as head of the department, wrote a postdoctoral thesis examining the social and professional environment of the Polish Army officers. Such an in-depth sociological analysis of the aforementioned subject constitutes one of the best contributions to the literature in this field.

The study of safety issues in such a specialist and also scientific research center confirms the need to explore this theme. Results arising from these research efforts have already been included in several publications in the field of the disposable services referred to, which are the guardians of multidimensional security. What remains when referring to this activity is a fairly important security development proposal that is a priority for the smooth functioning of societies and an indispensable pillar for the creation of its existence and development. There is no reason to seek any aberration whatsoever in the context of development of new areas of safety for today's communities and transnational organizations. Satisfaction of security is a universal value and an elementary need which allows proper human development and the proper functioning of human society. It is only in safe conditions that its members can work and learn, i.e., develop normally.

When presenting the determinants behind the creation of a knowledge of safety, it must be demonstrated that "the science refers to a systematic analysis and definition of the world around us. The success shared by many scientists with respect to the theory that shapes the individual areas

of knowledge including security."[10] Risks to security are perceived in a growing group of phenomena which distort or even prevent the development, duration, and stability of man. Risks appear created by a peculiar structure of the globalization processes associated with the transnational space of the globe, where, at Poland's national level, army, police, and various guards can be quoted (including fire departments, border guards, and prison guards).

Safety concepts tend to be generalized in the themes of war and military threats. However, the problem of protection and defense of the people, the environment and material assets, or the issue of life or survival of the individual, the society, the organization, as seen in the perspective of the given state area within a specified period of time, does not only have to depend on direct or indirect threats of attack. Hence, the human need that is safety should be understood in the general context as public property, in which it relates not to individual citizens, but to all social groups and the whole nation; in other words, it is universal.

The disposable group as a specific social and professional entity, created based on politics, society, and professional and organizational institutionalization,[11] also adopted mechanisms of formation of groups in line with sociological theory. They appear to be a permanent structure that enables the implementation of the statutory purposes of serving the public good. These groups protect the individual, other groups, communities and nations, and their conglomerates, in terms of safety. They are a kind of force directed to other social entities. So let us describe the three basic disposable groups of Polish society: the military, police, and fire departments. The disposable groups referred to are responsible for different areas of security which, in the area of their competences, build a system for emergency response. As the society's military power, the army provides protection when the sovereignty of the country is assaulted. "The army is a special social institution with a strong hierarchical structure, known as bureaucratic structure."[12] Another disposable group is the police, or "uniformed and armed system of social service, designed to protect the safety of people and maintain social order. In civil society, the main role of the police

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10 S. Bruce, S. Yearley, *The SAGE dictionary of sociology* (London: Sage, 2006), p. 269.

11 J. J. Wiatr, *Society:. Introduction to systematic sociology* (Warsaw: PWN, 1968), p. 102.

12 J. Maciejewski, *Officers of the Polish Army at the time of changes in social structure and in the army: Sociological Study* (Wrocław: Uniwersytet Wrocławski, 2002), p. 22.

is to carry out complex protective measures, preventive measures, investigation, inspection, and surveillance related operations.[13] It safeguards the law which for every citizen is a domain that guarantees universal social order. The last of the disposable groups presented is the state fire service. As defined by the law on the state fire service, it is "a professional, uniformed and purpose-equipped system designed to fight fires, natural disasters and other local threats."[14] The operations of the state fire service aimed at improving public safety are coordinated by synchronizing prevention and rescue operations and in the face of fire and other hazards, including danger to life, health, property, and the environment. An analysis of risk factors in the area of operation of the state fire service fully shows the importance and need for the flexible operation of that group in society. As specialized sections, these groups are designed to help in the face of a variety of threats. It is most appropriate, since today "the multiplicity and diversity of risks with which people come into contact every day, and in certain specific situations, cause safety to go beyond actions that man can take themselves."[15]

For every society, the issue of safety is one of the main dimensions when thinking about social reality. Hence, as part of the functioning of society, institutions develop that are responsible for ensuring the security of its citizens. These institutions operate in many areas of social life, hence their number depends on the areas requiring the provision of security. For every citizen, a fundamental element of the disposable groups identified, whose main function is to ensure the safe operation of state and society. Each of the disposable groups determined in the social structure executes tasks that can be identified with its role, mutually complementing their responsibilities in the event of crisis. The experiences of each of these disposable groups are autonomous and cover various spheres of social life.

It should be noted that contemporary Polish society is faced with a greater actual presence of risk and of its very clear perception. In subjective terms, this can be linked to increased sensitivity to threats and hazards arising from the reducing role of defence mechanisms and an almost

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13 E. Moczuk, "The police as a flexible group in opinions of the local community," in J. Maciejewski, O. Nowaczyk, eds., *National security and the disposable groups* (Wrocław: Uniwersytet Wrocławski, 2005), p. 279.

14 Dz. U. z 2006 r. Nr 96, poz. 667, ze zm.

15 J. Maciejewski, *Disposable Groups of Polish Society* (Wrocław: Uniwersytet Wrocławski, 2006), p. 11.

magical or religious rationalization, as well as increased awareness of the risks, becoming aware of the shortcomings in expertise, and repeated errors in the functioning of "abstract systems."[16] This is becoming prevalent in our society and augurs an increasing attention to security issues in the different dimensions of everyday life.

16 P. Sztompka, *Sociology of Social Changes* (Kraków: Znak, 2007), p. 91.

New Forms of Terrorist Organization Activies

Olgierd Paszkiewcz[1]

Summary: This chapter describes th*e* methods of conduct used by terrorist organizations. While for many decades these hardly varied, globalization and technological evolution have equipped terrorists with new tools to carry out attacks. Furthermore, the global coalition fighting terrorism must also be prepared for the feminization of terrorism and the creation of new internal threats. Also, examples cited show the planning of multiple attacks in the U.S. undertaken by amateurs while using relatively primitive methods.

Keywords: American terrorism, terrorist attacks, methods of action

Introduction

The essence of terrorism—which is a political occurrence, but also a method involving the use of force—is borne of fear and concern. And the targets of today's terrorist attacks are mainly innocent victims, with the intent of compelling individuals or state authorities to cede to their demands. According to David Rapaport, we have witnessed four waves of terrorism. The first, at the turn of the twentieth century, was the emergence of anarchist terrorism, which was replaced by anti-colonial terrorism that lasted until the 1960s. More recent decades have seen the existence of two further waves: so-called new left terrorism—it declined with the arrival of the new millennium—and the contemporary wave identified with religious extremism.[2]

It should be noted that those in the national liberation movements who engaged in terrorist activities in the twentieth century were clearly different from other terrorists operating in the more negative meaning of the term.[3] For years, terrorism was seen as a weapon of the weak, that is, of those

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[2] K. Liedel, *Zarządzanie informacją w walce z terroryzmem* (Warsaw: Wydawnictwo Trio/Collegium Civitas, 2010), p. 14; D. C. Rapaport, "The Four Vaves of Modern Terrorism," in A. K. Cronin, J. M. Ludes, eds., *Attacking Terrorism: Elements of a grand strategy* (Washington, D.C., 2004), p. 46–73.

[3] P. Rees, *Kolacja z terrorystą. Spotkania z najbardziej poszukiwanymi bojownikami na świecie*, Towarzystwo Autorów i Wydawców Prac Naukowych Universitas, Kraków 2008, pp. 20–21.

deprived of rights in their own state. However, with the process of globalization and technological revolution, limits on acts of violence have disappeared and terrorism has taken on a more global character. The hijacking of the El Al aircraft flying from Rome to Tel Aviv on July 22, 1968, is widely regarded as a turning-point in the evolution of terrorism.

The theoretical approach has sought to create a single, coherent definition of terrorism. In 1990, Krzysztof Karolczak defined terrorism as a method of political struggle by means of intimidation.[4] However, in the face of change in regard to the nature of terrorism—but also the fact that it depends on the researcher's point of view—definitions of terrorism may arouse controversy. Indeed, Brian Jenkins argues that what is called terrorism seems to depend on the point of view.[5] Krzysztof Liedel posits, meanwhile, that terrorism is in fact just a method of implementation of a political objective.[6] By contrast, John Horgan sees terrorism as psychological warfare.[7] Regardless of the long-standing debate, one undeniable development has been the *evolution of the methods of terrorist attacks*. Accordingly, technological progress has resulted in attacks taking a *more deadly form*.

Methods of Action

The complexity of the phenomenon shows that, whatever the motivations of terrorists and their designated purpose, they use *certain methods of conduct*. Over the centuries they have not undergone any change—only the modalities of attack have evolved. Kuba Jałoszyński, a researcher on counter-terrorism, encapsulates terrorist activities as follows:

- Attacks of force on individuals
- Bombings
- Abduction of vehicles or aircraft
- Abduction of persons
- Hostage-taking[8]

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4 K. Karolczak, *Encyklopedia terroryzmu* (Warszawa: SPAR, 1995), p. 11.

5 T. Aleksandrowicz, *Terroryzm międzynarodowy* (Warsaw: Wydawnictwa Akademickie i Profesjonalne, 2008), p. 17.

6 Krzysztof Liedel, lecture, Collegium Civitas.

7 J. Horgan, *Psychologia terroryzmu* (Warszawa, 2008), p. 34.

8 K. Jałoszyński, *Terroryzm antyizraelski* (Warsaw: Akademia Obrony Narodowej, 2001), pp. 31–33.

A more modern approach to the methodology of action has resulted in the incorporation of a new element, a characteristic that was previously typical of a criminal case.[9] Hence, L. Thompson modified the approach by elaborating as follows:

1. *Killings* of people that are easy to carry out, which take a specific form such as the use of firearms, or improvised explosive devices
2. *Bombings* are the most common tool terrorists employ against persons, groups, and objects. The scale of destruction and the number of casualties are often indicative of a "blind" attack that is directed against the whole population.[10] Besides the fact that it takes many forms including the use of multiple explosive devices and suicide attacks, there can also be subsequent explosions timed with rescue operations, thus wreaking even more havoc.[11]
3. *Abduction of means of transport* is a method which brought a new era of international terrorism, especially in the context of aircraft hijackings—a favorite target of terrorists. Other land-bound vehicles have also been targeted, however.
4. *Abduction of persons* often revolves around the use of blackmail to achieve certain goals. However, it is characterized by a high degree of difficulty in preparation and implementation, and thus is rarely employed.[12]
5. *Hostage-taking* is the seizure of a facility or means of transport along with people unknown to the terrorists. This method can be effective only in conjunction with propaganda and publicizing it through the media.
6. *Robberies*.[13]

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9 Criminal terror is used by organized criminal groups using the same methods as terrorist groups. See K. Liedel, *Information Management in the Fight against Terrorism* (Warsaw: Publisher Trio/ Collegium Civitas, 2010), p. 19.

10 T. Białek, *Terroryzm: Manipulacja strachem* (Warsaw: Wydawnictwo Studio Emka, 2005), p. 37.

11 W. Zubrzycki, "Akty terroru z użyciem materiałów wybuchowych," in M. Żuber, ed., *Katastrofy naturalne i cywilizacyjne. Zagrożenia podczas imprez masowych* (Wrocław: Wydawnictwo WSOWL, 2008), p. 283.

12 Białek, *Terroryzm*, op. cit., p. 37.

13 K. Jałoszyński, *Współczesny wymiar terroryzmu* (Warsaw: Wydawnictwo TRIO/

The non-military element of terrorism such as financial crime—although relevant to terrorist organizations' funding and ability to operate—is not considered in this chapter.

Methods of violence employed by international terrorist organizations encompass other conventional and non-conventional activities not included above. Other measures to combat[14] encompass the following:

1. *Cyberterrorism*—the essence of which is to create a terrorist threat based on the use of information technology. It arose with the spread of personal computers and the Internet. Another name for this method of attack is *soft terrorism* defined as blocking, destruction, and deformation information, because the most common target is not the system as such, but the information contained on computers.[15] Cyberspace also offers an arena where an asymmetric conflict can be waged.
2. *Weapons of Mass Destruction*—the risk posed by biological agents, military warfare agents, and radioactive materials. Modern civilization has witnessed this type of risk only to a limited extent, and even in the 1970s, Brian Jenkins believed that terrorists do not utilize weapons of mass destruction, because they depend on the *mass of witnesses, rather than mass casualties*. Currently, in the face of fundamentalist terrorism,[16] there should be greater concern over the prospects for their use.
3. *Unusual method*—a kind of novelty, and their scope is limited only to the imagination. One attempt by a Palestinian terrorist that took place in 2004 was to use blood infected with HIV in an explosive charge. The attack was thwarted by the Shin

Collegium Civitas, 2008), p. 45; Leroy Thompson, *Ragged War* (London, 1994), p. 137.

[14] Krzysztof Liedel employs the term *superterroryzmu* to cover the use of chemical, biological, nuclear, and radiological weapons by terrorist groups. Explorer is a separate category of cyber terrorism as viewed by K. Liedel, see *Zarządzanie informacją w walce z terroryzmem* (Warsaw: TRIO, Collegium Civitas, 2010), p. 22.

[15] W. Ostant, "The Most Important Scenarios of Terrorist Threats for the Countries of the European Union at the Beginning of 21th Century," in J. Babiak, S. Wojciechowski, eds., *Terrorist Pandora's box* (Poznań: Institute of Political Science and Journalism, Adam Mickiewicz University, 2008), p. 121.

[16] It is known that the Islamists have acquired and thus disseminate information about the construction of nuclear and biological weapons. See Dietl, et al., *Terrorism,* p. 245.

Bet security service. In any case, it would likely have been ineffective because of the potential damage to the blood at the time of the explosion.[17] However, in another case, a British commander expressed fear of the use by Taliban terrorists of IEDs infected with viruses in medical needles. Another tool used by terrorists could be laser beams to dazzle the crew of an aircraft.[18] An example of this type of incident was carried out on a police helicopter crew by two youths in the city of Lod, on December 29, 2009.[19] Another example of an unusual method was the attacks in Israel in 2008 making use of heavy construction vehicles. A Palestinian resident (ex-criminal) Huss Taysir Ibrahim Dawiyat drove such a vehicle in Jerusalem, killing three persons and wounding about forty. In the latter case, Dawiyat destroyed a car, then hit a bus, before being killed a few hundred meters further on.[20] Atypical methods that should also be noted include combat missile technology to attack blindly or against specific objectives. A repeated target of attacks was the Israeli airline El-Al, with the last attempt being made in Switzerland in 2005. Finally, *threats and false alarms* are not typical, but should be noted as modern terrorism is based on the invoking of fear and panic.

The Latest Trends

This list indicates the potentials for the terrorist organizations members to develop a more comprehensive approach. The author seeks to combine the information and research on recent developments, trends and methods of conducting the attacks and, most important, to emphasize the aspects that are beyond the generally accepted assumptions.

The events of September 11, 2001, highlighted not only the fragilities of the existing security system of the United States, but also galvanized the

17 Adamski, *Nowe technologie w służbie terrorystów*, op. cit., p. 158

18 Threats to aviation security are a new, serious problem, and are impossible to eliminate. Threats and violations may even come in the form of lights from lasers. The problem of the use of light indicators, rangefinders, and sights against the crews of aircraft is the subject of investigation by police and security forces in many countries.

19 *Aviation Security International*, Vol. 16, No. 1 (February 2010), p. 4.

20 Information from the Meir Amit Intelligence and Terrorism Information Centre Response, Israel 2010, http://www.terrorism-info.org.il/malam_multimedia/English/eng_n/html/ ct_e003.htm

determination to fight the infidels by all available means and methods. At the same time Islamic fundamentalists changed the image of the existing profiled fighter.

Hence, it is impossible to create a standardized profile of potential perpetrators of terrorist attacks; events recorded during this decade contradict this approach. The ineffectiveness of the current procedure is also clear from the fact that terrorists are carrying out repetition patterns copied for decades, but use advanced, sophisticated ways of proceeding. At the same time they can not be identified with one ethnic or religious group.

Failure to deal with the practices of the Trojan horse manifestly exposed the lack of efficient strategy for solving the problem. This can be seen in the evolution of internal terrorism in the United States. So called "Novum" is in fact carrying out attacks not only by the Taliban but by those who are *converts, American or European citizens, or residents in the area*. This manner of operation brings extra challenges for the U.S. security system. Last year there were 17 cases involving American terrorists or U.S. residents. Therefore, the myth of terrorists being only Arabs is just that. This factor is compounded by the fact that the bombers are often *individualists* operating under the influence of charismatic spiritual leaders, who are a modern generation of Arab leaders who often speak English. An example is the mentor to the Shoe Bomber and the Nigerian Abdulmutallab Umar Farouk, who turned out to be a Christian convert to Islam, and William Forest, a Jamaican, now known as Abdullah al-Faisal. Thus, the planning of activities by individuals in secret, with little communication, significantly impedes the ability of authorities to detect preparations for an attack.

Another issue at stake is the effectiveness of measures adopted such as the "No Fly List." There have been several blunders in which people on the list have nevertheless been allowed to fly.

Recent attacks on the American continent have shown that perpetrators are unprofessional, having usually only received training in camps in Asia. One could go so far to say that the attacks have been the attempts of amateurs. It's just that by using an Arab expert they were able to create a real threat, and simultaneously find a sensitive point in the security system. One only needs to look at Internet forums, where supporters of Jihad consider which airports in the U.S. have the weakest security and make preparations for attacks. Not without significance is the fact that it is the government

agency who has made public information about the type of screening methods used at airport, as well as providing information on marshals and protective equipment on board aircraft.

The modus operandi of today's Islamic terrorists go beyond the well-worn patterns, not only due to the fact that the end justifies the means, but also because of their ability to be economically independent and self-financing. In discussing the modern conduct of terrorists, the use of women in the armed struggle and their active participation in suicide attacks should be noted. This was confirmed by the participation of "black widows" in the attacks of 2010 on the Moscow metro by Emir Doku Umarov. There have also been reports that the Taliban trained a group of women in Yemen with a view to committing suicide attacks in Europe. An earlier precedent was that of the Palestinian Wafa Idriss, who in 2002 broke the taboo of the martyrdom of women. That women's participation is becoming more common was signalled in the second half of June this year when a woman in a suicide attack in Afghanistan killed two local Americans as well as wounding civilians; the explosive device was hidden under her burka. Furthermore, it seems irrelevant that the victims of attacks are mostly co-religionists, that is, Muslims.

A new line has been crossed in suicide bombings in that explosive devices can be hidden within the body. The attack on the Saudi prince in 2009 was probably this type of incident. The irony of the situation was present in the fact that the bomber had been repeatedly monitored, under the supervision of the departments responsible for protection, while the victim was responsible for combating terrorism. The event in Guddah, moreover, has shown that it is possible to hide between 100 to 450 grams of explosive in the rectum or vagina. Therefore, we must expect not only IEDs in limb prostheses, artificial elements simulating a pregnant woman, but also surgical implants such as using breast implants. This all points to the growing sophistication of Islamic terrorism.

Another means of terrorist attack is the utilizing of weapons of mass destruction (WMD), which some researchers define as super-terrorism. In most cases, the use of a "dirty bomb" would seem to be more realistic. Last year in the United States, on the anniversary of 9/11, a leading figure of al-Qaida, Mustafa al-Yazid, as well as Ayman al-Zawahiri, called for a chemical attack on the subway. In a terrorist attack on a shop in New Delhi in

April 2010, furthermore, it is likely that the radioactive isotope Cobalt-60 was used.

Through analysis of several cases reported in the last year in the United States, the author wants to illustrate the practical dimension of this argument. Amateur attempts to use IEDs in vehicles have been seen such as in the case of Michael Finton and Faisal Shahzad. The former was born in California and was a convert to Islam, known as Talib Islam. The Pakistani-American planned attack, with the help of the New Mexico-born imam Anwar al-Awlakiego on May 1 at 18:30, was timed so as to assure a big television audience. To avoid detection, the materials for the construction of the device were purchased well in advance. A green Nissan Pathfinder was parked at 45 Street in Times Square in which was placed 113 kg of fertilizer (probably urea) in a cardboard box, three 75 liter propane tanks, and two 19 liter tanks with fuel and fireworks. These activities, unlike in the case of Najibullah Zazi, failed to prompt suspicion. It was only as a result of the lack of basic knowledge that the attack failed; the only chemical reaction caused was the separation of smoke that alarmed passers-by—a major mistake had been to close the gas tank, otherwise it could have been a repeat of the Oklahoma City bombing of 1995. The attack was supposed to be revenge for raids conducted on the camps of Islamic militants in Pakistan, and as was revealed in the investigation, involved the an employee of a catering company serving the local American embassy and a former major of the Pakistani army.

Another American resident, Najibullah Zazie, together with family members, planned the carrying out of attacks on the anniversary of 9/11. The tactics chosen by Mohammed Najibullah and Zaziego Zaziego consisted of assimilation into society. Both were father and son and were former drivers transporting passengers at Denver airport. They planned to set up their own company operating a bus service to the airport called the Big Apple Airport Shuttle, and offering limousine transportation All Seasons Limo Limousine Service.

However, when planning the attack, they aimed to replicate the events of Madrid but made a mistake in purchasing large quantities of nail varnish remover, which aroused the suspicion of the seller. Their training received in Peshawar in the construction of IEDs proved insufficient to create a large bomb, and, in the absence of access to conventional military explosives, they had to improvise by creating a TATP.

Another amateur was Abdulmutallab Umar Farouk. On December 25, 2009, during a flight from Amsterdam to Detroit, he attempted to create a chemical reaction of two components. Located in his underwear, PETN, in connection with a liquid detonator from a syringe, was supposed to lead to an explosion. It failed, however. The Americans knew that the Nigerian had planned to carry out an attack, for his father had reported his son to the authorities on account of the latter's radical stance.

A veritable Trojan horse turned out to be U.S. Army Major Nidal Hasan Malik, the son of Jordanian immigrants. Persuaded by Anwar al-Awlaki in November 2009, he attacked with the use of firearms soldiers stationed at Fort Hood. This resulted in the deaths of a dozen soldiers with many more wounded.

Concluding Remarks

These examples demonstrate not only the existence of domestic American terrorism, but also that there are serious problems with the security system. Despite the huge financial input, the current shape of the adopted solutions is not acceptable. The lack of implementation of relevant procedures resulted, in the case of Shahzad, in someone with the intention of committing a terrorist attack being able to board an aircraft. Failure to implement preventive measures enables terrorists, even lone amateurs, to stage attacks. New and ever more sophisticated forms of terrorism put at risk the fundamental global security system.

Nuclear Terrorist Attack as an Example of Serious Threat

Marian Żuber[1]

Summary: In this chapter the potential yet considerable threat of a terrorist nuclear attack is presented. The author describes the possible sources from which terrorists may obtain nuclear weapons as well as outlining the problems posed for crisis management in the eventuality of such an attack. Two scenarios of nuclear attack are analyzed: open and hidden scenarios.

Keywords: terrorism, terrorist nuclear attack, crisis management

Introduction

The phenomenon of terrorism has changed over the centuries both in the aims and methods of terrorist groups, for whom violence is the means of achieving their goals. Nowadays, it is one of the main threats to the modern world, which creates a lot of problems for those responsible for guaranteeing the safety of citizens.

For example, the European Safety Strategy of December 12, 2003,[2] which is the first strategic European Union concept in the context of a collective safety system, considers international terrorism to be the most serious threat, as it endangers lives, brings great costs, undermines tolerance and openness that the European societies are based on, and represents an increasing strategic threat to the whole Europe, as well as the wider world.

Terrorist organizations increasingly possess sources of considerable financing, electronic communication, and are able to wreak mass destruction.

Furthermore, the latest wave of terrorism has a worldwide range and connections with aggressive religious extremism—and Europe is both the aim and a base for terrorist groups.

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[2] *A Secure Europe in a Better World: European Security Strategy*, http://ue.eu.int/uedocs/cmsUpload/78367.pdf

Characteristics of Modern Terrorism

A characteristic feature of terrorism at the beginning of the twentyfirst century are the different aims that terrorists set, compared with those of their predecessors from the second half of the twentieth century. For the last twenty years, there have appeared new enemies, new motivations, and new justifications, which have caused some theories about terrorism and terrorists to have become out of date. The commonly presented view from a few years ago that "terrorists want to have a lot of spectators and listeners, they do not want to have many deaths"[3] has diametrically changed today.

There have appeared views about quite different aspirations of present terrorist groups, especially those whose ideology is based on Islamic fundamentalism. Among them, one should mention, among other things, the willingness to kill the greatest number of people possible, consequently leading to the destabilization of the political situation of the country against which the attack is aimed, as well as gaining the biggest publicity for their actions and causing panic over the largest area.[4] The media tend to focus on spectacular and negative events, and to get attention, most terrorists traditionally want "showy" attacks that produce a great deal of noise.[5] The most characteristic differences in perceiving modern and post-modern terrorism are tabulated in Table 1.

The Possibility of Terrorist Groups Using a Nuclear Weapon

Fears for the possibility of nuclear weapons being used by terrorist groups already appeared in the 1950s, when a miniature warhead W-54, called "a suitcase bomb,"[6] was constructed in the United States. This device, designed for secret service agents conducting acts of sabotage on enemy territory, because of the small dimensions, could become a perfect tool for terrorists to achieve their goals.

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3 B. M. Jenkins, *International Terrorism: The Other World War,* R-33022-AF (Santa Monica, CA: RAND, 1985), p. 12.

4 M. Żuber, "Terroryzm nuklearny – zagrożenie dla bezpieczeństwa globalnego," in M. J. Malinowski, R. Ożarowski, W. Grabowski, eds., *Ewolucja terroryzmu na przełomie XX i XXI wieku* (Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego, 2009), p. 235.

5 W. Laqueur, *The New Terrorism: Fanaticism and the Arms of Mass Destruction* (New York: Oxford University Press, 1999).

6 J. Mueller, K. Mueller, "Sanctions of Mass Destruction," *Foreign Affairs*, Vol. 78, No. 3 (May/June 1999), p 45.

Table 1. Comparison of selected traits of modern and post-modern terrorism

	Modern terrorism	**Post-modern terrorism**
Motives	Political/ideological, nationalistic/ethnic, separatistic	Religious, fundamentalist
Victims	Mostly selective/ limited	Mass, non-selective, mass-unlimited
Violence	Instrumental, rational, the aim is to change the world. Traditional (explosives)	Expressive, irrational, the aim is not to change but communicate something to the world, symbolic
Means	Traditional (explosives, kidnapping)	The most modern technologies, media, weapons of mass destruction, suicide attacks
Structure/ organisation	Clear, centralized, rather hierarchic	Dispersed, less centralized, web model
Financing	Countries-sponsors	Symbiosis with international organized crime
Public opinion support	Important	Unimportant

Source: Ł. Kamiński, *Technologia i wojna przyszłości: Wokół nuklearnej i informacyjnej rewolucji w sprawach wojskowych* (Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego, 2009), p. 196.

However, for the terrorist groups of the 1980s, the possibility of using weapons of mass destruction, especially including nuclear weapons, constituted a particular barrier. It was the effect of both technological difficulties connected with acquiring ready, finished nuclear bombs or fissionable material, which could be used for their construction, as well as moral qualms among terrorists themselves, resulting from the likely tragic results of any nuclear explosion.

One of the first signals concerning the breaking of this symbolic psychological barrier was the beginning of an attempt to acquire weapons of mass destruction, including nuclear weapons, by some terrorist groups.

Among these groups, religious sects have been considered to be the most dangerous, for whom a weapon of mass destruction has been seen as a tool for accomplishing "God's mission." The Japanese sect Aum Shinrikyo

(Supreme Truth), since 1987 led by Shoko Asahara, acquired and used a weapon of mass destruction. After an attack carried out in the Tokyo underground with the usage of sarin, which caused 12 deaths and affected about 5500 people, Japanese police raided the sect's laboratory. They found there a considerable amount of military gases, enough to kill approximately 4.2 million people,[7] as well as other chemical and biological substances.[8]

Furthermore, a search of the premises of Aum Shinrikyo revealed some traces of documents proving that the sect had attempted to come into possession of nuclear weapons. For this reason, a farm in Western Australia, known as Banjawarn Station, had been bought and a uranium mine was to be opened there to acquire uranium for the purposes of the development of its nuclear program.[9]

Many analysts studying the phenomenon of terrorism claim that the twentyfirst century heralds a so-called era of super-terrorism,[10] the main purpose of which is the escalation of terrorist activities to unimaginable proportions. One can distinguish three main reasons behind terrorist groups' aspirations to acquire and use nuclear weapons.[11]

The first reason may simply be the willingness to kill the greatest number of people. This can be achieved by using a nuclear weapon, which is able to annihilate thousands or even hundreds of thousands of people at a time.

The second motive, for which those groups strive to escalate violence with the usage of nuclear weapons, is the willingness to use a classic terrorist weapon, which is fear.

The third possible reason for using this kind of weapon is a desire to be able to negotiate from a position of greater strength. The credible threat of using weapons of mass destruction certainly will not be left unanswered by

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7 R. L. Parry "Sect's Poisons 'Could Kill 4.2 m'," *Independent on Sunday*, March 26, 1995.

8 T. Ballard, J. Pate, G. Ackerman, D. McCauley, S. Lawson, *Chronology of Aum Shinrikyo's CBW Activities* (Monterey, CA: James Martin Center for Nonproliferation Studies, 2001, http://cns.miis.edu/reports/aum_chrn.htm (accessed June 30, 2010).

9 S. Daly, J. Parachini, W. Rosenau, *Aum Shinrikyo, Al Qaeda, and the Kinshasa Reactor: Implications of Three Case Studies for Combating Nuclear Terrorism*, Paper DB 458 (Santa Monica, CA: RAND, 2005), pp. 5–22. http://www.rand.org/pubs/documented_briefings/2005/RAND_DB458.pdf (accessed July 5, 2010)

10 Y. Alexander, M. Hoenig, eds., *Super Terrorism: Biological, Chemical, and Nuclear* (Ardsley, NY: Transnational Publishers, 2001), p. 7.

11 Ibid., p. 24

the government, and in thus doing, would gain the organization a political tool of great leverage.

In Western countries, there is an extensive debate about how serious and real the threat of weapons of mass destruction is.[12] Analyses of data gathered by different organizations dealing with national security conclude that such an attack is very probable, and that is why intensive efforts should be carried out to prevent such a threat from materializing.

Among the many different kinds of weapons of mass destruction, a nuclear weapon is characterized by great striking power. The initial shock wave and the thermal radiation caused immediate destruction and the deaths of people in close proximity to the epicenter of the explosion. The symptoms of penetrating and radioactive radiation contamination of the ground appear with a certain delay in the form of radiation sickness. In order to construct a nuclear bomb, one needs to have highly enriched uranium or plutonium.

Secret services of many countries report that there is evidence of terrorists planning to use nuclear weapons.[13] One of the possible motivations for the appearance of nuclear terrorism is the situation in which terrorists come to the conclusion that they no longer have anything to lose. When a group realizes that it is in decline, it may make use of nuclear weapons, mostly to publicize its existence. Ideology destroys moral qualms. If a deed, no matter how horrible, works for "the cause," it is assumed to be good.

There are three possibilities of how terrorists may come into possession of nuclear weapons:

- Cooperation and acquiring nuclear weapons from the government of the country possessing such weapons (e.g., Pakistan, North Korea)
- Theft or illegal purchasing of ready finished items in the countries where there are inadequately protected nuclear arsenals (e.g., former Soviet Union countries)
- Independent construction of a nuclear bomb by scientists recruited by terrorist groups (e.g., Aum Shinrikyo, Al-Kaida)[14]

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[12] M. Madej, "Możliwość uzyskania przez terrorystów broni jądrowej a zagrożenie terroryzmem nuklearnym," *Polski Przegląd Dyplomatyczny,* Vol. 5, No. 5 (27), 2005, p. 73.

[13] P. L. Wiliams, *The Al Qaeda Connection: International Terrorism, Organized Crime and the Coming Apocalypse* (Amherst, NY: Prometheus Books, 2005), p. 116.

[14] Madej, op. cit., p.75.

Acquiring Nuclear Weapons from a Proliferating Country

The worst scenario is one in which terrorists acquire nuclear weapons from one of the so-called "axis of evil" countries, which may support terrorism and have access to nuclear technologies.

The Nuclear Non-Proliferation Treaty (1968) assumed the existence of five so-called "nuclear superpowers" (USA, USSR—now Russia—Great Britain, France, and China) which at the time possessed nuclear weapons or were at an advanced stage in developing them. Unfortunately, the resolutions in this treaty were not respected and some countries from outside the "atomic club" started to realize their own nuclear programs (Israel, India, Pakistan, and North Korea). The nuclear arms race, which was a defining aspect of the Cold War, led to the creation nuclear arsenals, which had the capacity to destroy all life on Earth in case of a global conflict. Data from 2004 indicated the existence of about 30,000 war heads in nuclear arsenals. [15]

According to Israel intelligence, today intensive efforts are being made by Iran to develop nuclear technologies, which may be especially dangerous because of its connections and willingness to support Islamic terrorist groups. The willingness to possess nuclear weapons as a counterbalance to the increasing threat is also shown by Japan and Saudi Arabia, which may mean the beginning of a nuclear armament race in Asia and the Middle East and the return of the nuclear scare tactics.

Transferring nuclear bombs to terrorists by one of the above mentioned countries would be the most attractive way of acquiring them; that is, it would be relatively speaking, the easiest way for terrorists to come into the possession of (so called ready to use) a proven (tested) striking weapon.[16] At the same time, they could get help with transporting the explosive abroad and be trained in how to make use of the weapon.

As Madej argues, however, the probability of a nuclear weapon being supplied to a terrorist outfit by one of the proliferating countries is slim for a few reasons. [17] Among them can be mentioned:

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15 *SIPRI Yearbook 2004* (Oxford: Oxford University Press, 2004), pp. 615–17, 629; "NRDC Nuclear Notebook," *Bulletin of the Atomic Scientists*, http://www.thebulletin.org/issues/nukenotes/nukenote.html

16 M. Bunn, A. Wier, J. P. Holdren, *Controlling Nuclear Weapons and Materials: A Report Card and Action Plan*, Nuclear Threat Initiative and Project on Managing Atom, Harvard University, Washington 2003, pp. 22–24.

17 Madej, op. cit., pp. 77–78.

- A small number of countries possessing nuclear weapons and the diversification of their arsenals;
- Little profitability from the point of view of the national interests of a possible proliferator, especially as it would be threatened with different sanctions from the international community. It would certainly make it difficult to achieve its goals both in security and economic or social spheres;
- The carrying out of a nuclear terrorist attack by a group supported by a proliferating country would most probably cause retaliatory attacks on the terrorism-sponsoring state;
- Transferring a nuclear explosive to terrorists would mean leaving a dangerous weapon in the hands of unpredictable and difficult-to-control subjects, such as terrorists, which could lead, by way of nuclear blackmail, to them influencing the policy of the "sponsor."[18]

The probability of transferring nuclear weapons—even by Pakistan or North Korea—to terrorists by the government of a certain country is rather slim.[19] But there cannot also be excluded the possibility of such a transfer by an influential political fraction sympathizing with a terrorist group, or simply by a group aspiring to gain certain financial profits (an example is the Abdul Qadeer Khan group, the creator of Pakistan's nuclear program, who according to official declarations, without the knowledge of the Pakistan government, sold specialist knowledge and equipment for the production of nuclear weapons at the end of 2003 and the beginning of 2004).[20]

The Purchase or Theft of Nuclear Weapons

The purchase or theft of ready finished nuclear weapons seems to be the most probable way of gaining access to such weapons by terrorist groups.

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[18] K. H. Kamp, "An Overrated Nightmare," *The Bulletin of the Atomic Scientists,* Vol. 52, No. 4 (July–August 1996), pp. 30–34; J. J. Wirtz, "Counter-Terrorism via Counterproliferation," *Terrorism and Political Violence*, Vol. 14, No. 3 (Autumn 2002), pp. 131–33.

[19] N. Gurr, B. Cole, *The New Face of Terrorism: threats from weapons of mass destruction* (New York: I. B. Tauris, 2001), pp. 196–200, 204–5.

[20] D. Albright, C. Hinderstein, "Unraveling the A.Q. Khan and Future Proliferation Network," *The Washington Quarterly*, Vol. 28, No. 2 (Spring 2005), pp. 111–28.

According to Madej, however, the protection of sites, also where nuclear warheads are stored, is satisfactory,[21] and reports of an existing "nuclear black market" have not been confirmed. However, they do not exclude the possibility that a terrorist group sufficiently prepared will perform an attack on a nuclear weapons storage facility or, which is more probable, will gain access to them by means of so- called insiders, in other words, people responsible for the security and protection of nuclear weapons, but who are bribed, blackmailed, or even having sympathies with the terrorist group in question.[22]

A different view on this subject is represented by Paul Wiliams in his book *Al-Kaida: International terrorism, organized crime and an incoming apocalypse*.[23] He gives many examples of both an increasing interest, as well as real transactions, connected with gaining access to nuclear weapons. Below is presented a detailed list of selected incidents connected with the activity of Al-Kaida (Table 2).

According to Graham Allison, in August 2001, "during the final countdown to what Al-Kaida calls the 'Holy Tuesday' attack, bin Laden received two key former officials from Pakistan's nuclear weapons program at his secret headquarters near Kabul. Over the course of three days of intense conversation, he and his second-in-command, the Egyptian surgeon and organizational mastermind Ayman al-Zawahiri, quizzed Sultan Bashiruddin Mahmood and Abdul Majeed about chemical, biological, and, especially, nuclear weapons."[24]

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21 Ch. D. Ferguson, *The Four Faces of Nuclear Terrorism*, Center for Nonproliferation Studies, Monterey Institute of International Studies, Monterey 2004, pp. 58–59.

22 M. Bunn, A. Wier, *Securing the Bomb: An Agenda for Action*, Nuclear Threat Initiative and Project on Managing Atom, Harvard University, Washington 2004, pp. 14–15.

23 Williams, op. cit., pp. 102–21.

24 G. Allison, *Nuclear Terrorism: The Ultimate Preventable Catastrophe* (New York: Times Books/Henry Holt, 2004), p. 20.

Table 2. Selected nuclear incidents connected with the activity of Al-Kaida

Term of incident	Kind of WMD	Course of incident	Source of information
Unknown	Nuclear	There is an intelligence leak that Bin Laden paid over £2m to a man in Kazakhstan for a "suitcase bomb."	Marie Colvin, "Holy War with US In His Sights," *Times*, Aug. 16,1998.
Unknown	Nuclear	Bin Laden gives a group of Chechens US$30m in cash and 2 tonnes of opium for about 20 nuclear warheads.	Riyad' Alam Al-Din, "Report Links bin Laden, Nuclear Weapons,"*Al-Watan al-Arabi*, Nov. 11, 1998; Emil Torabi, "Bin Laden's Nuclear Weapons," *Muslim Magazine*, Winter 1998,
Unknown	Nuclear	Bin Laden sends some people to a few East European countries to buy enriched uranium.	"Arab Security Sources Sapek of a New Scenario for Afghanistan: Secret Roaming Networks that Exchange Nuclear Weapons for Drugs," *Al-Sharq Al-Awsat*, Dec. 24, 2000.
Unknown	Nuclear	Bin Laden purchases seven enriched uranium rods from a Ukrainian arms trader, Siemion Mogilewicz.	Uthman Tizgart, "Does Bin Laden Really Possess Weapons of Mass Destruction? Tale of Russian Mafia Boss Simion Mogilevich Who Supplied Bin Laden With the Nuclear 'Dirty Bomb,'" *Al-Majallah*, London, Nov. 25, 2001

Table 2. (cont'd)

Unknown	Nuclear	Two Pakistani scientists share their information about nuclear weapons with bin Laden and learn about nuclear materials which had been delivered to him by the Islamic Movement of Uzbekistan	Toby Harnden, "Rogue Scientists Gave Bin Laden Nuclear Secrets," *Daily Telegraph*, Dec. 12, 2001; Peter Baker, "Pakistani Scientists Who Met Bin Laden Failed Polygraphs, Renewing Suspicions," *Washington Post*, March 3, 2002; Susan B. Glaser, Kamra Khan, "Pakistan Continues Probe of Nuclear Scientists," *Washington Post*, Nov. 14, 2001
1993–94	Nuclear	Jamal al-Fadl claims that, on behalf of bin Laden, he purchased uranium, needed for the production of nuclear weapons	Kimberly McCloud, Matthew Osborne, "WMD Terrorism and Osama bin Laden," *CNS Report*, 20.11.2001
1998	Nuclear	Russian intelligence probably prevented bin Laden from purchasing enriched uranium of Russian origin	Earl Lane, Knut Royce, "Nuclear Aspirations?" *Newsday*, Sept. 19, 2001
Nov. 2004	Nuclear	Sharif al-Masri, a "key" Al-Kaida agent, informs the authorities that bin Laden made an attempt to smuggle nuclear materials nuclear tactical weapons to Mexico	"Al Qaeda Wants to Smuggle N-Material to US," *The Nation*, Nov. 17, 2004
Sept. 1998	Nuclear	The Al-Kaida agent Mamduh Mahmud Salim was arrested in Munich, when he tried to buy nuclear materials, especially highly enriched uranium	Benjamin Weiser, "US Says Bin Laden Aide Tried to Get Nuclear Weapons," *New York Times*, Sept.26, 1998

Table 2. (cont'd)

End of 2000	Nuclear	Intelligence agency from an unrevealed country in Europe intercepts the delivery of about 20 nuclear warheads coming from Kazakhstan, Russia, Turkestan and Ukraine. The delivery was meant for bin Laden and the Taliban regime in	"Arab Security Sources Speak of a New Scenario for Afghanistan: Secret Roaming Networks that Exchange Nuclear Weapons for Drugs," *Al-Sharq Al-Awsat,* Dec. 24, 2000
Since Summer 2001	Nuclear	Iraqi military instructors train Al-Kaida agents in Northern Iraq how to handle nuclear devices. There were trained between 150 to 250 AL-Kaida agents	"Abu Nidal's Nemezis", *Akta DEBKA*, Jerozolima, 20.08.2002
Before Sept. 9, 2001	Nuclear	Bin Laden buys 48 nuclear suitcase bombs from Russian mafia	"Al-Majallah Obtains Serious Information On Al-Qaeda's Attempt to Acquire Nuclears Arms," *Al-Majallah,* Sept. 8, 2002
Nov. 2001	Nuclear	The evidence collected from Ummah Tameer E-Nau offices in Kabul indicates that nuclear weapons might have been sent to the US from Karachi in a cargo container	Arnaud de Borchgrave, "Al Qaeda's Nuclear Agenda Verified," *Washington Times*, Dec. 10, 2001
Nov. 2001	Nuclear	Bin Laden purchases in central Asia nuclear suitcase bombs made in Russia. Each item weighs ca 8 kg and contains at least 2 kg of fissionable uranium and plutonium. The report says, that the device with series number 9999, which was transported to the U.S., can be detonated with a mobile phone	"N-weapons May be In US Already," *Daily Telegraph,* Sydney, Nov. 14, 2001

Table 2. (cont'd)

Nov. 2001	Nuclear	The *Times* reporter (London) discovers in a house deserted by Al-Kaida in Kabul a project called "Nagasaki Bomb"	"Nuke Plans Fund; Brit Paper Discovers Details Of Weapons in Kabul Safe House," *Toronto Sun,* Nov. 15, 2001; Hugh Dougherty, "Afghan Nuclear Weapons Papers 'May Be Internet Spoofs,'" *Press Association*, Nov. 19, 2001
Nov. 2001	Nuclear	In one of the houses in Afghanistan there are found instructions how to handle a "super bomb," the sketch of which, in fact, shows a modern nuclear bomb	"Osama bin Laden's Bid To Acquire Weapons of Mass Destruction represents the Greatest Threat That Western Civilization Has Faced" *Mail on Sunday*, London, June 23, 2002
Nov. 2001	Nuclear	Mossad arrests, at the border crossing in Ramallah, an Al-Kaida agent with a rucksack, in which there is probably a tactical atomic bomb	United Press International, Dec. 21, 2001. "Pierwsze doniesienia mówiły o bombie radiologicznej"
Jan. 2002	Nuclear	In the deserted camps and factories of Al-Kaida in Afghanistan there are found sketches of nuclear power plants in the U.S.	Bill Hertz, "Nuclear Plants Targeted," *Washington Times*, Jan. 31, 2002

Source: Kimberly McCloud, Gary A. Ackerman, Jeffrey M. Bale, *Chart: Al-Quaida's WMD Activities*, Center for Nonproliferation Studies, Monterey Institute of International Studies, January 21, 2003. Document checked and modified by Paul L. Williams.

Self-construction of a Nuclear Device

Another method, at least hypothetical, to acquire nuclear weapons is by building a so-called improvised nuclear device (Improvised Nuclear Device, IND). There are two factors which determine the possibility of coming into possession of a nuclear explosive in this way:

- The possibility of acquiring a sufficient amount of fissionable material for constructing a nuclear explosive
- Possessing well-trained personnel, equipment, and a place and time for carrying out the necessary works connected with building an explosive

According to experts' estimates, it is essential to have 6–10 kg of plutonium or 25 kg of highly enriched uranium (HEU) to produce a ca 20 kT explosive. Of course, taking into consideration the amount of uranium compared with world resources, it is not much. Globally, there are about 250 tons of military plutonium and about 1700 tons of military HEU.[25]

Any actor seeking to develop a nuclear device must deal with a number of design options and must complete a number of essential steps. The aspiring nuclear actor must:

- Develop a design for its nuclear device or obtain such a design from a weapon-holding state
- Produce the fissile material for the core of the device or obtain it from an external source and then machine the fissile material to fabricate the nuclear parts of the weapon
- Fabricate or obtain from outside, the non-nuclear parts of the device, including the high-explosive elements and triggering components that will detonate the nuclear core
- Verify the reliability of these various elements individually and as a system
- Assemble all of these elements into a deliverable nuclear armament, commonly reffered to as "weaponization"[26]

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[25] "Nuclear Terrorism," *Disarmament Forum,* No. 2 (2003), p. 10.

[26] Carnegie Analysis, *Going Nuclear: What it takes to build a bomb*. Based on R. W. Jones, M. G. McDonough, T. Dalton, and G. Koblentz, *Tracking nuclear proliferation: A guide in*

Each of these steps represents particular challenges. Unsuccessful state nuclear weapon programs (e.g., the Iraqi) are often taken as evidence of the infeasibility of establishing nuclear weapon capabilities. This is probably why some scholars uncritically choose to dismiss the risk of nuclear terrorism.[27]

In 1993–2003, 884 attempts to smuggle or sell nuclear and radioactive materials were reported, of which 205 were illegal attempts to transfer nuclear material, and 18 of them involved the smuggling of material suitable for the production of nuclear weapons. The perpetrators of the majority of such incidents were people not engaged in criminal activities, but mostly a different kind of insiders. It is difficult to estimate how many transactions were uncovered and how many were successful. Protection which is used nowadays as well as the equipment used for detection of radioactive substances in Western countries should allow the improvement of the safety of storing and more effective detecting attempts in the case of smuggling radioactive materials; this will increase safety in this regard.

Some scenarios provide the possibility of having fissionable materials stolen by a very well-trained and organized squad, which could make assaults on the storage sites of used reactor fuels, centers carrying out advanced works on nuclear weapons (like, e.g., Los Alamos), or finally, places that store and utilizing nuclear warheads that have been withdrawn from arsenals.[28]

As far as producing an explosive itself is concerned, assuming that a terrorist group possesses fissile material, most experts believe that some organizations, especially having sufficient funds at their disposal, are able to accomplish such by using less sophisticated methods of producing atomic weapons.[29]

The attempt to construct a nuclear explosive would certainly be successful by employing people who have sufficient experience and specialist knowledge in the field of nuclear weapons production. The threat of this kind appeared after the fall of the Soviet Union, when the collapse of

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maps and charts (Washington, D.C.: Carnegie Endowment for International Peace, 2001).

27 R. D. Howard, J. J. F. Forest with N. Bajema, *Weapons of Mass Destruction and Terrorism* (Dubuque, IA: McGraw Hill, 2008), p. 113.

28 Ferguson, op. cit., pp. 155–67.

29 Alexander, Hoenig, op. cit., p.7.

the nuclear industry made real the prospect of terrorist groups with suitable financial means "employing" workers in this sector.[30] The latter threat still exists, as there can always be found a person who for enough money would be prepared to sell his knowledge. Blackmail cannot be excluded either (possessing embarrassing materials, kidnapping members of the family, etc.) as a way to enlist specialists. One can hope that the relative stability that has appeared among the countries of the former Soviet Union, as well as surveillance conducted by the authorities of those countries, reduce the existing threat. Unfortunately, there are still countries supporting and sympathizing with terrorists (Pakistan, North Korea, Iran), which can share their technology and specialists with them.

Nuclear Explosion—High Intensity Incident

Nuclear explosion striking factors, which were mentioned earlier, serve to cause a crisis situation, requiring the usage of considerable forces both in the period immediately after the explosion and later when restoring the conditions that existed before the explosion. The intensity of the incident will depend on the particular effects of the strike.

There can be distinguished both direct and delayed in time destructing results. Direct effects (shock wave, thermal or ionizing radiation, and electromagnetic impulse) cause serious damage within a few seconds or minutes after a nuclear explosion. Delayed effects (radioactive fallout and other environmental effects) are active for a longer period and cause loss of life even in areas distant from the place of detonation. The shock wave is the main and, it can be certainly said, the most powerful factor of the strike. This stems from the fact that the energy used for creating the striking force constitutes the biggest part of the whole energy of the nuclear explosion (ca 50 percent). It is concentrated in the medium in which it moves. When the wave travels through a solid material, the lost energy causes the damage. When it travels through the air, it gradually loses its momentum. The more matter through which the energy travels, the weaker the effect. The size of the area through which the shock wave travels grows with the growth of the capacity of the sphere, which is in the epicenter of the explosion.

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[30] S. K. Weiner, "Preventing Nuclear Entrepreneurship on Russia's Nuclear Cities," *International Security*, Vol. 27, No. 2 (Fall 2002), pp. 126–58.

The striking force can damage or destroy buildings, equipment, technical devices, logistic resources, infrastructure, and cause the deaths of people who find themselves in the range of its influence (in proximity of the epicenter of the explosion). The bomb dropped on Hiroshima on August 6, 1945, of 15 kT exploded at an altitude of 550 meters. As a result of the explosion, nearly 98 percent of buildings were destroyed, ca 80,000 people were killed, and a further 60,000 died before the end of the year. According to certain data, a rocket containing a warhead of 12.5 kT dropped on a moderately populated urban area (3,000 persons/km^2) will cause the death of 20–80,000 people and the destruction of an area of 7–8 km^2.

Another striking factor of a nuclear explosion is thermal radiation, the source of which is the fireball that comes into existence during the fission reaction of the radioactive material, of which the explosive is constructed. The energy used for the emission of thermal radiation accounts for ca 35 percent of the whole energy created during the explosion. This radiation may cause fires and serious burns to exposed areas of skin. Moreover, the thermal radiation may cause buildings or forests to be set on fire, and the deformation or melting of equipment and devices. Indeed, fires may increase the gross impact of nuclear weapons.

One of the striking factors of delayed action is the penetrating radiation. The neutron explosive explosion is accompanied by the emission of alpha, beta, gamma, and neutron rays. Alpha and beta radiations spread through the air in small distances, not posing a serious threat to people in their range. A serious threat appears the moment of radioactive fallout, containing elements emitting alpha and beta rays; they may get into the organism, via, for example, the respiratory tract or through food.

The stream of gamma rays and of neutrons emitted during a nuclear explosion, called the penetrating radiation, in the direct zone of the nuclear explosion, reaches a radiation dose of 75 cGy/h. It may be the factor causing radiation sickness among those people exposed to it directly during the explosion or from radiation deriving from the radioactive fallout.

The radioactive contamination of terrain is another striking factor. The source of the contamination are the products of the fission of the nuclear explosive, secondary radiation, that is, radioactive isotopes, coming into existence as a result of interaction between neutrons and the medium as well as dispersed remains of not fissioned atomic explosive. Falling out of

the radioactive substances sucked into the fireball at the initial stage of the explosion will cause radioactive contamination of the terrain. The directions and range of spreading and the density of falling out of the radioactive substances will depend on the weather conditions, including the direction and strength of the wind, as well as the possibility of the atmospheric fall. It is expected that in case of rainfall, in a particular area there will be high contamination caused by the "falling out" of cloud with rain.

The contamination of the terrain will create a serious problem for the services dealing with the elimination of the results of the nuclear explosion, as it will force the need for carrying out a decontamination of the region of the explosion and the terrain contaminated by the radioactive cloud moving in the direction of the wind. On account of the range and the size of the contaminated area, this operation will be extremely expensive, but necessary, as the "life span" of the elements which came into existence in the fission reaction is thousands of years. So, staying in the contaminated area, on account of the threat of ionizing radiation, would be impossible.

The last striking factor, not affecting people's health and life, however, but causing the damage of power and telecommunications infrastructure, is the electromagnetic impulse as the result of the influence of gamma radiation on the surroundings. The size of the impulse depends on the power of the explosion and its altitude. The higher the altitude, the bigger the range of the influence of the impulse, but the intensity gets smaller. The impulse which is partially weakened in the atmosphere will cause smaller damages in comparison with the other striking factors of nuclear weapons.

In the case of terrorists using a nuclear weapon, this factor will not really be of large significance, because of the small range of its influence.

If there is a terrorist attack on a big city, in which there is a detonation of a nuclear explosive, the accumulation of the above mentioned factors will decide the degree of damage and the number of casualties the relevant authorities will have to deal with. In the case of a specific situation such as a "high intensity" threat, a large area will be affected, with the devastation of urban, including vital, infrastructure.

There may be buildings damaged that are vital to care for the victims of any attack, including hospitals, points of medical help, emergency units, and also those centers which would be necessary to run any effective rescue operation—such as power plants, telecommunication centers,

transportation infrastructure (roads, bridges, airports, etc.). One should also bear in mind the fact that crisis management departments, the police, including the municipal police stations and fire and emergency brigades, may also be knocked out by any nuclear strike. In such a situation, it will be necessary to call upon support from outside of the affected area. This in turn will generate new problems: firstly, people being evacuated from the contaminated area will be in a state of panic, with the result there will be widespread chaos. Rescue workers coming in from outside the city will also be operating in an unknown area, additionally increasing the confusion. Salvaged hospitals will be overcrowded, so it will be necessary to transport the injured out of the city. The terrorist attack will cause the authorities to impose a curfew, which will partially restore some order, on condition that armed units (the army, the police, the municipal police) know how to behave in such a difficult situation. Hence, it is extremely important that the command of any such operation be handled in the right way.

Scenarios of a Terrorist Attack with the Usage of a Nuclear Device

Considering the possibility of a nuclear attack being carried out by terrorists, one could be tempted to consider model scenarios of any such attack, the development of the crisis situation, as well as ways in which damage from the nuclear attack could be limited.

One of the scenarios may be a so-called "hidden scenario."

It can be assumed the terrorist group will plant a nuclear explosive in the most crowded place (the city center, a hypermarket, a railway station, etc.) and detonate it at what they deem the most suitable moment.

As a result of any nuclear attack, much will be destroyed, including government administration buildings, hospitals, and maybe also crisis control centers. There will be many fires, which will increase the damage caused by the shock wave. There will also be a lack of communication, lack of electricity, and the threat of gas explosions in many parts of the city.

As a result of the explosion there will be mass casualties around the streets and in the buildings close to the epicenter of the explosion. The wounded that find themselves within the range of different striking factors (people with mechanical injuries, people with burns, and those showing symptoms of radiation sickness) will need help. Additionally, the rescue

operation will be hampered by the damage caused around the epicenter of the explosion, making it difficult to get access to the potentially injured.

Areas which lie in the direction of the prevailing wind will be contaminated by the products of the fission reaction of the nuclear explosive, secondary radiation, and dispersed remains of the nuclear explosive, which will make it necessary to carry out the evacuation and then decontamination of the most contaminated areas.

It will be necessary to use the army, especially chemical troops as well as military medical services, which are best prepared to act in such situations, for they have the professional equipment to identify and minimize the results of the usage of nuclear weapons.

The decontamination of the contaminated area will be a lengthy process, which will be organizationally complicated and requiring huge financial and material outlays.

In case the terrorists make use of a so-called "open scenario," for example making it known in advance that they have planted an explosive and making certain claims (e.g., to free other terrorists kept in prisons, demanding considerable amounts of money) as well as setting a deadline for their fulfillment, the authorities will gain some time to organize and carry out the evacuation of people living in the area in which the detonation of a nuclear explosive is expected. The scale of the success of the operation will depend on the time the authorities will have at their disposal, the effectiveness of the carried out operations, as well as the cooperation of the inhabitants with the services responsible for carrying out the rescue operation.

At the same time, a crises center will be established, which will carry out the negotiations with the terrorists and will organize efforts to minimize the effects of any nuclear explosion. Meanwhile, most probably, a search would be conducted for the planted nuclear explosive. If the negotiations did not bring any positive results and the terrorists decided to detonate the explosive, the number of casualties would be dependent on the effectiveness of the evacuation and the preemptive measures taken to minimize the effects of the nuclear explosion.

In the event of terrorists using a nuclear device, we would most likely expect to be dealing with a "hidden" scenario, as the terrorists will strive to maximize the number of deaths and destabilize the situation in the country by causing widespread panic. The number of deaths will be considerable,

and any operation to further limit the damage will rely on assistance from the outside and the speedy actions of rescue teams.

Concluding Remarks

The proven and strong interest demonstrated by some high-profile terrorist groups in acquiring nuclear weapon capabilities does not allow us to ignore the risk of nuclear terrorism. While the risk can still be deemed to be low, the potential level of physical destruction and the number of casualties would be so great that even the potential for terrorist acquisition and use of nuclear devices warrants serious consideration.

Fortunately, Poland is not very "attractive" to terrorist groups, mainly because of its rather small influence in shaping international politics. However, it cannot be excluded that such an attack could happen, as theoretically such a possibility exists. The probability has increased in connection with Poland's involvement in Iraq and now in Afghanistan, while fulfilling our commitments towards the Alliance.

This threat will certainly increase with the staging of the football championship Euro 2012. This event will gather football supporters from the whole Europe, and for their protection, there will be a need for carrying out a range of exercises including preparations in case of a terrorist attack.

We should hope that such an incident, which would have catastrophic results, will not happen; however, the services responsible for ensuring security during this event should be prepared to respond to any crisis. Meanwhile, educational campaigns must be conducted among the general public, who must be prepared to follow the correct guidelines should an extreme situation arise.

Threats to the Natural Environment Resulting From Military Actions and the Development of Military Technologies

Tadeusz Szczurek[1]

Summary: This chapter examines the influence of warfare activities and military technique on man and the natural environment. By referring to historical examples, the author points to the far-reaching effects of the use of chemical, biological, and radioactive substances on the natural environment. Furthermore, there is detailed discussion of nuclear weapons testing with regard to its impact on future generations. Without doubt, the most dangerous activity is the use of military technique in martial conflicts. Policymakers fail to think about the side-effects of using weapons. While destroying military targets, one also destroys the surrounding nature. Very often the decisions of politicians seem short-sighted. Indicative of this was the dumping of large quantities of German chemical weapons in the Baltic Sea after the end of World War II.

Keywords: warfare, military technique, military technologies, environment, weapon

The concept of "military technique" is very broad and its scope covers any technical means intended and used in combat. J. Urbański from the Military University of Technology divides military technique into the means used directly in combat, "militant technique," and the means related to combat indirectly, calling it "auxiliary technique."[2] Some experts on this topic see military technique in an even wider context and, next to military technical devices, they also include technical thought, the defense industry, and research on military needs.[3] In the most general terms, however, military technique is perceived as a collection of all combat tools—ranging from the arming of an individual soldier, right up to intercontinental ballistic missiles and combat supporting systems put in space.

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1 Ph.D., Deputy Rector of Military University of Technology, Warsaw, Poland

2 A. Kiepas, J. Urbański, *Philosophy: Selected Problems of Technical Philosophy* (Warsaw, 1994), p. 100.

3 L. W. Zacher, "Technique–Army–Future," in J. Skowronek, Z. Trejnis, eds., *From the History of Education and Technique Development in the Polish Army,* Part 3, *Technique–Politics–Ethics* (Warsaw, 1992), p. 7.

Combat resources are closely related to explosive materials (conventional and nuclear), chemical and biological substances, and any types of fuel supplying energy to technical devices.

The consequences of applying state of the art scientific and technical achievements in the area of the military aroused the concern of scientists looking at military conflicts. According to R. Rosa, a Polish philosopher who saw the threat of the military technique was Jan Bloch, who pointed to the "effects of the applied technical and scientific solutions in the military area, the growing material losses not only in wartime but also during 'peaceful' preparations for war."[4]

The assumption behind the military technique is that it has been invented as a tool of destruction in human hands for use against other humans. But, is this only against humans? For example, the natural environment is destroyed by military action—not only indirectly, but it may also be directly targeted. However, even the intended destruction of the natural environment is always connected with inflicting harm upon an adversary. By targeting the natural environment, the economy and logistics back-up facilities of the enemy group are also adversely impacted. One can find numerous examples of such behavior. The white settlers in North America, who strived to exterminate the native Indian inhabitants in colonized areas, carried out the mass destruction of local fauna, particularly bison which constituted a staple food for the natives. From the beginning of contact between the native inhabitants of both Americas and the newcomers from the old continent there existed conflicts, in which the technologically more advanced Europeans prevailed. The most severe losses amongst the Indian peoples were inflicted, however, not by the military actions of the foreign aggressors, but by the diseases they brought by them—sometimes disseminated in the environment of the autochthons on purpose (e.g., by infected blankets). Another source of epidemics were also the animals brought to the American continent, which were infected with bacteria and viruses harmless to the Europeans; but the Indians, not versed in animal husbandry, were defenseless. Such spread of diseases is an example of using biological weapons on an unprecedented scale, even though the actions of the Europeans were not always intentional. The death toll of the natives in both Americas

[4] R. Rosa, L. Wyszczelski, *War and Peace in Polish Social and Military Thought* (Warsaw, 1993), pp. 41–43.

is estimated differently, depending on the source. According to some, at the turn of the twentieth century, only 15 percent of the Indian population remained compared to the fifteenth century.[5] In terms of the natural environment, it is more difficult to assess what the damages of the early activities of the colonists on the natural environment were. It can be assumed, however, that imported diseases also had a large impact on local fauna.

Another example of purposeful nature destruction within martial action was the tactic of "burned ground." The strategy consisted of the intentional destruction of everything that could be of use to the opponent. In effect, the enemy is deprived of the sources of supplies and its march is slowed down. The masters of this strategy were the Russians, who applied it successfully both during the conflict with Napoleon Bonaparte in 1812 and in World War II when the German forces marched through their territory in 1941. A specific form of the "burned ground" tactic was put into effect during the Sino–Japanese War (1937–45), when water was used instead of fire. With the aim of slowing down the adversary's progress, the Chinese artificially induced the flooding of the valley of the Yellow River, which devastated an area of approximately 54,000 km^2. It also contributed to the deaths of nearly half a million people.[6]

Along with the development of martial technologies, the capabilities in terms of the destructive impact of military forces on nature entered a totally new dimension. The example of this destructive power is the invention commonly called the "Roman plough," which has been used many times in the past half century. This specific method of military action consisted of the use of colossal bulldozers equipped with blades that could cut through even the thickest of tree trunks. This technique is often used in confrontation with groups of guerillas, for whom dense, tropical primeval forests provide excellent refuge. The most serious harm, however, is done to the natural environment and not the guerillas: a forest takes hundreds of years to regenerate. Moreover, resulting erosion processes and soil acidity further limit the possibilities for plants' renewal. This may also serve to disturb the food chain, leading to the deaths of animals and saprobic bacteria. A classic case was the Vietnam War during which only 20 of over 150 bird species survived,

5 Z. Kozimor, *The genocide of native Americans* (Atlantic City, Wielichowo: Polish-American Ethnological Society, 2007).

6 "Natural hazards in Asia: Analytical Information," Embassy of Poland in China, Beijing 2008, p. 17.

according to estimates; serious losses of local fauna were also recorded in river environments, where fish, reptiles, and fliers disappeared.[7]

Generally, the Vietnamese–American conflict is a good example of the destruction of nature for military purposes. In order to decimate the dense flora giving shelter to the soldiers of the Vietcong and thereby enabling their locations to be found, the U.S. army disseminated various chemical agents—herbicides and defoliants mainly—causing, among other things, the leaves of trees to be stripped. The so-called orange mix (Agent Orange) suited this purpose best. This chemical, so called due to the orange color of the labels on containers, also caused agricultural crops to perish. In total, the use of various substances destroyed more than 350,000 hectares of agricultural land. The plenitude of chemicals is made all the more graphic when one considers that three kg of toxins were used for every one inhabitant. Moreover, these chemicals have a lasting impact. For instance, dioxins, which are capable of maintaining their structure for dozens of years, cause ailments such as: weakened natural resistance of the organism, heart and blood vessel disorders, cancers, miscarriages, deformations, and high mortality of newly born babies. Destruction of the natural environment during the Vietnam War was perhaps epitomized by the carpet bombing undertaken by aircraft, as a result of which fertile soils turned into muddy pools.

A particularly destructive conflict for the natural environment was the Persian Gulf War (1990–91), the extreme consequences of which could even be defined as an ecological disaster. Withdrawing from Kuwait, the Iraqi army blew up nearly 700 local oil wells and drained a large volume of oil into sea. Oil issuing from the destroyed devices was set on fire, the flames of which reached a hundred meters. It is calculated that about one hundred thousand tons of soot were emitted into the atmosphere, as well as seventy thousand tons of carbon dioxide and fifty thousand tons of sulfur dioxide; dust clouds containing benzopyrene and aromatic hydrocarbons covered an area of more than 100 km^2. The latter substances are dangerous both to the health and life of living organisms (respiratory and nervous system disorders) and the climate (environmental acidification, the greenhouse effect). Shortly thereafter, acid rain fell on the region, which even reached as far Saudi Arabia.

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[7] J. Wożniak, "War with nature," *Bulletin of the Ministry of Science and Higher Education, Bio i Techno,* Warsaw 4/2003.

Not only was the air contaminated. Contamination, including numerous cancerogenic contaminants, permeated the earth's soil. Soil degradation was exacerbated by the use of salt water in extinguishing fires. In some places the harmful substances permeated to a depth of 20 meters, reaching ground water (in the future, this may affect the supply of potable water to the local population). In this way they were further assimilated by plants, and then, reached the organisms of farm animals giving, e.g., milk. It is without doubt that the environmental degradation impacted human health in the Persian Gulf; increased child mortality was noted as well as increased instances of respiratory diseases.

Apart from military strategies aimed *directly* at destroying the environment in order to weaken opponents, the natural environment is more often than not degraded as a "byproduct" of armed conflict. One such clear example of natural resource waste is artillery bombardment prior to launching an offensive against the enemy—for every hectare there may be thousands of artillery pieces. A similar situation occurs during bombardment from the air, in which the measure is a ton of explosive material. If after the above mentioned actions parts of the natural environment remain intact, their destruction will be assured by the huge numbers of combat vehicles and other mechanical vehicles traversing the terrain. In this case, again, a well documented example of environmental degradation was during the First Persian Gulf War. During this conflict around 3500 tanks and 2500 armored vehicles were used. Thus, martial activities must have had a negative effect on the balance of soils, particularly sandy desert soils dominating in the region that are very prone to erosion. What is more, the Iraqis, wishing to strengthen their position, dug up nearly 120 km of ditches with a capacity of 3750 m^3, a large part of which was additionally filled with oil. At the same time, the ditches increased the threat to the environment because of the pollution caused by oil derivatives and, most of all, increased the susceptibility of the soil to erosion.[8] The soil, deprived of most of its flora, lost its structure and was exposed to wind and precipitation. As a consequence of the boosted erosion processes, the number of moving sand dunes increased to 1300, and the migrating sand covered irrigation ditches and roads—in the

[8] See A. S. Omar, et al., "The Gulf War Impact in the Terrestrial Environment of Kuwait: An Overview," First International Conference on Addressing Environmental Consequences of War (Washington, D.C., 1998).

end about 20 percent of Kuwait's agriculturally useful land was affected in this way.

The destruction wrought by war and the resulting degradation of the land increased the mortality indicators amongst representatives of the local fauna and flora. Certain species of plants, e.g., *Stipogrostis plumosa* or *Cyperus conglomeratus,* were characterized by limited growth and even a 50 percent decrease in survival. Plants growing in areas contaminated with oil derivative substances are still toxic for creatures reliant on them. Numerous animals—namely, small mammals or birds—perished because of the contamination of the desert air and ground; in addition, they were affected by oil stains in natural water pools.[9] There was a stench of rotting bodies mixed with smoke and dust. In order to prevent the emergence of plague, different chemical repellents against insects and rodents were applied. However, application of these substances turned out to be very harmful in the long term, especially to the health of American soldiers. One of the pest repellents employed, DEET, interacted with pyridostigmine bromide, a substance used to counteract the effects of chemical weapons. Examinations proved, among others, those conducted in 1994 by James Moss from the U.S. Department of Agriculture, that mixing of these substances can cause serious damage to the nervous system. Another scientist, Goran Jamal from the Institute of Neurological Sciences of the Southern General Hospital in Glasgow, examined a group of 14 soldiers who had participated in the Gulf War. It turned out that nervous system disorders and dysfunctions were found in every veteran, particularly in the limbs.[10]

Apart from the serious contamination of the Persian Gulf with harmful chemicals, there was also a spread of nuclear waste and residual ionizing radiation took place. Among the radioactive materials that could have contaminated areas subject to shelling and bombardment, one should mention depleted uranium that was applied to special ammunition. The shells made from this material demonstrate an uncommon effectiveness in being able to penetrate armored equipment, concrete structures, and targets hidden in bunkers. Uranium is 1.7 times heavier than conventional lead. Accordingly, it is applied in armor-piercing shells and bombs intended to destroy

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9 Cf. C. W. T Pilcher, D. B. Sexton, "Effects of the Gulf War oil spills and well-head fires on the avifauna and environment of Kuwait," *Sandgrouse,* No. 15 (1993), pp. 6–17.

10 *Journal of Neurology, Neurosurgery and Psychiatry,* Vol. 312, No. 3 (1996).

so-called "hard" targets.[11] The harmfulness of depleted uranium does not derive from the martial ammunition radiation emission, which is four times higher than this element's radiation in a natural condition—so it should not injure humans. What is dangerous, however, is the toxic uranium dust and its oxides emitted during the use of shells in combat action (e.g., bombing of tanks). These wastes can easily permeate an organism through the skin and by breathing in contaminated air or by consuming food. Uranium cumulates in this form in different parts of the body, among others, in bones or kidneys, where its poisonous and radioactive qualities are much more dangerous. The numerous ailments displayed by soldiers who had direct contact with this element—both in the Gulf War and, for example, in the Balkan conflict where depleted uranium missile were widely used—prove its calamitous effects on the organism. The victims usually complained of pain in their bones and muscles, experienced problems with their respiratory, nervous, or urine systems, as well as developed itchy rashes. Specialists, however, are not fully sure whether these afflictions are the effect of the influence of this radioactive element or whether, perhaps, some other toxic substances used in warfare are responsible.

The military potential to destroy the natural environment is one that is growing. The dynamic development of technical sciences enables the creation of increasingly perfect and more refined weapons that can destroy targets which martial commanders hitherto could only dream about. The earlier mentioned methods of devastating the environment usually did not require very complicated tools. In the meantime, a highly technologically advanced military system is being developed in Alaska. Its aim is to target the natural environment directly. Work on the HAARP Project—High frequency Active Auroral Research—was started as early as 1990.[12] Three important American military institutions are interested in the research conducted on this technology: U.S. Air Force, U.S. Navy, and DARPA (Defense Advanced Research Projects Agency). The weapon is based on a patent registered by the U.S. physicist E. J. Eastlund as the "Method and apparatus for altering a region in the earth's atmosphere, ionosphere, and/or magnetosphere."[13] The system functions based on the principle of sending

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11 See T. Szczurek, *War Conflicts: Philosophical and Moral Problems* (Warsaw, 2009).

12 "The High Frequency Active Auroral Research Program," Air Force Research Laboratory, Kirtland 2009, pp. 1–12.

13 J. B. Eastlund, *Method and apparatus for altering a region in the earth's atmosphere,*

a high frequency and high power energy blast (the set of HAARP antennas can reach up to 1 GW of power) in order to influence atmosphere, ionosphere, and magnetosphere, in accordance with the description from the patent. It means, among other things, the possibility of applying the device in the role of the emitter of a high dosage of heat, i.e., using it as a "powerful heater." Officially, it is stated that the goal of the project is to examine the influence of the physical and electric qualities of the Earth's ionosphere on the communication and navigation systems. However, some of the parties interested in the matter are of the opinion that the HAARP system can be used as a weapon allowing weather manipulation in the certain areas of the globe. The influence on the aura will result from the possibility of changing the direction of atmospheric winds or introducing changes in the sun adsorption pattern. Another application of the HAARP devices involves the interruption of communications and IT systems as well as their interception and modification, which could enable one, for example, to take over the command of airplanes or missiles. The aforementioned possibilities of using the HAARP system, particularly, the capacity to influence the atmospheric environment, arouse a number of doubts related to the associated losses in the natural environment, as well as impact on human health, that the application of such technology could cause. The most important concerns are as follows:

- At the moment, it is not easy to estimate the side-effects of the artificial heating of the ionosphere and atmosphere. However, there is a serious threat that the application of HAARP will cause disruption of the Earth's atmosphere, and even the global climatic balance, contributing to, e.g., deepening of the greenhouse effect or the extension of ozone depletion.
- It is thought that the influence of the strong electromagnetic impulse on the Earth's interior could lead to unknown ecological effects.
- Emission of electromagnetic energy has a negative influence on living organisms. A human exposed to its activity faces the threat of: increased blood sugar and cholesterol levels, disruption of heart rate, and an increase in blood pressure,

ionosphere, and/or magnetosphere (Los Angeles: USP 1985).

and finally, perturbations in the chemistry and frequency of brain waves.

- Application of electromagnetic waves impacts also animals, e.g., by interrupting a bird's sense of orientation—birds use the Earth's magnetic field.

The HAARP system is an example of the possibility of using modern technologies for weapons manufacturing, whose destruction range exceeds significantly the possibilities of conventional armaments. Yet, these advanced installations are not the only example of utilizing knowledge from the field of contemporary science in order to create tools of mass destruction. Weapons incorporating nuclear energy or knowledge from the fields of chemistry and microbiology are well known. The use of such weapons has always constituted a great threat to the natural environment as well as man. Effects of its use can be felt for many years—not just the moment of its detonation—depending on the type of applied chemical, biological agents, or the power of the nuclear load. What is most important is that such weapons pose threats to nature and humans alike, and not only in wartime. Chemical and biological weapons have a negative influence on fauna and flora, and test nuclear explosions have led to the devastation of large areas on the globe.

U.S. nuclear martial installations alone cover an area of nearly three million hectares. In the 1950s, the United States conducted nuclear testing mainly on the Pacific Islands, where 106 nuclear weapon tests were carried out. The atomic testing ground in the Nevada desert was established later. In total, 935 nuclear explosion tests were carried out there.

Until to the present day, this testing ground has been a center of practical nuclear experiments. The result of the above mentioned actions can be measured as far as its influence on the natural environment is concerned, both near the testing ground in Nevada and in the Pacific; there remain some twenty contaminated islands, including the Bikini and Einwetok atolls.[14]

It should also be remembered that nuclear and thermal nuclear explosions in the air, on the surface of the Earth, or under its surface, introduce large volumes of radioactive isotopes into the atmosphere, which, depend-

[14] G. Charpak, R. Garwin, *Will-o'-the-wisps and Atomic Mushrooms* (Wrocław, 1999), p. 253.

ing on the energy of the explosion and other factors, can stay underground, create a local fallout, or even permeate the stratosphere and thus create a global fallout.

According to the assessment of the Stockholm International Peace Research Institute (SIPRI), 2020 nuclear explosion tests were carried out between July 1945 and the end of 1993. One can add to this the eight tests since carried out by France, five by India, six by Pakistan, and two by North Korea, which means that there have been a total of 2041 nuclear explosions.

The most infamous examples of the atomic bomb being used were the attacks on Hiroshima and Nagasaki at the end of the World War II (on August 6 and 9, 1945). The unprecedented scale of the destruction caused by the explosions shocked the political and social milieus of most countries. Although there have been no unequivocal long-term assessments of the effects of the attacks on the Japanese cities, the environmental threats caused by atomic energy are clear. The more powerful explosion— the explosion of the bomb called "Little Boy"—was detonated over Hiroshima within a radius of 1.6 kilometers from the place of load dumping, and the contamination from ionizing radiation covered an area several times larger. According to U.S. estimates, the explosion caused the deaths of 70,000 people, but a Jesuit mission calculated the toll to have been at least 100,000.[15] More victims died after the event due to post-radiation diseases and radioactively contaminated land. There is an unofficial estimate that approximately a quarter of a million people died within five years after the detonation of the bombs. The main causes of death were cancers and post-radiation heart attacks as well as birth defects in newly born babies. What is more, one should not underestimate the psychological impact of the bombings that left lasting traces in the memories and psyches of the witnesses and their descendants.

In spite of knowledge of the threats that the use of atomic energy for military purposes posed, the world's military powers continued to carry out the testing of even stronger bombs for decades. Preceding the attack on Hiroshima, the first nuclear test explosion was conducted by the United States in Alamogordo, New Mexico, on July 16, 1945. One of the creators of the nuclear bomb, the physicist Robert Oppenheimer, said that when he saw the flash he remembered a fragment from an Indian book: "Now I will

15 Cf. R. Rhodes, *How Was the Atomic Bomb Created* (Warsaw, 2000), pp. 666–67.

become death, destroyer of the worlds." The first Soviet atomic bomb was detonated on August 29, 1949, at a testing ground in Semipałatyńsk.[16]

The strongest nuclear charge detonated in a test explosion was by the USSR on October 30, 1961, with a power of 58Mt, which means that the explosive force was 58 million tons of trotyl. This is the equivalent of loading conventional explosive material on to a goods train ten thousand kilometers long! The consequences of the blast were huge. The quake caused by the detonation was felt even in Alaska. The shock wave ringed the Earth three times and the explosion itself was seen from a distance of 900 kilometers. What is more, a mushroom of a height of 60 kilometers was seen over the destroyed area, seriously contaminating the atmosphere. It is worth mentioning that it was initially planned that the explosion would have a power of 150 Mt; however, it was subsequently reduced as the radioactive rain which would occur after such a strong detonation would have reached as far as Europe. It is difficult to estimate the scale of destruction that would have been caused by such an explosion, had it taken place in an area inhabited by man. Suffice to say that the bombs detonated over Hiroshima and Nagasaki (each of the power of about 13 KT) were more than four thousand times weaker.

During the course of the two thousand-odd tests, there must have occurred mishaps harmful to man and the environment. The Americans alone admitted to losing eleven atomic bombs in seas and oceans and some of them were never found.[17] The Russians are still silent on the matter, but not everything can be hidden. There was, in 1958, a serious nuclear accident at the weapons manufacturing plant in Czelabińsk, with the resulting radioactive cloud contaminating an area many thousands of square kilometers in size. Twelve villages were evacuated at the time.[18]

A significant hazard to the sea environment is constituted also by the radioactive material in the reactors powering atomic submarines. There have been numerous cases of environmental pollution resulting from submarine disasters. Here are examples of such disasters in the case of the Russian fleet:

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16 P. Wroński, "Contemporary Wars," Magazine of *Gazeta Wyborcza*, No. 35, August 31, 2000.

17 Charpak, Garwin, *Will-o'-the-wisps*, op. cit., p. 253.

18 K. Alibek, *Biohazard* (Warsaw: Pruszyński i Spółka, 2000), p. 67.

- January 13, 1960—a leak of fuel from the reactor, 13 sailors killed in the Barents Sea
- July 4, 1961—a reactor explosion in the Norwegian Sea, 8 killed
- February 10, 1965—an overheated reactor in Siewierodwińsk, 7 victims
- September 8, 1967—39 sailors died in a fire on an atomic submarine in the Norwegian Sea
- April 8, 1970—a Russian submarine sank near the Spanish coastline. The Russians admitted 52 victims. The Pentagon claimed there were 88
- February 24, 1972—there was a fire on the deck of an atomic submarine at the coast of Novaya Zemlya; 30 people died
- June 24, 1983—a Charlie type atomic submarine sank near Kamchatka. The Russians admitted 17 victims. The Americans said there were 90 people on board
- August 10, 1985—ten sailors were killed in a reactor blast on a submarine in the Pacific
- April 7, 1989—42 sailors die in a fire aboard the *Komsomolec* submarine. On board there were at least two torpedoes with nuclear heads. The wreck rests 500 km off the Norwegian coastline
- January 26, 1998—one man was killed in a reactor breakdown on a submarine at a base on the Kola Peninsula; four were injured. The Russian command assured that there was no leakage of radioactive substances
- May 5, 1998—emergency on a Delta IV class submarine equipped with 16 intercontinental missiles, two were damaged
- August 12, 2000—the atomic submarine *Kursk* sank in the Barents Sea, most likely after a torpedo blast; 118 sailors died

The contamination of ocean waters with radioactive materials has galvanized ecological organizations. The loudest protests in the last decade of

the past century accompanied the nuclear testing conducted by France on the atoll of Mururoa in the Pacific.[19]

The Japanese press, among others, conducted an active protest campaign. The newspaper *Yomiuri shimbun* published the sensation that radioactive iodine 131 had been found present in on Mururoa attol. Another Japanese newspaper, *Asahi shimbun,* also doubted the assurance of the French authorities that the testing would not cause the dissemination of radioactive waste.[20]

The intensive involvement of the Japanese can be explained by the fact that it was they who had experienced at first hand the destruction wrought by nuclear weapons. The tragedies of Hiroshima and Nagasaki are still within the living memory of some.

In this context, it is apt to quote the words of a young Japanese medical doctor, T. Akizuki, at the time:

> The sky was unbelievably dark, full of heavy smoke clouds; under this dark coat the Earth was enveloped with yellow and brown fog. The veiled Earth surface started becoming visible; the horror of what I saw enchained me to the place where I was standing. All the buildings that I could see were on fire. Trees, twisted like potato stalks on fields, were shrouded by smoke. [...] The sky was dark – the Earth scarlet, and between them there were floating clouds of yellowish smoke. All these people running in all directions like ants looking for an emergency exit were bathed in these three colors– black, yellow and red. The ocean of fire, the sky veiled with smoke. One could think it was the end of the world.[21]

When one considers that the nuclear attacks on Japan had a lasting impact on the natural environment of the region for many years, it is justified to say that even a "limited nuclear war" has the potential to affect the global ecosystem.

Destruction of the natural environment during wartime would seem to be unavoidable, and in the situation of the development of weapons of mass

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19 A. Ciupiński, "Nuclear Scaring Away and Testing on the Pacific," *The Army and Upbringing*, No. 8 (1996), pp. 80–84.

20 Ibid.

21 T. Akizuki, "Nagasaki 1945," in *Quartet* (London, 1981), quoted in Charpak, Garwin, *Will-o'-the-wisp*, op. cit., p. 258.

destruction, one should not expect that future wars can somehow be waged without detriment to the environment. However, one should expect that after the end of a conflict, the concerned parties will be supported by international society to do everything possible to minimize the effects of war and adopt measures to compensate for the destruction of the environment. Yet, how should we assess the actions of the ally forces after the end of World War II, who at the Potsdam conference legalized the dumping of chemical ammunition and poisonous martial agents at sea?

Commander Tadeusz Kasperek from the Polish Naval Academy in Gdynia, author of many publications on this subject, has made a huge contribution in the search for documents and evidence pointing to the exact locations where this ammunition was dumped.

According to data checked by the Working Group for the matters of the Dumped Chemical Munitions, established in 1993 by the Environmental Committee of the Helsinki Commission, within the space of two years (1947–48) the Russians dumped up to 34,000 tons of chemical munitions containing an approximate volume of 12,000 tons of poisonous martial agents (east of Bornholm and near to Gotland). According to other sources, the Russians dumped between 36,000–50,000 tons of chemical munitions in the two mentioned regions of the Baltic Sea, and the government of the former German Democratic Republic admitted dumping about 200–300 tons of chemical munitions in the region east of Bornholm. This was said to contain burning and vomitive poisonous substances as well as tabun[22] and phosgene.[23] However, the author of this source makes the reservation that it is difficult to establish the actual quantity of the sunken chemical munitions owing to the lack of reliable documentation.[24]

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[22] Tabun is the most toxic of the poisonous substances dumped in the Baltic Sea. A highly poisonous agent it reaches the organism through the respiratory system, the canal, and through permeating the skin. The symptoms of poisoning are: shrinking of eye pupils, headaches, salivation, coughing, breathing difficulties, sweating, vomiting, trembling, twitching of skeleton muscles. Death is caused by the stoppage of the heart and lungs.

[23] Phosgene is a smothering poisonous agent. It permeates the organism through the respiratory canal. The symptoms of poisoning with phosgene appear after a period of latency lasting from 2 to 12 hours (in the case of high concentration, symptoms are immediate). The toxicity of phosgene impacts on the lung alveoli and the hindering of gas exchange in the lungs, which leads to the blocking of the oxygen inflow to the organism.

[24] T. Kasperek, *The Chemical Weapons Dumped in the Baltic Sea* (Toruń, 1999), pp. 27–32.

While official sources stay silent about many details concerning the quantity and types of dumped chemical ammunition and martial poisonous agents, scientists examining the pollution in the Baltic Sea have sought to fill in the information gap. Specialists from the Institute of Chemistry and Anti-chemical Protection of the Military University of Technology state that in the years 1946–47 about 87,000 tons of munitions were dumped jointly in the Baltic Sea**.** This volume contained up to 15,000 tons of martial poisonous agents. The following volumes of poisonous chemicals were dumped in the Baltic Sea under supervision of the Russian army: 6440 tons of sulfur mustard gas, 500 tons of nitric mustard gas, 1950 tons of arsine oil, 260 tons of diphenylochloroarsine, 1550 tons of adamsite, 550 tons of chloroacetophenone, and 80 tons of cyclone B and other poisonous agents—in total just over 12,000 tons.

According to the agreement, the munitions were to be located in strictly specified and marked regions. The transport route was, however, often shortened and such arrangements were disrespected. It therefore occurred that munitions were simply dumped outside the allotted regions while still in transit. There were also cases where chemical ammunition (particularly in wooden boxes) sometimes washed up onshore.

Poisonous martial substances were also found on the Polish Baltic coast. Officially, five cases of such substances being beached were noted as well as twenty cases where fishermen dredged them up in the Polish Exclusive Economic Zone.[25] It is highly probable that many such cases were not reported to the authorities by the fishing boat crews. One can assume therefore that the above is only the tip of the ice berg. Special attention should be paid to the fact that in 1955, when a barrel with martial poisonous substances washed up onshore in Darłówek, 102 children suffered from contamination. The last incident noted in Poland took place on September 1, 1997, about thirty sea miles north of Władysławowo, where a lump of mustard gas weighing 4–5 kg was fished out; eight fishermen were consequently contaminated. The chromatographic analysis of the fragments of the mustard gas lump fished out by the fishing boat WŁA 206, carried by the Institute of Chemistry and Anti-chemical Protection of the Military University of Technology, proved the presence of over 36 compounds. Specialists emphasize that the toxicity

25 Ibid., p. 87.

of some of these compounds can be higher or comparable with the toxicity of sulfur mustard gas.

In the last sixty years there have been cases of chemical munitions being brought ashore to harbors, and then, dumping them again in other places (frequently, in the vicinity of harbors). At the present moment, it is not possible to define the exact location of the chemical munitions and containers with martial poisonous agents lying on the bottom of the Baltic Sea.

T. Kasperek is of the opinion that the specific hydrological conditions of the Baltic Sea (among others, limited exchange of waters with the North Sea) influence the high sensitivity of its ecosystem. The presence of sunken chemical ammunitions in the sea has contributed to an increase in the concentration of toxic substances, the lowering of oxygen levels, and bioaccumulation of harmful compounds in the environment, especially those containing arsenic. This is why the problem of assessing the technical condition of ammunition and control of the concentration of toxic substances in the marine environment has become very important in recent years. Examination of the technical condition of the dumped ammunition is carried out in some countries, e.g., Finland, Norway, Sweden, Germany, and Russia. This examination is related to the actual ammunition and the containers dredged up from the sea or spotted on the sea bottom, and the model laboratory samples. General corrosion of the metal housing of the ammunition and the container walls progresses at a rate of about 0.05–0.1 mm per year. The rate of local corrosion can often be much quicker. It is assessed that the thickness of the ammunition housing and container walls has thinned by 2–3 mm, in comparison to the original thickness.

The rate of corrosion is conditioned by the type of material used for the ammunition housing and the container walls, as well as the specific environment of the sea water in which they are located. On the basis of laboratory research, an elapse of between eight and 390 years is calculated as the time taken for martial poisonous substances and explosive materials to escape from dumped ammunition and containers. This means that the process of toxic substances escaping into sea water has already started depending on the type of ammunition and containers. For example**:** toxic substances can escape from containers after 8–30 years, and from artillery missiles (150 mm) 100–390 years from the moment of dumping. According to some opinions, the housings of dumped ammunition have now been corroded by 70–80

percent, which means that in several decades' time, toxic substances will be released into water on a mass scale. This will cause contamination and have a negative influence on flora and fauna. According to one thesis, there is a possibility of an ecological disaster unfolding of a much more serious magnitude than the Chernobyl disaster even. However, this is contested, with some arguing that mass contamination of the Baltic Sea will not take place even in the event of the complete corrosion of ammunition housings and the walls of containers filled with poisonous substances. They instead refer to the conclusions from analyses of the physical and chemical qualities of the dumped poisonous substances. Sulfur mustard gas, for instance, dissolves in sea water very poorly, and its hydrolysis in the marine environment is very slow. Compounds of arsenic and chloroacetophenone do dissolve in water, however, and undergo faster hydrolysis. Prussic acid, meanwhile, is a gas possessing qualities that does not cause long-lasting water contamination. Owing to the low level of solubility and the slowness of hydrolysis, most of the poisonous substances will remain where they were dumped for several decades yet but maintain their toxic qualities. Once the metal coatings are corroded, the toxic substances from inside will escape to the surrounding water mainly by diffusion. By its nature, diffusion is slow and it will be additionally hampered by the fact that the ammunition and containers may be covered by a layer of sludge. This is why the concentration of toxic substances in the surrounding waters will not be high. The concentration of products deriving from the hydrolysis of poisonous substances will be also low. At the same time, most of the products of hydrolysis are not toxic.[26]

Nevertheless, many specialists are of the opinion that owing to the toxic qualities of the martial poisonous substances dumped in the Baltic, there is a serious threat not only to the natural environment but also to humans. The consequences of every direct contact with the chemicals may be very damaging for humans.[27]

The explosive materials dumped in the Baltic Sea pose a certain threat to the marine environment owing to their toxic and cancerogenic features. Apart from the explosive materials dumped after the war, a certain danger to the natural environment and human life is also posed by unexploded

[26] Ibid., pp. 54–99.
[27] Ibid., p. 54.

ordnances. A recent example was the 500-kilogram deep water mine that floated into Gdańska Bay on June 14, 2000. In the summertime, an additional danger is the fact that poisonous substances vaporize in higher temperatures. Therefore, they may be hazardous both for humans and marine fauna.

The above analysis indicates that we should admit the possibility that waters are contaminated or that the contamination will increase with chemical ammunition corrosion, which will cause large volumes of toxic substances to escape. It is, however, difficult to foresee exactly how this process will play out and/or whether contamination reaches catastrophic proportions. For example, an exact examination of the products of the mustard gas hydrolysis showed that in the case of its hydrolytic disintegration, apart from non-toxic substances or substances with low toxicity, certain products with higher toxicity than the toxicity of mustard gas occurred and that their disintegration is very slow. Among the sulfur compounds, chlorodiphenylarsine was found to have been deposited in the Baltic Sea. It is striking that it has not hydrolyzed. The products of arsenic compounds hydrolysis also contain arsenic and this is why they maintain toxicity, although it can be at a lower level than the toxicity of the input substances. The results of certain chemical analyses indicate that the content of arsenic compounds in the Baltic Sea is already much higher than it is on average in sea water. These compounds can cumulate in living organisms, causing their genetic changes and mutations.[28]

The Baltic Sea was by no means the only sea in which chemical munitions were dumped after World War II. In *Chemical Weapons Dumped in the Baltic Sea*, T. Kasperek specifies four other regions where German chemical ammunitions were dumped:

- 32–34 German chips with approximately 130,000 tons of conventional and chemical munitions were sunk by the British and Americans in the North Sea
- 462 artillery missiles with tabun were dumped by the government of the former German Democratic Republic in the Norwegian Sea; one ship filled with conventional and chemical munitions was sunk by the British

[28] Ibid., pp. 61–72.

- 9 transport chips with at least 20,000 tons of munitions with mustard gas were sunk in Skagerrak (a bay in the North Sea)
- 2 vessels with approx. 1500 tons of chemical munitions were probably dumped by France, also in the region of Skagerrak

The cases of environmental contamination listed above constitute just a minute part of the larger problem of discarding unnecessary and, at the same time, hazardous substances related to the production and testing of weapons of mass destruction. The short-sighted policies of many countries led to the situation where sea and desert areas located very far from human inhabitation were exposed to unacceptable levels of contamination.

The picture is not all doom and gloom, however. There are certain grounds for optimism in that threats to the Earth's natural environment by chemical and radioactive substances have been recognized. This has resulted in the signing of several international treaties aimed at limiting contamination in those areas most at risk.

One of the first documents concerning this problem was the Antarctic Treaty. It forbids the use of the South Pole region for military purposes. The most important provisions for the natural environment were included in the first article: "[…] in particular, any undertakings of military nature are forbidden [...] as well as experiments with any types of weapon." The provision in article five is also very important: "any nuclear explosions in the Antarctic continent and discarding radioactive waste in this region are forbidden."[29]

Numerous nuclear tests in the seas, oceans, and in the atmosphere, including the nuclear explosion by the Soviet Union in 1961, have contributed to the radioactive contamination of areas much larger than those marked by the territorial borders of the countries performing the explosions.

Pursuing the honorable objective of protecting the natural environment—desiring to put an end to contaminating the natural environment with radioactive substances—the three world powers of the time (USSR, U.S., and Great Britain), hereinafter called the "original participants," came to an agreement which forbade nuclear weapons testing in the atmosphere,

[29] The treaty was signed in Washington on December 1, 1959, by 28 countries. The Polish ratification document was submitted to the government of the United States on June 8, 1961. The treaty entered into force on June 23, 1961 (*Journal of Laws* of 1961, No. 46, Items 237, 238),

in outer space, or at sea. Later, the original participants were joined by 112 other countries from around the world. The full name of this understanding is the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water. The treaty was signed in Moscow on August 5, 1963. The treaty came into force on October 10, 1963, and the Polish ratification documents were submitted to the governments of the original participants on October 14, 1963.[30]

Article one of the above mentioned treaty obliges its parties to "forbid, prevent, and not to perform any test explosions with the use of nuclear weapons," in the following places:

- In the atmosphere, including outer space[31]
- Underwater, both in the open seas and oceans and in territorial waters
- Wherever such an explosion causes radioactive precipitation to reach outside the borders of the country under the jurisdiction or control of which the explosion takes place[32]

The practical significance of this treaty was crucial. Most nuclear tests were subsequently conducted underground instead. This limited the radioactive environmental contamination considerably. Nevertheless, the development of military technique still posed a threat to the marine environment. This is why a second treaty was signed. The second treaty enforced legal regulations in the area of securing the seas and oceans against insertion of military installations with chemical, biological, and nuclear weapons. This document obliges signatories not to install and not to insert any kind of nuclear weapon or other kinds of mass destruction weapon as well as structures, launchers, or any other devices specially intended for the storage, testing, or usage of such weapons on the bottoms of seas and oceans as well as in their subsoil (outside the territorial waters zone – T.S.). The treaty

30 *Journal of Laws* of 1963, No. 52, Items 288 and 289. See also Government Statement of November 14, 1963 of the ratification by Poland of the Threaty of the prohibion of nuclear weapons tests in the atmosphere, in outer space and under water, Dz. U z 1963 r., nr 52, poz. 289.

31 This item of the treaty was then extended in 1967, reaching an understanding of the peaceful use of outer space,

32 *Journal of Laws* of 1968, No. 52, Item 288. See the Outer Space Treaty of 1967, Moscow, London, Washington, January 27, 1967.

banning nuclear weapons and other types of mass destruction weapons on the bottom of the seas and oceans and in the subsoil was signed in London, Moscow, and Washington on February 11, 1971. Poland ratified it on September 23, 1971. The treaty was signed by 86 countries.[33]

The above mentioned legal regulations ensure that harmful chemical, biological, and radioactive substances remain on the territories of those countries performing tests. There is, however, the question of implementing effective compliance with these arrangements. Will contaminated air remain within the borders of the nuclear testing ground? How can the border between contaminated and clean water be maintained? Will not pollution of the ecosystem in one region of the world influence the quality of the natural environment in other areas?

There are many such doubts. Nonetheless, they all lead to one conclusion—even the best of laws will not enforce common care for the natural environment, not only locally but on a global scale. Perhaps a change in the ecological awareness of people is necessary to save the world? Is this possible? Some philosophers (e.g., H. Skolimowski) express hope that there is a chance and postulate the rise of "homo ecologicus."[34]

The use of seas and oceans as a dumping ground for redundant martial poisonous substances is only one of the many threats that military technique poses to the natural environment. Dangerous for the environment, too, is the careless (or maybe even hostile) actions of military technique on land. A legacy of which is on the territory of the former garrisons of the Russian army, in northern and western Poland.

For several decades, the above territory was inhabited until 1993 by people—the Russian army—for whom "ecological thinking" was an alien concept.[35] A report prepared based on research carried out by specialists from the Military University of Technology (21 structures were selected out of a total surface area of approximately 60,000 hectares) found in some garrisons levels of ground contamination with heavy metals which significantly

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33 *Journal of Laws* of 1972, No. 44, Item 275. The *Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil Thereof* (the *Sea-Bed Treaty*) of 1971, Moscow, London, Washington, February 11, 1971, The Sea-Bed Treaty Information, Center for Nonproliferation Studies, Monterey 4/2009.

34 Por. K. Waloszczyk, *The Planet of Not Only Humans* (Warsaw, 1997), pp. 219–20.

35 *Identification and Valuation of the Ecological Losses Caused by the Army of the Russian Federation Quartering in Poland,* Warsaw 1996.

exceeded allowable norms. For example, the concentration of chromium was 90 times higher than normal for the region; lead 61 times; mercury 38 times; cadmium 17 times.[36]

Oil derivative products account for the largest share of contamination, an excessive volume of which has been documented in an area of about 400 ha—of which 90 ha was covered by so much fuel that on the roof of the impermeable ground layer, or on the surface of underground water, there was in places a five-meter-thick layer of floating fuel. It is estimated that the total volume of oil derivatives deposited in the environment (together with the floating fuel) is approx. 155 million liters (such a volume of fuel equals the capacity of about a thousand average-sized petrol stations). An interesting fact is that at the airport in Kluczewo near Szczecin (covering an area of 20 ha) there was nearly 30 liters of oil derivatives per one cubic meter of ground.[37]

Why has there been such tremendous environmental degradation in these areas? Was the lack of interest in environmental protection only the result of insufficient ecological awareness of the Russian army, or, rather, the result of serious legal and legislative negligence on the part of the Polish authorities? And, perhaps, the then Polish authorities did not have any possibility of action in this regard.

Martial equipment is constructed, first and foremost, with the thought of its destructive power. Thus, one should not expect that an airplane, a tank, or another piece of military equipment, will be environmentally friendly. For example, one tank burns about 400 liters of diesel oil per 100 km. Unimaginable volumes of fuel are used by airplanes and rockets. Thus, should it be surprising that the joint capacity of the repositories in the discussed areas was about 460,000 m^3 of fuel?

The report analysis showed that in these areas there were no measures securing against the contamination of the natural environment by oil derivatives. They were simply poured out on to the ground.

Here, the legal conditions (or, rather, their non-existence) for the presence of the Russian army on Polish territory should be mentioned. Until 1956, there were no agreements regulating the legal status of the Russian army in Poland. The Russians did not have any formal obligation to observe

[36] Ibid., pp. 12–44.
[37] Ibid., pp. 173–82.

any norms related to the protection of the natural environment. On December 17, 1956, in Warsaw an agreement between the then Polish government and the government of the former USSR was concluded. The agreement provided for the legal status of the Russian army temporarily quartering in Poland.[38] The agreement did not provide for protection of the natural environment in the territory occupied by this army. There was only a mention that the structures returned in the future to the Polish party still be usable. Article 8 of the agreement read as follows: "In the case the Russian army leaves the barracks, airports, training fields and testing grounds occupied by it these structures will be returned to the Polish authorities together with the installations and fixtures in a usable condition." This document, as many others from that period, seems to confirm the complete lack of interest in the issue of ecology. The mantra of industrialization, with everything subordinated to military goals, meant there was no place for a more considered approach to the natural environment.[39]

One could therefore say that the military technique and the carelessness of its users were the main causes behind the substantial harm done to the natural environment in those areas occupied by the Russian army in Poland.

The problem of responsibility—both of the military technique creators and its users—takes an important position within the area of technique philosophy. Prominent representatives of this philosophy emphasize the limited responsibility of an individual in relation to the development of the present science and technology. They are of the opinion that an engineer, the creator, and constructor of military technique cannot be responsible for all the effects of its application. The creator is not able to predict all the effects of his work.[40]

Naturally, martial technologies and research in the martial scientific centers can and should serve the environment. The Military University of Technology is a good case in point. Two examples from 2010 are in the

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38 *Journal of Laws* of 1957, No. 29, Item 127. See Resolution to established the United Forces Command States of the Warsaw Pact of Friendship, Cooperation and Mutual Assistance signed in Warsaw on May 15, 1955.

39 J. Jaroń, *Ecology, sozoology, eco-philosophy, eco-ethics, pro-ecological economy* (Warsaw, 1997), pp. 58–60.

40 A. Kiepas, "The Problem of Responsibility in the Context of the Military Technique Development," in Skowronek, Trejnis, eds., *From the History of Education and Development of Technique in the Polish Army*, pp. 23–34.

Department of New Technologies and Chemistry: 1) research on new methods of assessing the level of coal adsorbents used in water and fuel gas cleaning processes; 2) research on the neutralization processes in selected sulfuric organic compounds with the use of modern oxidizing techniques.

The presented examples of applying military technique and technology seem to confirm the thesis that the more dangerous to the environment military techniques are, the less responsible are its creators and users. Hence, the importance of international control of martial technologies.

Presently, the international community undertakes legal actions to protect the natural environment against the testing of mass destructive weapons and against contamination by chemical and biological substances as well as radioactive waste. Research by military scientific centers on new environmental protection technologies should also be noted. While military technique and martial technologies are dangerous, they can turn out to be even more so in the hands of irresponsible people. This is why they should be subject to international control.

From Corruption to Professional Ethics: The Case of the Polish Customs Service

Tomasz Węgiel[1]

Summary: In countries that previously belonged to the Soviet Bloc, the phenomenon of corruption in public services, inherited from Communism, is still a very important problem, which has an enormous influence on the activity and behavior of society. The corruption in public services disturbs economic processes and impacts the perception of government efficiency. Customs services in those ex-communist countries which in 2004 and 2007 became members of the European Union, fought and are still fighting with this phenomenon. The present chapter presents an analysis of some of the aspects of the battle with corruption, namely that of the Polish Customs Service, including the role of professional ethics.

Keywords: corruption, civil service, Customs Service, professional ethics

Changes in the late 1980s and 1990s that took place among those countries previously dependent on the Soviet Union, brought about a profound economic transformation—not to mention political changes—and its essential element was the restoration of economic freedom, including in the area of foreign trade exchange. In most countries, customs control was performed by administrations previously operating under the communist system. Only the customs administrations of the so-called Baltic countries, formerly a part of the Soviet Union, were established from new. This means that the supervision by states and the collection of customs duties and taxes on goods transported across borders were given to services that were organizationally and intellectually prepared to fulfill the variety of somewhat different duties in a centrally planned economy, with a strong emphasis on the control of movement across frontiers of forbidden literature and religious materials. On the basis of the Polish customs administration, which changed the formula of its activities from 1989/1990, I will present some of the problems which accompanied, I believe, the administrations of all countries emerging from Communism towards a contemporary modern customs service, performing

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its tasks upon accession of these countries to the European Union under the rules that were coordinated by its institutions. According to many analyses, one of the major problems facing post-communist countries undergoing the transformation of their customs administrations was corruption.[2] During the twenty years of political and economic changes, the problem became increasingly apparent. Over the years, various systematic attempts to counteract this phenomenon have been made, and finally, it seems, the problem has been significantly reduced.

In the period of the so-called People's Poland (*Polska Ludowa*), the customs administration's activities focused on the control of goods imported and exported by individuals. This emphasis was clearly visible through the existing legal arrangements that divided trade with foreign countries into commercial and non-commercial. The first one, run by the great centers of foreign trade, mostly carried out between fraternal countries, remained virtually beyond the actual control of customs offices. The evidence of the attitude of the customs administration towards state trade was the need to take socialist care over the product, which was enshrined in law. In turn, non-commercial trade implemented by individuals was the only field in which the customs administration's effectiveness and efficiency could be demonstrated. The poor internal market, producing products below Western standards, forced the citizens of the communist bloc to find ways to import goods from abroad; of course, only those who could cross the border were able to buy goods. Hence, colored clothes, items of hygiene, electronic gadgets, and stimulants from Western Europe and the United States were transported in travelers' suitcases and through postal packages. Also, gold, caviar, Armenian cognac, and shoes were transported from Czechoslovakia, East Germany, or the Soviet Union. All these goods passed through the hands of customs officers who, owing to the low traffic at border crossings, could devote a considerable amount of time to inspections, especially since no one made them hurry up. This situation provoked a type of behavior, and thereby incidents, that was not in keeping with the law. Bribery became a common feature on the Polish border (although, of course, similar phenomena occurred in all communist countries). Business with customs officers has also become an element of commonly read literature. Such phenomena are

2 "Corruption in Poland. Review of priority and proposal in interaction against occurrence" [part of a World Bank report], *Prokurator,* No. 3 (2000), p. 28.

characteristic of so-called socialism where limits and restrictions, in access to most goods, represent the reality. Article no. 13 was famous in customs law, under which publications and pornography imported from overseas were confiscated. In any case, already under Communism, an impression of dishonest customs officers spread. It is also important to note that customs officers were officers of a totalitarian country.

Unfavorable opinions of customs officers were further solidified in the confusing time that accompanied the collapse of the centrally planned economy and its transition to a market economy. Certain events such as the liberalizing of the economy that took place while the communist government was still in power, in 1988, could be called pathological. In Poland, the most notorious example was the so-called alcohol affair in 1989, when the import of duty-free alcohol was allowed for several days, and long queues of tankers, designed for the so-called non-commercial trade of alcohol, were stationed on the border, a situation which obviously required the confirmation of customs officers. The only two people recognized as guilty in this affair were the head of the Polish customs officers (formerly the general of the communist militia) and his supervising Minister of Foreign Economic Cooperation. It was the liberalization of trade that caused many people to start looking for earnings in retail trade. The country imported huge quantities of second-hand vehicles that were treated as undervalued, with customs officers turning a blind eye in return for bribes. An additional factor was the low earnings of customs officers in comparison to representatives of other jobs. This rapidly growing movement of people and goods came under the control of 3–4000 customs officers—nearly the same number of customs officers as had formerly existed. There were also new phenomena, not yet known to the customs administration. Companies appeared and vanished, individual cases of smuggling were replaced by the transport of large quantities of goods, including alcohol, cigarettes, or even drugs. It was in the early 1990s that most citizens discovered from personal experience how customs officers worked, which helped to form an opinion about them. Opinion polls were not favorable, however, with the profession being viewed as one of the most corrupt.

However, the legacy of the service, especially in the customs duty, under the communist regime cannot be completely denounced. Among the customs duty officers there was a significant portion of officers of elder

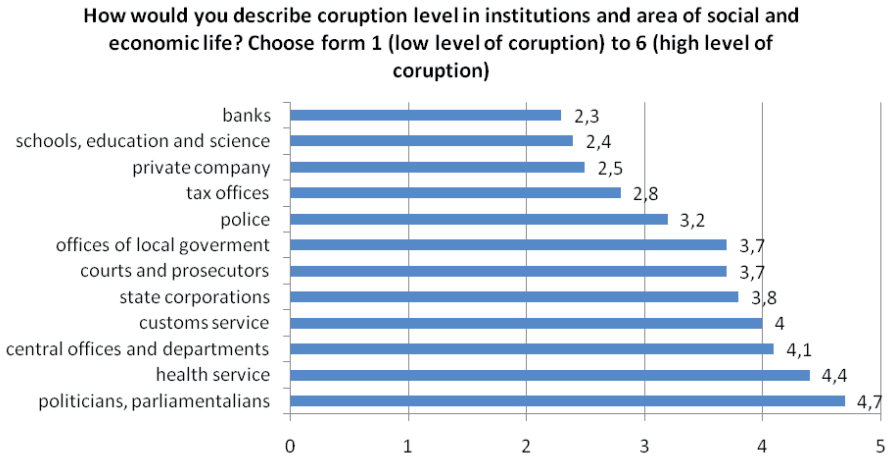
generations, who represented a more professional pre-war ethos. Even nowadays there are widespread stories reporting their accomplishments. Such tradition played a crucial part in creating the professional environment.

The 1990s were a period of enormous transformations. Many organizational changes were introduced (a number of new customs offices were created), and the number of customs officials was increased, to 14,500. New to the service, a younger generation of officers came to characterize the Polish customs service. The majority of the commissioned officers had attained a high level of education. The decisions that unified economic and political approaches with that of the European Union, taken in the early 1990s, demanded some gradual taking over of the community law solutions. At the end of the decade, a customs code modeled on the EU one was introduced, the convention on a Common Transit Procedure was initiated, and the computerization of Polish customs offices embarked upon on a large scale. At that time the threat of corruption was clearly defined: it could affect the functioning of the state (in the year 2000, 32 percent of the budget revenues of the country was money that had passed through the hands of customs officers as duties and taxes levied on imported goods) and the process of integration with the EU. Control institutions pointed out that the operations associated with the customs procedure were often performed individually; additional searches were carried out extremely rarely. The fact that in an investigation of customs offices, devices measuring the weight of transported goods were all damaged and out of order is, without doubt, associated with corruption. There is no ambiguity in this respect—there was no possibility to measure the weight of transported goods. The audit thus proved that there was not a proper system of control over the activities of customs warehouses.[3]

Public opinion regarding the functioning of the customs administration was, therefore, still far from positive. A poll conducted by the Institute of Market and Opinion Research, called PENTOR, indicated that the customs service was still seen by society as a public institution highly vulnerable to corruption.

[3] Information derived from results of the control of the customs administration, General Chamber of Control, Warsaw, 1998, and others.

Fig. 1. Results of the opinion polls on corruption level in institutions.



Source: PENTOR, 2004

Numerous pieces of information and articles on inappropriate activities appeared in the media showing the incompetence or simply the increase of corruption among customs officers.[4] Informative activities undertaken by the customs service aimed at the presentation of its achievements, and thereby also to diminish the negative image of the service, succeeded unfortunately only to a limited extent. The stereotype of the "unfair" customs officer became deeply rooted in people's minds. What is more, even those people that had influence over shaping public opinion resorted to such stereotypes. The media, for instance, published price lists for specific services provided by corrupt customs officials. One could learn how much money a customs officer demanded for the transit of a truck full of alcohol (approximately 50,000 DM) or for smuggling people (about 500 DM p. c). There were also occasional financial affairs or scandals on a big scale, as well as cases involving undervalued cars where customs officers were prone to accepting a low price for the vehicle. Public opinion was also shaped by strange incidents such as the suicide of the director of the customs office in Kuźnica, which took place on the border with Belarus in 1993. Another controversial event was connected with the head of the Polish customs officers (1993–95),

4 "Customs Mafia," *Wprost*, March 3, 2001.

who had supposedly committed suicide by shooting himself three times in the stomach with a long gun.

It was not until the late 1990s that the government agreed to the need to actively fight against corruption by the customs administration, through punishing those deemed corrupt. In the year 2000, 42 cases of dismissal were reported due to a breach of duties. This figure is twice as high as that in 1998. The number of disciplinary proceedings initiated against employees of the customs administration (in the year 2000 it equaled 270 cases, and was almost three times higher than in 1998) was also increasing. The largest share of these proceedings was connected with employee punishment (in 1998 it was equal to 64.9 percent of all decisions, 43.2 percent in 1999, and 62.1 percent in 2000). Serious concerns may be raised in regard to the increase of criminal cases initiated against customs officers in Poland (in 1999 there was an increase of 119.2 percent; in 2000 167.7 percent).[5]

The cases presented were associated with strange incidents and crimes committed by employees of the customs administration. These were mainly related to the acceptance of financial benefits that were viewed as being criminal and corrupt; but they only paint a partial picture of the situation that existed in the country. Practically from the very beginning of 1989/1990, there was an increase in accusations of corruption against persons holding state positions. The number of cases grew from 337 in 1993, 394 in 1995, 537 in 1997, 1014 in 1999, to 1890 in 2001. It should also be stressed that with all crime statistics there is also a number of unreported crimes; and in the case of corruption it is virtually inestimable.[6]

To counter corruption in the customs administration, the activities of a series of anti-corruption forensic services were intensified in the late 1990s. A new institution—Customs Inspectorate—was also created in 1997. Its main tasks were to focus on an active combat of smuggling and corruption among customs officers using the techniques of operational work.

In addition to police actions, organizational, technical, and legal approaches such as creating automated systems for segregating the goods to customs control, the so-called pipelined schemes of customs checking

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5 Summary of customs administration's activities in 1998. GUC (General Customs Service), Warsaw, 1999, p. 20, Statistical Compendium of Customs Administration. Last five years of activities (1996–2000) (Warsaw: GUC, 2001).

6 G. Mosiej, "The signs of corruption in custom administration's activities," *The Customs Law and Tax Law Monitor*, No. 12 (2005).

with systems of "many eyes," intensification of official supervision, and the development of control techniques, etc., there was a great need to also improve the motivation of officers by boosting morale. However, the necessity of establishing a standard of ethics in the profession of customs officers was not a product of the 1990s. In addition to law regulations concerning procedures in the service, there appeared other solutions—a set of extra-legal norms that referred to human morality. Even before World War II such solutions had existed in the sphere of Polish duty. Apart from discussions about the need for professional ethics, and the arguments of their opponents and supporters, it should be noted that in many professions they had functioned already for years. A wave of public discussions in the 1990s regarding the professional ethos also reached customs officials. The process of creating professional ethics for the Customs Service was affected by a set of external and internal factors.

External factors related primarily to international conditions. The Customs Cooperation Council operating since the 1940s (from 1994 bearing the name of the World Customs Organization) formulated in 1993 the so called Declaration of Arushi. It states that "corrupted duty reduces its capacity to fulfill its proper mission by the reduction of state revenues, by the lack of effectiveness in combating illegal trade and by stopping legally established trade as well as economic development." It was recognized also that "the desire to maintain not corrupted duty should be an absolute priority of the government and the highest political and administrative levels should be involved." Besides, as has already been mentioned, organizational and legal steps, actions aiming at instilling loyalty among employees and pride at work associated with duty, "the team spirit," and the desire to cooperate in projects aiming at reducing situations provoking corruption, must be taken. Officers should be given a sort of code containing the rules of conduct.

The guidelines of the European Commission (XXI General Directorate of Customs and Indirect Taxation) created a similar document. These were called Blueprints and were connected with the pre-accession strategy for customs services of the countries aspiring to membership in the European Union. It was recorded there that "the policy of ethics should be developed at the customs administration. It would treat issues relevant in terms of professional and personal conduct, determine the necessary standards for all workers and would be fully supported by top management." Also, there

was the need to develop and distribute an Ethical Code (*Kodeks Etyczny*) to employees (or any similar document) setting out the principles of ethical policy, and finally, "ethical policy puts emphasis on respect for workers, rights, fairness, impartiality and fair proceeding under all circumstances." Many countries of Central and Eastern Europe (including the Czech Republic, Slovakia, Macedonia) created such a document and then disseminated it among their customs officers.

These issues were reflected in negotiations, led in our country, on EU membership in the domain of the customs union. Since Poland was to become part of the community customs territory, and the Polish customs duties were to be collected on behalf of and to the common fund of the Union, the efficiency of such services should grow; this growth, however, as is clearly seen in other countries, is connected with the acceptance and fulfillment of professional ethics. It is beyond doubt that it is important in the process of integration and functioning within the EU. Hence, the condition for concluding the negotiations in the area of the customs union was to create and develop and implement the principles of professional ethics vis-à-vis customs offices. In this respect, the external factor affecting the creation and implementation of the document was of great political significance.

In turn, the internal dimension was based on existing and created legislation. In accordance with Article 32 of the Polish Constitution, everyone has the right to equality of treatment by public authorities. Similarly, Article 30 formulates the principle that "the inherent and inalienable dignity of human freedom is the source of human and civil rights"; it is inviolable, and the respect for this is the duty of public authorities. Also, the law on Customs Service, created in the late 1990s and finally passed in 1999, which again, in a new way, defined the nature of the services of customs officers, has introduced a number of provisions and rules relating to issues directly related to the sphere of ethics. This act, created with the extensive involvement of the professional environment, defined in Article 2 that the customs officer may be a person who, among other things, has "a good reputation." Also, the text of the vow, spoken upon joining the service, directly relates to the ethical context. The vow is as follows: being aware of the responsibilities of the customs official, I promise to faithfully serve the Polish Republic, to follow the rules of the Polish Constitution, to honestly perform my duties and protect the good name of the service, its honor and dignity of the

customs officer. Other state services also had similar documents formulating ethical principles. For example, in 1999, such documents were created for the police, border guard, and the civil service.

Prepared in the years 1998–99, with the official document approved by the government (the Council of Ministers) in October 1999, "the Strategy of the Polish customs administration until 2002" also referred to the problems being discussed. Among others, thanks to the existence of the Code of Ethics, it was supposed to pursue and realize the first and most important of all strategic goals—the adaptation of the customs administration to the requirements dictated by EU membership. As a result of such conditions, in autumn 1999, a Group of customs officers, representing all 19 Polish customs offices, was created. Its task was to establish an ethical code and to elaborate methods of its implementation, and to prepare and conduct trainings in ethics, particularly for new officers joining the Customs Service. The result of a series of meetings of the Group, which lasted till September 2000, was the formulation of a document entitled "Code of Ethics of the Customs Service." The theoretical content of the Code, presented in 15 standards, divided into four areas, recognized the fundamental principles of professional ethics which, according to the authors, should generally apply to customs officers. The Code was adopted during the celebrations of the Customs Service (September 21, 2000) in the presence of the representatives of the Customs Service, as well as other services and government administrations. In addition to the Code of Ethics, other documents with the aim of establishing procedures for the implementation of professional ethics in the Customs Service were created. An ethics training module was devised so as to conduct basic courses for customs officers joining the service. It included a 12-hour block of training aimed at heightening the awareness of ethical problems through, for example, the explanation of tasks and the role of ethics, presentation of the most important ethical positions, and setting out knowledge of legal and moral standards as well as manners. This block of training provided general basic skills for handling ethical concepts, and enriched the listener in a conceptual foundation necessary for the proper understanding and verbalizing of ethical issues understood intuitively. Next, the program introduced the concept of professional ethics, the problem of corruption, methods to prevent it, tried to draw the image of an ideal customs officer through workshops, and discussed the Code of Ethics. Another result was

the brochure entitled *Ethics of the officer of the Customs Service – a practical guide*. This publication constitutes excellent preparatory material for trainers on the course of ethics in primary classes; it includes exemplary cases, systemize the concepts and attempts to establish principles of conduct for customs officers. This is the first attempt, in the history of Polish duty, to present the problem as a whole in a comprehensive way, and its role is to create a kind of map to facilitate orientation in moral issues connected with the profession of a customs officer, furnishing basic knowledge, even the image of what professional morality is, on how important social and professional honesty is.

The question arises to what extent the Code of Ethics will fulfill its role? Will it only represent a particular obligation that fulfilled the formal requirements of the European Union in preparation for accession, or does it signify a clear departure from the corruption of the 1990s? The authors of the Code of Ethics saw the need for its functioning in two main areas. The first one was in a praxeological aspect, closely related to the theme of the performance of the Customs Service. The second one involved a moral dimension, with a whole range of conditions relating to the sphere of ethics.

It is the critical opinion, previously discussed, concerning the quality of Polish Customs Service that deserves attention in the first place. Without any doubt, the negative image has begun to be reversed, but only to a certain and inadequate extent. Except for the necessary activities concerning Public Relations, the procedures profoundly limiting the mentioned phenomena were introduced and developed. Thus, the Code of Ethics for customs officers served as a tool to facilitate the elimination of negative phenomena in the Service; it is noteworthy that this was not a repressive tool. Indeed, it allowed human attitudes to be shaped, without which any regulations prohibiting or mandating a specific procedure would not work or be very difficult to achieve. There is no need to prove that legal solutions in themselves (though there is the possibility to undertake certain initiatives here), the development of operative work or punishing only the passive part of corruption, do not eliminate negative phenomena. To a limited extent, they also influence the nature of the relationship binding the customs officer with the customer's duty. It is impossible to formally state the personal culture, the respect for human dignity, to avoid any discrimination in solving the cases. These categories must be due to an internal employee's beliefs,

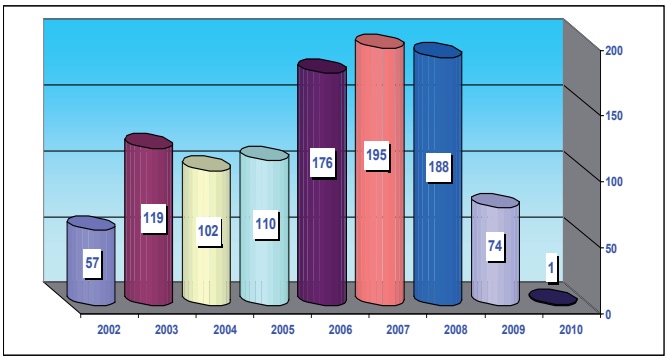
which will be the opinion of the formation of professional environment. Thus, if the majority of professional groups accept the rules resulting from the Code of Ethics, the quality of services provided by customs officers will be improved. Apart from meanings, knowledge, and experience, it is also the way the officer performs his duties that has a huge impact.

The second area is related to the moral dimension. In this respect, the Code of Ethics undoubtedly helped to shape the perceptions of moral issues through raising the awareness of actions undertaken by individual officers in the good-bad system. Regardless of what views and approaches they represented vis-à-vis religious items (there was Christianity in Poland), and whether they represented a typical utilitarian or pragmatic approach, in general, they used a liberal ethic. Consequently, many of them felt, and still feel, the need to continuously improve their personalities. Even where this is not the case, formulating ethical rules could be a motivation for greater reflection on behavior. By drawing attention to problems, unnoticed in everyday life, and avoiding conflict of interest between private business and official administration, many customs officers are able to observe their own behavior in this context, and consequently modify it. Another important element was to determine moral standards for the profession. No one can say for certain whether an officer accepts the Code of Ethics during training using active methods of communication, or if he/she is acquainted with the standards of the document. Consequently, the principles of the Code are intended to permeate, in a more subtle manner, the normal, everyday work of customs officers.

Over the following decade, an active fight against corruption in the Polish Customs Service began. This affected practically the entire organization. In 2004, the police detained the director of a Board of Customs and a number of managers at different levels within regional institutions. In total, more than 40 officers of the Chamber were arrested on suspicion of corruption while controlling the transport of clothes from the Far East. Almost all customs staff (dozens of people) were apprehended on Poland's eastern border. Not only were those arrested accused of corruption, but they were also accused of participating in organized criminal activities; that is, of illegally accepting bribes that were shared among customs officers according to their position in the customs hierarchy. The largest number of customs officers were arrested in the period 2006–08, which was certainly on account

of increased pressure on the part of the political authorities at the time (Fig. 2). However, it was primarily the management of the Customs Service that inspired these actions—and in fact initiated them. Much information on cases of corruption came from customer officers themselves, reporting their corrupt colleagues. This was an expression of their disapproval against such practices.

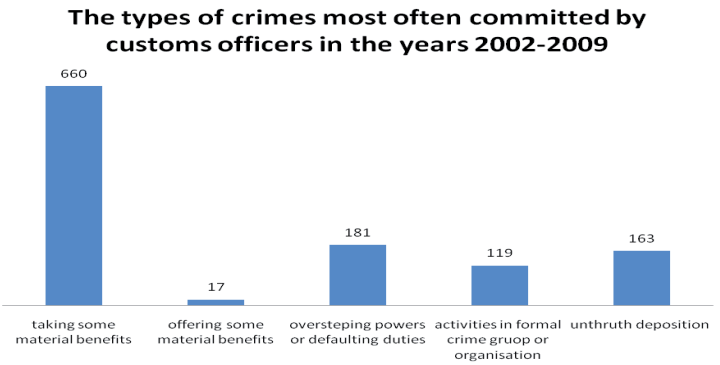
Fig. 2. Number of Polish customs officers accused of corruption, 2002–09



Source: Department of Customs Control and Excise, Ministry of Finance

Nearly eight percent of all customs officers were accused of corruption. Out of a study of 1000 customs officers in 2002–09, 660 of them were connected with bribery (Fig. 3).

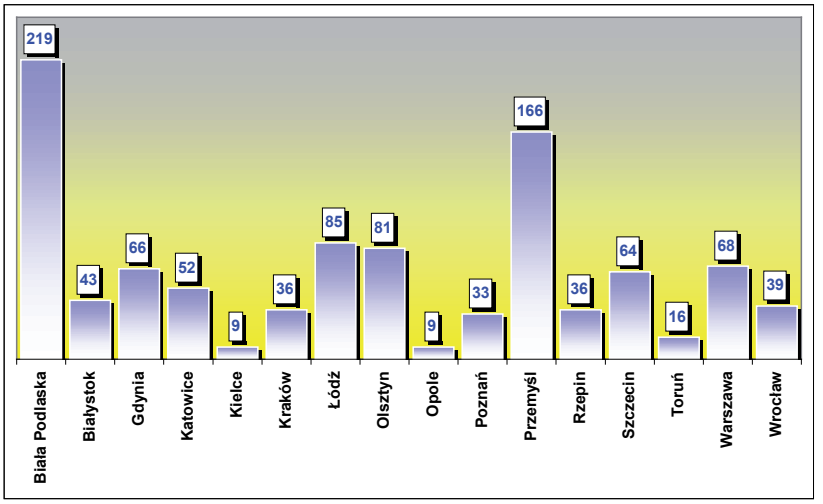
Fig. 3. The types of crimes most often committed by customs officers, 2002–09



Source: Department of Customs and Excise Control, Ministry of Finance, Warsaw 2010.

In response to the corruption found among customs officers, many were taken to court and dismissed from the Customs Service. As previously mentioned, cases mostly concerned those customs officers operating on the borders with Ukraine, Belarus, and Russia (Customs Chamber in Biała Podlaska, Przemysl and Olsztyn – Fig. 4).

Fig. 4. Number of complaints against customs officers by Board, 2002–09



Source: Department of Customs Control and Excise, Ministry of Finance, Warsaw 2010

Most complaints related to the accepting of small amounts of money as bribes; in the majority of cases this was money given by persons crossing the border without being checked. In thus doing, it also mean that cartons of cigarettes could be smuggled into Poland without tax being paid. This significantly affected the work of border offices. Customs officers working there could think that they would be accused of corruption too. That is why a great number of them, so as to avoid accusations, decided to go on sick leave. This situation provoked mass protests by customs officers where, in the beginning of 2008 in Dorohusk, a staff of about 150 people were arrested. It cannot be argued that all the protestors were simply afraid of being arrested. Apart from arrests, officers, upon Poland's accession to the EU, were also transferred on a large scale from the western and southern

borders of the country to the eastern one (approx. 1500 people representing 10 percent of total man power). Also, disgruntlement was connected to the low salaries and lack of social security.

One should also add that due to the slowness of the Polish justice system—corruption cases concerning customs officers are complicated because of the mutual interest in leaving the matter unrecognized (complaints are often based on the testimony of witnesses, including officers showing remorse for their actions)—no accusations were formulated against a number of customs officers, and many cases still remain in court. In most cases, however, the accused customs officers were dismissed from their posts.

In sum, it must be recognized that there has been some success in the twenty-year struggle of the Customs Service to come to terms with corruption. As a result of action on the part of the police, political factors, and the changing of the Customs Service authorities, as well as internal organizational processes, a Code of Ethics has been created and popularized. The Code was in itself, or so it seems, part of a raft of anti-corruption measures aimed at consolidating appropriate behavioral practices among customs officers. The number of new accusations against officers has diminished. If this is taken to indicate that the scale of corruption has reduced, then this represents a significant departure from the situation of the early 1990s.

It seems that the intensification of corruption, its identification, and, finally, combating the threat of corruption, is a process fairly typical for those countries of Central and Eastern Europe that two decades ago were in the grip of communist ideology. This process was apparent in these countries at different intensities, while in some countries it is still present. This notwithstanding, the elimination of corruption in the customs administrations of these countries is influenced by both external factors (the pressure of international institutions, mainly the EU), and local political forces identifying social expectations, reducing informal phenomena, or even the opinions and aspirations of the greater number of customs officers themselves concerned with upholding a good image of the Customs Service.

The last twenty years have brought about profound economic transformation, political changes, and modifications in customs administrations. One of the major problems faced in the transformation of the customs administration was corruption. This problem has been identified and named. As a result of various attempts to counteract this phenomenon, which were taken

up systematically, the problem has been reduced. Under Communism, the situation "encouraged" behaviors and incidents that collided with the law. Next, the confusion amidst the collapse of the centrally planned economy served to consolidate negative opinions about the Customs Service. The 1990s witnessed changes in Polish duty—introducing a new customs code, initiation of the convention on a Common Transit Procedure, the computerization of customs offices, creating professional ethics. Today it can be said that the efficiency of customs officers is connected with the fulfillment of professional ethics.

Disinfection of Drinking Water and Genotoxic Risk

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Summary: The outcomes of measuring the concentration of by-products of ClO_2 disinfection of drinking water, which was carried out with the help of gas chromatography with mass detector, are presented in this chapter. The situation was monitored in a selected region of the Czech Republic. The emphasis was laid on the content of trihalogenmethanes which are likely carcinomas and have a potential impact on the health of the exposed population. Genotoxic risks were calculated for toddlers up to one year of age, children from one to 18 years, and adults. Ingestion, inhalation, and dermal contact were considered as the pathways of exposure. Excess cancer risk was assessed while assuming additive effect of trihalogenmethanes and exposure pathways under consideration. The total excess lifetime cancer risk was expressed either as a sum over the three chosen age groups or as a weighted average considering the time of exposure in each age category.

Introduction

The sanitary treatment of drinking water through disinfection may produce by-products, which have negative impacts on the quality of drinking water. Such by-products may occur due to the interaction of oxidation agents with organic substances, which are naturally present also in ground waters. Trihalogenmethanes, including chloroform ($CHCl_3$), bromdichloromethane ($CHBrCl_2$), dibromchloromethane ($CHBr_2Cl$), and bromoform ($CHBr_3$) are the dominant products of the reaction of disinfection means on chlorine base with organic precursors.

Trihalogenmethanes show hepatotoxic and nephrotoxic effects. Carcinogenic, mutagenic, teratogenic, and embryotoxic effects are not excluded either. Therefore their contents in water have to be carefully monitored and in case of higher concentrations both non-carcinogenic and genotoxic risks have to be assessed for the exposed population.

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Theoretical Part

The disinfection by strong oxidants, e.g., by chlorination and ozonization, is a common practice in the treatment of drinking water with the aim to inactivate pathogenes and provide microbial security of water. In the 1970s it was found out that toxic and potentially carcinogenic by-products are produced during disinfection.[4] It is caused by the reaction of oxidation agent with organic microcontamination, which is a natural part of not only surface, but also ground waters.[5] At the same time, during the distribution of drinking water there is a deposition of particles of various origins in the areas of the distribution network with favourable hydraulic conditions. Such particles are mostly of organic origin and the analysis of organic deposits proved that the relevant part of organic water contamination are humin acids and other alkylderivatives with high content of $–CH_3$ and $–CH_2CH_3$ functional groups. The quantitative data on the composition of organic substances in the distribution water system are stated by Sly, et al.[6] Algae, their metabolites and the metabolites of microflora present in water and distribution network may also produce, to a lesser extent, disinfection by-products (DBPs).

More than 500 types of halogenderivatives, generally marked as DBPs, were detected by studying the chlorination of raw water containing humin acids. The most significant DBPs identified in water are halogenacetic acids, halogenacetonitriles, chloral hydrate (2,2,2-trichloro-1,1-ethanediol), chlorine cyan, chlorophenols, bromates, and last but not least, trihalogenmethanes (THMs).[7]

The reaction rate and the spectrum of produced DBPs depend mainly on the type of disinfection agent, its dose, concentration of precursors, holding time, temperature and pH.[8] The common disinfection agents used in the

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4 J. J. Rook, "Formation of Haloforms During Chlorination of Natural Waters," *Water Treatment and Examination*, Vol. 23, No. 2 (1974), pp. 234–43.

5 P. C. Singer, "Control of Disinfection By-Products in Drinking Water," *Journal of Environmental Engineering*, Vol. 120, No. 4 (1994), pp. 727–44.

6 L. I. Sly, M. C. Hodgkinson and V. Arunpairojana, "Deposition of Manganese in a Drinking Water Distribution System," *Applied and Environmental Microbiology*, Vol. 56, No. 3 (1990), pp. 628–39.

7 WHO. *Disinfectants and Disinfection By-Products: Session Objectives World Health Organization Seminar Pack for Drinking Water Quality* (2002), http://www.who.int/entity/water_sanitation_health/dwq/S04.pdf(accessed March 6, 2010)

8 H. Whitaker, et al., "Description of Trihalomethane Levels in Three United Kingdom Water Suppliers." *Journal of Exposure Analysis and Environmental Epidemiology*, Vol.

Czech Republic are chlorine gas and, to lesser extent, NaClO, ClO_2, weaker chloramine, and the combination of chlorination and ozonization. The application of chlorine is accompanied by the least desirable side-effects and the highest risks when considering the aspect of DBPs production. The use of weaker disinfection means in comparison with chlorine gas is connected with the necessity to provide standard bacteriological quality of drinking water. Ozone is increasingly applied in the world for its high efficiency against resistant pathogenes such as oocysts of *Cryptosporidium*, and lower inclination to the production of DBPs. However, all disinfection agents are oxidants producing, to a lesser or larger extent, DBPs.[9]

THMs make up to 90 percent of DBPs during the chlorination of water. $CHCl_3$ is a dominant component of THMs, while other THMs, i.e., $CHBr_3$, $CHBrCl_2$, and $CHBr_2Cl$ are present in lower concentrations. The THMs are received by inhalation, ingestion, and absorption and have toxic effects. In case of a long-term exposure they damage kidneys, the liver, and thyroid gland. They also have a certain degree of carcinogenity according to the U.S. Environment Protection Agency (EPA) and are classified, except for $CHBr_2Cl$, into the B2 group as probably carcinogenic to humans. $CHBr_2Cl$ is in the C group of substances classified as possibly carcinogenic to humans.[10] THMs are suspected of having negative reproduction impacts, e.g., on infants' lower birth weights, although this fact has not been sufficiently proved.[11] For the above mentioned reasons the THMs represent potential risks to the exposed population even in lower concentrations in drinking water and deserve a more detailed analysis.

The international limits for THMs range from 25–250 $\mu g\ dm^{-3}$[6]. The limit of THMs sum in drinking water is 100 $\mu g\ dm^{-3}$ in the Czech Republic and complies with the EU Directive.[12] However, it is necessary to emphasize that

13, No. 1 (2003), pp. 17–23; WHO. *Guidelines for Drinking-Water Quality. Vol. 1: Recommendations* (Geneva: WHO, 2006).

9 T. P. Bonacquisti, "A Drinking Water Utility's Perspective on Bromide, Bromate, and Ozonation," *Toxicology*, Vol. 221, Nos. 2–3 (2006), pp. 145–48.

10 U.S. Environment Protection Agency. Integrated Risk Information System (IRIS), Database of Toxicological Parameters for Human Health, http://www.epa.gov/iris/subst (accessed March 6, 2010).

11 M. Nieuwenhuijsen, et al., "Chlorination Disinfection Byproducts in Water and Their Association with Adverse Reproductive Outcomes: A Review," *Occupational and Environmental Medicine*, Vol. 57, No. 2 (2000), pp. 73–85.

12 The Council of the European Union. *Council Directive 98/83/EC on the Quality of Water Intended for Human Consumption* (Brussels: CEU, 1998).

the risk resulting from the insufficient inactivation of pathogens in drinking water is of higher-order priority in comparison with the health risk resulting from the presence of DBPs produced through the interaction of disinfection agent and organic precursor.[6]

The removal of DBPs by common water-treatment procedures, such as adsorption on activated charcoal powder or granules and air stripping, is not sufficiently effective. Therefore, the emphasis is laid either on the removal of precursors or the application of disinfection agents other than chlorine in the water-supply practice. Riverbank filtration is of considerable significance in the process of providing the microbial security and eliminating the THMs in less developed countries in which microbially contaminated water is used as a source of drinking water.[13]

Applied Methods and Devices

The sampling of drinking water was carried out in compliance with standards.[14] The concentration of THMs in drinking water was determined by the liquid-gas extraction technology with the help of the TriPlus static head space dosing device and the Trace GC Ultra gas chromatograph with the Trace DSQ mass detector, produced by Thermoelectron Corporation. The limit of determination for individual THMs was 0.1 μg dm^{-3}.

The assessment of genotoxic risks was carried out in compliance with the valid Czech guidelines and instructions,[15] which are based on the method proposed by the U.S. Environmental Protection Agency.[16] The dimensionless quantity of individual excess cancer risk (*ECR*) showing the increase over the general ECR average was used for the risk description. The individual values of $ECR_{EP,A,S}$, for the assessed exposure pathways (*EP*), age periods (*A*), and contaminants (*S*) were calculated according to the relation (1), where $ADD_{EP,A,S}$ [μg kg^{-1} day^{-1}] represents the corresponding average

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13 W. J. Weiss, et al., "Bank Filtration: Fate of DBP Precursors and Selected Microorganisms," *Journal of American Water Works Association*, Vol. 95, No. 10 (2003), pp. 68–81.

14 ČSN EN ISO 5667–3. *Water Quality-Sampling-Guidance for the Preservation of Samples and Handling* (Prague: Agency for Technical Standardization, Metrology and State Quality Control, 2004).

15 Ministry of Environment, "Metodical Instructions No 12 for the Risk Analysis of Contaminated Area," *MoE Bulletin*, Vol. 15 (2005), Article 9.

16 U.S. Environment Protection Agency, *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual. Interim Final*. EPA/5440/1-89/002 (Washington, D.C.: Environment Protection Agency, 1989).

daily dose, and $CSF_{EP,S}$ [kg day μg^{-1}] is the carcinogenity slope factor for the assessed exposure pathway *EP* and a contaminant *S*.

$$(1) \quad ECR_{EP,A,S} = 1 - e^{(-ADD_{EP,A,S} \times CSF_{EP,S})}$$

It is clear from the relation (1), that the necessary prerequisite for assessing the risk of contaminants without threshold effect is the knowledge of carcinogenity slope factor $CSF_{EP,S}$. The mentioned values may be taken from the U.S. EPA database.[8] If the $CSF_{EP,S}$ value is not published, the contribution of $ECR_{EP,A,S}$ for the assessed exposure pathway, age period, and contaminant may be assessed by substituting it for another exposure pathway for which the value of $CSF_{EP,S}$ is known and at the same time the ratio of both $ECR_{EP,A,S}$ exposure pathways is assessed. When it is not possible to proceed in this way it is recommended to assess $ECR_{EP,A,S}$ qualitatively.[14]

The second prerequisite for quantifying the genotoxic risk is the assessment of average daily dose $ADD_{EP,A,S}$ for the assessed exposure pathway *EP*, age category *A*, and contaminant *S*. The procedure for determining the numerical value of $ADD_{EP,A,S}$ is specified, together with the necessary exposure factors for the exposure pathways and age categories, in the national methodical instructions[13] and the U.S. EPA materials[1,4]

The final value of the individual excess lifetime cancer risk (*ELCR*) is given by the sum of contributions of exposure pathways for each contaminant, the effects of all THMs contaminants and also the assessment of contributions in different age categories. There is a consensus in the world that if the acceptable limit for the individual genotoxic risk is $ELCR \leq 10^{-6}$. If $ELCR \in (10^{-6}; 10^{-4}$, the risk is tolerable. If $ELCR > 10^{-4}$, the risk is unacceptable and it is necessary either to implement corrective measures immediately, or to stop the particular activity.

Outcomes and Discussion

Drinking water is supplied into the group water system of the assessed region in the Czech Republic with the number of inhabitants approx. $N = 4x10^5$ from two aquifers. There are two siphon mains, which consist of drilled wells 12–21 m deep and water is then supplied into the $5x10^3$ m^3 group water tank. The water tank serves for the fixing of the hydraulic situation in the siphons and also as an operationally essential accumulation for controlling

the water intake from both water withdrawal areas. Permission for water intake from both intake structures is 1.08 $m^3 s^{-1}$. The ground water is mixed with approx. 10 percent of surface water treated through the technology of preionization, coagulation, floculation, sedimentation, and filtration. The Origin of water guarantees its constant quality complying with the requirements of the Directive. Before being supplied into the distribution network the water is subject to homogenization, aggregation, sedimentation, filtration, and finally disinfection, with ClO_2 produced directly in water according to the equation (2). Thus it is necessary, besides other things, to check the remains of unhealthy chlorite, which shows also system-toxic effects.

$$(2) \quad 2\,ClO_2^- + Cl_2 = 2\,ClO_2 + 2Cl^-$$

The assessed risk factor was the group of four THMs, namely $CHCl_3$, $CHBrCl_2$, $CHBr_2Cl$, and $CHBr_3$, which are present in water after disinfection as contaminants *S*. The drinking water was taken at five sampling locations in order to determine the concentration of contaminants and cover the assessed region appropriately. The findings are recorded in Table 1.

Table 1. The concentrations of THMs (neg. means the absence of detector response)

Type of THM	Unit	Sampling Location					Uncertainty [%]
		A	B	C	D	E	
$CHCl_3$	μg dm^{-3}	0.5	1.1	0.3	< 0.1	1.7	± 35
$CHBrCl_2$	μg dm^{-3}	0.3	1.6	0.2	neg.	0.4	± 35
$CHBr_2Cl$	μg dm^{-3}	< 0.1	1.9	< 0.1	neg.	0.1	± 35
$CHBr_3$	μg dm^{-3}	neg.	0.3	neg.	neg.	neg.	± 35
Sum of THMs concentrations	μg dm^{-3}	0.9	4.9	0.6	0.1	2.2	± 35

It is clear from Table 1 that the location B used for the quantification of genotoxic risk is the most problematic from the aspect of summary content of THMs in water. The following exposure pathways (*EP*) were considered: ingestion *EP* = *ING*, inhalation *EP* = *INH*, and dermal contact *EP* = *DC*. The risk was assessed for three consequential life periods *A*, which respect

paediatric practice, i.e., toddlers up to one year of age, children from one to 18, and adults from 18 to 70 years old.

The carcinogenity slope factors $CSF_{EP,S}$ [kg day μg^{-1}] for individual exposure pathways *EP* and contaminants *S* were taken from the U.S. EPA materials[8, 15] and are shown in Table 2.

Table 2. The Carcinogenity Slope Factors $CSF_{EP,S}$

Exposure pathway	Unit	$CHCl_3$	$CHBrCl_2$	$CHBr_2Cl$	$CHBr_3$
Ingestion $CSF_{ING,S}$	kg day μg^{-1}	6.1E-06	6.2E-05	8.4E-05	7.9E-06
Inhalation $CSF_{INH,S}$	kg day μg^{-1}	8.1E-05	-	-	3.9E-06
Dermal contact $CSF_{DC,S}$	kg day μg^{-1}	3.1E-05	-	-	-

The average daily doses $ADD_{EP,A,S}$ [μg kg^{-1} day^{-1}] for the assessed exposure pathway *EP*, the age period *A* and the contaminant *S* were calculated for ingestion according to the equation (3), for inhalation according to the equation (4) and for dermal contact according to the equation (5).

$$(3) \quad ADD_{ING,A,S} = c_{w,s} \times IR_{ING,A} \times EF \times ED_A \times BW_A^{-1} \times AT_A^{-1}$$

$$(4) \quad ADD_{INH,A,S} = c_{a,s} \times IR_{INH,A} \times ET_A \times EF \times ED_A \times BW_A^{-1} \times AT_A^{-1}$$

$$(5) \quad ADD_{DC,A,S} = c_{w,s} \times SA_A \times K_{p,A,S} \times ET_A \times EF \times ED_A \times C_F \times BW_A^{-1} \times AT_A^{-1}$$

where $c_{w,S}$ [μg dm^{-3}] represents the average concentration of contaminant in water acquired through measurement, $c_{a,S}$ [mg m^{-3}] is the concentration of contaminant in air, $IR_{ING,A}$ [dm^3 day^{-1}] is the daily rate of consumed water, *IRINH,A* [m^3 h^{-1}] is the rate of air inhaled per hour, ET_A [h den^{-1}] is the exposure time, SA_A [cm^2] is the skin area which is in contact with contaminated water, $K_{p,A,S}$ [cm h^{-1}] is the coefficient of skin permeability, $C_F = 10^{-3}$ dm^3 cm^{-3} is the cm^3 to dm^{3}conversion factor, *EF* [day year^{-1}] is the exposure frequency, ED_A [year] is the exposure duration, BW_A [kg] is the body weight of population, and finally AT_A [day] is the time during which the concentration of contaminant $c_{w,S}$ or $c_{a,S}$ may be considered constant. The concentration $c_{a,S}$ can be expressed with the help of concentration $c_{w,S}$ by the relation (6), where

f represents the fraction of releasable contaminant, Q [$dm^3\ h^{-1}$] is the water flow, t_A [h] is the showering time, and V [m^3] is the volume of bathroom.

$$(6) \quad c_{a,S} = c_{w,s} \times f \times Q \times t_A \times V^{-1} \times 2^{-1}$$

The following principles were followed for determining the exposure scenarios of carcinogenic effects of THMs and the calculation of average daily doses $ADD_{EP,A,S}$.

a. The exposure factors were either taken from the methodical instructions13,14 or estimated in case the data were absent.
b. For the calculation of exposures through inhalation it was not feasible to express numerically the values of individual THMs backgrounds in the "indoor" air, where THMs are released during an arbitrary manipulation with water with the free water level being in contact with the air. In order to partially compensate for such an effect, the exchange of air was not considered during the time the persons stayed in the bathroom.
c. As the carcinogenity slope factor for dermal contact $CSF_{DC,S}$ was absent and the $CSF_{INH,S}$ was known, the excess lifetime cancer risk caused by dermal contact was considered as being of one third of risk caused by inhalation pathway, i.e., $ECR_{INH,A,S} = 3 \times ECR_{DC,A,S}$, which is in compliance with the recommendation of the U.S EPA[14].
d. As the carcinogenity slope factors both for inhalation $CSF_{INH,S}$ and dermal contact $CSF_{DC,S}$ were absent, the cancer risk caused by both inhalation and dermal contact was considered equal to the cancer risk caused by ingestion, i.e., $ECR_{INH+DC,A,S} = ECR_{ING,A,S}$, again in compliance with the recommendation of the U.S EPA.
e. The calculated values of average daily doses $ADD_{EP,A,S}$ and a genotoxic risk expressed in the form of age, in Table 4 for children from one to 18 years and in Table 5 for the population of adults from 18 to 70 years old.

At the same time in each Table 3–5 of the selected age groups A there are presented the values of summary genotoxic risk for individual ECR

$(\sum ECR_{EP})_A$ and analogical values for identified THMs $(\sum ECR_S)_A$. The applied procedure assumes the additive effects of both individual THMs and the pathways under consideration. Finally the Tables 3–5 show the value of $(\sum ECR_{EP,S})_A$ in bold type, including all the considered exposure pathways and contaminants, given by the equation (7).

$$(7) \quad (\sum ECR_{EP,S})_A = (\sum ECR_S)_A + (\sum ECR_S)_A$$

The final value of *ELCR* over the general average of *ELCR* was calculated as a simple sum $ELCR_{SUM}$ through the three selected age groups A according to the equation (8), or by the weighing average $ELCR_{WEIGHT}$ according to the relation (9), which considers the length of exposure in each of three age groups.

Table 3. Average daily doses $ADD_{EP,S}$, excess cancer risk $ECR_{EP,S}$ and the values of summary risks for toddlers up to 1 year of age

Parameter	Unit	$CHCl_3$	$CHBrCl_2$	$CHBr_2Cl$	$CHBr_3$	$\sum ECR_{EP}$
ADD_{ING}	μg kg^{-1} day^{-1}	6.72E-02	9.78E-02	1.16E-01	1.83E-02	
ADD_{INH}	μg kg^{-1} day^{-1}	3.34E-02	4.85E-02	5.76E-02	9.10E-03	
ADD_{DC}	μg kg^{-1} day^{-1}	6.73E-03	9.79E-03	1.16E-02	1.83E-03	
ECR_{ING}	non-dimensional	4.10E-07	6.06E-06	9.74E-06	1.45E-07	1.64E-05
ECR_{INH}	non-dimensional	2.71E-06	6.06E-06	9.74E-06	3.55E-08	1.88E-05
ECR_{DC}	non-dimensional	2.09E-07			2.62E-08	
$\sum ECR_S$	non-dimensional	3.33E-06	1.21E-05	1.95E-05	2.07E-07	$\sum ECR_{EP,S}$
						3.52E-05

Table 4. Average daily doses $ADD_{EP,S}$, excess cancer risk $ECR_{EP,S}$ and the values of summary risks for children from 1–18 years

Parameter	Unit	$CHCl_3$	$CHBrCl_2$	$CHBr_2Cl$	$CHBr_3$	
ADD_{ING}	μg kg^{-1} day^{-1}	1.93E-02	2.81E-02	3.34E-02	5.27E-03	ΣECR_{EP}
ADD_{INH}	μg kg^{-1} day^{-1}	1.70E-02	2.47E-02	2.93E-02	4.62E-03	
ADD_{DC}	μg kg^{-1} day^{-1}	1.44E-03	2.10E-03	2.49E-03	3.93E-04	
ECR_{ING}	non-dimensional	1.18E-07	1.74E-06	2.81E-06	4.16E-08	4.71E-06
ECR_{INH}	non-dimensional	1.38E-06	1.74E-06	2.81E-06	1.80E-08	6.00E-06
ECR_{DC}	non-dimensional	4.46E-08			6.01E-09	
ΣECR_S	non-dimensional	1.54E-06	3.48E-06	5.62E-06	6.56E-08	$\Sigma \boldsymbol{ECR}_{EP,S}$
						1.07E-05

Table 5. Average daily doses $ADD_{EP,S}$, excess cancer risk $ECR_{EP,S}$ and the values of summary risks for adults from 18–70 years

Parameter	Unit	$CHCl_3$	$CHBrCl_2$	$CHBr_2Cl$	$CHBr_3$	
ADD_{ING}	μg kg^{-1} day^{-1}	1.58E-02	2.30E-02	2.73E-02	4.32E-03	$\Sigma ELCR_{EP}$
ADD_{INH}	μg kg^{-1} day^{-1}	9.04E-03	1.32E-02	1.56E-02	2.47E-03	
ADD_{DC}	μg kg^{-1} day^{-1}	5.42E-04	7.89E-04	9.37E-04	1.48E-04	
ECR_{ING}	non-dimensional	9.64E-08	1.43E-06	2.29E-06	3.41E-08	3.85E-06
ECR_{INH}	non-dimensional	7.32E-07	1.43E-06	2.29E-06	9.63E-09	4.48E-06
ECR_{DC}	non-dimensional	1.68E-08			3.21E-09	
$SECR_S$	non-dimensional	8.45E-07	2.86E-06	4.58E-06	4.69E-08	$\Sigma \boldsymbol{ECR}_{EP,S}$
						8.33E-06

$$(8) \quad ELCR_{SUM} = \sum_{A=1}^{3} (\sum ECR_{EP,S})_A$$

$$(9) \quad ELCR_{WEIGHT} = \sum_{A=1}^{3} t_A \ (\sum ECR_{EP,S})_A \times t_\alpha^{-1}$$

$(\sum ECR_{EP,S})_A$ in the equations (8) and (9) represents the individual ECR over the general average given by the equation (7) for a particular age group *A*. The t_A in the relation (8) represents the number of years during which the given age group is assessed and $t_\alpha = 70$ years is the sum of exposure duration of all three considered age subpopulations.

The acquired outcomes are summarized in Table 6. It is obvious that the individual ECR over the general average is $(\sum ECR_{EP,S})_A < 10^{-4}$ for all subpopulations. It approximates the value of 10^{-5} also in the most sensitive subpopulation of toddlers despite the fact that the calculated risk is probably considerably overestimated. The above mentioned fact may be explained by the way of constructing the exposure scenarios and the validity uncertainties of a number of input data, which were used for the genotoxic risk assessment. The genotoxic risk for each subpopulation may therefore be considered as socially tolerable. It is not surprising that the most sensitive group are toddlers up to one year of age, followed by the category of children from the age of one to 18, and the least threatened group is the population of adults from the age of 18.

Table 6. Genotoxic risks resulting from the consumption of drinking water containing trihalogenmethanes

Genotoxic risk	Unit	Age group		
		Toddler up to the age of 1	Child 1-18 years	Adult 18-70 years
$(\sum ECR_{EP,S})_A$	non-dimensional	3.52E-05[a)]	1.07E-05[b)]	8.33E-06[c)]
$ELCR_{SUM}$	non-dimensional	5.42E-05[d)]		
$ELCR_{WEIGHT}$	non-dimensional	9.29E-06[e)]		
$APCR_{SUM}$	citizen year^{-1}	3.10E-01[f)]		
$APCR_{WEIGHT}$	citizen year^{-1}	5.31E-02[g)]		

a) The value presented in the table 3; b) see the value in the table 4; c) see the value in the table 5; d) calculated with the help of equation (8); e) calculated with the help of equation (9); f) calculated from the relation (10); g) calculated from the relation (11).

It is also obvious from Table 6 that the level of *ELCR* over the general average differs depending on the way of quantification, for which there were used in principle two numerically different methods. The value of $ELCR_{SUM}$

was acquired under the assumption of additive effects in the selected age categories and is approximately six times higher in comparison with the value of $ELCR_{WEIGHT}$, which was calculated as a weighted average considering the duration of exposure in individual age categories. We take it that the value of the weighted lifetime genotoxic risk $ELCR_{WEIGHT} = 9.3x10^{-6}$ is the closest to reality with regard to the existing uncertainties and the used exposure scenarios and factors. This value is not too far from the limit of social acceptability $ELCR \leq 10^{-6}$, recognized by the U.S. Environmental Protection Agency.

The genotoxic impacts on the population exposed to the effects of one or more carcinogenes may be assessed with the help of annual population cancer risk *APCR*. The *ACPR* [citizens year^{-1}] represents the average number of cancers in the exposed population of N citizens during one year while the assumed average length of life is 70 years. The $APCR_{SUM}$ accepts the additive effect of carcinomas over the assessed age categories. It is based on the $ELCR_{SUM}$ and is given by the relation (10). The $APCR_{WEIGH}$ represents the weighted average of annual population risk, stems from the $ELCR_{WEIGHT}$ and was calculated with the help of the relation (11).

$$(10) \quad APCR_{SUM} = ELCR_{SUM} \times N \times 70^{-1}$$

$$(11) \quad APCR_{WEIGHT} = ELCR_{WEIGHT} \times N \times 70^{-1}$$

The calculated values of $APCR_{SUM}$ and $APCR_{WEIGHT}$ for the assessed region with the number of exposed inhabitants approximately $N = 4x10^5$ are shown in the Table 6. It is logical with regard to the relations (8) and (9) that, similarly to the comparison of $ELCR_{SUM}$ and $ELCR_{WEIGHT}$, the reality is reflected more by the value of $APCR_{WEIGHT}$.

The input data used for the quantification of genotoxic risk include certain degree of uncertainties, which undoubtedly affected the outcomes of assessment. The uncertainties are mainly as follows:

a. Data on the concentrations of THMs are objective, with the level of uncertainty ± 35 %.
b. The selection of water sampling site affects the values of $ELCR_{SUM}$ and $ELCR_{WEIGHT}$ by more than one order within the

assessed region as it results from the measured concentrations of THMs. It is clear from Table 1 that, e.g., the summary concentration of THMs at the sampling point D is almost 50 times lower in comparison with the same datum at the sampling point B, which was selected for the risk assessment. This fact represents maybe the most serious uncertainty and more significantly increases the assessed values of $APCR_{SUM}$ and $APCR_{WEIGHT}$, because it cannot be expected that all N = 4x105 inhabitants of the region will be exposed to the drinking water the most contaminated by THMs.

c. The exposure scenarios, developed for the assessed age categories, try to model the behavior of people during ingestion and consumption of drinking water. There is not elaborated a standardized model for toddlers and children from one to 18 years in the national methodical instructions. Therefore a number of exposure factors, especially for these age categories, had to be either adopted from abroad 8, 14, 15 or estimated.

d. The process of ingestion and consumption of drinking water is highly variable and is the function of many factors, such as sex, education, social and cultural environment, household equipment, habits, etc., which bring further uncertainties into the construction of exposure scenarios.

e. The validity of $CSF_{EP,S}$, taken from the U.S. EPA databases, is assessed by the institution itself as "medium."

f. The calculations of $ADD_{EP,A,S}$ are based on the assumption of full absorption of contaminants in the human organism, which is not very likely to happen in practice. This fact also increases the assessed values of $ELCR_{SUM}$ and $ELCR_{WEIGHT}$.

g. The inhalation/dermal ratio of THMs intake was $p_{INH/DC}$ = 3 for the needs of risk assessment. It was based on the experiments with $CHCl_3$, although there can be found $p_{INH/DC} \in \langle 1; 3 \rangle$ in the literature. The choice of $p_{INH/DC}$ does not significantly affect the assessment of genotoxic risk expressed in the form of $ELCR_{SUM}$ and $ELCR_{WEIGHT}$, because $p_{INH/DC}$ = 3 was applied solely to $CHBr_3$, the concentration of which in the samples of drinking water was much lower compared to other THMs.

h. There were not found CSF_{INH} for inhalation nor CSF_{DC} for absorption in case of $CHBrCl_2$ and $CHBr_2Cl$ in the available materials. Therefore the intake of joint inhalation and dermal pathways was considered as equivalent to the intake through ingestion, which was in compliance with the recommendation of the U.S. EPA. However, the above mentioned substitution may increase the value of $ADD_{INH} + ADD_{DC}$ by one order especially among toddlers up to the age of one.

i. The level of ELCR over the general average is dependent on the applied option of numerical quantification of ELCR, as it is demonstrated on the acquired values of $ELCR_{SUM}$ and $ELCR_{WEIGHT}$ calculated according to the relations (8) and (9).

j. The degree of genotoxic risk $ELCR_{SUM}$ and $ELCR_{WEIGHT}$ will also be the function of dividing the exposure into the assessed age categories A, the selection of which will affect the values $(\sum ECR_{EP,S})_A$.

k. The assumption of the additive effect of THMs is another factor increasing the uncertainty of the assessment of $ELCR_{SUM}$ and $ELCR_{WEIGHT}$, because the mutual interaction of THMs may show not only synergic, but also antagonistic effects.

l. The interaction of THMs with other compounds present in the analyzed samples of drinking water was not considered either. It also reduces the validity of acquired outcomes.

Concluding Remarks

The genotoxic risk was quantified from the long-term consumption of drinking water supplied by a group water system to the inhabitants of a selected region of the Czech Republic. The assessed indicator of risk was the group of four THMs, i.e., chloroform, bromdichloromethane, dibromchloromethane, and bromoform. The above mentioned pollutants are constantly present in the drinking water supplied through the distribution network due to the interaction of disinfection agents with organic precursors.

The value of summary ECR including all considered *EP* and identified *S* from the group of THMs was $(\sum ECR_{EP,S})_A < 3.6 \times 10^{-4}$ for all the assessed age categories *A*. The genotoxic risk is tolerable for all subpopulations, because the level of acceptability recommended by the U.S. EPA is $(\sum ECR_{EP,S})_A \leq 10^{-6}$. Toddlers up to the age of one are the most sensitive subpopulation with

$\sum ECR_{EP,S} = 3.5 \times 10^{-5}$, followed by the group of children from 1–18 years with the value of $\sum ECR_{EP,S} = 1.1 \times 10^{-5}$. The least endangered group is the subpopulation of adults, for which the value of $\sum ECR_{EP,S} = 8.3 \times 10^{-6}$ is in the order of E-06.

Similar outcomes apply to the *ELCR* over the general average. Scooping proved there is a tolerable level of life-long genotoxic risk for the exposed population of the region supplied with the drinking water with the maximal detected concentration of THMs. The final value of *ELCR* is highly affected by the way of numerical quantification. The $ELCR_{SUM} = 5.4x10^{-5}$ assuming there are additive effects of selected age categories, while the application of weighted average considering the duration of exposure in individual age categories resulted in $ELCR_{WEIGHT} = 9.3x10^{-6}$, which was approximately six times lower.

The annual population cancer risk *APCR* was calculated with the use of $ELCR_{SUM}$ and $ELCR_{WEIGHT}$. The calculated value of $APCR_{WEIGHT} = 5.3x10^{-2}$ people year^{-1} reflects the reality rather than the value of $APCR_{SUM} = 3.1x10^{-1}$ people year^{-1}, and it is the same with the $ELCR_{WEIGHT}$ when compared with the $ELCR_{SUM}$.

The genotoxic risk resulting from the long-term consumption of drinking water from the regional group water supply may be considered overestimated with regard to the construction of exposure scenarios, uncertainties in validity of many input data and the use of the most critical values of exposure factors for the calculation of risk. The above mentioned statement is supported especially by the selection of the sum of concentrations of THMs in drinking water at the most problematic risk analysis sampling site. It can be expected that only a small number of inhabitants of the region will be exposed to these maximal detected concentrations. The concentrations of THMs at the other four sampling sites are lower.

The above mentioned statements lead to a legitimate assumption that the calculated values of indicators of genotoxic risk may currently be accepted by society as a whole. Such a conclusion corresponds with the comparison of the values of concentrations of THMs with the currently valid limits for their individual and summary concentrations.

Based on the acquired outcomes it may be concluded that the current situation does not require measures to be taken immediately or in a short time period aimed at reducing the concentration of THMs in drinking water

supplied to the consumers through the regional water supply system. However, in the future it will be suitable to take gradual measures in order to reach the target value $ELCR_{WEIGHT} \leq 10^{-6}$ recommended by the U.S. EPA at all sampling sites.

Part 2

From Knowledge to Management

Management of Tax Security Knowledge in Intra-Community Trade

Konrad Raczkowski[1] and Artur Krukowski[2]

Summary: This chapter explores the issues of knowledge appreciation and knowledge management in the context of securing VAT in intra-community trade. This knowledge is proven to be necessary to both honest taxpayers carrying out legal economic activity as well as to bodies enforcing the tax law. The VAT to be presented has been deliberately selected owing to the ever-growing number of VAT scams within fraudulent tax "carousel" schemes; they involve multiple exports and imports of the same goods (in many cases exclusively based on fictitious invoices) through a diverse chain of supplies in a variety of EU countries.

Keywords: management, knowledge, VAT, trade, fraud

Introduction

Taxes have a long-standing history as a source of revenue for state budgets. Throughout history, however, taxes due were collected in the form of both tributes (e.g., crops, commodities) as well as in monetary sums. Taxes are an ordinary phenomenon in the functioning of societies and within the society many groups seek legal optimization of tax burdens, whereas others seek quite the opposite, pre determining the performance of unlawful activities which are driven by a desire to make profit and which indirectly reduce the economic security of the state where the malpractice of diminishing mandatory money obligations takes place.

It suffices to mention that in the European Union (EU) itself new opportunities of destabilizing tax security, notably with regard to Value Added Tax (VAT, arose due to the establishment of free movement of persons, goods, services, and capital within the single internal market. Thus, trade transactions from various EU countries since 1993 are no longer subject to control at internal borders, and the VAT rate in the case of intra-Community

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supply of goods is zero percent, with the tax being paid by the purchaser in another country.

VAT governed by normative regulations in specific EU member states is one of the major revenues for the state budget. Though the concept of value added tax was developed already in 1919 by C. F. Siemens, its practical application has only been made possible since 1954. The factors underlying the abuse of the whole system by dishonest tax payers for the purpose of perpetrating tax fraud in relation to VAT are the scarcely precise, fairly liberal and basic structure of the Sixth Council Directive[3] as well as the currently applying Council Directive 2006/112/EC,[4] in combination with a complex mechanism for settlement of this tax. As the scale of fraud in this respect is significant, it is necessary to comprehend that the knowledge and its management within VAT security proves to be one of the more substantial elements in the protection of budget revenue in the EU member states.

Towards Knowledge Management

A distinguished expert in management, P. Drucker (1909–2005) was one of the first to highlight that knowledge and knowledge expert workers constitute the principal assets of the enterprise or organization—depreciating somehow natural resources, capital, or work. Around 1960, he defined the term *knowledge work* and *knowledge worker*.[5] He also asserted that

> we know now that the source of wealth is something specifically human: knowledge. If we apply knowledge to tasks we already know how to do, we call it "productivity." If we apply knowledge to tasks that are new and different we call it "innovation." Only knowledge allows us to achieve these two goals.[6]

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3 Sixth Council Directive 77/388/EEC of 17 May 1977 on the harmonization of the laws of the Member States relating to turnover taxes – Common system of value added tax: uniform basis of assessment, OJ 1977 L 145, case 09-1–23.

4 Council Directive 2006/112/EC of 28 November 2006 on the common system of value addend tax, OJ L 347, 11.12.2006.

5 E. Skrzypek, "Wiedza jako czynnik sukcesu w nowej gospodarce" (Knowledge as a factor for success in the new economy), in E. Skrzypek, A. Sokół, eds., *Zarządzanie kapitałem ludzkim w gospodarce opartej na wiedzy* (Management of human capital in an economy based on knowledge) (Warsaw: Instytut Wiedzy i Innowacji, 2009), p. 145.

6 P. F. Drucker, *Managing for the Future: The 1990s and Beyond* (Oxford: Butterworth-Heinemann, 1992), p. 23.

Knowledge is created by people due to mutual interactions between them and their environment. Therefore to appreciate the core of knowledge it is necessary to explore and understand the human being and the reaction process which generates knowledge. It is human relations that are a source of creation of knowledge, knowledge is subjective, relational in process, esthetical and generated in practice. For this reason the core of knowledge and process of knowledge creation need to be oriented toward a man and acting in a manner conducive to producing a kind of added value in the form of new knowledge for both a person as well as for an organization.[7]

K. R. Popper argues that knowledge never starts out of nothing; as a starting point it always needs some general background of knowledge which is recognized as prevailing at a definite time alongside its difficulties and problems. In principle it arises out of a contradiction between expectations embedded in our general background of knowledge from one side, and a new outcome such as observations or a certain hypothesis suggested by them on the other hand.[8] Therefore, knowledge is a result of all possible acts of cognitive understanding— where knowledge is a result of cognitive processes and cognition is, to a large extent, conditional on knowledge already possessed (the level of possessed knowledge determines the chance of cognitive choice of the object as well as a manner of cognition).[9]

> Knowledge, however, is more difficult to define – one is to see it as using information to make a decision. Knowledge is more on knowing how to interpret information and providing new insights to some problem at hand. It is often using previous experience to interpret the information and use the interpretation to initiate some action. Thus knowing the temperature influences a person's choice of what to

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7 See K. Raczkowski, "Zarządzanie wiedzą w organizacji inteligentnej" (Knowledge management in an intelligent organization), in S. Lachiewicz, A. Zakrzewska-Bielawska, eds., *Zarządzanie wiedzą i innowacjami* (Knowledge and innovations management) (Łódź: Politechnika Łódzka, 2010).

8 K. R. Popper, *Objective Knowledge: An Evolutionary Approach* (Wiedza obiektywna. Ewolucyjna teoria epistemologiczna) (Warsaw: PWN, 2002), p. 93.

9 A. G. Neweś, "Stan zasobów wiedzy w polskich przedsiębiorstwach w świetle badań empirycznych" (State of knowledge resources in Polish enterprises in the light of empirical research), in J. Bogdanienko, M. Kuzela, I. Sobczak, eds., *Zarządzanie wiedzą w warunkach globalnej współpracy przedsiębiorstw* (Knowledge management in circumstances of global cooperation among enterprises) (Toruń: Wydawnictwo Adam Marszałek, 2008), p. 42.

> wear based on their earlier experience in similar weather. Knowledge arrives in many forms.[10]

Relying on the realistic theory of knowledge it is possible to present a clock-like structure of the author's knowledge; likewise the knowledge structure by A. Jashapara contains previous experiences forming extensive networks of social, political, economic, and organizational relations.

A time-related arrangement of knowledge refers to the metaphor of a clock—to 24 hours within a day; the reference to hours, determining successive needs or possibilities for application of knowledge and passing time, being a synonym of passing knowledge if it fails to be preserved and codified. Also a clock represents the future which we have to confront using experiences acquired in the past; the past to which we cannot return physically but only metaphysically. A clock like structure of knowledge placed on a knowledge axis involves three major components:

a) **Experience radar (seconds),** assessing each situation systematically and straightaway, making use of afterthought, retrospective, and experiences analogously to an active radar, with a pointer counting seconds symbolizing a radiating beam that explores a specific area within which all signals are caught, received, and processed. Depending on the time pressure, the meaning of data, information, and consequently knowledge may take on a standardized shape in the form of quick reaction (as in single loop learning, without use of afterthought) or long impulses—a longer time for searching (as in double loop learning and extensive deployment of creative and reflective thinking).

b) **Explicit knowledge (minutes)**—as overall knowledge being within a prevailing circulation. It may be gleaned from books, newspapers, radio, and television broadcasting, verbally, via the Internet, and other message types, it is a type of external knowledge regarding an individual and is codified.

c) **Tacit knowledge (hours)** is a type of specific personal knowledge. It includes all conditional circumstances, habits and culture, religious, social and other assumptions. It is the most precious knowledge as only its user is aware of what knowledge he possesses and only he may apply a specific

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[10] I. Hawryszkiewycz, *Knowledge Management: Organizing Knowledge Based Enterprises* (Basingstoke: Palgrave Macmillan, 2010), p. 72.

scope of knowledge to a specific place and time. Successful use of tacit knowledge may be achieved by dynamic interaction and teamwork which deploys explicit knowledge (hour hand) as well as operational-strategic radar of experiences (second hand).[11]

The foregoing assumptions indicate that a man faced with a new situation and new problems frequently refers to the previously gained knowledge and intuition he possesses. He determines a response by transforming possessed knowledge into actions. The foundations of the knowledge structure are previous experiences which further both knowledge types: "I know how" as well as "I know what" (tacit and explicit knowledge). It is suggested that usage of the experience radar is a specific example of double loop, deepened learning. It means that the radar every time refers to both reflective thinking as well as to experiences of the man, thus opening up new thinking perspectives in a specific case. Thus, it leads to the restriction of routine and generation of new ideas which may improve or destabilize functioning of a given organization.[12]

So what does knowledge management mean? According to R. von Spek and G. Carter, knowledge management in numerous cases is synonymous with a concept of an organization being in a process of learning, sharing with good practices, competence management, business excellence, management of innovations or intellectual capital.[13] Knowledge management is inextricably linked with a man who stores the resource of knowledge and a man has the capability of adding possessed knowledge to this repository. Above all he decides whether, when, and to what extent to avail himself of collected data and information and convert them into knowledge and then use it in a proper place and time through wisdom with the purpose of materializing knowledge.

An integrated approach towards defining the core of knowledge management is demonstrated by A. Jashapara. An author that while depicting strategic, systemic, and social perspectives, specifies knowledge

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11 K. Raczkowski, *Zarządzanie wiedzą administracji celnej w systemie bezpieczeństwa ekonomiczno-społecznego* (Management of customs administration knowledge in a system of economic-social security; ms.) (Warsaw: 2010).

12 Ibid., p. 71.

13 R. Spek, G. Carter, "A survey on good practices in knowledge management in European companies," in K. Martins, P. Heisig, J. Vorbeck, eds., *Knowledge Management: Concepts and Best Practices* (Berlin: Springer, 2003), p. 196.

management as the "effective processes of learning related to discovering, applying and sharing human knowledge (both codified as well as non-codified); they deploy appropriate technologies and organizational culture for the purpose of expanding the intellectual capital of the organization and enhancing the efficiency of its operations."[14]

It seems that currently in many cases the term knowledge management is incorrectly associated with transfer of documents or accessibility and application of computer networks. In fact knowledge management constitutes the whole system of methods, forms, and means designed to guarantee effective economic and social functioning in an organization. An organization or rather its management is tasked to create such an organizational culture in which members of the organization will be aware of the necessity to cooperate appropriately both in an internal (intra-organizational) environment as well as an external one by means of localization as well as gaining, developing, sharing, applying, and storing the knowledge.

Value Added Tax in EU Countries

Value Added Tax is a turnover of indirect tax—which is assumed to affect to the least degree the final prices of goods and services that are subject to taxation due to so-called transferability on subsequent phases of the economic trade. It is the multi-phase tax that is really offloaded on to the consumer; the recipient of goods and services.

Maurice Lauré, a former French minister of economy, is considered one of the creators of VAT, which came into effect for the first time in 1954. In 1993, standard VAT rates were established; they could not be lower than 15 percent or higher than 25 percent, with the reservation that states could apply a single reduced rate as well as transitional rate in subsequent years. In recent years VAT rates have been subject to numerous changes; the current standard percentage ratio ranges from 15 percent for Cyprus and Luxembourg, to 25 percent for Hungary, Denmark, and Sweden (see Table 1).

[14] A. Jashapara, *Knowledge Management: An Integrated Approach* (Harlow: Pearson Education, 2004), p. 12.

Table 1. VAT rates in 27 EU Member States, 2010

No.	State	Standard rate (%)	Reduced rate (%)
1.	Cyprus	15	5; 8
2.	Luxemburg	15	6; 12; 3
3.	Great Britain	20	5
4.	Spain	18	8; 4
5.	Malta	18	5
6.	Germany	19	7
7.	Holland	19	6
8.	Romania	24	9
9.	Slovakia	19	6; 10
10.	France	19.6	5.5; 2.1
11.	Estonia	20	9
12.	Czech Republic	20	10
13.	Bulgaria	20	7
14.	Italy	20	10; 4
15.	Portugal	21	5; 12
16.	Austria	20	10
17.	Slovenia	20	8.5
18.	Latvia	21	10
19.	Belgium	21	6; 12
20.	Ireland	21	13.5; 4.8
21.	Lithuania	21	5; 9
22.	Poland	22	7; 3
23.	Greece	23	11; 4.5
24.	Finland	23	9; 13
25.	Hungary	25	5; 18
26.	Denmark	25	-
27.	Sweden	25	6; 12
EU 27 Average		20.5	

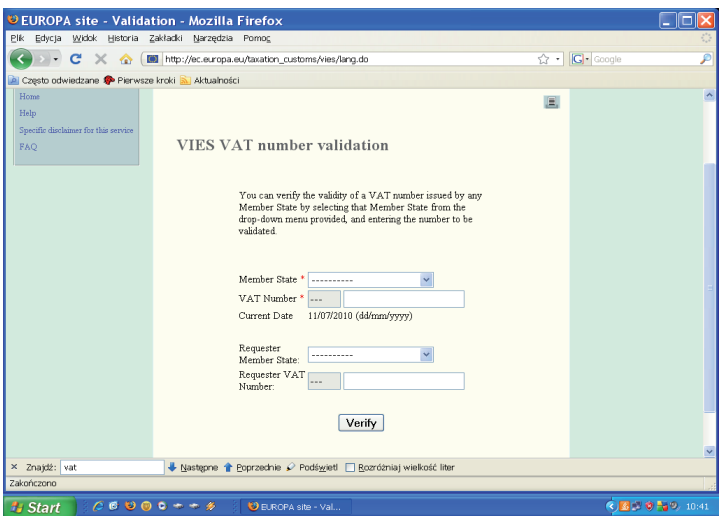
Source: Based on *Taxation trends in the European Union* (Luxembourg: Publication Office of the European Union, 2010), p. 100.

At the beginning of the twenty-first century, VAT was applied in 118 countries. The United States was an exception. As a strong global economic power, it was the only country within the OECD which did not have VAT in its structure of tax contributions.[15]

[15] See *Combating VAT fraud in the EU: The way forward* (Brussels: International VAT Association, 2007), p. 11; and *Consumption Tax Trends* (Paris: OECD, 2004).

Currently all enterprises that desire to conduct business within the European Union need to have a VAT number.[16] The structure of identification numbers in the EU states mostly comprises of about 8–12 numbers, preceded by a descriptor comprising one or two letters, e.g., ATU11111111[17] (Austria, 9 characters; the first position following the prefix is always "U"), BE0111111111 (Belgium, 10 digits; the first character following the prefix is always zero "0"), PL1111111111 (Poland, 10 digits), SE111111111111 (Sweden, 12 digits). But the most heterogeneous structure of VAT identification numbers can be identified in Great Britain where four formats operate: blocks of 3, 4, and 2 digits: GB111 1111 11 or GB111 1111 11 111, GBGD111 (in relation to government departments), or GBHA111 (in relation to health authorities).[18]

Fig. 1. Characterization of possibilities for use of VAT Information Exchange System (VIES)



Source: Taxation and Customs Union Database

16 EU VAT registered taxpayers are obligated to lodge an application and confirm registration of economic activity in the EU in order to avoid double taxation in member states.

17 A digit 1 in a presented sequence of characters is only an example of illustrating the number of digits in a sequence of characters in a specific structure of the tax identification number.

18 See Taxation and Customs Union, "VAT identification number structure," Brussels 2008, https://www.verisign.com/partners/vsvatformat.pdf

The VAT Information Exchange System (VIES)— see Fig. 1—constitutes an efficient tool used to exchange information regarding VAT (especially in relation to intra-Community supplies) among EU tax administrations as well as to confirm the VAT number.

The system does not enable collective examination of VAT numbers of the economic entities; neither does it provide full access to the type of economic activity conducted by the registered taxpayer. Yet, although it facilitates verification of whether a given entity is registered and currently active or not (response 0–1), it implies that it is impossible to check the previous activity of the given entity, for example, that of a few months ago.

Tax Fraud—Challenges to Security with Regard to VAT

As a result of the evolution of crime mechanisms which frequently involve hundreds of people, there are many cases of tax scams, notably involving VAT. An annual scale of scam VAT in the EU states—fraudsters assisted by high-priced tax consultants and consulting agencies are increasingly improving their knowledge of the European VAT system—is estimated at a level close to €100 billion. Such a huge scale of scams poses a danger not only to the budgets of single countries but also to that of the entire EU budget.

However, a key issue is the reason for such behavior, which historically has tended to be the same, namely the desire to make profits quickly. It also transpires that dishonest taxpayers may also quite easily exploit regulations of single laws on VAT, which correspond in principle with the structure of directives.

First, following the implementation of the EU directive into the legal system of specific states, new regulations became noticeable; they regard among others taxation of transactions among the EU states including intra-Community supply of goods and intra-Community acquisition of goods. In this context a tax rate at zero percent for the intra-Community supplies is of major importance.

Such a rate is exceptionally beneficial for a taxpayer as all possible VAT from such supply (from the previous phase of trade/turnover) may be practically subject to refund to the bank account of the taxpayer. Yet, to achieve such preferential tax assessment/settlement there are formal requirements that have to be fulfilled with regard to, among others, documents certify-

ing such supply between VAT-registered taxpayers from two various EU countries.

Second, in a majority of member states taxable persons may, as a rule, deduct from the tax due purchases insofar as the goods and services used for their taxable business activities. In practice each invoice with a deductible tax, even from a dishonest trader, is extremely beneficial to a taxpayer; after taking into account that he is entitled to reduce his tax paid to a tax office or apply for a refund of the excess between the calculated tax and due tax.

Third, the issue of the refund of VAT (if there is an excess between tax due and calculated tax). The tax refund shall be transferred to a bank account indicated by a taxpayer within statutory time limits (e.g., 60 days). It must be manifestly underlined that financial funds obtained as VAT refund on the bank account are exempt from any extra tax burdens, specifically they are not taxable income subject to the law on personal income tax (and similarly exempt from corporate income tax).[19]

Fourth, after the European Union has been joined by a given country the check-in (clearance) proceedings cease to be carried out. Consequently, no officer can confirm the movement of goods across the border. Such a practice is the result of the EU principle of free trade among the member states. The procedure continues to apply in relation to the export of goods, that is, their transportation across EU borders. What is interesting is that the scale of fraud is far smaller, since at the moment the only proof evidencing that a trader from an EU state has received goods are the documents prepared in accordance with the requirements of the tax on goods and services law. It is clearly a vulnerability of the VAT system, which may be used to facilitate scams.

Fifth, tax bodies never assume that a taxpayer acts in bad faith, and if he is a VAT-registered taxpayer who lodged a tax return VAT-7 or VAT-7K within the time limit and claimed a refund from tax on goods and services, he has a good chance of receiving the refund within the statutory time limits.[20] As a rule, such a refund will certainly be verified, yet if all documents appear correct, the tax body is obliged to refund the difference of the tax.

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[19] Law on personal income tax of July 26, 1991, uniform text from 2000, Dz. U. No. 14, item 176 as amended.

[20] Characterized numeration of the tax return may be differently numbered in various EU states.

The interesting aspect is that the above construction is totally separated from payment for goods; which would be extremely helpful while conducting an investigation and may prove that the transaction has taken place.

Given the foregoing defects of the tax on goods and services system we may identify the prevailing types of tax fraud:

- Understating or not disclosing receipts due to counterfeiting and concealing invoices
- Extortion scam of the calculated VAT
- Theft of tax identification numbers, registration of fake companies (fraud type: missing trader)
- Carousel frauds including frauds with the participation of numerous groups of entities from at least a few member states, also called Olympic rings

Missing trader fraud has not yet been defined in legal terms but may be characterized as an entity's activity involving VAT registration of a fictitious enterpriser in order to avoid tax payment. In the whole structure it is the tax authorities that suffer losses.[21] In most cases a trader that registers for VAT uses data which are inconsistent with the actual circumstances (e.g., indication of a private apartment as an office for business or indication of false address). Another rule that applies in the procedure is that registration is made by a person who does not actually run the business (e.g., unemployed or foreigner). Registration is repeatedly made on the basis of stolen documents. A distinctive feature of the trader that tends to avoid tax in this way also involves an imprecisely defined scope of his activities (i.e., a trader deals with production and trade as well as services). Further the above described trader frequently changes bank accounts and usually possesses many accounts.

One of the simplest mechanisms of *missing trader fraud* refers to a transaction where goods are transferred between two EU states. An intra-Community transaction is performed between trader A (a member of state X) and trader B (a member of state Y) in such a way that trader A, in dispatching goods to trader B, makes intra-Community supply of goods and trader

[21] P. Rochowicz, "Don't let yourself get involved into the carousel," *Rzeczpospolita*, March 24, 2005.

B makes intra-Community acquisition of goods. Then trader B will make domestic delivery of the previously acquired goods to another trader C (also a member of state Y).

In this scheme traders A and C may be legally operating enterprisers, yet B may not report intra-Community acquisition of goods and, above all, makes a domestic transaction at the price including VAT but fails to pay this tax. Missing traders often submit tax returns including the VAT but they fail to pay it. Usually the business of such traders ceases to continue when the tax authorities discover the fraud. However, due to lack of property and assets, further actions by these authorities appear unsuccessful. In addition trader B is aware that without paying the VAT, he will be able to sell goods at dumping prices.

A more complicated scheme refers to the situation in which a *missing trader,* B, will acquire goods from a legally operating trader, A, and then he will make domestic delivery of the previously acquired goods to another trader, C. Traders A and C are legally operating enterprisers. At the same time trader B makes a fictitious intra-Community supply of goods to the benefit of another trader D in another member state, thus evading payment of VAT. In this specific event trader D may be a VAT taxpayer and unaware of the fraud when his VAT number was utilized used by a missing trader. However, it may arise that this trader will be a partner of enterprisers perpetrating the fraud.

In both cases a decisive element in terminating this malpractice is prompt reaction on the part of the tax authorities.[22] Taxpayers carrying out intra-Community transactions are obligated to disclose them in summing up information on VAT returns. In most EU states, taxpayers are only required to disclose the intra-Community supply of goods. This information is further transferred to all EU states within the VAT Information Exchange System.[23] Therefore, the tax administration of a given country possesses information whether its taxpayer performed the intra-Community acquisition

[22] It should be noticed that one of the main problems is that the system which was put in place in 1993 for the exchange of information between member states on intra-Community supplies of goods does not provide relevant and timely information for tackling VAT fraud efficiently. See Communication from the Commission to the Council concerning some key elements contributing to the establishment of the VAT anti fraud strategy within the EU, SEC (2007) 1584.

[23] VIES is an integrated IT system enabling exchange of information on transactions among VAT registered taxpayers within the European Union.

of goods and is capable of taking measures to verify legality and proper procedures of such a transaction. It may then transpire that the VAT number[24] (e.g., in Poland it is a NIP, the TAX Information Number is preceded by a code PL) used in the transaction was only borrowed for the purpose of the fraud. In connection with this, an obligation to disclose not only the intra-Community supply but also intra-Community acquisition in summary information brings a greater probability that tax authorities will detect all the irregularities in transactions more quickly. Tax administrations in the EU states collect information not only about supplies from the EU (within VIES), but also about supplies that are disclosed in summary information of the VAT return submitted quarterly. In this manner a simple comparison of information will provide a full picture of possible inconsistency, which then may be analyzed thoroughly.

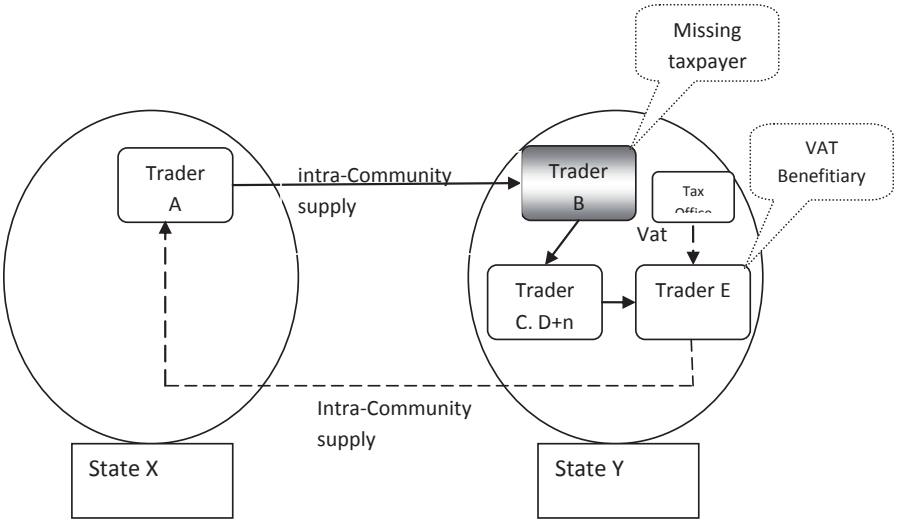
The other type of fraud is the so-called carousel which may be briefly described as the movement of goods between two (or more) member states, arranged in such a manner that the goods return to the state of origin. Such carousel circulation of goods is facilitated by the lack of border checks within the EU. In numerous cases of this type of fraud there is only a simulation of the circulation of goods, so no charges such as transportation costs are incurred.

A common trait of carousel frauds is the lack of collateral in the form of trade loans as they are predominantly cash transactions, despite the high value of the goods, or transfers to accounts owned by enterprises of legal entities which hampers identification of the person in charge of the business. Frequently the payments are disguised as supplies which are followed by money transfers. However, most often the same amount of funds is in circulation throughout the carousel which, after calculation of payments made by one trader, create multiplied amounts far exceeding the real one.

The simplest mechanism of the carousel fraud is built in the following way (see Fig. 2):

[24] A name for the VAT number may be different in various states, e.g., in Poland there applies a number NIP preceded with a code PL.

Fig. 2. Basic scheme of carousel fraud in the EU states



Source: The author

1. Trader A having its registered office in a member state X sells goods on to trader B with the registered office in a state Y (due to intra-Community supply of goods trader X has a zero rate and possible VAT refund) at a total price of €100,000.
2. Trader B which is most often a missing taxpayer[25] resells the goods on to buffer trader C with a loss of €80,000 + VAT (e.g., at a rate of 20 percent it is €16,000). Trader C has a registered office in a state Y (certainly issuing a proper VAT invoice—yet it fails to pay VAT to a relevant tax authority). Thus, trader B acts to the detriment of tax authority and goes missing (or ceases to exist) without paying the tax for domestic supply of goods.
3. Subsequently, sale of the goods by trader C may be made with a negligible profit (e.g., selling the goods for €85,000 + VAT) and further traders, e.g., D and E (brokers), will settle VAT properly.

[25] Importers (being purchasers) may receive goods without paying VAT for intra-Community acquisition and at the same time they have to pay VAT from their sale.

4. The last element in the chain, trader E will make an intra-Community supply of goods to a trader which began the carousel, i.e., to trader A. Since the intra-Community supply is zero rated (?) trader E will be entitled to claim back the VAT on the bank account (trader E sells the goods on to trader A for, e.g., €95,000 and recovers the whole calculated VAT, that is €17,000, from the tax office). Traders D and E are labeled buffer traders and trade with missing tax payers. However, unlike missing traders they duly discharge their tax obligations.[26]

The scheme presented above may be repeated until the tax administration of a given state interrupts this malpractice. It needs to be highlighted that supply of goods is made on the basis of invoices issued at proper intervals. A more complicated structure of the carousel fraud will involve numerous missing tax payers in its chain, thus rendering the whole situation increasingly blurred. Further, it makes the cracking of this mechanism of fraud extremely labor-intensive and time consuming. Additionally such carousels may encompass many member states creating so-called Olympic rings.

A report by the European Commission regarding carousel frauds and offenses while acquiring goods (SCAC 364 document) collected and described a total of 151 fraud cases.[27] Key conclusions refer to, excepting scam mechanisms, the types of goods that are frequently the objects of the transaction. To achieve the best financial outcome fraudsters mostly prefer to transfer mobile phones and their accessories, computers, and IT components, expensive electronic equipment, and even luxury cars. Extraordinary situations arise when some models of mobile phones become an object of transactions even before their release on the market. Recently the assortment of goods has expanded with xenon car bulbs and engine injection systems. The demand for these goods measured by issued invoices exceeds its real yearly demand twofold.[28]

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[26] Mechanism of tax frauds making use of chain transactions, supplement to VAT Guide (Poradnik VAT), No. 6,May 10, 2007, Wydawnictwo GOFIN.

[27] SCAC 364 – The second report on carousel and acquisition crimes – result of reports prepared by the member states, March 31, 2003, TAXUD/2327/03.

[28] See M. Duda, *Dziennik*, March 31, 2010, p. A4.

In order to combat the above described fraudulent tax schemes, in spite of actions at a national level, there are attempts to introduce systemic solutions through furthering cooperation among the member states' administration within the system VIES or SCAC forms as well as multilateral checks.

To enhance all-embracing cooperation among tax authorities of the member states in respect of fighting against tax frauds, the Council of the European Union adopted in October 2003 a new Council Regulations (EC) No. 1798/2003 on administrative cooperation in the field of value added tax, which came into force on January 1, 2004. [29] The fundamental postulates of this document, apart from strengthening the role of VIES, included formalizing the thorough exchange of information on intra-Community transactions in a specific EU member state by, among other means, a standard form SCAC 2004 which combines a request for information exchange as well as a request for administrative proceedings—Articles 5 and 19 of the regulation. However, the most significant from the perspective of fighting tax fraud is the standard form SCAC 383, intended specifically to counteract missing tax payer fraud.

It should be underlined that the above findings may be subject to criminal responsibility for crimes or tax offences pursuant to national regulations of criminal and penal laws.[30] As described above, a missing tax payer under this law may be liable for the following: failing to declare tax or delinquent default on payment of a tax. In the case of counterfeiting documents (e.g., forging invoices or bills of lading) the sanctions envisaged in the Criminal Code of the given country may be applied.[31]

Apart from structures set out above and methods for preventing VAT scams, the jurisdiction of the European Court of Justice has had a substantial impact on determining the approach of tax administrations to this problem. In regard to this issue, the first judicial decision was made on January 12, 2006 (combined cases *Optigen, Falcrum, Bond House*).[32] The fact findings certainly dealt with a carousel chain of supplies where British traders made

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[29] Council Regulations (EC) No. 1798/2003 on administrative cooperation in the field of value added tax, OJ L 264, October 15, 2003, p. 1.

[30] See e.g. Law of September 10, 1999, Criminal-penal Code, Dz. U. No. 111, item 765 as amended.

[31] E.g. Art. 270 or 271 of the law of June 6, 1997, Criminal Code, Dz. U. No. 88, item 553 as amended.

[32] Judgment of the European Court of Justice of January 12, 2006 (joint cases No. C-354/03, C-355/03, C-484/03; *Optigen, Falcrum, Bond House*).

an intra-Community supply of goods to traders in various EU states, having previously purchased them from missing traders. One of the major findings was that traders had acted in good faith and did not know and were unable to know that they were involved in the carousel. Tax bodies denied their right to make tax deductions from transactions performed with missing traders. The Court of Justice in its deliberations, based on the objective approach towards supply of goods, argued that examining intentions stimulating other participants of the supply chain would be in contradiction with the objectives of the common VAT system. Also the Court asserted that the right to deduct VAT is a basic constructive element of the value added tax and as a rule it cannot be restricted.

The Court, in its decision, manifestly supported traders acing in good faith. It deprived the member states of the right to compensate their losses suffered from unpaid VAT on other participants of the carousel fraud.

In another judgment of July 6, 2006 (combined cases C-439/04 and C-440/04 *Kittel i Rewolta*),[33] the findings were similar, with the exception that one of the traders consciously participated in a circulation of supplies that constituted tax fraud. In this case, the Court decided that a taxpayer who was or should have been aware of involvement in a fraudulent chain of supply should be, under the 6th Directive, treated as an active fraudster regardless of any benefits derived from the malpractice. He cannot be regarded as an entity acting in the capacity of the taxpayer and conducting business. Therefore, this group is not entitled to exercise its right to deduct the tax calculated in accordance with regulations of the 6th Directive.

The European Court of Justice therefore, gave a vague green light to refuse the entities consciously engaged in tax fraud the right to reduce the tax due by a tax calculated in the previous phase of the trade**.** Yet in this event it is exceptionally difficult to show proof evidencing such conscious activity of the trader.

[33] Judgment of the European Court of Justice of July 6, 2006 (joined cases C-439/04 and C-440/04 *Kittel i Recolta*).

Concluding Remarks

The foregoing considerations provide an overview of the value added tax system which in principle facilitates scams. The approach of the Court of Justice in many cases proves to be excessively liberal, which is conducive to huge losses in budgets of specific EU member states. To prevent such a situation, new solutions affecting the whole system of VAT are being proposed including the idea to pay VAT at the end of the chain (*reverse-charge*)[34] and that the whole system of VAT should be completely unified by eliminating diverse reduced special rates which apply exclusively in certain countries and to selected groups of goods or services.

The other method capable of combating VAT fraud in a systemic way (irrespective of any amendments to the VAT system) would be the establishment of a European Union fiscal police—one that is fully task-oriented, flexible, and operative (as practice shows OLAF[35] in this structure and system of operations is unable to guarantee a minimal degree of security in this respect).

Such a body should not only be afforded with physical capability to operate in real time in any EU member state, but also would have opportunities of transmitting or verifying information *just in time*, presupposing a proper organizational culture of the integrated system of employees in the EU member states combined with efficient and effective application of information and communication technology. As practice shows, information processed from EUROCANET (European Carousel Network),[36] with the use of SCAC forms, and multilateral cooperation under the Council Regulation (EC) No.1798/2003 of October 7, 2003, on administration cooperation in the

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[34] "Union aims counteraction against tax fraudsters," *Gazeta prawna,* February 26, 2008.

[35] OLAF, the European Anti-Fraud Office established on the basis of the Commission Decision 1999/352/EC. The key task of OLAF is combating frauds and corruption as well as protection of European Union interests. Even though the Office is independent as regards investigations, the scope of proceedings is considered negligible as compared with reported irregularities in the areas of abuse and frauds, notably VAT. A good move would be to expand the powers of OLAF in respect to conducting proceedings and penalizing controlled prohibited actions and establishment of so-called OLAF cooperation centers located in each EU member state and directly subject to OLAF rather than to a particular financial department (as currently in operation).

[36] EUROCANET, project initiated by the Belgian administration on January 1, 2005, with a view to enhancing cooperation among EU member states due to the quicker transmission of information, and oriented towards counteracting carousel frauds.

field of value added tax, are not fully exploited, or their usage should be regarded scarcely effective.

Possibly the human contribution to this institution should be constituted by representatives of police forces, customs services, and the tax administration (including tax control) from a given country delegated to discharge of specific functions for a term of office, e.g., of 4–5 years. Having completed the functional tasks within the national unit of the OLAF they would be able to apply for a subsequent term of office or return to their previous organizational units.

Nonetheless, in order to bring about such a revolution entailing changes to tax law across all EU member states, as well as establishment of organizational and integrated institutions intended to counteract tax frauds, it is necessary to gain broad endorsement and undertake many time consuming discussions and settlements. Proof of this can be seen in the attempts to implement the Eurofisc scheme[37]—construed as EU common operational structures aimed at a very fast exchange of targeted information in the area of tax frauds through strengthening administrative cooperation.

Beyond doubt, in this regard, it will be a challenge to set up an appropriate framework for collaboration a model and concept of management knowledge which enables conversion of data into information, information into knowledge, and then knowledge through human wisdom expressed as practical application. Yet, it is unlikely to happen without intervention, but only when an administration from each state will be capable of obtaining and making use of human resources, or rather intellectual capital—which is currently possessed but not used (usually because of personal motives of a particular decision-maker) as well as that which is lacking and ought to be gained. Knowledge is a key for establishment as well as reinforcing permanent competitive advantages of a given organization or society, and man

[37] An attempt to establish Eurofisc is a very good solution given that all EU states will obligatorily participate in the Project (it is also recommended for an entity to have legal status—autonomous or within OLAF structures). Original guidelines of Eurofisc provide for four principles of functioning: each state will individually decide on participation in specific activities of the network, confidentiality and active cooperation in exchange of information, and lack of additional encumbrances for the trader. See Eurofisc project 11714/08 FISC 91 as well as Communication from the Commission to the Council, The European Parliament, The European Economic and Social Committee, COM (2008) 807 final, Brussels, December 1, 2008, and Press Release of the Council of the European Union 13784/08 (Press 279), Luxembourg, October 7, 2008.

is its carrier. Until specific organizations integrated within a single community apprehend these correlations in a practical manner, all deliberations on optimization of activities in the field of fighting threats to economic security though the viewpoint of tax will be solely diversions burdened with a smaller or larger error of success in practical application, giving ground to the black economy and illegal organized activities.

Building Solid Relationships with Customers: Working to Promote the Safety of Doing Business in the Services Sector

Wioletta Wereda[1]

Summary: Relationships of a company with its clients limited to one form—an order, delivery, invoice, payment—are highly uncertain. The risk is particularly inherent when faced with the emergence of competition and/or in times of crisis. When relations with a customer are closer, exhibiting more of a partnership, it is easier to counteract crises and to bolster relationships. A tough situation and reacting to it an effective manner is a test for the efficiency of an organization's activity, its service, its attitude to a customer, and the creation of some sort of business safety. The aim of this chapter is to show the important role that building permanent relationships between a firm and its clients plays, which as a result should have positive influence on the quality of relationship and business safety in a highly competitive service market.

Keywords: solid relationships with customers, safety of doing business, sphere of services, quality of relationships

Introduction

The theme of "building lasting relationships with customers" on an everyday basis is becoming one of the most popular issues of contemporary marketing. But this is not simply the result of a trend or fashion. Tackling this issue in business is an activity that should be undertaken by all means, and one might say is necessary. It is a truism that regular customers provide for a constant-profit company. Potentially, they provide increased profits, which can also be achieved through disseminating information on the brand or company, and the popular recommendation of a product or a service to others. For new customers, such recommendations are in a sense a guarantee of good quality. Therefore, the new customer makes a choice, which is easier to do if someone first confirms that this is a positive choice, that is, by someone who has tried the product and is satisfied with it. This is particularly important when selecting services, business partners, as well as for purchases of

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more expensive goods, where the costs of a potentially wrong decision are more expensive.

Of course, the client relationship with the company or brand in the B2C relationship is specific, because competition in the services sector is usually strong and high. Choice of service provider business is based not only on more rational factors that are measurable and economic, but also the importance of reputation, references, expert opinions—all of which are factors that providers should not underestimate. Organizational culture, knowledge of the environment in the ways of doing business, methods of work, may all affect the potential partner's decision to cooperate. It is difficult at the stage of the emergence of client services on the market to think in terms of emotional involvement, identification with the brand, as is the case in other commodity markets. However, human factors are also of great psychological importance.

In just looking at the running of a company, it is clear that building positive relationships with customers, getting closer to them, is desirable. Everyone wants to work in pleasant conditions and have good quality contacts with suppliers, with other companies also being factors that affect employee satisfaction. Therefore, it can be postulated that the building of solid relationships with customers by services engenders the possibility of survival, development, and in particular the security of doing business in a highly competitive market, which probably is a market for services.

The Process of Building Relationships with Customers

The customer has the right to freedom of emotions and behavior, therefore expressing their authentic needs and feelings. The employee must possess a favorable impression of the client, must make the client feel happy, and be satisfied that the conversation is enjoyable. Indeed, the feeling of satisfaction when in contact with the seller is a prerequisite for long-term cooperation, and thus also a key to first-time purchase by the customer. The customer must be sure that we meet their needs—that we are not out for a quick profit at his/her expense. The successful sale of services entails a struggle to get the customer's money. Only the company which, besides offering economic benefits to its customers, shows respect, well-being, security, affection, and quality, will gain a reputation for being professional. In the era of fierce competition and that of the market buyer, regardless of the company they

represent, increasing importance is attached to the process of building relationships with clients to achieve short-and long-term sales targets. The process of building relationships with customers can be divided into the following stages:

1. The first contact with the customer
2. Convincing the customer to purchase
3. After-sales service and use[2]
4. Phase re-purchase

The First Contact with the Customer

Customer service begins when the customer enters the premises of a company. In observing the workers (their dress, behavior, conversation), the client draws conclusions about the entire company. These first impressions are of importance. Expertise and professional preparation on the part of the company are therefore important. If after the first meeting, the client feels satisfied that he has been treated properly and is understood, it is probable that the next time he will want to repeat this experience with the same person or company. For institutions, this may mean not only a regular customer, but also that new customers are recommended to them. To reach this stage, the company should fulfil the following tasks:

- Establish human contact and identify customer needs
- Deal with his/her inclinations
- Adapt to the type of customer

One of the most important tasks in this stage will be notice and recognize the customer as an individual and not as a future source of revenue. The moment of first contact trading is difficult for both sides. The client does not trust us, and we often think of unfair trading intentions. As a result, customers often treat the merchant suspiciously, and merchants try to overcome this by distracting the client, urging them to buy, talking about possible

[2] *Building relationships with clients. Marketing – promotion – advertising,* Lublin Development Foundation, September 8, 2006, www.konkurencyjnosc. gov.pl (accessed July 10, 2010).

discounts and advantages over the competition. This is one of the fundamental errors, because at this stage, the merchant has time to ask questions and listen carefully to understand the client's situation and, accordingly, adjust their proposals to their needs. It is also time to be in "tune" with the preferences of the client. This gives rise to a situation in which a trader, to persuade the customer to buy, must meet him in his world, that is, tune in, establish a relationship with him—only then will employees of companies have the chance to begin the process of persuading the customer to buy.

Figure 1. The process of transition from "tuning" to "running" a customer over the firm

Source: Based on *Building relationships with clients. Marketing – promotion – advertising*, Lublin Development Foundation, September 8, 2006, www.konkurencyjnosc.gov.pl

Tuning (in other words fitting) is a process of continuously following and reflecting on the other person's behavior, manner of expression, ideas, and emotional states. The customer, in this "semi-stage," has the opportunity to make deeper contact with the company. The purpose of this semi-stage is for the staff to adjust to the client using "body contact" (or body language—the use of body language and voice is a process older than language; it also passes on 90 percent of information), voice (verbal predicates, strength, color, and pace of speech) and mind (personality and temperament, way of thinking, emotional state).

"Running" a customer over the firm is the reverse process to the process of tuning, in which the company uses contact to change the behavior or thinking of the other person. Driving is not possible without prior contact. If the client listens to the merchant, and incidentally he smiles, shakes his head, and he wants to talk with him, it means that this contact gives him the satisfaction, and, as a result, provides a positive trade transaction without paying attention to words, the employee will be directed to the client. But in the situation that the customer is indifferent and bored or irritated, "words of wisdom" are not worth anything. This approach should be immediately

stopped and/or the subject changed to one that is more interesting for the customer. Adapting to a customer's subconscious information programs is one of the most important ways to win them over and provide satisfaction.

It is important at this stage to know the extent of the customer's expectations, that is, to recognize how large his "interest" is. Listening to the words of the customer as well as asking questions, the seller must understand the client's motivation, so as to find out what really drives him to buy their product in particular, and not any other product or service. In knowing the dominant customer, one can then go to the next stage; namely, to convince him to buy a given good.

Convince the Customer to Purchase

Convincing the customer to purchase goods is the time to employ arguments by a commercial vendor—ones that show the advantages sought by the customer for goods (handling benefits). At this stage, they should start from the corresponding aspects of the customer's needs, even if they are the main benefits of the product. The first minutes of contact affect the conduct of trade talks, and so will decide whether the client will return to the vendor and how he imagines the prospect of further cooperation. It is important to note, however, that the priorities of customers are likely to differ from the priorities of the seller. The real trick is to make the right offer to the appropriate customer at the right time. Sales involve offering benefits to the client who in this way meets their needs. It also impacts customers, but it should not involve elements of manipulation, which aim to meet their own needs at the expense of the interests of others, for example, by making empty promises. Both sides should make such an exchange, in which each of them sees tangible benefits for themselves. Linked to this is the so-called philosophy of contact with customers. Two factors should be taken into account: sales that give immediate financial benefit and customer satisfaction, ensuring long-term gain in terms of his loyalty and devotion to the company. Accordingly, the following scenarios should be observed:

1. The customer bought the product or service and is pleased
2. The customer bought the product or service, but is not satisfied

3. The customer did not buy the product or service, but is pleased
4. The customer did not buy the product or service and is not happy

Of course, in the first case, the company can count on both types of profit—immediate and long-term—and this is the most favorable situation for an entity trader. The second case is not a positive commercial transaction, and despite the fact that the customer purchased the goods, his dissatisfaction may stem from the fact that he felt cheated; the product did not meet expectations or the purchase price proved too high in relation to the value of the goods. The third case indicates that there is a chance to conclude the transaction in the future—the customer did not buy goods or services, but the company made a good impression on him and won his sympathy. The fourth option indicates that the company has suffered a total defeat and will not win custom either now or in the future. In the first and third case the company can also count on a recommendation—the cheapest and most effective form of advertizing for each operator.

After-sales Service and Use

There are a number of concerns that a client might have after having chosen a particular product. These include, for example, the fear of having made the wrong choice, failure of the product, concern that the product fits the intended needs and requirements, and dissatisfaction with the service provided. Customers, in view to possible problems being encountered with the product, look for ways to ensure security. Therefore, they look for those companies that provide long-term guarantees on goods purchased and provide a professional after-sales service. After-sales contact is contact with customers after the first positive transaction. After-sales contact is a service initiated by the vendor. Such activities are highly effective and should be the basic form of promotion used by the company, because they are relatively inexpensive, but require the involvement of company staff. Forms of after-sales contact include inter alia: requests greeting, thank you for your purchase, brochure of the company and its products, special offers for regular customers, guarantees for the purchased product. To be able to keep in touch with the customer after-sales, one obviously must know the address,

telephone number, and have the customer's personal data. This necessitates having previously entered the client into a database. Such a database, in addition to the contact details of the customer in question, should—it can be collected at the time of completing the contract, signing of the invoice, or on the basis of questionnaires filled in by the customer—note the value of purchases made and also the type of deals they benefited from. The client should first be asked, of course, whether they agree to contact by regular mail, in connection with the clause on personal data protection. Therefore, the customer should sign the relevant agreement. Stages of active after-sales customer contact include:

1. Preparation of a database
2. To decide as to which of the forms of contact will be used and how they are acquired, customer information
3. Prepare a sufficient number of different patterns of letters that can be used
4. Purchase envelopes, paper, and stamps
5. Getting data about customers and typing them into the database
6. Current "tracking" data and deciding whether to send a letter by mail and/or electronically
7. The inclusion of after-sales contact initially to a small number of customers

Many companies discover the importance of building relationships with customers. Known is the fact that it is not winning a customer as such, but rather it is the ability to keep the customer. Many companies design strategies of customer relationship management. Building customer relationships is a method of management focusing on the value generated by the client. Relationship management focuses on customer value, and not on what the company wants to sell. It is also a tool that builds long-term profits. All employees should be involved in this process, and the leader should be a person with senior management experience. It is impossible to manage relationships with all clients. Each company must answer the question which customers and with how many they can make a permanent relationship.

This necessitates customer segmentation and analysis of target groups in terms of their behavior and level of profitability.[3]

Re-purchase Phase

Re-sale is the goal of any strategy for gaining customer loyalty. Once acquired the customer will return, and the purchases and sales cycle starts again. Accordingly, it is much easier to make contact with him, because the company is already an "old friend." At this stage, the company can begin the process of building customer loyalty through any business activity aimed at shaping positive customer behavior to the provider of the product or service at a given moment, and in the future, in order to establish or expand their customer relationships.[4]

The Role of the Quality of Relationships in Building Solid Business Relationships with Customer Service

In recent years, managers of many companies have sought to improve competitiveness and increase security to keep certain activities. However, a proper and comprehensive understanding of quality, and also to introduce it as an important strategic factor, including integrating it with all the key areas of the organization, is not always successful. However, this is the first step in treating quality as an element that, if used properly, can allow organizations to achieve a sustainable competitive advantage and thereby security to remain on the market. A comprehensive concept of quality is closely associated with enduring customer satisfaction with the cooperation of all employees. Such activity requires the understanding of quality in the direction of improvement, which is an ongoing process, for all employees.

Today's organizations use the following strategies to create different market behavior:

1. Production orientation, where the steering organization focuses primarily on achieving high production efficiency and a wide distribution;

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3 Ibid.

4 P. Kenzelmann, *Forming a good relationship with customers. How to find and retain customers* (Warsaw: BC Edukacja, 2008), pp. 20–21.

2. Product orientation, where the steering organizations are mainly focused on creating products with exceptional dynamic pricing and continuous improvement of their quality;
3. Orientation for sale, which is based on the contention that customers are not left to their own devices when purchasing products of a company. The organization, therefore, must take an aggressive sales stance and pursue promotional activities;
4. Marketing orientation, which is based on the assumption that the key to achieving the objectives of the organization lies in identifying the needs and requirements of target markets, and delivering the desired satisfaction more effectively and efficiently than competitors.[5]

The last, and fourth, kind of orientation—orientation of marketing—is the one most in line with the concept of total quality management (TQM). Therefore, today's organizations show sensitivity to the need to integrate quality improvement of its objectives in a manner consistent with the objectives of marketing orientation.

Relationship marketing is also otherwise known as the marketing partnership is a model that has already gained wide recognition in the world of management theorists and practitioners.

This concept draws attention to the fact that the accents in the relationship with the customer shift from transactions to partnerships, and the purpose of this activity is to maintain long-term relationships with customers. Then, the concept emphasizes the importance of establishing and maintaining permanent contacts with other external markets, including markets, suppliers, potential employees, market intermediaries, and influential market institutions.[6]

The last key factor characterizing this concept is to integrate the three elements associated with the activities of an organization: quality, customer service, and marketing activities.

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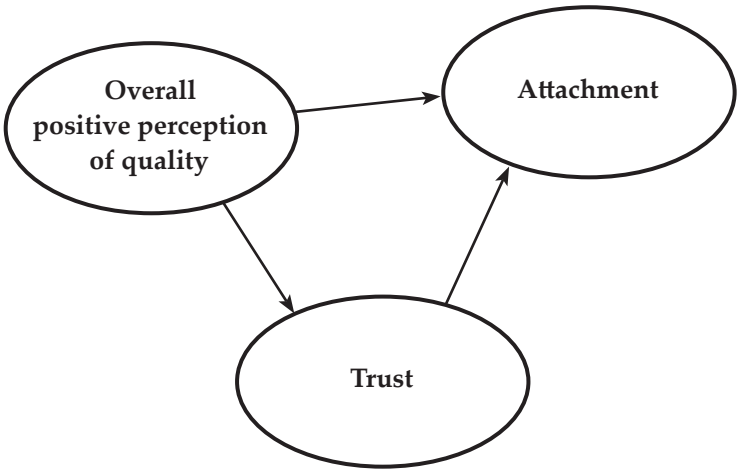
5 A. Payne, *Marketing services* (Warsaw: PWE, 1996), pp. 60–70.

6 W. Wereda, *Customer relationship management and the behavior of buyers in the market of services* (Warsaw: Difin, 2009).

Improving the quality of relationships is based on emotional factors such as trust and relationship commitment, while a positive perception of quality leads to confidence and loyalty, and trust in turn leads to commitment.

Figure 2. Improving the quality of relationships based on emotional factors such as trust and relationship commitment



Source: T. Henning-Thurau, A. Klee, "The Impact of Customer Satisfaction and Relationship Quality on Customer Retention: A Critical Reassessment and Model Development," *Psychology & Marketing*, Vol. 11, No. 8 (December 1997), pp. 753.

The Quality of Relationships in Selected Service Companies

Polish companies currently operate in a very difficult market. Significant decreases in the prices of services, a number of risks associated with the functioning of the Polish free market, European Union structures and regulations, and increased competition as a result of the current global market financial crisis, do not allow Polish managers sleep peacefully. The traditional marketing mix takes into account the classical parameters such as price, promotion, distribution, and when the product does not meet expectations. Companies need to look for such management methods that will ensure their long-term success. Polish organizations are currently adapting to their customers' needs, which entail acting quickly and flexibly, while minimizing maintenance costs. Essential for this, however, is maintaining the quality of the relationship in the first place with customers, and later

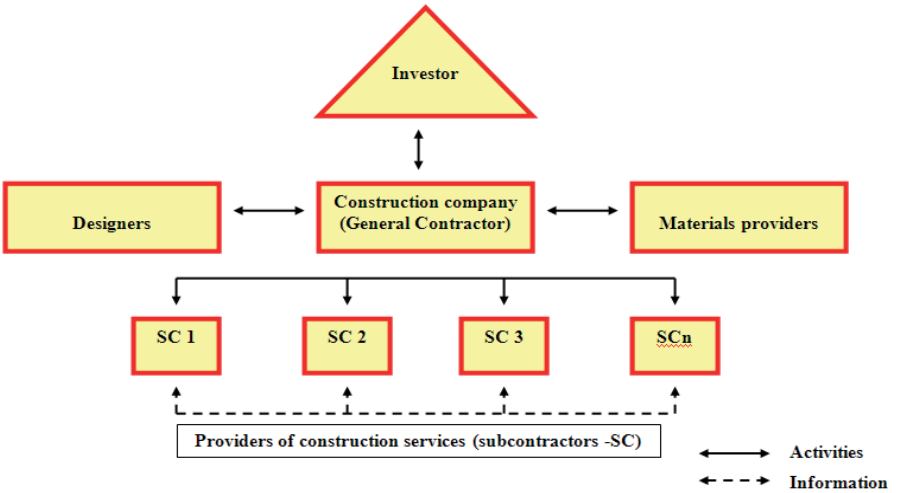
with other market participants and therefore suppliers, agents, employees, potential employees, and influential institutions. In particular, service companies rely on making full use of market relationships in order to secure a competitive advantage over competitors. Increasingly, an emerging market trade in so-called organizations is a key factor for success.[7] Below are shown aspects of the quality of the relationship of three types of service companies—which operate in the construction industry, trade, and telecommunications—and which use all or part of the concept of relationship marketing.

The Quality of the Relationship of a Construction Company

Construction companies currently operate under very difficult market conditions. A growing and not always fair competition and decreased hourly rates for the execution of construction processes significantly affect a company's strategic objectives. Common strategies of construction firms are often, unfortunately, focused only on survival, not development. In these difficult circumstances, the strategic goal of these organizations is to maintain an existing group of customers and its achieved market position. For this purpose, in practice the ideal business model for the realization of marketing is relationship marketing, which is focused primarily on improving the quality of relationships with key players in the construction process. Mutual relationships and dependencies between these actors in the implementation of construction services are depicted in Figure 3.

[7] M. Jabłoński, A. Jabłoński, "Selected aspects of building business relationships, service companies," www.bsc.edu.pl/files/publikacje/aspekty_relacji_biznesowych.pdf

Figure 3. Mutual relationships and dependencies between the participants of the implementation of construction services



Source: M. Jabłoński, A. Jabłoński, "Selected aspects of building business relationships, service companies," www.bsc.edu.pl/files/publikacje/aspekty_relacji_biznesowych.pdf

In practice, the construction companies, in building and sustaining fair, positive relationships with market participants, support the concept of strategic quality management. More and more construction companies already have the quality management systems certified according to ISO, which draw attention to the quality of the relationship between the supplier, the organization (construction company), and the client. The company attaches great importance to the quality of the relationship, but also takes into account in their strategies the existing results of cooperation. Factors that have a significant impact on the strategies are:

a) Clients

- Customer payment terms;
- Position of stability in service delivery to the customer (future intentions of the client);
- Length of time in liaison with the client, and the experience.

b) Suppliers

- Previous cooperation with the supplier (quality of supply, on-time deliveries, responsiveness to needs);
- The negotiated terms of payment;
- Speed of delivery;
- Length of time of continuous cooperation with the supplier

c) Employees

- Previous successful employee in relation to company performance;
- Length of employment;
- Relationships with staff[8]

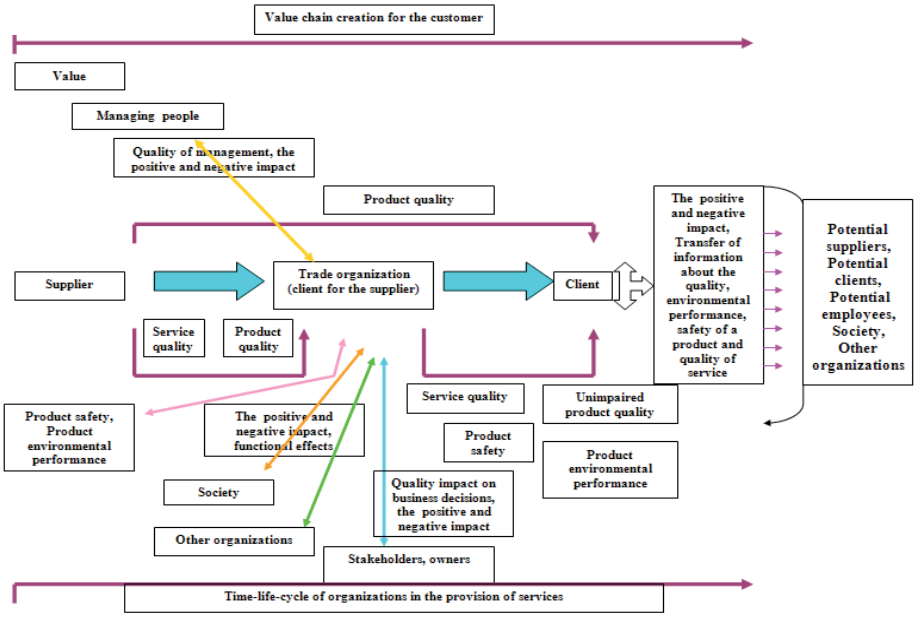
The Quality of Relationships of a Merchant Company

In the case of merchant companies, building commercial market relationships of a demonstrably high quality is extremely important. The factors set out in the concept of Relationship Quality (quality of relationships), and therefore trust and commitment based on the quality of services, are becoming items of strategic importance. Quality of service trade is also tied to the quality of the product sold, as well as possession of the knowledge and skills in its transmission to the client. A practical model for the creation and delivery of quality in relationship marketing for the organization providing the services is shown in Figure 4.

In this model, it is clear to see internal and external relationships, which may positively or negatively affect a company competing in the commercial market. So the quality of relationships and their complexity can significantly affect the company's competitive position in the market.[9]

8 Ibid.
9 Ibid.

Figure 4. A practical model for the creation and delivery of quality in relationship marketing for organizations providing commercial services

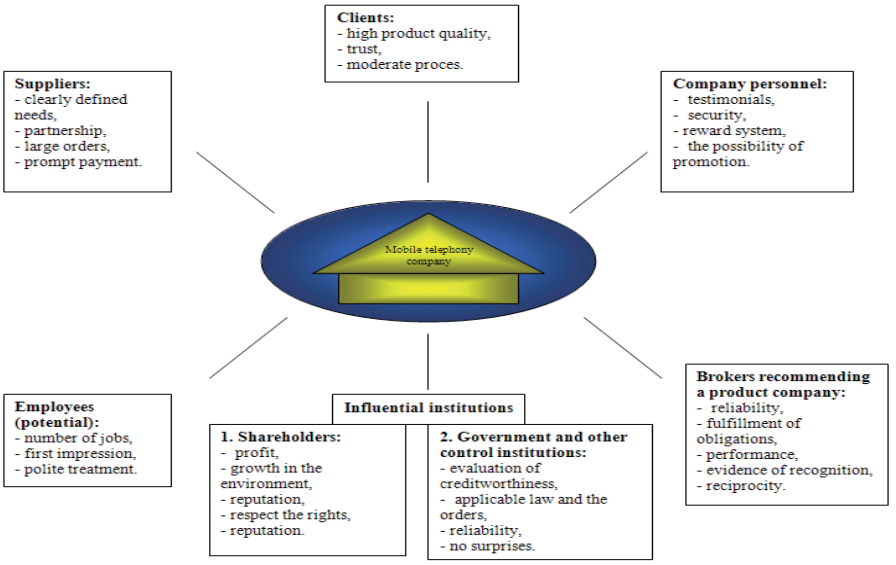


Source: M. Jabłoński, A. Jabłoński, "Selected aspects of building business relationships, service companies," www.bsc.edu.pl/files/publikacje/aspekty_relacji_biznesowych.pdf

The Quality of the Relationship of a Mobile Telephone Company

As far as mobile companies in Poland are concerned, relations with all stakeholders are of great importance because of the increasing competition and other virtual operators offering substitutes, such as voice or text messaging offered by internet providers. The quality of the relationship of these businesses with others is essential in times of financial crisis, when the suppliers, customers, company personnel, and agents pay increased attention to the operating costs of its activities, including the costs of buying. The quality of the relationship provides some security by maintaining relations and trade, even during times of financial crisis.

Figure 5. The quality of the relationship market participants and entities involved in the mobile business



Source: Based on A. Payne, *Marketing services* (Warsaw: PWE, 1996), p. 69.

Concluding Remarks

Service companies operating in a free-competition market must reckon with fierce competition, and they must capture their customers by offering substitutes for other vendors, whose main objective is to increase sales figures.

Especially in service companies, marketing activities should adopt the strategy of building positive and stable relationships with market partners. In this way, these organizations have a marketing orientation. Combining it with the quality strategy, building a positive image, and a market position based on the trust and loyalty of customers and market partners, will equip them with the security to survive and enable them to expand their business both in opportune times as well as in times of crisis.

The Role of Territorial Governments in Reducing Barriers of Local-scale Entrepreneurship Development—Good Practices

Urszula Kobylińska[1] and Ewa Glińska[2]

Summary: An unquestionable advantage of the market economy is the creation of conditions conducive to active entrepreneurship. Experience shows that the state—by creating a legal and administrative framework for business activity—can significantly impact companies' growth dynamics and potential. Excessively complicated legal regulations and administrative requirements reduce the performance of businesses, limit their innovativeness potential, and increase operating costs.

Key words: government, administrative barriers, good practices, procedures

Introduction

Changes in the principles of economic life, resulting from the transformation of the political system, radically modified the development conditions for local communities in Poland. In the lives of local communities, the key role is now played by local governments whose powers and responsibilities are determined in relevant legislation. One of the main tasks of the local governments is to indicate directions for further socio-economic development and to ensure appropriate conditions for it. This is done primarily by creating an environment conducive to the development of broadly understood entrepreneurship and innovativeness. Local governments' activities aimed at supporting entrepreneurship development may be analyzed both in the internal and external dimension. The internal dimension covers the structure, functions, and management processes within the local government's office. The external dimension covers activities relating to local development of a given local government's territorial unit.[3]

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2 Ph.D., Faculty of Management, Białystok University of Technology, Poland
3 B. Tuziak, *Samorządy lokalne regionu Podkarpacia a rozwój przedsiębiorczości i innowacyjności* [Podkarpackie Province's local governments and the development of entrepreneurship and innovation], Samorząd Terytorialny, No. 1–1 (2006), p. 61.

Legal and administrative requirements for running business activities in Poland are among the main barriers to the development of entrepreneurship in the country. Inflexible labor law regulations and arduous administrative procedures are the main disadvantages, according to the conclusions of numerous studies conducted among entrepreneurs in Poland.[4] Accomplishment of formalities connected with the settlement of various regulatory liabilities (duration of procedures, number of required documents, availability of various document forms from one place, etc.) constitutes the main difficulty. This particularly applies to smaller companies which are used to traditional payment methods and fulfilment by themselves of all procedures required by the authorities.

Entrepreneurs criticize both the inadequate procedures and ineffective system of service provision to citizens in municipal offices. Barriers experienced by newly established and already existing businesses remain too strong. The Polish government still has a lot to do in this area, and one of the most urgent tasks is to simplify the procedures related to business establishment and continuation. Experience has shown, however, that legislative processes in our country are lengthy and often have significant drawbacks. Initiatives on the local level can be implemented more quickly to make it easier for entrepreneurs to legalize their businesses and formalize other important aspects thereof in municipal offices. Local governments' initiatives, mainly related to organizational solutions, are already visible in some municipalities, which translate into a better climate for entrepreneurship in Poland.

Administrative Barriers to Business Activity at the Local Level

According to the *Ease of Doing Business Ranking* published by the World Bank in 2009, Poland ranks in 72nd place among the 183 studied countries.

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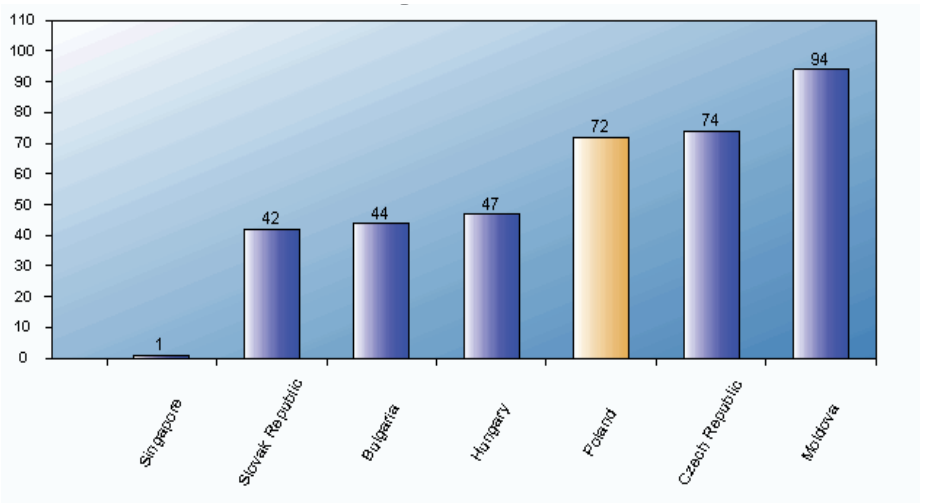
4 See *Raport o sytuacji w sektorze małych i średnich przedsiębiorstw w latach 2002–2003* [Report on the Situation in the Sector of Small and Medium Enterprises in 2002-2003] (Warsaw: Ministerstwo Gospodarki i Pracy, Polska Agencja Rozwoju Przedsiębiorczości, 2004); P. Rymaszewski, Kurek, P. Dobrowolski, *Reforma procesu stanowienia prawa* [Legislative process reform], CASE, Commercial Union Poland, Nokia, Warsaw 2004; *Przedsiębiorczość w Polsce w 2004 r.* [Entrepreneurship in Poland in 2004] (Warsaw: Ministerstwo Gospodarki i Pracy, 2004), http://www.mgpips.gov.pl; M. Starczewska-Krzysztoszek, *Bariery rozwoju małych i średnich przedsiębiorstw w Polsce* [Barriers to the development of small and medium-sized enterprises], INFOS Biuro Analiz Sejmowych, No. 4 (28) (2008).

Countries that rank higher than Poland include Slovakia (42nd), Bulgaria (44th), Hungary (47th) and Belarus (58th) (see Fig. 1).

Figure 1. Poland vs. selected other countries, according to Ease of Doing Business Ranking



Source: World Bank, *Ease of Doing Business Ranking*, http://www.doingbusiness.org/economyrankings/

According to the authors of this report, Poland's main problems include excessive bureaucracy, overcomplicated tax regulations, and multiple licences and permissions required in various sectors of the economy. According to the partial criterion "*starting a business*," our country ranks a very lowly 117th place.[5] This, undoubtedly, is a significant problem for Polish entrepreneurs and, at the same time, a major challenge for legislators who should quickly implement legislative solutions supporting new business development.

Although in the past few years the number of procedures required to start a business in Poland has decreased from ten to six, the level of formalities is still unsatisfactory.[6]

5 *Ease of Doing Business Ranking*, http://www.doingbusiness.org/economyrankings/ (accessed March 27, 2010).

6 The best international practices in this field, applied in Australia, Canada, and New Zealand, require the implementation of only two procedures.

In terms of the amount of time needed to start a business, however, Poland ranks favorably among the new EU member states. Yet, the required amount of time (about 32 days) is still very long compared to such countries as Australia, Canada, or Denmark, where it takes 2–4 days to establish a company. The average number of days needed in OECD countries is 25. While the situation in Poland is not bad in this respect, there is still a need for shortening the duration of the procedures.[7]

According to the results of surveys conducted among Polish entrepreneurs from the SME sector, for almost 57 percent of the respondents the main barriers to their development are administrative procedures. They are described as arduous, expensive, arising from inadequate legislation, its incorrect application by public administration authorities, and the authorities' and their personnel's insufficient preparation for work. Excessive administrative procedures constitute a source of unnecessary costs incurred by businesses due to constant changes in legal regulations. These costs should be increased by costs related to regulatory risk (the necessity of monitoring compliance with legal regulations applicable to the business) and by opportunity cost (the cost of foregone alternatives). The latter occurs in connection with investment and operational activities foregone, e.g., due to the unpredictability of dates and directions of changes in legal regulations and in government and public agency charges. The costs related to administrative barriers also include the time spent by company managers on processing various document forms required by the authorities. Owners of small and medium-sized companies estimate that they spend 16.6 percent of their working time, i.e., 1 hour 20 minutes per day, dealing with such formalities. In micro-companies the time is even longer: 1.5 hours (18.8 percent of overall working time). Given the small numbers of people working in such companies, each additional administrative burden limits the time available for company management, including strategy development and implementation and building lasting customer relationships.[8]

In Poland, business activity registers (which are the registers of sole proprietorships) are kept by municipal offices. Each sole proprietorship has to

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7 *Bariery administracyjne związane z podejmowaniem i prowadzeniem działalności gospodarczej w Polsce. Ocena. Raport końcowy* [Administrative barriers to starting and conducting business activity in Poland. A review and final report] (Warsaw: Ministerstwo Gospodarki, 2005), p. 3.

8 Starczewska-Krzysztoszek, *Bariery rozwoju małych i średnich*, op.cit., pp. 3–4.

be registered by the municipal office responsible for the territory on which the sole proprietor resides. Formally, the registering entity which keeps a local register of business activity is either the *wójt* (head of rural municipality) or the mayor of a town/city. The registering entity is under the obligation to enter the sole proprietorship into the register and to provide a certificate of the registration to the proprietor no later than within 14 days of the application for the registration. In practice, the time is often extended up to 30 days.

Negative opinions can be expressed not only about legislative solutions but also about certain relations between municipalities and entrepreneurs. According to empirical studies conducted in different regions of Poland, local authorities' policies towards the SME sector are either non-existent or inadequate. This is reflected, inter alia, by a lack of activity or the indifferent attitude of local authorities.[9] In addition, a major problem in many communities is the lack of local spatial development plans which halts new investment projects. Local governments have problems with meeting their commitments under investment contracts; this leads to negative opinion formation among entrepreneurs and withdrawal from investment projects by many companies.

The Role of Local Governments in Reducing Administrative Barriers

Obviously, local authorities are unable to remove all administrative barriers, as most of the required decisions are beyond their powers. However, there are a number of organizational solutions that can be implemented in municipal offices' work. What enterprises seek most from local authorities are:[9]

- To ensure the clarity of and access to legal regulations and administrative procedures in different forms (at the municipal office and on-line) for the general public and for businesses entities; clarity of interpretations of legal regulations is also required;

[9] W. Łaptaś, K. Wach, *Bariery rozwoju przedsiębiorczości i praktyczne sposoby ich przezwyciężania – na przykładzie działań Urzędu Miasta Krakowa* [Barriers to business development, and practical methods of overcoming them, on the example of measures undertaken by Kraków Municipal Office], a multimedia presentation available at: http://www.archiwum.technoinkubator.com/prezentacje2/2.ppt

- To introduce a clear division of responsibilities between different units of one institution, and to ensure effective flow of information;
- To apply a carefully planned, coherent, and long-term fiscal strategy and local fees strategy; the rules should be publicly available, and any changes should be infrequent and carefully designed;
- To undertake consistent and regular activities to enhance the competences of staff; wherever possible, office positions should be de-politicized to avoid staff rotation;
- To create citizen-friendly municipal offices without excessive bureaucracy;
- To create conditions for new investment projects, in particular to develop and update local spatial development plans and infrastructure development plans, and to cooperate in investment project implementation;
- To establish and maintain a coherent system of entrepreneurship development support;
- To facilitate access to information, training, and consultancy services for entrepreneurs;
- To actively cooperate with enterprises in the fields of unemployment reduction, regional promotion, and local business stimulation.

The problems most frequently encountered by entrepreneurs—at all stages of contact between the entrepreneur and the local government office—and the preventive measures which may be accordingly adopted, are listed in Table 1.

The improvements indicated in table 1 can significantly contribute to the revival of entrepreneurship in the regions, and become a source of increased satisfaction of this group of municipal office clients.

Table 1. Possible initiatives of local authorities (urban/rural municipal offices) to facilitate contacts with entrepreneurs

No.	Problem	Possible solution by municipal office
1.	Long duration of procedure in municipal office	To develop procedure flow charts defining the sequences of steps taken and the requirements for documents submitted by entrepreneurs (e.g., in the form of instructions used by the municipal offices when applying for the award of ISO 9001 certificate)
2.	The necessity to collect different document forms from different units	To ensure the availability from municipal offices of document forms required by other offices, e.g., statistical office or revenue office
3.	Poor information policy of the office, and insufficient communication	To create front office desks, information desks, or Customer Service Desks in municipal offices for the first contact with the client; they should provide comprehensive information and assistance in filling in document forms
4.	The necessity to go to the municipal office in person	The municipal office's IT infrastructure adjustment to the requirements of the information society (the possibility to download document forms, to securely submit them, and to check the status of one's case on-line)
5.	Lack of standardized document forms	Introduction of standard document forms and their numbers for the whole territory of the country
6.	Not identified or poorly identified needs of local entrepreneurs	Introduction of new forms of municipal offices' communication with clients (e.g., discussion panels, questionnaire surveys, seminars, specific-subject mailboxes to which inquiries could be sent, etc.); consideration should be given to taking into account entrepreneurs' opinions on the procedures, and regular collection of information on desired improvements

7.	Unclear document forms	Identification of the most common mistakes made by entrepreneurs (resulting in the rejection of applications), and creating conditions for avoiding such mistakes, for example by printing appropriate information brochures, provision of information on meetings held with entrepreneurs, etc.
8.	Lack of attractive locations for investment projects in rural/urban municipality	Giving priority to pro-investment policies of local governments, in particular to agricultural land reclassification as a basic element of this policy; preparation of thorough investment process guidebooks for investors
9.	Low professionalism of services provided by contact personnel	Improvement of service quality by: • trainings for municipal office personnel in the field of interpersonal relations between public administration officers and entrepreneurs; • regular customer opinion surveys; • introduction of an ethical code for public administration officers; • internal incentive systems for public administration officers: performance-based bonus schemes, etc.
10.	Poor system of communication between offices/authorities	Creation of a system ensuring access by personnel of one office to databases of other offices (to verify data), to process or supplement applications or data included in them

Source: Based on *Bariery administracyjne związane z podejmowaniem i prowadzeniem działalności gospodarczej w Polsce. Ocena. Raport końcowy*[*Administrative barriers to starting and conducting business activity in Poland: A review and final report* (Warsaw: Ministerstwo Gospodarki, 2005.

Good Practices of Municipal Offices

Over the past few years, more and more municipal offices have been undertaking initiatives aimed at business climate improvement in their localities, through the introduction of simple solutions helping local entrepreneurs to overcome administrative barriers. One of the solutions common for these offices is the implementation and certification of quality management systems compliant with ISO 9001:2000. With the aim of identifying specific

"best practices" in the field of local entrepreneurship support by municipalities, a survey was carried out in the form of direct interviews with those municipal offices' representatives responsible for quality management systems. The interviews were conducted by one of the authors of this report, in the second and third quarter of 2008.[10]

The Municipal Office of Płock was one of the first municipal offices in Poland to establish (already in 2001) a special Client Service Office, providing comprehensive services to its clients, including entrepreneurs. The municipal office registers a very low number of justified complaints; this confirms its professionalism in task performance. Once a year, a citizen satisfaction survey is contracted to an external company which analyzes the respondents' opinions on a sample of 1000 citizens. The results of the surveys confirm the inhabitants' growing satisfaction with the municipal office services. The municipal authorities also stimulate local citizens' activity through the work of a foundation established jointly by the municipal office and local businesses. The foundation supports initiatives in the fields of education, security, and tourism. In 2004 and 2005, the town was awarded a special prize for its excellent cooperation and development of contacts with other European towns and cities.

The activity of the town's authorities is particularly focused on investors as a client group. The municipal authorities offer a number of incentives for potential investors. Among them are individual tax rebates depending on the scale of investment, real property tax exemptions, and infrastructural investments adjusted to the needs of businesses. In the field of service quality increase, a lot is expected of the full computerization of the municipal office. Work related to electronic document flow system implementation is coming to an end, and it is hoped that the system will finally resolve document flow problems. Documentation within most departments already flows electronically, which significantly shortens the duration of issuing administrative decisions.

Another entrepreneur-friendly municipal office is that of the city of Olsztyn. It has implemented a quality management system which contains numerous mechanisms that facilitate office management and increasing

[10] The survey was carried out within U. Kobylińska's project "Improvement of quality management systems in local government offices," Department of Management, Białystok University of Technology.

the satisfaction of the local community. Processes are monitored by means of internal audits and customer satisfaction surveys. The office managers attach particular importance to client service improvement. An interesting solution has been the opening of a professional Client Service Office which, apart from desks with representatives of all departments of the municipal office, has desks with representatives of the ZUS Social Security Company, the Revenue Office, and the Polish Post. Such a grouping in one place of specialists in various fields of knowledge makes it easier for entrepreneurs to formalize their business activity; other clients also save time as they do not have to go to various places to have their matters settled. The clients may express their opinions on the work of specific public administration officers in an anonymous questionnaire available at the office. Analyses of the filled-in questionnaires confirm the clients' growing satisfaction with the services of the municipal office. In addition, once a year, an opinion survey is contracted to an external company to canvass citizens' opinions on the work of the office.

The Municipal Office of Gdansk is fully prepared to carry out all the tasks as an e-office. It has implemented an electronic document flow system thanks to which the clients may check their case status (pending, closed) on the office's website. Currently, 43 official procedures can be carried out via the Internet. Without leaving one's home and having to queue, one may carry out numerous procedures such as registration of a sole proprietorship, or notification about a public meeting. The office's website also includes descriptions of the remaining 273 procedures. The city ensures very good conditions for business activity, which translates into a growing number of new businesses. The Office has a special Entrepreneur Service Unit whose main task is to help in new business registration. Again, this is done by grouping, in one place, representatives of all the departments of the office which the client would otherwise have had to visit separately in order to register his/her business activity. In addition, a special booklet "Entrepreneur's Assistant" has been issued which contains comprehensive information about all procedures and formal and legal requirements connected with the registration of new sole proprietorship. The booklet is available to all persons visiting the Entrepreneur Service Unit.

In another example, the Municipal Office of Tychy has implemented an electronic management system for documents and official procedures in

order to improve communication within the office and to increase the quality of service to citizens/entrepreneurs. In order to unify the principles of document flow in the system, a document flow procedure has been designed and adopted. The implementation of the system has shortened the duration of document search by 50 percent, has ensured a better control over the pending procedures, and has made it possible to automatically create registers. Clients who want to check the status of their case on the telephone are immediately informed of the unit dealing with the case and about its status. A special glossary has been issued to help the clients understand specialist legal terminology required by legal regulations. The municipal office staff are under obligation to provide access to the glossary to all interested persons. The municipal office has also prepared information materials on the municipality's key development documents, including the Local Spatial Development Plan and Multiannual Investment Programme; the materials inform local inhabitants about the city's priorities in terms of fields of activity and planned projects.

Concluding Remarks

Based on the considerations included in this chapter, it may be concluded that the barriers to starting a new business or continuing an existing business in Poland are very significant. The Polish government still needs to do a lot in the field of legislative initiatives in order to adjust the scope of required formalities to the actual needs. One of the most urgent tasks is the simplification of the Polish tax system which is too complex and thus lacking in transparency and clarity. Among the solutions that can be implemented immediately are the individual local governments' initiatives as described above. However, a main way to minimize business-blocking procedures should be sought through an increase in the quality of the institutional environment in which business activity is conducted. What is mainly required, therefore, is a more positive approach and a greater efficiency on the part of the authorities in issuing various decisions and permits related to business activity. Such an approach and greater efficiency do not require legislative solutions but just a few purely organizational improvements. Also, the municipal authorities' cooperation with business organizations and institutions supporting entrepreneurship may provide up-to-date information about the actual needs of local entrepreneurs.

Strategies of Energy Security in the Asia and Pacific Region: Outline of the Issue

Bogusława Drelich-Skulska[1]

Summary: The development of every country—its long-term existence and efficient functioning— needs to be based on sound economic foundations. In this sense, economic security, which is the subject of this chapter, is crucial for other security areas of the country. One area of economic security which has a significant influence on the development of every country is that of energy security. The energy security of countries that comprise the Asia and Pacific region is the focus of this chapter. Strategies which serve to ensure that resources indispensable for long-term economic development for individual countries are presented in the context of problems related to energy security. Shaping the energy security strategy of both a country and a region is a process dependent on overcoming various barriers and on the impact of a number of factors. It is impossible to guarantee full security when caring for only one element of the entire system. However, the weakness of a single component may determine the failure of the whole security strategy. This observation has significant consequences when working on strategies and ensuring energy security of a particular national economy. On a country level, this means caring about the balance of various elements which constitute a well-functioning economic organism. On the international level, in turn, this enforces cooperation, since the increasing level of economic mutual dependence on the global scale makes it impossible to overcome some threats independently. As emphasised below, the countries belonging to ASEAN and APEC are perfectly aware of the existing correlations in the global economy.

Keywords: energy security, economic development, Asia and Pacific region

Introduction

The development of every country—its long-term existence and efficient functioning—needs to be based on sound economic foundations. In this sense, economic security, which is the subject of the present chapter, is crucial for other security areas of the country. However, ensuring economic security requires also proper actions taken on the social, political, and

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even military planes. Economic security is, thus, a perfect example of the interpenetration of various security areas.

One of the areas of economic security which has a significant influence on the development of every country is energy security. Strategies which serve to ensure that resources indispensable for long-term economic development are presented in the context of problems related to energy security.

The Essence and Structure of Economic Security

Since the beginning of the 1990s, security has depended to a large extent on the condition of the economy, the natural environment, and social and cultural factors. In the commonly accepted classification by B. Buzan, five security sectors may be distinguished: military (traditional), political, economic, ecological, and social.[2] These sectors do not exist separately but they create a network of mutual ties.

Economic security creates the foundation for the development of individual countries and regions in the global economy, as well as plays a crucial role in ensuring today's international security.

Economic security may be defined as "the entirety of factors and considerations securing the independence of the national economy, its stability and balance, as well as guaranteeing the ability to continuous regeneration and self-improvement."[3] The foregoing definition points to the three-element structure of economic security:

- The independence of the economy; obviously the point here is not to achieve autarchy, but to achieve such a position on the international arena that enables free competition and participation in the global trade on a partner basis
- The stability and balance of the economy, i.e., optimum conditions for the operation of enterprises and/or the lack of large disproportions in the redistribution of income

[2] B. Buzan, *People, states and fear: An agenda for international security studies in the post-cold war era* (Harlow, 1991), pp. 19–20.

[3] K. A. Kłosiński, "Światowe determinanty bezpieczeństwa ekonomicznego," in T. Guz, K. A. Kłosiński, P. Marzec, eds., *Bezpieczeństwo ekonomiczne państw* (Polihymnia, Lublin: Tomaszów Lubelski, 2006), p. 41.

- The ability for continuous regeneration and self-improvement, i.e., enabling the free development of investments and innovations

It is worth addressing the problem of the independence of the economy in the context of economic security more profoundly. In the era of the global economy, it is impossible and, at the same time, economically unjustified to reach a state of autarchy (self-sufficiency), as such a state would exclude gaining benefits from the international division of labor, foreign trade, and achieving return to scale as a result of production designated for export. Guaranteeing the independence of the economy comes down to achieving a state in which the economy of a given country is characterized by the ensured supply of the production factors indispensable for its development and functioning, and full freedom in accomplishing the goals of macroeconomic policy.[4]

Energy Security vs. Economic Security

The issue of the energy security of a particular economy should be considered in the context of its general economic security. The definition of energy security based on this assumption may be the following: "The balance between the demand and supply of energy favourable to permanent economic and social development of the country."[5]

A broad view on energy security problems results also from practical considerations. Energy is a general notion. Many sources of energy used in a variety of ways are encountered every day. Every source of energy has specific characteristics, which require specific methods of production, delivery, and usage of the energy obtained from it. From the point of view of the economy as a whole, detailed solutions are significant to the extent to which they lead to the main goal, which is ensuring foundations for stable and long-term economic development. In the power industry area, this goal may be achieved in numerous manners and with the use of competitive

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4 D. B. Bobrow, H. Haliżak, R. Zięba, *Bezpieczeństwo narodowe i międzynarodowe u schyłku XX wieku,* (Warsaw: Wydawnictwo Naukowe Scholar, 1997), p. 78.

5 S. Tønnesson, Å. Kolås, *Energy Security in Asia: China, India, Oil and Peace*, Report to the Norwegian Ministry of Foreign Affairs, PRIO Report 2006, International Peace Research Institute, Oslo, 2006, p. 8, http://www.prio.no/files/file47777_060420_energy_security_in_asia__final_.pdf

technologies. Although the selection of individual solutions itself does not determine the overall effect, it ought to take into consideration the assumptions made on the system level. The employed spectrum of various technological solutions needs to eventually ensure the energy balance in the scale of the entire economy.

As mentioned above, the energy security of a country is a basic constituent of its economic security. The stable operation of the economy and maintaining a specified level of economic growth require ensuring the continuity of energy supplies. The broadly understood energy "powering" of the economy of a given country "producing" GDP is different from the electricity, gas, or petroleum used by specific enterprises to produce specific goods. In fact, ensuring energy security means guaranteeing undisturbed processes of obtaining energy from primary sources, processing and distributing power products, and finally, their use to obtain commercial energy. There are a number of such chains between sources of energy and the final recipients in every economy. Ensuring security within one type of power chain or one type of power product does not guarantee the energy security of the entire economy. Hence, in practice, energy security means guaranteeing the security of various stages of producing and delivering energy in all its forms.[6]

Diversification of methods of obtaining and using energy needs to be taken into consideration in every well-prepared energy security strategy, with this notion understood as an optimum way of using the available possibilities in order to ensure energy security on every level.[7] When thinking of improving energy security of a country, the power needs of all entities operating there have to be considered. Thus, the point is not to ensure energy supplies in a sufficient, albeit random, form, but to guarantee a balance on

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6 Kuciński writes: "What is perceived as indicators of perturbations by those managing the economy and social life on the national and international level are […] irregularities present in acquiring, processing and distributing energy. The energy crisis means the collapse of the whole resource process of generating and consuming power in its all forms." See K. Kuciński, ed., *Energia w czasach kryzysu* (Warsaw: Difin, Warsaw 2006), p. 25.

7 R. Ayson, D. Ball, *Strategy and Security in the Asia-Pacific* (Crows Nest, NSW: Allen & Unwin, 2006), write that "[…] the given actor (an organization, group or person) is adopting a strategy as a way of achieving their key objectives. In particular, it is a way of organizing available resources to achieve one's goals. Strategy here is thus the linkage or bridge between means and ends" (p. 11).

the markets of various power raw materials and products, to ensure infrastructure necessary to deliver and receive those goods, and to care for their good quality. In this context the balance means not only the relationship between the demand and supply, but also the proper combination of energy sources allowing for various needs.

Barriers to Shaping the Strategy of Energy Security

Problems with ensuring energy security result from the barriers which appear in the access to the carriers of primary energy (raw materials, nuclear energy, energy of falling water, geothermal energy, wind energy, solar energy, etc.) and the carriers of secondary energy (primary energy transformed into petroleum and coal refining products, electric current, etc.). A shortage of energy may be caused by the following limitations:

- Physical barriers (natural)
- Economic barriers
- Technical barriers (infrastructural)
- Political barriers (administrative)[8]

All these barriers may occur at every stage of the energy production and distribution process. Hence, the lack of fossil fuel deposits in a particular country is only one of the manifestations of natural limitations in producing energy. The lie of land or the specificity of the natural environment may also prevent mining of the existing deposits and impair the transportation of the carriers of energy in various forms.

An economic barrier is, for instance, the unprofitability of mining the possessed deposits, in light of the current market prices of a given raw material, or the necessity to undertake large investments in order to provide the economy with alternative energy sources.

Infrastructural barriers (i.e., above all the lack of appropriate infrastructure, but also the poor quality or unsuitable parameters of the existing infrastructure) prevent, in turn, the transport of power raw materials between key nodes of the energy production and distribution chain. The more broadly understood technological barriers may also be observed in

8 See Kuciński, ed., *Energia w czasach kryzysu*, op. cit., p. 25.

the case of a lack of mutual compatibility of individual elements of the mentioned chain.

The access to sources of primary energy (especially to fossil fuels) is impeded by political barriers dividing individual countries and their groups. Since the oil crisis of the 1970s the access to power raw materials deposits has been used at times as an additional argument in political disputes and as a tool of exerting political (or even military) pressure. For instance, the subject of today's disputes is the natural gas deposits under the seabed of the South China Sea.

The problem from the field of international politics is also ensuring the security of trade and shipping sea lanes. This results from the legal specificity of this form of transport, from the conflicts concerning the ownership of some water basins, as well as from the necessity to have large military forces (usually obtained as a result of international cooperation), which is indispensable for controlling vast sea areas. The subjects of the dispute are, for example, the Spratly Islands and the Paracel Islands in the South China Sea. Claims over the latter territories are variously put forward by China, Vietnam, Philippines, Taiwan, Malaysia, and Indonesia. The archipelago and the islands composing it are of great significance as communication routes, since 25 percent of global sea transport traverses—the area, and the region constitutes a strategic through route for different navies.[9]

Developing the Energy Security Strategy—The International Dimension

Strategies of securing access to energy sources, that is overcoming the mentioned barriers, may take on various forms which are usually a combination of two extreme approaches: the use of market mechanisms in order to optimize the process of energy supply, and the full control of the state over the entire chain (from mining raw materials to selling the energy to customers).

What is crucial in the market option is the economic calculation. Obtaining access to the carriers of primary and secondary energy consists of ensuring the possibility to purchase and sell them both at home and abroad at the lowest possible prices. Striving to possess one's own power resources at all

[9] B. Skulska, P. Skulski, eds., *Bezpieczeństwo międzynarodowe w regionie Azji i Pacyfiku. Wybrane zagadnienia* (Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2010), p. 118.

costs does not occur, nor are power investments carried out on a large scale, if energy obtained as a result of these actions is more expensive than on the global markets.[10] Taking into consideration the conditions determining economic calculations, energy security may be defined as "the process of securing energy supplies permanently and at a reasonable price."[11]

In the variant which guarantees control over energy production (above all by the physical access to the resources), the economic calculation is pushed into the background. Ensuring full physical control over energy sources and the entire chain of its production and distribution becomes more significant. One of the basic requirements of this strategy is possessing deposits of power raw materials. Pursuing this strategy in a determined manner, in the situation of a lack of deposits, may eventually lead to military conflicts, the goal of which will be to guarantee access to raw materials. In a less drastic variant, military force will be an additional argument for maintaining market access to energy sources abroad, e.g., through foreign investments of domestic companies (frequently state-owned).

In practice, strategies employed by different countries are mixed in nature. On the one hand, the possibilities created by international raw materials markets and foreign investments in countries possessing deposits of fossil fuels are taken advantage of. On the other hand, ensuring the highest possible level of self-production in overall energy consumption is strived for.

Geographic distribution of power raw materials, differentiation in the access to other energy sources, and the related virtual impossibility of executing the concept of power self-sufficiency at the level of one country, result in the international nature of the process of securing energy supplies. Due to the fact that the trade in energy is a part of the international economic system, there is no possibility of achieving energy security alone.[12]

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[10] A situation in which it is more profitable in a large country to export a raw material extracted in one region, instead of transporting it to other regions of the country, where it is possible to purchase it for a lower price (including the transport costs) on the international market, may occur in extreme cases.

[11] Definition from a document published after the 3rd Network of East Asia Think-tanks (NEAT) conference by a work group for power cooperation in Eastern Asia, Singapore, May 6, 2005, http://www.ceac.jp/e/pdf/neat_wg5.pdf. NEAT is an organization established by the ASEAN+3 states and operates within the Council on East Asian Community, http://www.ceac.jp/e/neat.html

[12] The International Energy Agency calls for international cooperation in the following

Attempts to develop a energy security strategy at the regional and global levels are a natural consequence of the existence of the above mentioned barriers in the availability and production of energy—the majority of them may be effectively overcome only as an effect of international cooperation. Therefore, energy security belongs to the group of extended security strategies (*extended security*, *transnational security*).[13]

It is worth noticing that the entities of international energy security strategies are not only countries. Transnational corporations (TNCs) as well as smaller international companies, which are significant players on the international energy market (*non-state actors of extended security*), also play a crucial role. The experience and investment capacity of TNCs are important both for countries importing power raw materials and for countries exporting them, even if state groups attempt to compete with them.[14]

A country's energy security strategy is normally based on five pillars:

- Diversifying directions of importing energy or energy carriers
- Maintaining (developing) a safe level of strategic fuel reserves
- Seeking deposits of power raw materials home and abroad;
- Diversifying fuels /energy sources
- Improving the power effectiveness of the economy[15]

Each of the mentioned fields features problems related to the above described physical, technological, economic, and political barriers.

Nowadays, the issue of energy security is clearly embedded in the ecological context. The awareness of threats resulting from the devastation of the natural environment has resulted in ecological norms becoming one of the main indicators for directions of technological development applied in the power industry. Accounting for the influence of energy production,

manner: "No large energy consumer may be certain of safe deliveries if deliveries to other recipients are threatened. And there may be no effective long-term solution of the threat of climatic changes until all major energy consumers take actions." International Energy Agency, *World Energy Outlook 2007: Executive Summary*.

13 See Ayson, Ball, *Strategy and Security in the Asia-Pacific,* p. 108.

14 It ought to be remembered though that state groups become increasingly dominant on international markets. The International Energy Agency estimates that by 2030 the entities will be responsible for up to 80 percent of the total gain in production. See International Energy Agency, *World Energy Outlook 2008: Synteza*.

15 Tønnesson, Kolås, *Energy Security in Asia,* pp. 19 and 43.

distribution, and consumption processes on the natural environment adds a new dimension to attempts to ensure energy security. The point is to achieve a balance between the power needs of the economy and the natural environment.

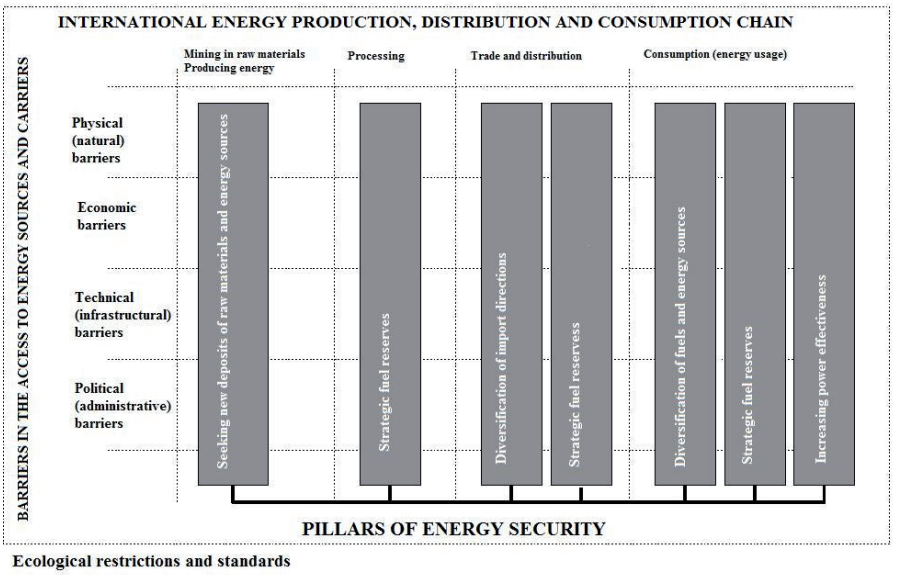
All the above mentioned aspects of energy security can be clearly and concluded in four adjectives (the so-called 4 A's of energy security):

- *Availability*, i.e., possessing deposits of power raw materials and the possibility to produce energy from renewable sources
- *Accessibility*, i.e., access to deposits of power raw materials and energy, which requires overcoming geographical, technological, economic, and geopolitical barriers
- *Acceptability*, i.e., restrictions concerning the characteristics of the acceptable sources of obtaining energy, and above all their impact on the natural environment
- *Affordability*, i.e., market considerations determining the costs of the implemented energy security strategy, which includes both the cost of power raw materials and energy production, and the amount of investment outlay needed for executing the strategy[16]

When discussing the ways of ensuring energy supplies, it should not be forgotten that the balance of the whole power system consists of choices and decisions concerning numerous types of energy, various technological processes of its production, as well as the individual needs of recipients. As shown in Figure 1, the existing international processes of producing and distributing energy from different sources are a result of specific considerations. This network of correlations (which are both domestic and international in nature) is a space in which energy security strategies are developed and executed. Thus, their effectiveness depends on adapting to the existing conditions as much as possible.

[16] Asia Pacific Energy Research Centre, *A Quest For Energy Security in the 21st Century,* 2007, pp. 7– 42.

Figure 1. Pillars of energy security with multidimensional correlations resulting from the manner of producing and distributing energy and from various barriers within the organization of this process



Source: The author.

Power-related Characteristics of the Asia and Pacific Region

Energy security strategies in virtually all countries of the Asia and Pacific region are developed based on the above described five elements: diversification of power raw material import directions, diversification of fuels and energy sources, creating strategic fuel reserves, seeking new deposits of raw materials and energy sources, and increasing power effectiveness of the economy. However, due to completely different considerations, the final shape of the strategies may be very different depending on the country. The individual character of natural, technical, economic, and political barriers, which individual countries need to face, is reflected in energy security strategies. The planned solutions and actions have to be adjusted to the reality of every economy, and the power diversity of the countries in these regions is very large.

Table 1. Energy supply in the Asia and Pacific region, 2006

	Energy production [Mtoe[1]]	Net energy import [Mtoe]	TPES[2] [Mtoe]
Australia	267.79	-145.74	122.47
New Zealand	13.05	4.73	17.54
Japan	101.07	431.11	527.56
South Korea	43.73	185.92	216.5
China	1749.29	135.88	1878.74
India	435.64	134.83	565.82
ASEAN	2300.3	209.9	2469.12

Source: International Energy Agency, http://www.iea.org

Notes: [1] Tonne of Oil Equivalent: the value of energy obtained from the combustion of one tonne of oil. [2] Total Primary Energy Supply, the energy supply coming from primary sources (carriers).

The first division which may be applied with regard to the countries of the Asia and Pacific region is differentiating countries which are importers and exporters of net energy. Obviously, in each of the cases this may mean a completely different structure of export (and analogously import) of power raw materials. Australia, which is the largest energy exporter in the region (see Table 1), sells mainly coal. Indonesia, in turn, exports coal, quite a large amount of gas, as well as petroleum (with the net export of the latter raw material being insignificant). In Malaysia, export is dominated by oil and gas. What is interesting is that the majority of countries exporting energy in the region sell a significant portion of the possessed power resources. The most drastic example is Brunei, which exports 87 percent of what it manages to mine and produce (see Table 2). The major exporters of the region—Australia and Indonesia—sell 54 percent and 41 percent of their annual production of energy carriers, respectively.

Table 2. Energy supply in ASEANcountries, 2006[17]

	Energy production [Mtoe]	Net energy import [Mtoe]	TPES [Mtoe]
Myanmar	22.13	-7.79	14.29
Brunei	21.79	-19.06	2.81
Philippines	24.7	18.53	42.97
Indonesia	307.7	-127.81	179.07
Cambodia	3.56	1.42	4.99
Malaysia	97.94	-29.13	68.33
Singapore	0	53.21	30.67
Thailand	56.23	46.88	103.39
Vietnam	71.94	-18.84	52.29

Source: International Energy Agency, http://www.iea.org

Out of the countries which are energy importers the example of Singapore deserves attention, since 100 percent of its demand for power raw materials is met by foreign sources. Obviously, in the case of the developed economies of the region (except Australia), the necessity to import large amounts of power raw materials is a rule. Both in Japan and South Korea the net import of energy carriers exceeds that of domestic production more than four-fold.

The division of the region into economically developed and developing countries is crucial for the power profile of the region, also in respect of the power effectiveness of individual economies. The power supply ratio per every American dollar of GDP of a given country (see Table 3) clearly shows that highly developed economies (Australia, New Zealand, Japan, and South Korea) use the produced (and imported) energy much more efficiently. The enormous gap between Japan, which is an unrivalled leader in this respect, and China, which is the second-bottom (after Vietnam) ranked country, deserves attention. Taking into account their GDP, China is nine times less effective in using energy than Japan.

17 With the exception of Laos for which data in the IEA database are missing.

Table 3. Power effectiveness in the Asia and Pacific region, 2006

	TPES/PKB [toe/thousands USD of r.]	TPES/PKB PPP [toe/thousands USD of 2000]
Australia	0.25	0.19
New Zealand	0.28	0.18
Japan	0.1	0.15
South Korea	0.32	0.21
China	0.9	0.22
India	0.8	0.15
ASEAN	0.72	0.21

Source: International Energy Agency, http://www.iea.org

Table 4. Power effectiveness in ASEAN countries, 2006[18]

	TPES/PKB [toe/thousands USD of 2000]	TPES/PKB PPP [toe/thousands USD of 2000]
Myanmar	0.82	0.14
Brunei	0.56	0.47
Philippines	0.43	0.11
Indonesia	0.82	0.22
Cambodia	0.79	0.13
Malaysia	0.57	0.26
Singapore	0.25	0.25
Thailand	0.63	0.2
Vietnam	1.08	0.21

Source: International Energy Agency, http://www.iea.org

The level of development influences also the extent to which those power technologies that diminish the negative impact on the natural environment are applied. It should be remembered, however, that in this case the type of power raw material used as the main source of obtaining energy is of the greatest significance. This is one of the reasons why Australia and China, whose power industry is based on coal, emit the greatest amount of carbon dioxide to the atmosphere per a unit of obtained energy.

[18] With the exception of Laos for which data in the IEA database are missing.

Table 5. Carbon dioxide emissions in the Asia and Pacific region, 2006

	CO2/TPES [t CO2/toe]	CO2/PKB [kg CO2/USD of 2000]	CO2/PKB PPP [kg CO2/USD of 2000]
Australia	3.22	0.82	0.62
New Zealand	2.1	0.58	0.38
Japan	2.3	0.24	0.34
South Korea	2.2	0.71	0.47
China	2.98	2.68	0.65
India	2.21	1.78	0.34
ASEAN	2.75	1.98	0.57

Source: International Energy Agency, http://www.iea.org

Table 6. Carbon dioxide emissions in ASEAN countries, 2006[19]

	CO2/TPES [t CO2/toe]	CO2/PKB [kg CO2/USD of 2000]	CO2/PKB PPP [kg CO2/USD of 2000]
Myanmar	0.69	0.57	0.09
Brunei	2.06	1.15	0.96
Philippines	1.55	0.67	0.17
Indonesia	1.87	1.53	0.42
Cambodia	0.81	0.65	0.11
Malaysia	2.25	1.29	0.59
Singapore	1.41	0.35	0.35
Thailand	2.1	1.32	0.42
Vietnam	1.58	1.71	0.34

Source: International Energy Agency, http://www.iea.org

The brief power-related characteristics of the region expose the differences in regard to developing energy security strategies in the individual countries of the region. The countries that have a high demand for energy, which do not possess rich deposits of power raw materials, are forced to seek sources of supply from abroad. The rapidly developing countries, even those with large domestic resources of power raw materials, are not capable of being self-sufficient permanently. At the same time, the energy consumption ratio of their economies is too large when compared to global

[19] With the exception of Laos for which data in the IEA database are missing.

standards. There are also countries at a low development level which, even when possessing quite large resources of power raw materials, are not able to use them due to their small economic potential and the lack of proper infrastructure. In these economies the export of coal, gas, or petroleum forms a significant portion of the proceeds from foreign trade.

Energy Cooperation within ASEAN

Energy security is an international problem. Therefore, international cooperation (at the regional, or even global, level) in relation to developing an energy security strategy is a must, given the existence of a number of barriers in both the access to energy sources and their production. Indeed, many of the economic, infrastructural, or administrative problems may be effectively solved only as a result of international cooperation.

The international dimension of energy security is perceived also in the Asia and Pacific region, and the power-related issues have been discussed for years on the forum of the two largest organizations operating in the region: the Association of South East Asian Nations (ASEAN) and Asia-Pacific Economic Cooperation (APEC).

Issues related to energy security are considered "strategic" by the countries belonging to ASEAN; this was confirmed among others by the declaration signed during the 5th ASEAN summit in Bangkok on December 15, 1995.[20] Point 8 of the declaration (concerning economic cooperation) includes an obligation to ensure security and sustainability of energy supplies through diversification, development, and conservation of energy sources, and increase in power effectiveness, as well as implementation of environmentally-friendly technologies.[21]

Energy security is also one of the main areas of cooperation between the members of ASEAN and the European Union. This was mentioned in

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[20] *Bangkok Summit Declaration of 1995*, 5th ASEAN Summit, Bangkok, Thailand, December 14–15, 1995, ASEAN Document Series of 1994–1995, http://www.aseansec.org/2081.htm

[21] In the original: "ASEAN shall ensure greater security and sustainability of energy supply through diversification, development and conservation of resources, the efficient use of energy, and the wider application of environmentally sound technologies. ASEAN shall implement the Medium-Term Programme of Action on Energy Cooperation (1995–1999) with greater private sector participation in various modes of investment, transfer of technology and human resource development, with major thrust on power sector development."

an agreement on cooperation between ASEAN and the EU concluded on March 7, 1980, in Kuala Lumpur.[22] One manifestation of the decision to undertake common actions for developing better power strategies was the establishment of an international training and research center (ASEAN–EC Energy Management Training and Research Centre, AEEMTRC). The decision on establishing the center was taken during a meeting of the ASEAN and EU ministers of economy on October 17–18, 1985,[23] and the relevant agreement was signed on September 8, 1988, in Brussels.[24]

AEEMTRC operated for 10 years until it was transformed into the ASEAN Centre for Energy (ACE) on January 4, 1999.[25] The mission of ACE is to integrate the power strategies of ASEAN members, taking into consideration their needs and development problems, as well as the ecological balance of the region. The following eight goals are set for ACE:

1. The Centre is to be a regional institution initiating, coordinating, and facilitating the implementation of power-related programmes within ASEAN.
2. The Centre is to enlarge the possibilities of ASEAN to react to global and regional power-related problems by coordinating the power strategies of the member states.
3. The Centre is to facilitate intraregional energy trade, especially by supporting agreements which concern combining power and gas grids.
4. The Centre is to promote regional cooperation in regard to increasing power saving and power effectiveness growth as the major goals of managing the demand side of the power industry.

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22 *Cooperation Agreement between Member Countries of ASEAN and European Community*, Kuala Lumpur, March 7, 1980, ASEAN Document Series of 1967–1988, http://www.aseansec.org/1501.htm

23 *Joint Statement of ASEAN-EC Ministerial Meeting on Economic Matters*, Bangkok, October 17–18, 1985, ASEAN Document Series of 1967–1988, http://www.aseansec.org/1517.htm

24 *Agreement on the Establishment of the ASEAN–EC Energy Management Training and Research Centre*, Brussels, September 8, 1988, ASEAN Document Series of 1967–1988, http://www.aseansec.org/805.htm

25 *Agreement on the Establishment of the ASEAN Centre for Energy*, Manila, Philippines, May 22, 1998, ASEAN Document Series of 1998–1999, http://www.aseansec.org/1719.htm

5. The Centre is to support the development of new renewable energy sources as the main instrument in ensuring stable and permanent power development.
6. The Centre is to function as a regional and global centre of exchanging information on the power industry.
7. The Centre is to raise the competence of ASEAN in the field of developing and managing the power industry.
8. The Centre is to encourage the private sector to participate in regional power-related undertakings and support private investments in this area.

ACE is responsible for preparing the regional action plan concerning energy cooperation (ASEAN Plan of Action for Energy Cooperation, APAEC). So far two such plans have been carried out, in 1999–2004 and 2004–9. The plans form the basis for specific actions taken by specialized institutions established within ASEAN, whose work is coordinated by ACE. These are, among others:

- Forum of Heads of ASEAN Power Utilities/Authorities (HAPUA)
- ASEAN Council on Petroleum (ASCOPE)
- ASEAN Forum on Coal (AFOC)
- Energy Efficiency and Conservation Sub-Sector Network (EE&C-SSN)
- New and Renewable Sources of Energy Sub-Sector Network (NRSE-SSN)
- Regional Energy Policy and Planning Sub-Sector Network (REPP-SSN)

Energy Cooperation within APEC

The importance of international cooperation vis-à-vis energy security was also reiterated at the APEC forum. The statement concluding the 18th APEC ministerial meeting, held on November 15–16, 2006, in Ha Noi, contended that "energy security, in the form of reliable access to reliable sources of energy is fundamental to the region's continued economic development."[26]

[26] *The Eighteenth Apec Ministerial Meeting. Joint Statement*, Ha Noi, Viet Nam, November

Cooperation in energy security within APEC is mainly conducted on the level of the meetings of ministers of economy, whose settlements constitute a basis for actions of the APEC Energy Working Group (EWG). EWG was established in 1990, and its goal is to maximize the contribution of the power sector to the economic development and social well-being of the member states, and, at the same time, to minimize the negative environmental effects. It is worth noticing that the group belongs to the most active bodies of APEC, as it annually initiates and conducts the largest number of projects of all operating work groups.[27]

One of the major achievements of EWG in recent years was to define the overall concept of APEC energy security—the Energy Security Initiative (ESI). The concept was formulated in 2000 and approved at the government and ministry level in 2001. It includes both short-term actions (enabling responding to temporary disturbances in power raw materials supply), and long-term projects (preparing APEC for more complex power-related challenges).[28] The group of short-term actions includes:

- Actions for the improvement of the transparency of the global market of petroleum (Joint Oil Data Initiative, JODI)
- Actions for ensuring security of shipping sea lanes (Maritime Security)
- Implementing a system of exchanging information concerning problems with power raw materials supply (Real Time Emergency Information Sharing System, RTEIS)
- Supporting member states in developing emergency plans and mechanisms in case of disturbances in energy supply (Energy Emergency Responses)

The long-term initiatives concern, above all, the following areas:

- Power-related investments (in particular investments in infrastructure ensuring energy supply sustainability)

15–16, 2006, point VI. 4., http://www.apec.org/apec/ministerial_statements/annual_ministerial/2006_18th_apec_ministerial.html

27 L. Hogan, R. Curtotti, A. Austin, *APEC energy security and sustainable development through efficiency and diversity*, ABARE Research Report, 07–12 (April 2007), p. 38.

28 *Tenth Report on Implementation of the Energy Security Initiative (ESI)*, report presented during 36th EEC meeting, Manila, Philippines, December 3–4, 2008.

- The trade market of natural gas (promotion of gas as a power raw material and diversification of ways of its supply)
- Nuclear power industry
- Power effectiveness
- Renewable energy sources (21st Century Renewable Energy Development Initiative, REDI)
- Clean energy from fossil fuels (above all within the scope of promoting new technologies which allow the minimizing of the negative environmental impact when obtaining energy from coal)
- Alternative fuels used in transport (biofuels)
- Hydrogen and fuel cells
- Petroleum infrastructure

In 2004 ESI was additionally strengthened to include the CAIRNS initiative (Comprehensive Action Initiative recognizing the need for strengthening the APEC Energy Security Initiative—energy security, sustainable development, and common prosperity).[29] The initiative was provoked by maintaining the high prices of petroleum on global markets.

The solutions proposed within ESI are implemented based on APEC Energy Working Group Work Plan: 2007–09, where specialized organizational units responsible for projects of individual areas are specified.

What deserves attention is the fact that—possibly due to a large diversity of member states and the geographical range of the organization—there is a strong conviction in APEC that it is necessary to develop an energy security strategy in a much broader scope than the regional perspective. The final declaration of the ministers of energy at the meeting held on May 29, 2007, in Darwin, Australia,[30] included statements which clearly recommended the necessity for member states and APEC to join international power initiatives (especially the International Energy Agency, IEA, whose representative was invited to the summit) as a whole. The document contained unambiguous

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[29] *Summary Record of the 28th Energy Working Group Meeting*, Port Douglas, Australia, November 3–4, 2004.

[30] *Darwin Declaration On: Achieving Energy Security And Sustainable Development Through Efficiency, Conservation And Diversity*, Eighth Meeting of APEC Energy Ministers, Darwin, Australia, May 29, 2007, http://www.apec.org/apec/ministerial_statements/sectoral_ministerial/energy/2007_energy.html

instructions for EWG, calling for cooperation with the IEA (and other relevant international forums) in regard to the coordination of actions aimed at securing against sudden disturbances in power raw material supply, developing and promoting alternative fuels used in transport, implementing standards to improve power effectiveness, as well as protecting the natural environment.

Both ASEAN and APEC particularly point to the issue of energy security as a component of economic cooperation in the Asia and Pacific region. The awareness of the necessity to develop international power strategies is becoming more and more pronounced among the member states of both organizations. This may be proved by the fact that most ASEAN and APEC member states participate also in other power-related initiatives functioning under the aegis of organizations such as the IEA, the United Nations Framework Convention on Climate Change (UNFCCC), Asia Pacific Partnership on Clean Development and Climate (AP6), East Asia Summit (EAS), the G-8, or the unofficial G-20 group.[31]

Concluding Remarks

Shaping the energy security strategy of both a country and a region is a process dependent on overcoming various barriers, and one that is subject to the impact of a number of factors. It is impossible to guarantee full security when caring for only one element of the entire system. However, the weakness of a single component may determine the failure of the whole security strategy.

This observation has significant consequences when working on strategies and ensuring the energy security of a particular national economy. On a country level, this necessitates caring about the balance of various elements that constitute a well-functioning economic organism. On the international level, in turn, this enforces cooperation, since the increasing level of economic mutual dependence on the global scale makes it impossible to overcome some threats independently. As emphasized in this chapter, the countries belonging to ASEAN and APEC are perfectly aware of the existing correlations in the global economy.

[31] Hogan, Curtotti, Austin, *APEC energy security and sustainable development through efficiency and diversity*, p. 44.

The Security of Polish Electrical Power System Development

Jerzy Tchórzewski[1]

Summary: This chapter is divided into two parts: Faces of Polish Electrical Power Industry and Safe Development of Electrical Power System. The first section presents some chosen characteristics such as aims to create conditions for the sustainable development of the country, ensure energy security, economic and efficient management of fuels and energy, development of competition, counteracting negative effects of natural monopolies, taking into account the requirements of energy policy and environmental protection, commitments resulting from international agreements and balancing the interests of electrical power companies and the consumers of fuels and energy as a system. In the second section some results of the passive identification experiment are presented.

Keywords: electrical power, system, development, energy

Faces of the Polish Electrical Power Industry

Ensuring the safe and efficient functioning of the electrical power system demands that all entities taking part in maintenance management[2] and development control[3] operate according to the Energy Law Act (*Prawo Energetyczne*),[4] as well as the agreements resulting from the executive regulations.[5] The establishment of the Energy Regulatory Office (*Urzędu Regu-*

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2 A. Kądzielowa, "Bezpieczeństwo energetyczne," *Elektroenergetyka* No. 1/2005 (52), pp. 1–16.

3 J. Tchórzewski, *Systemowe wspomaganie procesu badania prawidłowości rozwoju systemu sterowania na przykładzie elektroenergetycznej sieci przesyłowej*, PE'2000 Konferencje 38. Wyd. PCz. Częstochowa, 2000.

4 Act of April 10, 1997, Prawo energetyczne tekst jednolity (Dz. U. Nr 89 z 2006 r, poz. 625, ze zm.) [Energy Law consolidated text (Official Journal, No. 89, 2006, tem 625 as amended].

5 *Instrukcja Ruchu i Eksploatacji Sieci Przesyłowej. Warunki korzystania, prowadzenia ruchu, eksploatacji i planowania rozwoju sieci przesyłowej*, PSE-Operator S.A., Wersja 1.2, Warszawa, March 7, 2006 [Instruction concerning the movement and use of transmission network. The conditions of use, transmission, planning the development of transmission

lacji Energetyki – URE), transfer of the Minister of Finance's competencies as regards setting the prices of electrical power to the President of the Energy Regulatory Office, licensing business activity, and approval of charges set by electrical power companies, as well as making progress in the privatization of the energy sector, are key elements that influence the shape and the future of the electrical power system, taking into account: risk[6] and stability of the system's work[7] as well as planning the development of its subsystems,[8] e.g., distribution network,[9] especially from the point of view of safety of the system's work[10] and development.[11]

The Energy Law act aims to create conditions for the sustainable development of the country, ensure energy security,[12] economic and efficient management of fuels and energy, development of competition, counteracting negative effects of natural monopolies, taking into account the requirements of energy policy and environment protection,[13] commitments resulting from international agreements, and balancing the interests of electrical power companies and the consumers of fuels and energy as a system.[14]

Three basic processes, connected with the participation in the wholesale power market, may be distinguished: long-term planning, medium-term planning, and short-term balancing. They are connected with the same problem of preparation of a portfolio of contracts, considering different time

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network. PSE-Operator S.A., Version 1.2].

6 M. Cegielski, M. Sobierajski, K. Wilkosz, "Impedancyjny model węzła elektroenergetycznego. Podstawy teoretyczne. Perspektywy zastosowania do badania stabilnosci napięciowej," in K. Wilkosz, ed., *Problemy systmów elektroenergetycznych* (Wrocław: OW PWr, 2003).

7 F. Buchta, *Optymalizacja strategii rozwoju sieci przesyłowej w warunkach rynkowych z uwzględnieniem ryzyka*, ZN PŚ, No. 1712, Gliwice, 2006.

8 Tchórzewski: *Systemowe wspomaganie*, op. cit.

9 J. Kazarko, *Estymacja stanów pracy elektroenergetycznych sieci rozdzielczych*, Rozprawy Naukowe No. 9. PB. Białystok, 1991.

10 J. Popczyk, K. Żmuda, E. Siwy, H. Kocot, R. Korab [red. nauk.], *Bezpieczeństwo elektroenergetyczne w społeczeństwie postprzemysłowym na przykładzie Polski* (Gliwice: Wyd. PŚ, 2009).

11 J. Tchórzewski, *Self-Evolving Electricity Power System as Unmanned Factory*, Proceedings of Artificial Intelligence Studies AP-IPI PAN – WAT, Siedlce 2008, pp. 63–80.

12 *Polityka energetyczna Polski do 2025 roku* [Energy Policy of Poland until 2025], Zespól do Spraw Polityki Energetycznej (Warsaw: Ministerstwo Gospodarki, 2005), p. 56.

13 G. Bartodziej, M. Tomaszewski, *Polityka energetyczna i bezpieczeństwo energetyczne*, Wyd. FSN-T "Energetyka i Środowisko," Warsaw 2008.

14 W. Bojarski, *Przykładowe zastosowania analizy i inżynierii systemów* (Warsaw: PWN, 1984).

horizons (planning horizons). Long-term strategy on the wholesale market involves making plans for a period of one year or longer. Medium-term work on the market involves planning, optimization, and discussing schedules of energy supply with business partners for one month as well as negotiating transaction agreements on the market. First, the demand for energy in a given month or the next quarter is forecast. However, monthly schedules change into short-term balancing as monthly deadlines of realized daily supplies come closer when daily-hourly schedules are prepared.

The ability to make forecasts is very important both in strategic management and operational management. Long-term forecasts are especially useful in strategic management. In operational management, knowledge about the nearest future that allows the making of decisions concerning day-to-day control and management of the electrical power system,[15] as well as its regulation and stability,[16] is more useful. Balancing, on the other hand, is used in tactical activity, especially in day-to-day control of the electrical power system,[17] e.g., the selection of appropriate electrical power network configurations considering traffic[18] or the work of a power plant in the electrical power system.[19] At present, the safety of the system[20] is connected with the stability of the system,[21] which, for many years, has been the element of planning the development of the electrical power system[22] as well as making forecasts concerning this system,[23] in order to prevent disintegration of the system as well as work to satisfy one's own needs.[24]

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15 E. Castillo, A. J. Conejo, R. E. Prunela, C. Solares, and J. M. Menendez, "m-k Robust Observability in State Estimation," *IEEE Transactions on Power Systems*, Vol. 23, No. 2 (May 2008), pp. 296–305.

16 J. Machowski, *Regulacja i stabilność systemu elektroenergetycznego* (Warsaw: OW PW, 2007).

17 R. Lis, Z. Kremens, "Systemy ekspertowe w kierowaniu pracą systemu elektroenergetycznego," II KKN nt. *Inżynieria Wiedzy i Systemy Ekspertowe* (Wrocław: PWr, 1993).

18 T. Bułat, *Metoda doboru konfiguracji sieci elektroenergetycznej w warunkach ruchowych*, Praca doktorska pod kierunkiem naukowym dr hab. inż. Jana Pytela, Wydział Elektryczny PWr, Wrocław 1991.

19 H. Gładyś, *Praca elektrowni w systemie elektroenergetycznym* (Warszawa: WNT, 1990).

20 Z. Maciejewski, "Bezpieczeństwo elektroenergetyczne – uwagi ogólne," *Polityka Energetyczna*, Vol. 9. Zeszyt specjalny (2006), pp. 26–35.

21 J. Machowski, J. Bialik, *Power System Dynamics and Stability* (Baffins Lane, Chichester: Wiley, 1996).

22 J. Malko, *Planowanie systemów elektroenergetycznych* (Warsaw: PWN, 1976).

23 J. Malko, *Wybrane zagadnienia prognozowania w elektroenergetyce* (Wrocław OW PW, 1995), p. 84.

24 J. Malko, *Rozpad systemu elektroeneregetycznego. Wyłączanie źródeł. Przejście do pracy na*

Systemic transformation of the Polish electrical power industry is an extremely complicated problem as it is connected with simultaneous privatization of this industry. Thus, great emphasis was placed on drawing up the rules governing the operation and regulation of the market, which is primarily connected with drawing up rules governing trade in electrical power as well as the rules governing the operation of the balancing market. Prior to entering the next stages of the reform, it is important to define the final structure of the electrical power system, i.e., the structure at the end of the designed stage, existing forms of ownership, and the rules governing the operation of the KSE (Domestic System of Energy) after the reform. Therefore, it is also important to prepare appropriate infrastructure after each stage of the transformation, and when the phase of structural development is finished in particular. It is also important to make changes at individual stages of development in a systemic way, and controlling parametric changes of the electrical power system development in particular.

Characteristic features of the structural development and parametric development of power industry are i.a. vertical disintegration of electrical power companies, progressing horizontal consolidation, replacing strong state's interference with market mechanisms, deep privatization of electrical power companies, changes in the system that regulates the power industry, and the development of physical and financial markets that offer the opportunity to trade not only in electrical power including physical contracts and power services but also in financial instruments such as *futures* or *options*.[25] The introduction of market mechanisms into the Polish electrical power industry also demands that centralized optimization systems, which use complex models and algorithms, be replaced with modern methods such as methods of modern control theory and systems development engineering, which allow the construction of models of development in consideration of the higher levels of control and higher level of internal organization of the systems.[26]

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potrzeby własne. Ocena zdolności utrzymania się źródła na potrzeby własne, Raport z realizacji: zadanie ne 6, podzadanie nr 6.2.7. Projekt Badawczy zamawiany Nr PBZ-MEiN-1/2/2006 pt. "Bezpieczeństwo elektroeneregtyczne kraju: Konsorcjum Politechnik: Gdańskiej, Ślaskiej, Warszawskiej i Wrocławskiej." Wydz. Elektryczny. Politechnika Wrocławska, Wrocław, December 2008.

25 W. Mielczarski, *Rynki energii elektrycznej. Wybrane aspekty techniczne i ekonomiczne* (Warsaw: ARE S.A., 2000).

26 J. Tchórzewski, *Inżynieria rozwoju systemów*, Monografie Nr. 18 (Siedlce: WSRP,

Systemic transformation involves transformations of the system, including transformations of ownership, and it is a special case of the problem of electrical power system development, as it entails changes of both the structure and parameters of the system as well as the model of development. A fundamental element of systemic transformation are changes of law, which, in case of technical systems such as the electrical power system, involve changes of laws governing the development of the KSE, resulting from the code of development that consists of parameters and the structure of the model. In this respect, in the models of the development of the KSE, new elements appear as a result of systemic transformation, which means that the obtained models may be adjusted to construct new ownership states of the system.[27]

The problems of identification involve searching for a model of the electrical power system, which would allow to achieve the best possible (the optimum) consistency between the observed variables (empirical variables in this case) and the variables generated by the model for particular given input and output variables, in respect of the adopted method of identification. The algorithm for the process of identification is an iterative process, which, simply put, involves the selection of the structure of the model, conducting the identification experiment (a passive experiment in this case), determining parameters of the model using selected method of identification, and assessment of consistency between the qualities of the dynamic model and the real system, by comparing the consistency of the behavior of the model and the system if both are stimulated by the same input signal.[28]

This process is stopped when the optimum consistency between the model and the system is achieved. In order to conduct the process of identification of the development of the KSE system, appropriate empirical numeric data concerning input and output variables must be collected first. For the experiment that was conducted, data for the period 1946–2007 were used. The identification of the system was carried out in the MATLAB and Simulink environment using the System Identification Toolbox, for the

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1990).

27 J.Tchórzewski, *Wielki system elektroenergetyczny w warunkach zmian strukturalno-parametrycznych własności*. Prognozowanie w Elektroenergetyce. Konferencje 38. Wydawnictwo Politechniki Częstochowskiej. Częstochowa 2000, pp. 239–46.

28 A. Zimmer, A. Englot: *Identyfikacja obiektów i sygnałów. Teoria i praktyka dla użytkowników MATLABA*, (Kraków: Politechnika Krakowska, 2005).

pre-arranged measurement periods of 20 to 30 years with the step equal to one year. Using such criteria as safety of development (statutorily including the ecological point of view) as well as the efficiency of the development for the assessment of development, allows to assess the development of KSE in long time θ and in this way it allows i.a. to specify alarm signals for designers, forecasters, planners, or programmers, or even strategists of the development of KSE (it is important to emphasize that this criterion is the development assessment criterion and not development optimization criterion), according to the systems development engineering.[29]

The most important advantage of the proposed method, based on safety of systems,[30] is the possibility to generate models of development of the electrical power system, apart from predicting new states of the KSE system, taking into account the efficiency criterion of development and the criterion of safe development. In this respect, the notion of safety of the KSE system development and the safety of the KSE system model development were defined respectively, and appropriate characteristics of safe development for both the system itself as well as its model were obtained.

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29 Tchórzewski, *Inżynieria rozwoju systemów*.

30 The criterion of safety was defined by the author for the first time in 1988 and published in the paper "Bezpieczeństwo rozwoju systemów sterowania" [Safety of development of control systems], Symposium Bezpieczeństwo Systemów [Safety of systems] (Kiekrz 04–07.X.1988, ITWL, pp. 200–7), and in the extended paper "Niezawodność systemu organizacji transportu jako problem prawidłowego zabezpieczenia działania" [Reliability of the system of the transport organization as a problem of appropriate security of activity], in *Zeszyty Naukowe Politechniki Warszawskiej*, seria Transport (Warsaw: PW, 1993). The results of research published by the author as regards safety of the systems were also cited in the first book published in Poland on the safety of the systems by Prof. Krystyna Ważyńska-Fiok and Prof. Jerzy Jadźwiński *Bezpieczeństwo systemów* [Safety of systems], published by PWN in 1993. The author returned to the problems related to the safety of systems when the Act on crisis management was passed in 2007, and published the results of his research "Systemowy model zarządzania kryzysowego w dobrym państwie" [Systemic model of crisis management in a good state], in T. Jemioła and K. Rajchel, eds., *Bezpieczeństwo narodowe i zarządzanie kryzysowe w Polsce w XXI wieku – wyzwania i dylematy* [National security and crisis management in Poland in the 21st century – challenges and dilemmas], Wydawnictwa Wyższej Szkoły Informatyki, Administracji i Zarządzania, and in the paper pt. "Development of Electric Power System from the Point of View of Safety," IEEE Xplore pt. *Proceedings of 2008 IEEE Convention of Electrical and Electronics Engineers in Israel*.

In the period of systemic transformation of the Polish economy after 1989, the state's policy concerning energy was realized in accordance to four government documents, namely:

1. *Założenia polityki energetycznej Rzeczypospolitej Polskiej na lata 1990–2010* [Principles governing energy policy of the Republic of Poland in the years 1990–2010] (August 1990)
2. *Założenia polityki energetycznej Polski do 2010 roku* [Principles governing energy policy of Poland until 2010] (November 1995)
3. *Założenia polityki energetycznej Polski do 2020 roku* [Principles governing energy policy of Poland until 2020] (February 22, 2000)
4. *Ocena realizacji i korekta Założeń polityki energetycznej Polski do 2020 roku wraz z załącznikami* [The evaluation of realization and amended principles governing energy policy of Poland until 2010 with appendixes] *2* (April 2002)

The above mentioned documents as well as the documents that take the period until 2025 and 2030 into consideration, were based on the experiences gained during the transformation of the economy, which was also connected with the scope and the speed of the restructuring of the power industry. In practice, however, the adopted concepts of development did not differ as regards solving key development problems, and fulfilling basic aims of the adopted energy policy from the principles and directions of the energy policy implemented in the EU.

The documents paid special attention to the great potential of sources using biomass, especially short-rotation crops for energy, forest biomass, crop and industrial waste, biogas, wind and flowing water, which, according to experts' evaluations have the greatest potential to be used within the existing support mechanisms. Technologies using solar energy, due to low economic efficiency as regards production of electrical power, may only play a significant role in heat production and in island systems, not connected with the KSE.[31] Resources of geothermal energy are to be used as

[31] Data of the Agencji Rynku Energii S.A. [Energy Market Agency] for the period 2002–6 and Urzędu Regulacji Energetyki [Energy Regulatory Office] for the first half of 2007. Installed power of units, where fossil fuels are co-combusted with biomass (not

well, which requires the introduction of special mechanisms in local heat and power station.

Safe Development of Electrical Power Systems: Searching for Regularities in Development

Searching for models of systems development is a current issue because of the fact that there is a need to strengthen the level of electrical power safety, and due to the fact that there is a need to increase the efficiency and safety of the KSE system, which is connected with the package 3 x 20 and works on the macroeconomic model of the system.[32] "Macroeconomic model is one of the basic notions in macroeconomics and denotes simplified descriptions of behaviour and interactions in the economic reality [...]."[33] Moreover, the research on the development of the KSE system is a part of the process of searching for the internal organization of technical systems that work, to a large extent, as developing control systems, which include teleinformatics system, electrical power system, at present treated as unmanned factories.[34]

Individual components of the package should be examined jointly for three final markets: electrical power, heat, and transport fuels markets. Unit consumption of energy (decreasing the consumption of energy during production) by 20 percent by 2020 can be achieved because of fast Gross Domestic Product growth. The overall decrease in CO2 emissions by 20 percent and the increase in the share of renewable resources of energy by 20 percent in the production structure, is closely connected with the final market of all three markets. There are also plans to transfer 30 percent of the costs of the

included in the "Total" item). Data of Agencji Rynku Energii S.A. for the period of 2002–03 and Urzędu Regulacji Energetyki for the period 2004–6 and the first half of 2007. Data calculated by Krajowy Administrator Systemu Handlu Uprawnieniami do Emisji [The National Administration for the Emissions Trading Schemes] in April 2007 according to the latest guidelines by IPCC. Data of Krajowy Administrator Systemu Handlu Uprawnieniami do Emisji, October 2007.

32 B. Wnukowska, *Metodyka analizy i prognozowania potrzeb energetycznych odbiorców przemysłowych na rynku energii*, Prace Naukowe Instytutu Energoelektryki. Monografie No. 30 (95) (Wrocław: PWr, 2005).

33 Bezpieczeństwo elektroenergetyczne kraju. Projekt badawczy zamawiany Nr PBZ-MEiN-1/2/2006. Konsorcjum Politechnik: Gdańskiej, Śląskiej, Warszawskiej i Wrocławskiej. Gdańsk, Gliwice, Warszawa, Wrocław, December 2008.

34 Unmanned factory – flexible production process that does not require the participation of people or where the role of people is limited and controlling and monitoring the work of machines, elements, etc. [167, 169, 177, 178].

rights to emit CO2 in Poland[35] to the producers of energy. This share will be increased to 100 percent in 2020. In this way, the costs covered by consumers will increase by 55 percent in comparison with 2007.

Moreover, offices specializing in designs for the power industry, due to the development of possibilities to use such environments as MATLAB and Simulink with its toolboxes, are waiting for new methods and models that allow for the design of the development of the electrical power system, apart from computer-assisted forecasting, planning, or programming of the system. From the point of view of the current state of the KSE system development, it is important to take into account the increasing degree of diversity of technologies used to produce energy, as well as restrictions concerning the emissions resulting from international contracts, where, apart from parametric changes resulting from modernization of the technology, there are structural changes, beyond the process of systemic transformation, caused by various factors, i.a. the increasing degree of diversity of technologies used to produce energy, transmission technologies, distribution technologies. Moreover, in the official announcements by the Minister of the Economy[36] there appear the results of analyses and forecasts as well as appropriate reports as regards the realization of strategic goals and obtained results concerning the work of the electrical power system.

In Polish conditions, during a period of increasing crisis,[37] a significant piece of information to obtain from the models of development of the electric power system is the information concerning the costs connected with further systemic transformation of the power industry, including the costs connected with structural changes. It is an important problem to be solved, especially by economists. The models presented in this chapter also allow to introduce an additional input variable defined as the number of

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35 Polityka energetyczna Polski do 2025 roku [Energy policy of Poland until 2025] Zespól do Spraw Polityki Energetycznej (Warsaw: Ministerstwo Gospodarki, 2005), p. 56; and Polityka energetyczna Polski do 2030 roku [Energy policy of Poland until 2030], Ministerstwo Gospodarki.

36 Compare the Announcement of the Minister of Economy and Labour of July 1, 2005, on the national energy policy until 2025 (M.P. July 22, 2005) and the announcement of the Minister of Economy and Labor, December 12, 2007, concerning the report evaluating the progress in increasing the share of electrical power produced in high-performance co-generation in the total national production of electrical power (M.P. January 4, 2008).

37 In 2008–09, in the period of preparation of the final version of the treatise, Poland, following Europe and other countries all over the world, underwent a financial crisis, which affected all spheres of economic life including the electrical power sector.

entities included in the process of electric power system operation (or, in more detail, divided into existing and potential participants of the electrical power market), their property (the length of power lines or the number of turbine-sets) etc., and to introduce an additional output variable concerning the costs incurred so far connected with the systemic transformation of the power industry, etc.

Furthermore, defining the costs that can be incurred as part of systemic transformation is a specific state of critical information that is the element of a financial alarm signal if the Polish economy and the Polish power industry are to face crisis. It should also be noticed that it is convenient to use continuous models while examining systems at the macro level, as it allows the examination of the stability of continuous linear systems as well as impulse systems by means of examining the positions of characteristic equation roots using appropriate stability criteria. It showed that some of the obtained models, both parametric models arx as well as the corresponding models in the states space ss were characterized by instability (some characteristic equation roots were not positioned in the left semi-plane of the complex variable).

It should also be added that in the case examined in this chapter, we deal with the stability of the KSE system development and with the stability of the development of the KSE system model, and it is positive not negative feedback that is responsible for the development. Thus, a temporary instability of the development should only be treated as an appropriate signal informing the designers of development. It is also important to notice that state equations describe the transition of the electrical power system from one state of development to another. They usually have a non-linear form, which, in this case, may be transformed into a linear form, e.g., by differentiation in the neighborhood of certain points of development of the KSE system, as specific points of development of the electrical power system.

Finally, it is worth mentioning that identifiers of stability measuring its levels are characteristic roots of the KSE system with their level of domination. They relate to simultaneous connections represented by the matrices of internal organization of the process A (so called transition matrices) which take into account current adjustments within a given unit of long time θ. The level of domination of characteristic roots of the KSE system is often connected with matrix C representing inter-period connections which in the

discussed experiments were not strong. It is said that the development system approaches the balance if it is stable, with the stability being supported by means of control to maintain dynamic stability.

Thus, to gain stability of the development, roots (and radical lines) positioned in the right semi-plane of the complex variable z or s should be moved to the left semi-plane or at least to the beginning of the coordinate system, or even try to eliminate them and introduce new ones. It is connected with making appropriate analysis concerning systemic balance and the stability of development. Instability of the KSE system development examined from the point of view of safety of development leads to determining the attainability of critical states by the model, which depended mainly on technological, construction, organizational, or financial errors in the studied experiments. It is important for the design of the KSE system development that moving roots do not cross the axis of ordinates Im(s) and appropriate relations between the reinforcement coefficient and time constants be maintained. The source of information for the assessment of stability of the linear system are amplitude-frequency response and phase characteristics. Changes in these characteristics produce alarming signals informing about wearing or improvement of the electrical power system.

The main problem while designing and constructing technical systems as control systems, such as the domestic electrical power system, is formulating an appropriate mathematical model. If we deal with the problem of development, it is necessary to obtain a model of the electrical power system development (through analogy to the operation model, etc.)[38] For models that are not very complex, such a model is described by sets of equations on the basis of physical values balance. In case of huge, highly complex and hierarchical systems, etc.— such as the electrical power system—it is impossible to unequivocally define all significant parameters of the system, or the structure of the model by means of modelling, i.e., theoretical deliberations. In such a case, the model is constructed experimentally, by means of passive or active identification.

In the conducted identification experiments, passive identification was used. It was connected with the selection of input and output variables for the experiments (for the convenience of deliberations more than ten input variables and one output variable were assumed, i.e. MISO models, Multi

38 J. Paska, *Niezawodność systemów elektroenergetycznych* (Warsaw: OW PW, 2005).

Input Single Output). Then, the time horizon was defined, e.g., a dozen or a few decades. For the KSE, empirical numeric data were used for the period of 1946–2007, the period of identification was equal 20–30 years with the step equal 1 year, which allowed to obtain 31 th models for one output using *arx()* function, and 31 corresponding models in the states space. When the research was conducted (January 2008), the results for 2008 were not known.

At the moment of submitting the paper for publishing (July 2010) the full results for 2009 were not known, and it was impossible to obtain the results for the sources generating power at the end of 2009 because of losses of power resulting from renovations and operation conditions, and in the years 2007 and 2008 the losses of power increased and the demand for electrical power increased simultaneously. It resulted in the decrease of the available excess power in comparison with the maximum domestic power consumption, especially visible at the turn of 2007 and 2008.

This situation changed in the 4th quarter when the demand for power decreased. The increasing losses of power and the limited number of sources generating power resulted from the increased scope of renovations in power plants, high failure frequency in case of older power plants and heat and power plants, exceeding the allowable limits concerning the emission of pollutants (dust, SO_2, NO_x), shortage of coal, limitations concerning the outgoing amount of power supplied by some power plants during periods of higher temperatures. In the years of 2007–09, it was difficult to increase the import of electrical power, because of whirl flows caused by wind farms located in Northern Germany. In 2009, Polish network infrastructure, owned by PSE Operator S.A., comprised 235 lines with a total length of 12,953 km[39] and 177 transformers.

KSE has inter-system connections with Sweden using a direct current connection of 450 kV, with Belarus using a 220 kV line, Ukraine using 220 kV and 750 kV lines, Slovakia using a double-circuit 400 kV line, the Czech Republic using 220 kV and 400 kV lines, and Germany using 220 kV and 400 kV lines. The limits concerning transmission capacities were a serious obstacle to the exchange of the electrical power with other countries. It is

[39] Including: one line with the voltage 750 kV with a length of 114 km (withdrawn from use), 66 lines with the voltage 400 kV and a length of 4920 km, 165 km with the voltage of 220 kV and a total length of 7919 km, and 106 highest-voltage power stations. A considerable number of them, especially those with the voltage of 220 kV, were characterized by a considerable degree of wear and tear.

especially important as regards supplying the country in electrical energy in case of deficit on the domestic market. In 2008, investment outlay on the transmission network amounted to 827.0 million zlotys, and was higher than the 326.3 million zlotys spent in 2007. Technical analyses are made in cooperation with the EU and third parties as regards the extension of transmission system and trans-border connections.[40]

In 2008, economic activity as regards distribution of electrical power was conducted by 14 operators of distribution systems, that came into existence on July 1, 2007, and were parts of old distributing companies and PKP Energetyka S.A. company, as well as numerous small companies that were given the licence to distribute electrical power by the President of the Energy Regulatory Office. Their tasks included distribution and supply of electrical power to consumers using distribution networks of high, medium, and low voltage. Medium voltage lines and low voltage circuits, in which wires with small diameters (25 and 35 mm^2) as well as lines where the voltage drops below the norms require modernization and reconstruction.[41] Thus, in the experiment presented in this chapter (one of many conducted experiments) three models were obtained for one period (for three outputs) x 31 periods = 93 models, which in connection with defining two types of models (th and *ss* models)[42] gives 186 models.[43]

In this way, appropriate catalogues of models of development of the electrical power system were obtained, which allowed to conduct the identification of the model of development as a reflection of the development of the system, taking, e.g. in th model, the coefficients of polynomial terms

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[40] Plans to extend such connections are in possession of PSE Operator S.A., which negotiates these issues with operators from Germany, the Czech Republic, and Slovakia. There are also plans to build a power bridge connecting electrical power systems in Lithuania and Poland in the future.

[41] Announcement by the Minister of Economy on August 14, 2009, concerning the report on the results of the supervision of safety of electrical power supply (M.P. September 4, 2009).

[42] In the Control System Toolbox environment, the following functions th2tf, tf2ss, tf2zpk, etc., may be used for reciprocal transformations of models.

[43] Additionally, for one general period (1946–2007) identification was conducted and the model of electrical power system development was also obtained. The model proved to be a very good tool to look for models expressing structural changes because, as a rule, obtained rolling models (obtained for rolling periods) and the general model had an identical structure, but other structures of models were also obtained, which indicated years in which structural changes of the domestic electrical power system (KSE) took place.

Aj(q) at the appropriate elements *q-i* (i=0,1,1,2,...), as output variables and the coefficients of polynomial terms *Bk(q)* at the appropriate elements q-i (i=0,1,1,2,...) of the k-th polynomial (connected with k-th, as input variables input).

In this way the model of the KSE development was obtained, i.e., the model generating models of development, in the discussed experiment for the period θ=32 (years 1979–2008), for the period θ=33 (years 1980–2009), for the period θ=34 (years 1981–2010), etc.

Therefore, on the one hand, one general model of the electrical power system development was obtained (for the years 1946–2007) in two forms (model in the form of th matrix and model in states space). On the other hand, a group of 31 models for 30-year periods were obtained, also in two forms, with the latter forms providing data for the experiment that allowed another model to be obtained, concerning the development of the model, and not the KSE system, i.e., a metamodel (a specific picture of the model of electric power system development).

In the identification experiments, models obtained by means of identification are verified by assessing the consistence of the dynamic properties of the obtained model and the electrical power system as a real object (due to the precision of identification, which was as high as 98 percent), e.g., by comparing time responses of the model and the system to the same input signal.

For this purpose, appropriate models in Simulink were designed. In the conducted experiments the identification model *arx*,[44] which uses the least squares method LS[45] that involves finding a set of coefficients of the operator transfer function in the iterative way, while minimizing squares of differences between the response of the model and the real system in these time moments for which appropriate numeric data (years), were collected. Thus, the precision and accuracy of identification depends both on the selection of appropriate structure of the model (parameters na, nb, nk with the values 1–10 were searched) and on the quality of collected numeric data.[46] High parameters of the structure of the model resulted in difficulties in the inter-

[44] ARX – AutoRegressive with eXogenous input

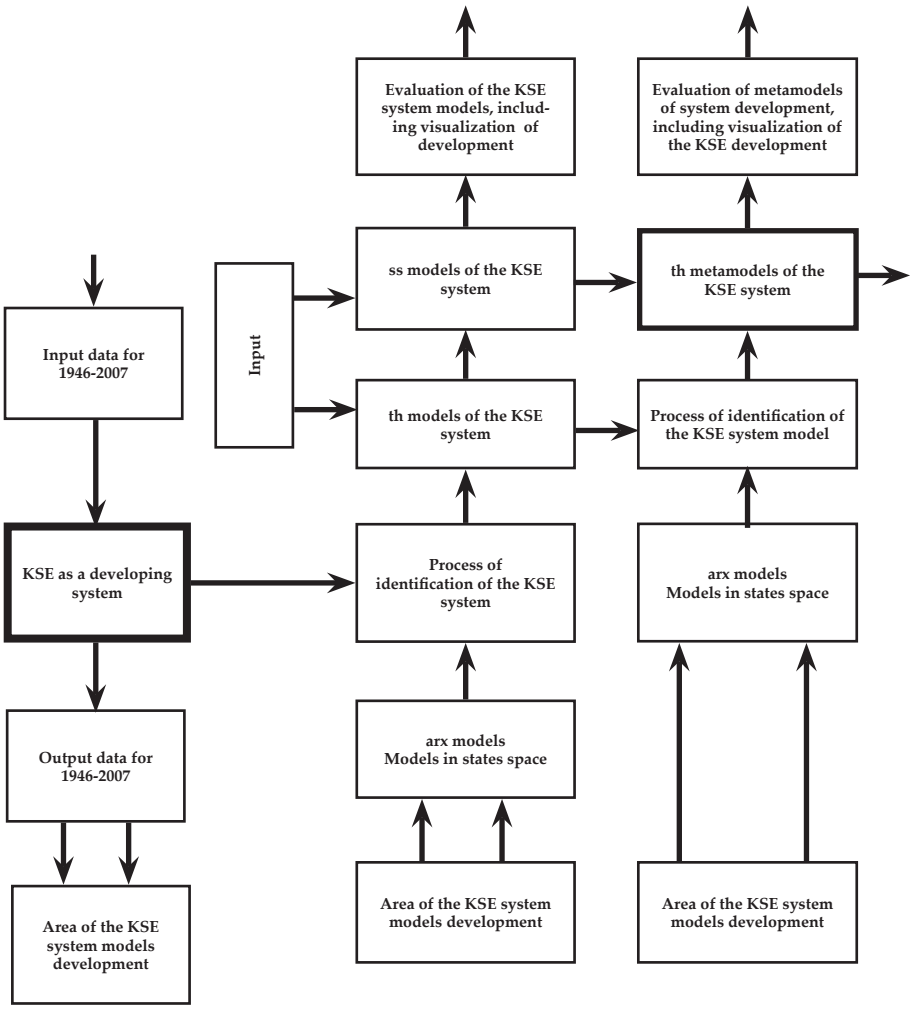
[45] LS – Least Squares

[46] In the discussed identification experiment of the domestic electrical power system, it depends on the quality of statistics, especially those compiled before 1989.

pretation, especially as regards state variables obtained on the basis of them in models of states space.

For these reasons, empirical data were subject to initial treatment (removing constant component, selection of the period of identification, etc.), and the attempt was made to standardize them, which improved the quality of models. Figure 2.1. depicts the algorithm presenting the solution of the problem of the electrical power system development.

Fig 2.1. General algorithm generating models and metamodels of the development of the KSE system



To sum up, it is worth adding that in the empirical research, models of the KSE were also obtained by means of identification of the electrical power system using various architectures of artificial neural networks. In order to improve the operation of the electrical power system the called Systemic Evolutionary Algorithm - SAE[47] as well as a self-evolving neural network were designed, presented in the papers "The Concept of Making Discoveries in Evolving Neural Net"[48] and *A Case Study in Neural Network Evolution*[49] published by IPI PAN (Institute of Computer Science, Polish Academy of Science).

Artificial neural network SOM was used for visualization of knowledge about the electrical power system, and the Perceptron Neural Network was used to train the model of development of the electrical power system.

Systemic Evolutionary Algorithm was also designed, which was verified for various problems connected with looking for a better structure and parameters of the model of electrical power system development.[50] In this respect, two significant changes were made in the genetic algorithms, the first one being connected with the systemic method of creating the initial population, and the second one being connected with systemic method of selection of the adaptation function. So far, these two important problems have not been fully covered by the literature. Moreover, adaptations of optimization methods were made to be used for the purpose of genetic algorithms, and this is a serious methodological error. In this way, attention was drawn to the necessity to return to the notion of the robustness function as the main problem in the field of genetic algorithms.[51]

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47 The results were published in various conference materials and scientific journals, and a conception of so called self-organizing neural network was prepared.

48 Proceedings of the IIS'2002 Symposium. Physica – Verlag. IPI PAN. Sopot. Poland 2002.

49 Monografie IPI PAN No. 943. Warsaw, 2002.

50 J. Tchórzewski, *Systemowy algorytm ewolucyjny w modelowaniu rozwoju rynku energii elektrycznej*, Inżynieria Wiedzy i Systemy Ekspertowe [pod red.:] Z. Bubnickiego. i A. Grzecha, OW PWr. Wrocław 2003, Vol. 1, pp. 231–38.

51 Moreover, in the period 2001–9, the author of the treatise supervised over 40 theses covering various problems connected with the use of computer science in electrical power engineering, including research on regularities of the electrical power system development, and reviewed scientific papers published in the *Postępy Cybernetyki, Studia Informatica* and *Techniki i Technologie Informacyjne* Journals (on the MEN (Ministry of National Education) list), and conference papers as a part of co-operation with IEEE Computational Intelligence and Artificial Intelligence Conference and Konferencji Inżynieria Gier Komputerowych [Computer Games Engineering Conference].

Therefore, two fundamental criteria for the assessment of the operation and development of the KSE were adopted, namely: effectiveness and safety, which was jointly called the criterion of robustness of operation and development of the KSE.[52] A robust system should be characterized by a specific balance between the effectiveness and safe efficiency of the operation and development. Thus, it should be a flexible system (the introduction of constant current connections *HVDC*, stabilizers, dynamic limiters, cutting systems, attenuating systems, flexible control systems *FACTS*, transformation of alternating current lines at all voltage levels into direct current lines using thyristor converters, which is connected with discrete increase in distribution capacities of lines, etc.) The following assumptions and theoretical arrangements are important to define the rules governing the development of the electrical power system, namely:

1. The existence of two opposite models of operation of the KSE system: model of full integration of the system operation (e.g., uniform electrical power system, allowing to turn on all generators operating in the KSE) and model of full disintegration (allowing to turn off all generators operating in the system and starting work to satisfy one's own needs, big role of distributed renewable resources).
2. The fact that the KSE system has a specific nature characteristic for control systems, the nature that changes (evolves i.a. from low efficiency to high efficiency, from small losses to big losses, from weak integration to strong integration, from brittle to ductile,[53] etc.).
3. The system was described using the following quantities: input and output quantities as well as state variables. Input quantities are coercions (control) and distortions. The distortions may be a cause of disintegration of the system, including catastrophic disintegration of the system. Output quantities are the responses ("system's traffic") and state variables

[52] Z. Henzel, *Sterowanie krzepkie ruchem nadążnym mobilnego robota kołowego*, Materiały VI KK Robotyki. Wrocław 1998, pp. 22–29.

[53] J. Malko, *Rozpad systemu elektroenergetycznego. Wyłączanie źródeł. Przejście do pracy na potrzeby własne. Ocena zdolności utrzymania się źródła na potrzeby własne*, Raport z realizacji: Zadanie nr 6. Podzadanie nr 6.2.7. Konsorcjum Politechnik: Gdańskiej, Śląskiej, Warszawskiej i Wrocławskiej. Wrocław, December 2008.

are variables that internally characterize the state of control and the state of internal organization of the electrical power system. An interesting macroeconomic problem is examining, on the global scale, the level of growth of control state and the degree of internal organization of the system, which is the result of i.a. progressing automation and robotization (e.g., introducing flexible technologies).

4. Assumption that the KSE system as a developing system has a changeable structure, parameters and values of individual parameters. Changes in the KSE structure are connected with the increase in the sources producing electrical power, the increase in the number of consumers, and, as a result, the increase in the number of the elements of the KSE. The change of parameters results from technological changes, and the change of values arises from the need to introduce elements of technical equipment of the KSE system that have a different quality, e.g., the introduction of elements in nanotechnology scale.
5. In the development of the KSE system, a state of normal functioning and a state of normal development of the KSE system may occur, as well as a state of abnormal functioning or abnormal development of the system, or even a catastrophic state, characterized by the loss of voltage stability and forming of island structures (separation from networks with the highest voltages or disintegration of the system).
6. Attention should also be drawn to the degree of wearing of the KSE system elements, whether it is an ageing system, or, whether it is a developing system (process of ageing and development are parallel in the electrical power system).
7. For the purpose of macroeconomic model, the KSE system should be described in systemic categories, i.e., material transfer should be taken into account, e.g., the transfer of energy, and the transfer of the service concerning electrical energy transmission. Also, financial transfers moving in the opposite direction should be considered. In this way, a particular model of the system will be a quasi-market model.[54]

[54] Under work realized by Politechnika Śląska–Silesian Technical University as a macroeconomic model of the electrical power market. Macroeconomic models of transmission

8. In the KSE system, subsystems should be distinguished by means of longitudinal-transverse sub-systeming,[55] distinguishing the subsystem of control, the subsystem of internal organization, and the subsystem responsible for the realization; and by means of praxeological sub-systeming distinguishing the subsystems in the electrical power system within the process of production, transfer, and receipt of electrical energy and power, i.e., subsystems, which produce, transfer, distribute, and receive electrical power.
9. Systemic changes mainly involve parametric changes. Structural changes are less frequent, and ownership changes are extremely rare. Changes concerning ownership result in the development of a competitive market as well as the gradual disappearance of monopoly practices. Changes include changes of structure and the process occurring in this structure. Thus, we may talk about the specific systemic transformation of the electrical power industry in Poland. The model allows to assign functions of ownership to the system by means of granting the KSE control system appropriate freedom concerning decision-making.

In conclusion, on the one hand, there is demand (on the part of economic practice) for new methods of examining regularities of the KSE system development, and on the other hand, science, and the field of engineering of systems development and artificial intelligence in particular, provides new methods to be used in the process of searching for appropriate models of electrical power system development.

Safe Development of KSE in Poland after 1989

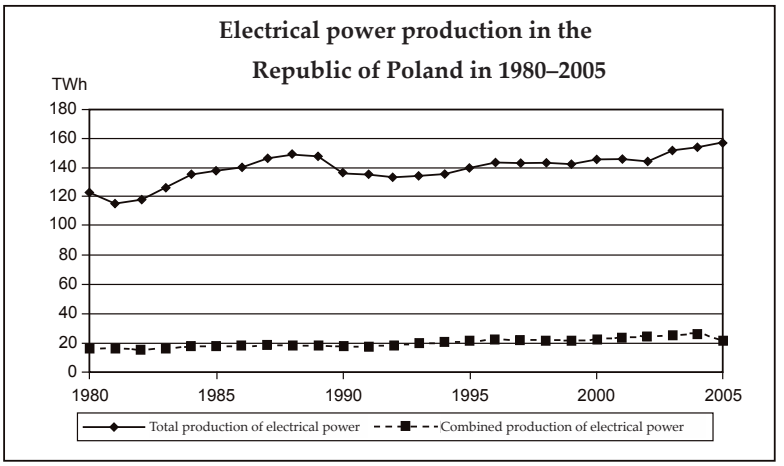
Structure of Domestic Electrical Power System in the studied period, i.e., 1946–2007 was a very simple structure in the 1940s and 1950s, but at the beginning of the twenty-first century, it became a very complex and distributed structure.

network. Report from realization. Zadanie 4, Temat 4.3, Punkt 4.3.1. Wydział Elektryczny. Politechnika Śląska.

55 J. Konieczny, *Inżynieria systemów działania* (Warsaw: WNT, 1983).

After 1989, the *CENTREL* group was established as a result of systemic transformation (Poland, the Czech Republic, Slovakia, and Hungary) as a result of disconnecting the KSE system from the USSR system and connecting it (gradually) to the electrical power system in Western Europe—*UCTE*. Systemic transformation in the 1990s triggered a process of decentralization, which resulted in the establishment of the PSE S.A. company as the Transmission System Operator and independent entities producing electrical power such as power plants and electricity boards.

Fig. 2.2. Production of electrical power in Poland, 1980–2005



Source: Announcement by the Minister of Economy of December 12, 2007, *Monitor Polski* (The Official Gazette of the Republic of Poland), January 4, 2008.

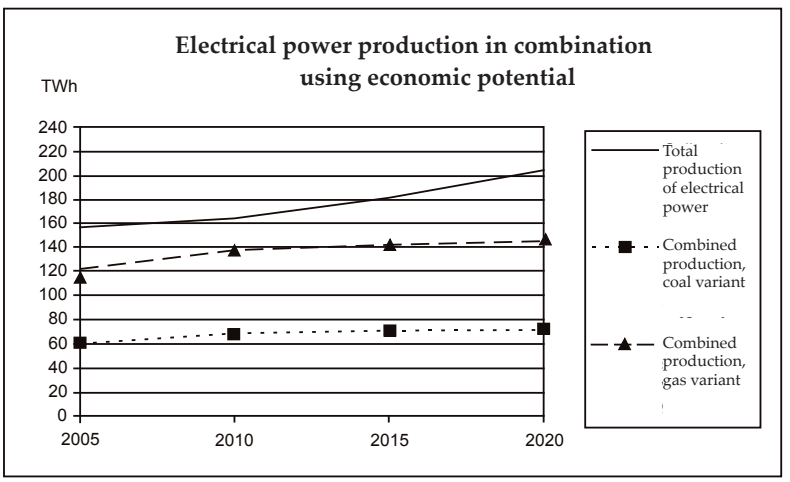
During the years of systemic transformation and at the beginning of the twenty-first century (Fig. 2.2), the energy law came into force, and the electrical power market was established. The Electrical Power Exchange (GEE) was established as well as distribution companies, companies selling electrical power (PO), technical operators (OT), technical-trade companies (OT-H), etc. There are still problems concerning privatization of the electrical power industry, which hinders appropriate investment policy and the development of the KSE system.

However, the KSE system develops according to the plan (Fig. 2.3 shows forecasts for 2010) and, according to the energy policy of Poland, the increase in the domestic consumption of electrical power by 80–93 percent is

anticipated by 2025. Presently, works on "*Polityka energetyczną Polski do 2030 roku*" (Energy policy of Poland until 2030) are coming to an end. The draft "Forecast demand for fuel and power until 2030" of March 2009 comprises basic directions of energy policy of Poland, considering the requirements of the European Union:

> the improvement of the efficiency concerning electrical power; the increase of safety of fuels and electrical power supply; diversification of the production structure of electrical power by introducing nuclear power stations, the increase in the use of renewable sources of energy; including biofuels, development of competitive fuel and power markets; limiting the negative influence of electrical power industry on the environment.

Fig. 2.3. Production of combined electrical power, with full use of economic potential



Source: Announcement by the Minister of Economy, December 12, 2007, Monitor Polski (Official Gazette of the Republic of Poland), January 4, 2008)

As regards energy efficiency the following goals of the energy policy, significant for the forecast, were taken into account: zero-energy economic growth, i.e., the growth of the economy without the increased demand for primary energy; gradual decrease of the energy-consumption of Polish economy to the level of the EU-15. The use of the existing reserves of efficiency as well as their influence on demand were forecast. The reserves

result from the market reform of the economy and additional instruments increasing energy efficiency, i.a. extended use of energy audits, introduction of energy-management systems in industry, introduction of sustainable management in the traffic and infrastructure in transport, introduction of standards concerning energy efficiency for buildings and commonly used equipment; faster replacement of lighting by energy-saving solutions, introduction of the system of white certificates.

In the area of safety of fuels and energy supply, the following were taken into consideration: the realization of the strategic direction—diversification of both the primary energy carriers and the directions of supplies of these carriers, as well as the development of all available reasonably inexpensive technologies of energy production, especially nuclear energy as a significant technology which does not produce greenhouse gases and has low susceptibility to price increase. It was decided that domestic resources of brown and hard coal will provide stability as regards the energy safety of the country. The decision was made to rebuild coal-based sources of energy that were taken out of service using the same fuel in the period up to 2017 and to build some heat and power stations using hard coal.

Simultaneously, no limitations were put on the increase of the gas share in the energy industry, both in units cogenerating electrical power and heat using gas as well as in peak energy sources and reserves for wind power plants. According to the anticipated requirements of the European Union, the increase of the share of renewable energy will be up to 15 percent in the structure of final energy in 2020 and increasing the share of fuels up to 10 percent in the transport fuels market.

Additionally, it was decided that forests be protected against excessive logging for biomass and that agricultural lands be used to produce renewable energy in a sustainable way, including biofuels so as not to allow the competition between production of biofuels and farming (agriculture).

It was decided that the fuels end energy markets as well as the system regulating the activity of energy companies should function efficiently, which allowed use in the computational model simulation of rational behaviour of consumers being able to choose electrical power suppliers. As for environmental protection, general assumptions were made as regards: charges for CO_2 emissions, according to the decisions by the European Council and the European Parliament of December 2008, limiting SO_2 i NO_x

Table 2.1. Selected empirical numerical values

Achievable power		**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Load		29,408	29,887	30,100	30,799	30,691	30,994	31,276	31,561	31,887	32,105	32,364	32,613
Power reserves		18,185	18,118	18,224	18,170	18,596	18,617	18,462	19,468	19,939	20,137	20,875	20,954
Losses of Power	Due to major and extensive renovations	5,608	5,690	6,178	6,063	7,143	6,761	7,489	7,174	7,061	6,698	5,295	4,615
	Due to medium renovations	3,242	3 229	2,692	3,106	2,789	3,239	2,671	2,667	2,695	2,712	2,684	3,163
	Due to emergency renovations	403	353	393	790	437	599	543	529	420	606	769	1,057
	Other	1,970	2 497	2,613	2,670	1,726	1,778	2,111	1,723	1,772	1,952	2,741	2,824

to the levels in currently binding international regulations, development of low-emission technologies of producing energy and combined and distributed sources. In each variant, the change of structure of the domestic consumption of energy is forecast, in favor of earth gas and liquid fuels, with variable pace of gas consumption growth.[56]

The examples concerning the average basic values of power characterizing domestic electrical power system (KSE) in the years 1996–2007, namely: achievable power, load, power reserves, power losses due to extensive and medium, emergency renovations and other losses of power are presented in Fig. 2.3, and numerical data characterizing the system are presented in Table 2.1. The indicated cogeneration potential is insufficiently used in Poland in comparison with the real potential.

The failure to work without interruptions of the whole KSE system or a big part of it is, potentially, one of the most serious source of problems as regards the work of domestic technical infrastructure, with social and economic consequences that are difficult to define. Structural changes occur in such a situation that are characterized by the failure of the whole structure of the KSE system or a big part of it. The situation is similar in case of development of the KSE system, which is characterized by the development of the structure. Failure to work continuously is strictly connected with the concept of reliability of the electrical power system functioning.[57] The reliability of the KSE system, understood as the ability of the KSE system to supply electrical power from the sources to final consumers, maintaining the adopted standards and the expected quantity and quality, consists of two attributers: safety and efficiency o the KSE system or its self-sufficiency.[58]

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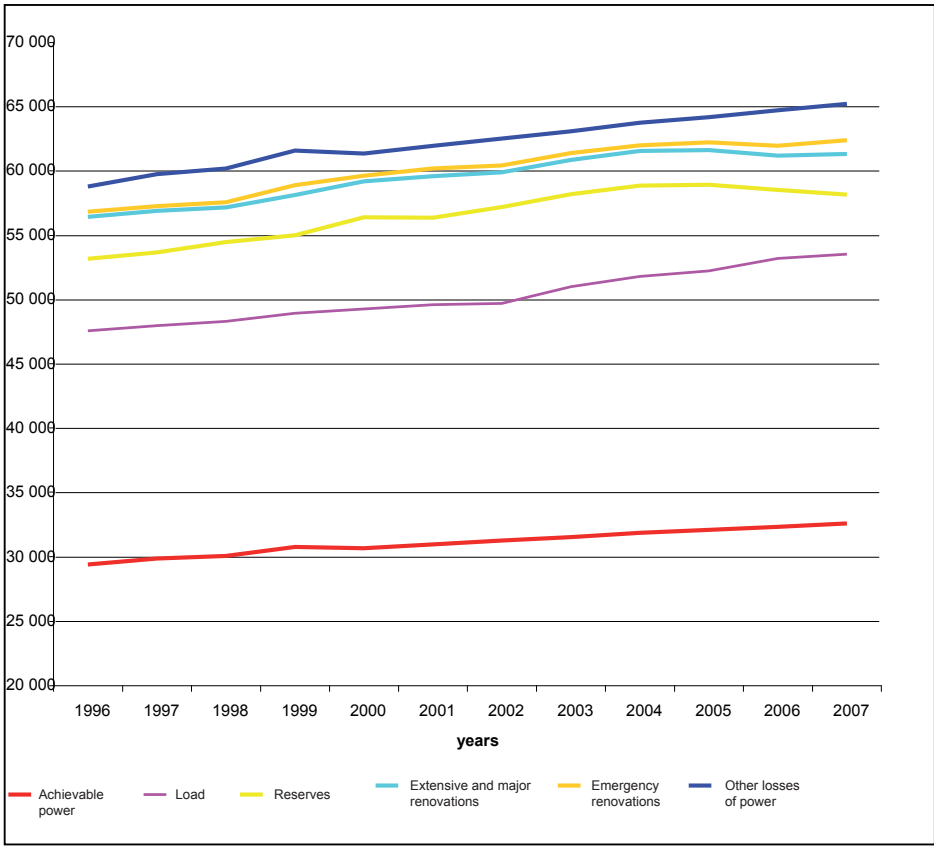
[56] In all variants of the forecast, ecological requirements set by the Kyoto Protocol, Second Sulphur Protocol, Nitrogen Protocol, and KPRE (National Plan to Reduce Emissions) are met. The requirements concerning the share of renewable energy set in the Accession Treaty are also met.

[57] In French electrical power engineering a system of exploitation aiming at maintaining a certain degree of reliability of electrical power machines RCM (Reliability Centre Maintenance), quoted in paper [125] after J. Rivard, et. al., "The application of RCM methods to RTE overhead transmission lines," GIGRE Session, Paris, 2004.

[58] J. Paska, *Niezawodność systemów elektroenergetycznych* (Warsaw: OW PW, 2005).

Fig. 2.3 Curves presenting average values of basic values of power characterizing the KSE system



Final Remarks Concerning Electrical Power Safety

Electrical power safety is defined as the state of sufficient capability of the electrical power system to defend itself against threats, i.e., to survive sudden failures, such as catastrophic damage; for example, short-circuits or the unpredictable loss of the elements of the systems or their elements, including limitations in movement and the capability of the electrical power system to maintain the work of synchronously connected regulating areas and avoid the occurrence of uncontrolled division of synchronous area in case of failure.[59]

59 Malko, *Planowanie systemów elektroenergetycznych*, op. cit.

The act *Energy Law* defines the notion of energy safety as "the state of economy allowing to cover the current and future consumers" demand for fuels and power in a technically and economically justified way, conforming to the regulations concerning environment protection," and the definition in the document *Energy Policy of Poland until 2025* approved by the Council of Ministers of the Republic of Poland on January 4, 2005, is as follows: "the state of economy allowing to cover the current and future consumers' demand for fuels and power in a technically and economically justified way, minimizing the negative influence of the energy sector on the environment and the conditions of living of the society."

The notion of electrical power safety is a narrower notion and it concerns safety of electrical power supply.[60] In July 2007, the Ministry of Economy began to prepare the act on energy efficiency in order to limit the consumption of energy, losses in the transmission and distribution, increase energy safety, and reduce environmental pollution—all of which is caused by the need to fully implement the European directives as regards energy efficiency including the reduction of electrical power consumption by at least 9 percent by 2016 and the reduction of electrical power consumption by 20 percent by 2020, approved at the EU summit in March 2008. The improvement of efficiency is connected with the reduction of carbon dioxide and other greenhouse gas emissions, and leads to the reduction of the degree of climatic changes.

According to the document *Energy Policy of Poland until 2030*[61] energy safety means availability of electrical power with acceptable quality, at a reasonable and justified price.

Electrical power safety of the KSE also depends on the indicators of the system's susceptibility to threats—the susceptibility of the state and way of functioning of sources of electrical energy, transmission networks, distribution networks, reception systems, as well as auxiliary systems such as measuring systems, protection engineering systems, systems processing information, and control system. Threats might be terrorist, ecological,

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60 Paska, *Niezawodność systemów elektroenergetycznych* , op. cit.

61 "Energy safety means ensuring stable supplies of fuels and energy at the level guaranteeing satisfying domestic needs at the price acceptable by the economy and the society, using national resources in the optimum way and by means of diversification of sources and directions of oil, liquid and gas fuel supplies," Ministerstwo Gospodarki [Ministry of Economy], Warsaw, 2006.

international, internal catastrophes, external invasions, etc. The effect of extreme activity may be failure to deliver electricity to vast areas of the country over a period longer than 24 hours. This state is defined as "catastrophe." Threats may also be classified as ordinary threats and extraordinary threats (very rare), and, on the other hand, the threats may be divided into direct or indirect.[62]

62 Malko, *Rozpad systemu elektroenergetycznego*, op. cit.

Natural Disasters in East Asia and Regional Cooperation in the Field of Counteracting Their Results

Zbigniew Piepiora[1]

Summary: The number of natural disasters has increased in the region of East Asia. Their occurrence has causes death or injuries of many people, economic losses and changes connected with the affected area. It contributes to boost the costs of living and to deteriorate the quality of life in the examined region. In the face of these alarming facts it is necessary to make the analysis of these kind of phenomena and counteracting their results.

Key words: natural disasters, Asia, international cooperation

Introduction

The region of East Asia includes Hong Kong, Japan, Macao, Mongolia, the Democratic People's Republic of Korea, the People's Republic of China, the Republic of China, and the Republic of Korea. The Republic of China is also called Taiwan or Chinese Taipei. Hong Kong and Macao are the two special administrative regions of the People's Republic of China. The East Asian states are characterized by political, economic, and social diversity. They possess an extremely diversified and vast geographical configuration, with many archeological monuments, a rich and unique cultural variety, as well as historic and religious areas. Furthermore, these countries are all threatened by the occurrence of natural disasters.

Natural disasters in the region of East Asia have been on the increase, leading to the deaths and injuries of many people, economic losses, and changes connected with the affected areas. As a consequence, the quality of life in the region decreases. In the face of these alarming facts, it is necessary to conduct an analysis of the natural disasters that afflict the region and assess how they can best be countered.

The aim of this chapter is to present the results of selected natural disasters in the region of East Asia. The author provides an analysis of the

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occurrence of these phenomena and their influence on the environment, and goes on to describe the forms of international cooperation designed to counteract the effects of natural disasters in the region.

Definition of Natural Disaster

According to the United Nations,

> […] disaster can be defined as a serious disruption in the functioning of either community or a society involving widespread human, material, economic, or environmental losses or impacts. It exceeds the ability of the affected community or society to cope with it using its own resources. The disaster *comes from the combination of the exposure to a hazard, the vulnerability to injuries and the insufficient capacity or measures to reduce or cope with the potential negative consequences*.[2]

According to the International Strategy for Disaster Reduction, which is executed by the United Nations (UN/ISDR), *the disaster may cause damages such as*

> *loss of life, injury, disease and other negative impacts on man's physical, mental and social well-being, including the damage of property, the destruction of estates, services, social and economic disruption and environmental degradation*. The hazards that potentially cause disasters are either technological or natural. Moreover, it marks out three groups of hazards and natural disasters: biological, geological and hydrometeorological.[3]

Furthermore,

> The first group is represented by processes or phenomena of organic origin or transmitted by biological carriers, including the exposure to pathogenic micro-organisms, toxins and bioactive substances. The biological hazards are for instance: insect or other animal plagues and infestations, outbreaks of epidemic diseases, plant or animal contagion.

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[2] United Nations/International Strategy for Disaster Reduction, *UN/ISDR Terminology on Disaster Risk Reduction* (Geneva: UN/ISDR, 2009), p. 9.

[3] See also Z. Piepiora, *Przeciwdziałanie skutkom katastrof naturalnych w regionie Azji Południowo-Wschodniej*, in B. Drelich-Skulska, ed., *Integracja Azji Wschodniej. Mit czy rzeczywistość*, Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, No. 67 (Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2009), p. 234.

> They can cause loss of life, illnesses, injuries or other negative health impacts, property damages, loss of livelihoods and services, economic and social disruption, or environmental damages.[4]
>
> The next group is constituted by geological processes or phenomena such as internal earth processes, earthquakes, volcanic activity and emissions. The geological disasters may cause loss of life, injuries or other health impacts, property damages, loss of livelihoods and services, economic and social disruption, or environmental damage.[5]
>
> The last group includes: avalanches, blizzards, coastal storm surges, cold spells, droughts, floods, hailstorms, heat waves, heavy snowfalls, tropical cyclones, thunderstorms, tornadoes. These processes or phenomena, which are of atmospheric, hydrological or oceanographic nature, may cause loss of life, injuries or other health impacts, property damages, loss of livelihoods and services, economic and social disruption, or environmental damages. The hydrometeorological conditions can also cause other disasters, such as epidemics, landslides, locust plagues, wildland fires, and spreading of toxic substances and volcanic eruption material.[6]

According to the UN/ISDR, the hydrometeorological factors are important contributors to some of geological disasters and related geophysical processes such as debris and mud flows, landslides, rockslides, surface collapses and other mass movements. They are difficult to categorize. For instance, tsunamis – although they are triggered by undersea earthquakes and other geological events, these are essentially oceanic processes causing disastrous floods on the coasts.[7]

The Profile of the East Asian Region

East Asia is the part of Asia that encompasses countries centered around the East China Sea (see Fig. 1). The entire area extends from Hong Kong,

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4 United Nations, *UN/ISDR Terminology on Disaster Risk Reduction,* op. cit., p. 4–5.

5 Ibid. p. 16–17.

6 Ibid., p. 18.

7 See also Z. Piepiora, *Inwestowanie w zrównoważony rozwój jako metoda przeciwdziałania skutkom katastrof naturalnych w regionie Azji Środkowej*, in T. Borys, B. Fiedor, eds., Ekonomia 5. Gospodarka a Środowisko, Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, No. 79 (Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2009), pp. 125–26.

Macau, and Taiwan in the south, to Mongolia in the north. The Mongolian Plateau, which includes the Gobi Desert, is located in the north-east part of the region. Mountainous areas predominate in the south of China, the Japanese Archipelago, the Korean Peninsula, and on the island of Taiwan which is also called "Formosa." The climate of East Asia is of a continental and monsoon character, with temporal and spatial variations in temperature and rainfall. The region also has a large rural population dependent on agriculture concentrated around the major rivers of East Asia, which are located mostly in China—the Yangtze, the Huangpu, the Amur, the Mekong, and their tributaries. These rivers provide sustenance for millions of people, supplying drinking water, fisheries, hydropower, inland navigation, irrigation, etc. Further, they contribute to the biodiversity of the wetlands.[8]

Fig. 1. East Asia

Note. Hong Kong and Macao are the two special administrative regions of the People's Republic of China.

East Asia is characterized by diverse areas, varying in their cultural legacies, colonial experiences, geography, natural resources, population, stages of development, and systems of government. The region also contains the most populous country in the world, that is, China, with a population of more than 1.3 billion (2008; Table 1). The annual population growth rate is 0.6 percent, with the highest rate being in Macau amounting to 2.4 percent.

8 Perry-Castañeda Library Map Collection, Asia Maps, http://www.lib.utexas.edu/maps/asia.html, (accessed June 27, 2010).

Table 1. Key indicators of countries in East Asia, 2008

Country	Capital	Total land area (km2)	Total population (thousand)	Annual population growth (%)	Urbanization rate (%)	Population density (person / km2)	GDP per capita (US$ - PPP)	Human Development Index	Human Poverty Index (%)
China	Peking	9621662	1337411	0.6	43.1	139	1772	0.772	7.7
DPR Korea	Pyongyang	120298	23819	0.4	62.6	198	551	-	-
Hong Kong, China	Hong Kong	1055	6982	0.5	100	6617	23029	0.944	-
Japan	Tokyo	375496	127293	- 0.1	66.4	339	30055	0.960	-
Macau, China	Macau	30	526	2.4	100	17290	23638	-	-
Mongolia	Ulanbataar	1320500	2641	1.1	57.1	2	978	0.727	12.7
Republic of Korea	Seul	98875	48152	0.4	81.5	487	14504	0.937	-
Taiwan	Taipei	35980	22878	1.0	68.9	636	31881	-	-
East Asia		**11573896**	**1546825**	**0.6**	**46,9**	**132**	**4579**	**-**	**-**

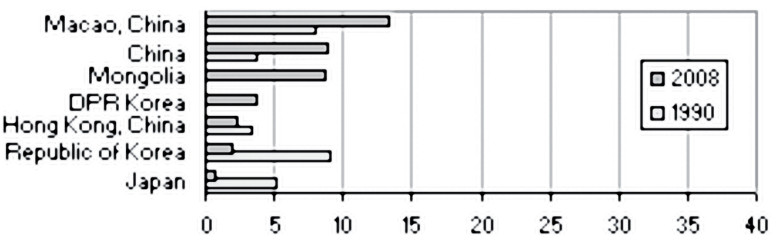
Sources: Based on "Azja Pacyfik – Wszystko o Azji Wschodniej," http://www.azjapacyfik.pl/index_2501.php?b_2501=86 (accessed June 27, 2010); ESCAP, *Statistical Yearbook for Asia and the Pacific 2009* (Bangkok: UN ESCAP, 2010), pp. 7, 16, 17, 104; UNDP, Human Development Reports, http://hdr.undp.org/en/statistics (accessed June 27, 2010)

* Human Development Index and Human Poverty Index are for 2007.

A growing population has also meant an increase in population density: 17,290 persons/km2 in Macau, but 132 persons/km2 in the region as a whole. The increase of population density poses a threat because land resources are gradually shrinking. Hong Kong and Macau have the highest urbanization rates (100 percent). The growing urban development puts pressure on urban infrastructure. Apart from the existing physical and environmental factors in East Asia, these pressures increase the vulnerability to damage caused by natural disasters.[9]

The GDP growth rate in the period 1990–2008 exceeded three percent, but there are large differences in the levels of incomes in particular countries (Fig. 2). The GDP per capita (purchasing power parity, US$) for the Democratic People's Republic of Korea is only US$551. The state with the highest GDP value is Taiwan (US$31,881). The average GDP per capita in the region amounts to US$4579.

Fig. 2. GDP annual growth rate in countries of East Asia (%)



Sources: ESCAP, *Statistical Yearbook for Asia and the Pacific, 2007*, p. 81; ESCAP, *Statistical Yearbook for Asia and the Pacific, 2009*, p. 100.

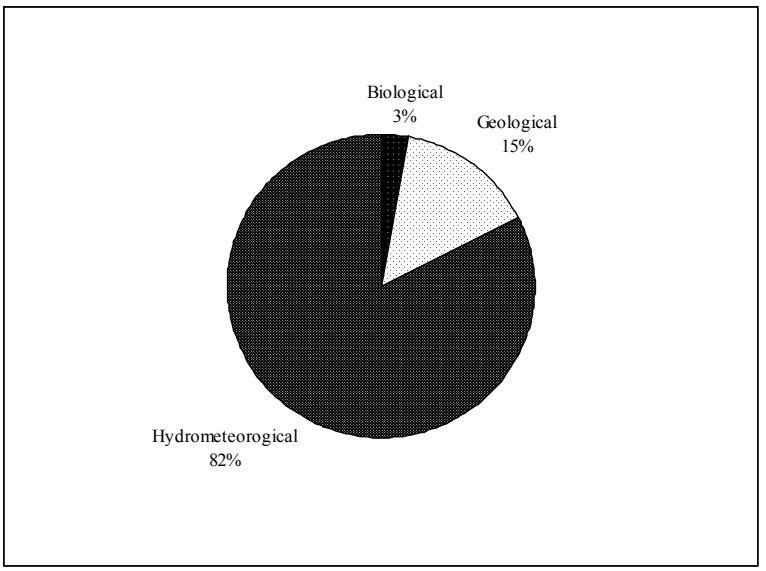
The majority of countries in the region have achieved a consistently high or very high level of human development (HDI over 0.8). The countries with the highest human development index in East Asia are Japan (0.960), Hong Kong (0.944), and the Republic of Korea (0.937), while the lowest is Mongolia with a HDI of 0.772. HDI data are not available for North Korea, Macau, and Taiwan. Meanwhile, Mongolia (12.7 percent) and China (7.7 percent) have the highest human poverty index (HPI-1). HPI-1 data are not available for the other countries of the region.

9 See also Piepiora, *Przeciwdziałanie*, op. cit., pp. 236–37.

Exposure to Natural Disasters in the Region

East Asia is a region marked by a high vulnerability to natural disasters. Considering the types of natural disasters, hydrometeorological disasters constitute the largest proportion (Fig. 3).

Fig. 3. The occurrence of natural disasters in the region of East Asia according to the factor of natural disaster, 1990–2009



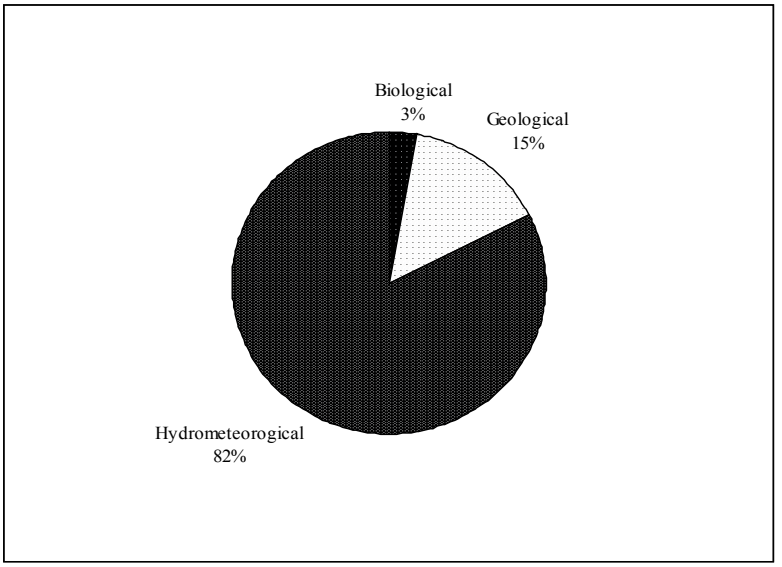
Sources: Emergency Events Database, The Office of Foreign Disaster Assistance / Centre of Research on the Epidemiology of Disasters (EM-DAT: OFDA/CRED), *Université catholique de Louvain*, http://www.emdat.be (accessed June 27, 2010).

Analysis of the type of natural disasters reveals that the region experiences mainly storms, floods, earthquakes (seismic activity), and mass movements. The occurrence of natural disasters in the region of East Asia in the years 1990–2009 according to type of natural disaster is presented in Fig. 4.

Tropical storms occur frequently in the East Asia region. The Typhoon "Nabi" on September 6–8, 2005, caused six deaths and led to property damage amounting to US$115.4 million in the Republic of Korea. The previous month, in August 2005, torrential rains were responsible for fifteen deaths and US$456.8 million in property damage.[10]

10 *Republic of Korea – Country Report 2006* (Seoul: ADRC, 2006), pp. 1–2.

Fig. 4. The occurrence of natural disasters in the region of East Asia according to the type of natural disaster, 1990–2009



Source: Emergency Events Database

Table 2. Mortality caused by natural disasters in East Asia, 1991–2008

Country	Deaths caused by natural disasters				Natural disasters mortality ratio			
	Cumulative number over the period				Per 100,000 population			
	91-95	**96-00**	**01-05**	**06-08**	**91-95**	**96-00**	**01-05**	**06-08**
China	14 045	14 151	5 690	91 720	0.2	0.2	0.1	3.4
DPR Korea	74	254	344	892	0.1	0.2	0.3	1.3
Hong Kong	38	83	303	2	0.1	0.3	0.9	0.0
Japan	5903	223	573	178	0.9	0.0	0.1	0.1
Macau	0	0	0	0	0.0	0.0	0.0	0.0
Mongolia	18	97	34	52	0.2	0.8	0.3	1.0
Republic of Korea	275	751	489	79	0.1	0.3	0.2	0.0
East Asia	**20 353**	**15 559**	**7 433**	**92 923**	**0.3**	**0.2**	**0.1**	**2.9**

Sources: Based on ESCAP, *Statistical Yearbook for Asia and the Pacific, 2008*, p. 211, ESCAP, *Statistical Yearbook for Asia and the Pacific, 2009*, p. 222.

The sources of floods in the region of East Asia are mainly the Yangtze, the Huangpu, the Amur, and the Mekong rivers. Floods accompanied by mass movements and epidemics have a negative impact on the socioeconomic development of the region. Floods repeatedly affected citizens during the 1990s in China; in the summer of 1998, close to 250 million people were affected. In June 2008, Sichuan Province in China was affected by severe floods, which impacted 40 million people and inundated 2.2 million hectares of farmland. Direct economic losses were estimated at US$3 billion. Floods were also responsible for a significant death toll in the Democratic People's Republic of Korea in the year 2006.[11]

Table 3. People affected by natural disasters in East Asia, 1991–2008

Country	Cumulative number over the period in thousands				Per 100,000 population			
	91-95	**96-00**	**01-05**	**06-08**	**91-95**	**96-00**	**01-05**	**06-08**
China	613 487	563 896	678 155	252 535	10 354	9 055	10 476	9 470
DPR Korea	5 703	3 799	204	1000	5 406	3 386	175	2107
Hong Kong, China	7	0	5	0	22	1	15	0
Japan	465	766	831	114	75	121	131	45
Macau, China	1	0	0	0	60	0	0	0
Mongolia	100	1 526	846	3	886	13 075	6806	60
Republic of Korea	25	99	490	1	12	43	208	1
East Asia	**619 788**	**570 086**	**680 531**	**253 653**	**8 961**	**7 868**	**9 061**	**8221**

Sources: Based on ESCAP, *Statistical Yearbook for Asia and the Pacific, 2007*, p. 212, ESCAP, *Statistical Yearbook for Asia and the Pacific, 2009,* p. 223.

Geological disasters can be very destructive in terms of the number of casualties. Vulnerability to this kind of disaster grows as the urban poor settle in houses which are built from the cheapest materials. The disaster

11 *China – Country Report 2006* (Beijing: ADRC, 2006), p. 1; ESCAP, *Statistical Yearbook for Asia and the Pacific, 2008* (Bangkok: UN ESCAP, 2009), p. 208.

loss levels increase with the growing concentration of economic activity and assets, and with the concentration of people and infrastructure crucial for the safety of the country and its citizens. The Kobe Earthquake in Japan in January 1995 took more than 5000 lives, with a further half a million affected. The Wenchuan Earthquake in Sichuan Province of China on May 12, 2008, was one of the worst natural disasters in the region. That single natural disaster killed 87,000 people, affected more than 45 million others, and caused US$20 billion worth of damage.[12]

Table 4. Economic damage from natural disasters in East Asia, 1991–2008 (US$ million)

Country	**91-95**	**96-00**	**01-05**	**2006**	**2007**	**2008**
China	48 756	72 736	43 125	12 464	8 005	110 999
DPR Korea	15 110	8 202	30	0	300	0
Hong Kong, China	519	10	0	0	0	0
Japan	113 675	18 183	49 671	2 500	13 810	277
Macau, China	0	0	0	0	0	0
Mongolia	10	1 793	0	0	0	0
Republic of Korea	1 118	2 099	10 414	0	70	0
East Asia	**179 189**	**103 022**	**103 240**	**14 964**	**22 185**	**111 276**

Source: ESCAP, *Statistical Yearbook for Asia and the Pacific, 2009*, p. 224.

Extreme temperatures and the phenomena connected with them—droughts, wildfires, and insect infestations—are also responsible for a high number of deaths. For instance, in 56 soums of thirteen provinces and in five districts of the capital city of Mongolia, Ulanbataar, there occurred 115 wild land fires (an area of 3402.6,000 hectares were affected, with damage in the order of approximately 120 million tugrik[13]).

12 *Japan – Country Report 2006* (Tokyo: ADRC, 2006), p. 1; ESCAP, *Statistical Yearbook for Asia and the Pacific, 2007*, pp. 175–76; ESCAP, *Statistical Yearbook for Asia and the Pacific, 2008*, p. 208.

13 *Mongolia – Country Report 2006* (Ulanbaatar: ADRC, 2006), p. 1.

International Cooperation in the Region in the Field of Counteracting Natural Disasters

In order to combat the effects of natural disasters, the countries of East Asia cooperate on the international level, and are members of the following regional international organizations (see Table 4):

- Asian Development Bank (ADB)
- Asian Disaster Preparedness Center (ADPC)
- Asian Disaster Reduction Center (ADRC)
- Asia-Pacific Economic Cooperation (APEC)
- United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP)

The first of the abovementioned institutions consists of all the countries of East Asia, excluding the Democratic People's Republic of Korea. ADB approved the Disaster and Emergency Assistance Policy (DEAP) on June 1, 2004. DEAP is a comprehensive policy encompassing natural, environmental, and technological hazards; health emergencies; and various conflicts on the national level. The policy establishes a series of objectives focusing on:

- Providing rehabilitation and reconstruction assistance after a disaster has taken place
- Strengthening the support for reducing disaster risk in developing countries (members of ADB)
- Supporting ADB's activities by developing partnerships[14]

This policy is realized by accepting the Action Plan by ADB, which develops an approach that will embed disaster risk management (DRM) within ADB's operational practices. A practical way for ADB to execute the Action Plan is an investment in sustainable development.

[14] *ADB and Disaster Risk Management*, http://www.adb.org/Disaster/glance.asp (accessed June 27, 2010).

Table 4. Membership of East Asia countries in regional international organizations

Country	Capital city	ADB	ADPC	ADRC	APEC	UN ESCAP
China	Peking	x	x	x	x	x
DPR Korea	Pyongyang					x
Japan	Tokyo	x	x	x	x	x
Mongolia	Ulanbaatar	x	x	x		x
Republic of Korea	Seoul	x	x	x	x	x
Taiwan	Taipei	x			x	

Sources: Based on ADPC, "Country Profiles," http://www.adpc.net/v2007/IKM/Country%20Profiles/Default-Country.asp; "About ADRC," http://www.adrc.asia/aboutus/index.html; "About ADB Membership," http://www.adb.org/About/membership.asp; APEC, "Member Economies," http://www.apec.org/apec/member_economies.html; UN ESCAP, "About Us, Members," http://www.unescap.org/about/member.asp (accessed June 27, 21010); * Hong Kong and Macao are represented by the People's Republic of China in the areas of defense and foreign affairs.

The second institution is the Asian Disaster Preparedness Center (ADPC), which was created in 1999. Members of the ADPC in East Asia are China, Japan, Mongolia, and the Republic of Korea. It is a non-profit organization supporting the development of safe communities and sustainable development, through implementing programs and projects that reduce the impact of disasters upon countries and communities in Asia and the Pacific, by

- Developing and enhancing sustainable institutional disaster risk management and supporting the development and implementation of government policies
- Facilitating the dissemination and exchange of disaster risk management expertise, experience, and information
- Raising awareness and enhancing disaster risk management knowledge and skills[15]

[15] *About ADPC*, http://www.adpc.net/v2007/About%20Us/Default-Aboutus.asp (accessed June 27, 2010)

The next organization is the Asian Disaster Reduction Center (ADRC), which out of East Asian countries includes China, Japan, Mongolia, and the Republic of Korea. ADRC was set up in 1998. Its mission and goals are:

- Building safe communities
- Creating a society where sustainable development is possible
- Enhancing disaster resilience of the member countries[16]

In executing its mission and aims, ADRC cooperates with global organizations such as the International Strategy for Disaster Reduction (ISDR), the Office for the Coordination of Humanitarian Affairs (OCHA), and the World Meteorological Organization (WMO).

The fourth institution is Asia-Pacific Economic Cooperation (APEC). It is the premier forum for facilitating economic growth, cooperation, trade and investment in the Asia-Pacific region. Members of APEC in the region under study are China, Japan, the Republic of Korea, and Taiwan (Chinese Taipei).[17] APEC also has a human security agenda called Task Force for Emergency Preparedness (TFEP). It plays a constructive role in enabling the region to better prepare for and respond to emergencies and disasters, by helping to reduce the risk of disasters and building business and community resilience. The APEC countries strengthen their capacity to mitigate, prepare for, and respond to emergencies and disasters, by sharing expertise and collaborating on emergency preparedness issues.[18]

Finally, there is the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). It is the regional development arm of the United Nations for the Asia-Pacific region. It consists of all the countries of East Asia excluding Taiwan. It carries out work, for example, in the area of Information and Communications Technology and Disaster Risk Reduction (IDD).[19]

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16 *About ADRC*, http://www.adrc.asia/aboutus/index.html (accessed June 27, 2010)

17 *About APEC*, http://www.apec.org/apec/about_apec.html (accessed June 27, 2010)

18 Emergency Preparedness Working Group, http://www.apec.org/apec/apec_groups/som_committee_on_economic/working_groups/emergency_preparedness.html (accessed June 27, 2010)

19 UN ESCAP, "General description," http://www.unescap.org/about/index.asp (accessed June 27, 2010)

One of the major pillars of IDD is the Disaster Risk Reduction Section (DRR). The major objectives of DDR are

- Multi-hazard assessment, preparedness, early warning, and response to disaster risk
- Policy options and strategies on multi-hazard disaster risk reduction and mitigation
- Regional cooperation mechanism for disaster risk management, including space and other technical support systems[20]

Concluding Remarks

East Asia is seriously affected by natural disasters which, aside from inflicting huge casualties, increase poverty in the region and generally have a negative influence on people's lives, decreasing the quality of life, destroying food crops and livestock, and causing whole households and communities to relocate.

The negative impact of natural disasters is higher in countries with insufficient international cooperation in executing natural disasters policy. The infrastructure to mitigate the effects of these phenomena functions in highly developed countries but the economic cost of the disasters is still considerable. The occurrence of natural disasters in developing countries—that are poorly prepared and equipped to cope—deprives them of an opportunity for achieving high economic growth, with development funds assigned instead to the reconstruction of damaged infrastructure crucial for the safety of the country and its citizens.

[20] Disaster Risk Reduction (DDR) Section, http://www.unescap.org/idd/drs.asp (accessed June 27, 2010)

Quantification of Notions in Crisis Management

Romulad Grocki[1]

Summary: We often encounter the definitions "small," "big," "distant," "sudden," and the like, that is, with relative definitions that can have or have a different significance, depending on the situation or the state in which they are used. The author introduces new definitions concerning time management and proposals of quantification of such definitions, such as the distance in the time (direct, average-distant, and distant) and of the level of the threat (small, average, big), definitions which are connected with the term weight of threat.

Key words: quantification, crisis management, time management, weight of threat, risk.

Introduction

When analyzing threats, we must determine the weight of the threat and the risk of the real threat. The weight of the threat is described by two parameters: *distance in the time* and *size of losses*. The *distance in the time* determines whether the event appeared suddenly, or whether in another time period. In practice, it means the time we have at our disposal in order to react to the threat. Comprehending the *size of losses* is a relative notion and the expressions "small," "average," or "big losses" cannot be a reference for analysis of the real threat. From here a necessity of the quantification of such notions exists as the *direct*, *average-distant* whether *distant* in the time and in case of losses of such notions like *small, average,* or *big* losses. In determining the risk which is a consequence of two parameters—of the *probability* and *loss*—a quantification of the notion is necessary: *small, average,* or *big* probability. In case of loss, these notions will be determined according to the same proposal like for the weight of the threat.

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Relative Notions Problem in Crisis Management

It is possible to assess the weight of threat on the basis of the rule included in the categories of the size and the immediacy of the threat. It is a consequence of two sizes: scale of the threat and the time which passes from the moment the potential threat is signaled till its termination. This evaluation can change according to a very wide range. In existing deliberations it was included in the presented way in Table 1.

Table 1. The weight of threat, as the relation of the scale of the threat and distance in the time

Distance in the time	**Scale of threat**		
	Small	*Average*	*Large*
Direct	Small	Average	Large
Average-distant	Small	Small/average	Average
Distant	Small	Small	Small

For distance in the time three gradual scales are accepted: *direct, average-distant,* and *distant* in time. Distance in the time determines the possibility of taking action in order to curb the effects of the threat. It is hard, however, to define what time is, e.g., distant, and which on average-distant.

Quantification of Notions in Crisis Management

Quantitative Time Distant (Time Management)

With the aim of transparently visualizing the temporal interrelation, I propose implementing the following notions: *time of the reaction, time of the readiness, rate of the reaction*, where:

- *Time of the reaction* t_r fixes the time we have which at its disposal from the moment of the appearance of the event or the information about the possibilities of it appearing, up to the direct moment of threatening in the determined point of the area

- *Time of the readiness* t_g, a time, essential to notify services, alerting the population, the conduct of evacuation and other undertakings included in the plan of acting in the case of the determined event

The interrelation between the time of the reaction (t_r) with the time of the readiness (t_g) is determined:

$$w_r = \frac{t_r}{t_g}$$

A potential step from the point of view of crisis management determines the rate of the *wr* reaction, which would be intentional so that the rate of the *wr* reaction is larger than "1". I propose, with point of reference to comprehending distance in the time, that the rate of the reaction in an explicit way determines relations between threat in the time and the possibilities of reacting during the event. It is possible to accept that for a rate smaller than "1", the threat is direct; however, for the rate with a greater value than "2", it is distant in the time. The time between obtaining information about the probability of danger and its occurrence plays a decisive role in the effectiveness and efficiency of the undertaken action. The longer the time of readiness, the more probable it is that effective actions can be undertaken as well as mitigating possible losses, regarding both human lives and people's property and belongings.[2]

Quantitative Loss

For the scale of the threat, three levels were accepted: *small, average, and big*. For individual levels, however, determining the value was so far not defined. The same size of losses does not always means the same size of problem, and doesn't give rise to similar effects. The scale of the threat depends on the kind of event, its intensity, its duration, and its effects.

I intend to classify the size of losses (for the Polish reality). The budget allocation for the crisis management serves as a point of reference. More

[2] R. Grocki, "Flood safety in the aspect of action in emergency situation," EURO-RIOB Conference, Wrocław, 2005, p. 183.

specifically it was the 0.5 percent benchmark that determined the level of threat. In practical terms, it means that losses up to 0.5 percent of the budget are managed by the administration alone. When the value exceeds that, the losses are deemed as "big" and therefore outside support is required. Following the above mentioned concepts the table looks as seen in Table 2.

Table 2. The scale of threats including the quantification of notions "distances in the time: direct, average-distant and distant" and "of losses: small, average, big"

Distance in the time		**Scale of threat**		
		Small	*Average*	*Big*
		< 0.5% budget	0.5 - 2.0% budget	> 2.0% budget
Direct	$w_r < 1$	Small	Average	Big
Average-distant	$1 \leq w_r < 2$	Small	Small/average	Average
Distant	$w_r \geq 2$	Small	Small	Small

Using Table 2 it is possible to state that the importance of the threat is only great in the event that the threat in the time is direct and that the scale of the threat is big.[3] It depends on the importance of the threat, what action will be taken, as well as what powers and centers will be used.

Quantitative risk assessment

Risk is taken as a product of probability *p* and losses *L:*

$$R = p^*L$$

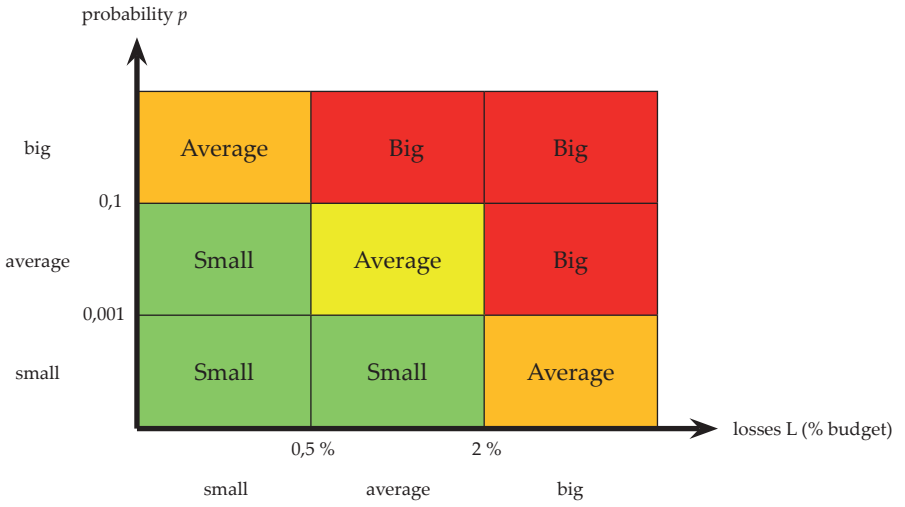
In as much as the parameter of losses was already discussed, a need to define the notion exists concerning the probabilities—small, average, big.

[3] R. Grocki, "Crisis situation-threshold values: Natural and civilization disasters," International Conference, Bełchatów, 2008, p. 331.

Quantitative Probability

I propose assuming the value of the probability p<< 0.001 for this criterion. It results from the assumption that, in the Flood Protection Plan, we are drawing up possibilities of acting upon the flood on the probability of exceeding 0.01, and in special cases 0.005. From here one should conclude that we are prepared for events about such a probability of the uprising. Since the crisis situation is associated with the improbability of the occurrence of the determined event, I propose the value lower than the one which we are taking into account for the flood, as a point of reference of our deliberations. The table of risk is thus presented below in Fig 1.

Fig 1. Elements of quantitative risk



Concluding Remarks

Quantification of the above notions permits for the explicit determining in practice both the risk and the weight of the given threat, considering both organizational and financial realities and the possibility of reacting when the threat emerges. Applying the above solutions allows for drawing up real crisis management plans and standard operating procedures. It allows also for comparing threats appearing on the analyzed area.