SECOND INTERNATIONAL SCIENTIFIC CONFERENCE

TRANSPORT OF DANGEROUS GOODS AND RISK MANAGEMENT

TOMUR'10

INTERNATIONAL THEMATIC ISSUE No.1

ISBN 978-86-83059-05-8

"Kirilo Savić" Institute • 51, Vojvode Stepe Street • Belgrade • Serbia

30-31.03.2010.

UDK:
007:912]:004
656.073.436:620.26

THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AS A FUNCTION OF HUMAN SECURITY CONCEPT REALIZATION IN A DANGEROUS GOODS TRANSPORTATION AREA

Djordjević Ivica, Džigurski Ozren

University of Belgrade, Faculty of Security Studies, 50 Gospodara Vucica St. Belgrade; djivica@gmail.com; odzigurski@gmail.com

Abstract: The dynamics of scientific and technological development and globalization of production activities have led to a drastic increase of dangerous goods volume transportation in all forms of transportation. In most cases, transportation corridors go past and/or through settlements. In the given circumstances there is a risk control need in case of possible accidental situation. In addition to traffic control and potentially harmful effects measuring, the ICT potential can be used for informing or educating and training people how to act in such circumstances.

The paper proposes an ICT architecture based on the concept of distributed computing systems implemented on the concept of Integrated command and control systems based on of C4I (Command, Control, Communication, Computers and Intelligence) principle. Information about a vehicle carrying dangerous goods location, as well as of the current parameters of hazardous substances, can be continuously sent to the monitoring center via wireless communication and the global positioning system (GPS).

The information obtained in case of an accident during hazardous matters transportation, can be used for the selection and implementation of an adequate plan for responding to and managing the emergency situation.

A successful response to an accident situation requires the previous development of plans for emergency situations, and education and training of population.

Besides a continuous gathering of information about the transport of dangerous goods, the use of ICT enables proper management accidental situation, and the ability of education and training based on the simulation of different accidental situation scenarios.

Key words: *Transport of Dangerous Goods, ICT, C4I systems, monitoring, education and training in emergency situations, notification and alerting, human security.*

INTRODUCTION

The globalization had opened national borders for transition of goods, services and people. Increase in cross-border activity proportionally increases the risks of transport volume growth, especially in the field of dangerous goods transport. The international standards in this field are very strict, obligating transport companies to undertake the appropriate measures and procedures in order to minimize the risk of unwanted events. However, considering an inevitable rule of grand numbers and lacking possibility of absolute risk control, it is necessary to prepare for the occurrence of crisis situations.

Technical solutions provide a vast potential in the field of dangerous goods transport control and monitoring. The powerful computers and software solutions enable model establishing and simulation of various situations. It is in fact possible to provide predictions according to the geographic features of terrain, type of matter and meteorological conditions. Success in implementation of drafted plans of reaction in crisis situations also includes the appropriate preparations of citizens situated in the zone affected by such crisis situation.

The state institutions and services are legally obligated to prepare the citizens for an appropriate reaction in possible crisis situation. Research performed for the purpose of this paper had shown that the citizens situated in close vicinity of roads used for dangerous goods transport were not provided with the sufficient information on circumstances they are exposed to and how should they react if any of such events should occur. Due to the lack of information, citizens may be exposed to the unwarranted security risks in the case of accidents involving the vehicles transporting dangerous goods.

DANGEROUS GOODS TRANSPORT REPRESENTING THE SOURCE OF HUMAN SECURITY VIOLATION

The Human Security concept in its very core provides an alternative approach in the fields previously monopolized by military-police structures. The foundation of the idea promoted by the UNDP in 1994 consists of care of human being as a basic value of any given society. In such context, security services have their role in human life preserving and providing the appropriate conditions for achieving potentials for each and every one of us. Of course, the individual achievement is to be in line with the established societal principles and norms, where adherence is provided by the appropriate control mechanisms.

System institutions, together with the system itself have the purpose of facilitating implementation of the established civilization norms and achievements, in order to prevent conflicts with other social groups, but also to superimpose the interest of majority against the interest of minority in the society.

The list of factors jeopardizing human security contains dangerous goods transport within its top items. If a methodological matrix used within the human security concept is to be applied, the dangerous goods transport can be recognized within several indicators depicting the human security status.

The core fields or components of human security according to the UNDP include:

- *economic security*, covering basic income earned by the “productive and lucrative work”;
- *food security*, all people, in any given moment must have access to food, both in physical and economic sense;
- *health security*, for all people, with special emphasis on underprivileged;
- *environmental security*, defined as a healthy physical environment;

- *personal security*, in form of decreased threats of any form of violence against an individual;
- *community security*, i.e. security by belonging to a group (providing that the groups societal norms and behavior do not threat individual's physical security being a member of the group, or security of others in the environment); and
- *political security*, life in an environment facilitating implementation of basic human rights.[24]

Having in mind fields quoted according to the UNDP concept, one may note that the human security, among the other issues, includes:

- availability of an appropriate health care and treatment in the case of illness and accidents;
- healthy environment and
- elimination of threats against citizens' health and life from the environment.

These issues are directly correlated with the presence of dangerous goods in the close vicinity of citizens, whether it was their working or living space. The scientific-technical development had enabled an expansion of economic activities' field throughout the planet Earth, bringing up the necessity of raw materials transport, traveling great distances.

Our country is, regarding the geographic position, located on the transport corridor carrying, among the others, miscellaneous aggressive substances, acids and other hazardous compounds which being released may contaminate the area and cause numerous casualties.

The international standards established in the subject field define prerequisites for minimization of the risk. However, having in mind that these activities are so dynamic that the unpredictability factor is ever present, our community must also be ready to react should the worst-case scenarios occur.

As Table 1 shows, the statistic indicators on dangerous goods transport volume indicate a mild stagnation. However, the long-term trends in comparison with the previous decade, i.e. before the latest globalization phase start, indicate that the dangerous goods transport had had multiple-factor increase.

The Denmark case presented in Table 2 can be illustrative within this context.

[24] UNDP (1994): *Human Development Report*. Oxford University Press, New York – Oxford, 24-33.

Table 1. Transport of dangerous goods (million t/km) – Selected countries

	2001	2002	2003	2004
BE	4,177	3,779	2,623	2,284
DK	827	998	780	901
DE	13,437	12,036	12,777	13,524
ES	10,300	1,236	12,185	12,669
FR	8,132	8,471	8,797	8,701
IE	1,139	1,094	1,414	1,468
LU	245	337	327	344
NL	2,123	1,680	1,664	2,021
AT	1,064	985	1,132	940
PT	1,775	1,730	1,900	2,066
FI	2,427	2,253	2,401	1,818
SE	1,623	2,009	1,778	2,180
UK	10,655	10,178	9,899	8,091
Total	57,924	46,786	57,677	57,007

Source: *European Road Statistics 2007*: European Union Road Federation, International Road Federation, Brussels Programme Centre. Brussels, 65.

Table 2: Transport of dangerous goods by Danish road

	Years	
Dangerous goods total transport	**1999**	**2008**
Weight of goods loaded, 1000 tones	295	737

Source: http://www.statbank.dk/statbank5a/SelectVarVal/saveselections.asp (25th March 2010.)

The table shows that, within the period 1999 – 2008, transport of dangerous goods via Denmark's roads had had multiple-factor increase. If we cross-reference the Table 2 data with the Table 1 data, the conclusion is drawn that the greatest quantities of dangerous goods were transported in 2002.

There is always an issue of data relevance and methodology used, but having in mind that the sources originate in EU area and are based on the data from national statistics sources we may assume that no issues of this type should arise in this case.

Regarding the volume of dangerous goods transported, providing a full overview requires a quality analysis of data available. Based on the data for the year 2006, we may note that the total structure of dangerous goods transported on the territory of 27 EU Member States and Norway covers the following categories of dangerous goods:

- flammable liquids – 58 %;
- fuels (different forms) – 12 %;

- acids – 11 %;
- miscellaneous explosive substances – 6 %;
- oxides – 3 %;
- other non-classified dangerous goods – 10 %.[25]

Undoubtedly, it is possible to establish a correlation between increase in dangerous goods transport and related risks. Verification of this thesis can be well depicted with the increase in number of emergency calls for crisis situations occurring in the situations of dangerous goods transport and storage in Canada (Table 3). During the period 1990 – 2008, the number of calls had increased from 173[26] to 1007[27].

Table 3: Emergency Calls for Crisis Situation on the Territory of Canada in 2008 per Transport Type

Transport type	Number of calls
Road	262
Railway	145
Air	17
Maritime	16
Pipeline	1
Storages and other infrastructure	564
Multimodal transport	2

Source: http://www.tc.gc.ca/eng/canutec/stats-2008stat-435.htm (20th March 2010.).

Presented structure indicates potentially critical points in traffic infrastructure regarding incident occurrence regarding dangerous goods transport and storage. The majority of calls came indeed from the storage capacities and reloading ramps. The second place belongs to the road accidents, followed by the railway, while the pipeline transport being at the end of the list had shown to be the safest transport option in the Canadian experience.

Which of the transport routes would potentially carry the highest risk depends on various factors – starting from the state of traffic infrastructure, covering status of vehicles, down to the cultural setting and security culture level within the community being analyzed.

Serbia, with its preconditions, is a territory where security analyses and prognoses are not easily made. Starting from the fact that the decades of economic crisis had deteriorated any form of institutional accountability towards citizens and that we are still in the initial capital accumulation phase when public officials take greater interest in their own pocket than social accountability of their appointment. Deterioration of infrastructure is not only reflected in physical downgrading of roads, but also in downfall of institutional prerequisites for the community to cope with any problem at hand.

The previous civil protection system, covering almost the entire population and drafting numerous plans for crisis situations had remained in tatters. Searching for new solutions, some of the good aspects of all systems were declared ideological heritage, while the new solution exist only on paper.

[25] Simo Pasi (2008): *Statistics in focus 66/2008*. EUROSTAT, Luxembourg, 6.
[26] http://www.tc.gc.ca/eng/canutec/stats-1990stat-453.htm (25th March 2010.).
[27] http://www.tc.gc.ca/eng/canutec/stats-2008stat-435.htm (20th March 2010.).

The problem may be clearly noticed by analyzing spatial distribution of buildings in the vicinity of roads, i.e. directions of dangerous goods transport. Limitation of this paper length discourages analyses of each individual aspect of this problem, but it is our opinion that one of the societal functions of this kind of papers is to point out the existence of a problem.

IMPLEMENTATION OF ICT IN DANGEROUS GOODS TRANSPORT CONTROL

Fast-paced development of the Information Communication Technologies (ICT) has a significant influence, among the others, on development of systems used for dangerous goods transport control. In general, these systems include the following aspects:

- transfer of information to and from the vehicle (telecommunication);
- data processing (information technologies); and
- information use for decision making with the purpose of safe transport and efficient solutions to use the existing technologies for transport control (command and control).

The new technologies, such as navigation systems, Internet, mobile networks are but a few examples of the Information Communication Technologies used for the dangerous goods transport control in road traffic, but also in other forms of transport. Application of these technologies can provide implementation of modern systems for dangerous goods transport control – the Integrated Transport Control Systems (ITCS)[28].

The innovative technologies may provide an active support for transport monitoring and provide value-added services for legally-required information provision, while also alleviating the risk in the case of accident. Open standards and migration to the SOA (service-oriented architecture) shall dramatically increase scales on global level regarding business models. The promising technologies, of course, include wide-spread satellite positioning systems.

In the case of dangerous goods transport, there is a need to permanently monitor both vehicle position and goods state, for the security purposes.

Automatic vehicle identification techniques based on RFID technologies, which provide for the transport information electronic storage. Route planning may be time-independent or reactive, depending on the fact if the real-time information of traffic network conditions is included in this management process. These information are acquired by sensor networks and made available to databases real time. Besides, the Geographic Information Systems (GIS) shall provide for the spatial data management with the purpose of decision making processes streamlining. The important technological requirements placed upon these systems are integration and interoperability, in order to assure the maximum traffic efficiency and security[29].

The following components are used for the transport vehicles location control within the ITCS[30]:

- transport monitoring equipment (sensors, detector, control and monitoring equipment, video-detectors), TV monitoring equipment;

[28]Russo F., Vitetta A., Rindone C., Delfino G., Quattrone A. (2008): "*ITS for monitoring and estimating road accident probability for dangerous goods transport*"; Association for European Transport and Contributors.
[29] Fisichela M., Targon V., Pandolfi A. (2006): "*The framework for dangerous goods tracking and management – The Integrated Information System*"; 5th Prague, AED Conference.
[30] Batarliene N. (2006): "*Location and control of cargo and vehicles with new technologies*"; Transport and Telecommunication, Vol 7, No 1.

- satellite navigation and positioning systems (GPS, GLONASS, EGNOS, Galileo);
- radio-communication systems;
- geographic databases and information systems (GIS);
- road databases;
- electronic cards with transport data;
- meteorological data monitoring systems and
- measuring and other systems.

In the technical sense, modern systems providing dangerous goods transport can be implemented as an integrated command-control systems, based on C4A concept (Command, Control, Communication, Computers and Intelligence). These systems, via the satellite, GSM and other secure forms of communication, augmented with the appropriate security equipment and trained staff; cover all critical points throughout the territory where the transport occurs. Besides stationary local security centers, C4I systems also cover mobile centers used in the crisis situations to cover the locations of accidents and breakdowns or for mobile supervision of critical buildings and locations.

The C4I concept based systems are the command-information systems, unifying all of the advantages of application of modern communications, computers, processing of data and information of importance for security during the commanding process. Within the C4I system, spatial data and relations processing and visual presentation is provided by the special software subsystem GIS (Geographic Information System). By integrating expert systems in GIS software, C4I also obtains special capabilities for a quality spatial decision support for managing of crisis situations invoked by the security accidents.

Based on the analysis performed, we can conclude that due to the extreme significance of this field for the state and economy operation, numerous activities regarding the dangerous goods transport safety may be regulated on the state level through the ministries of army, police, energy and economy. For that reason, having in mind the strategic significance and numerous endangering forms, dominant dangerous goods transport security systems implement C4I concept. Such systems are presently standard applications for defense and security in state institutions, as well as in the organizations of strategic importance. Prominent quality of C4I concept and systems based on it is that such systems facilitate an efficient real time management, which is one of the basic requirements for the security system implementation.

Besides the basic requirement for an efficient, real time management, complex security systems require completion of the following fundamental tasks:

- **security supervision** of all critical buildings and locations;
- **decision support** based on reliable information and expert knowledge and
- **command and control** in real time setting.

In order to provide for the high level dangerous goods security, completion of such tasks can be assured by implementation of Integrated C4I systems.

INTEGRATED C4I SYSTEMS

The C4I concept (Command, Control, Communication, Computers and Intelligence) had been developed with the objective to execute and support security operations planning and management. Its main systems are:

- **integrated command and operations centers** – stationary or mobile centers used for unification and processing of all information regarding the transport security;

- **decision support system** – decision support software providing necessary expert information and situational notifications in logical form for command executives, regardless of their location, providing a general overview of the current situation or incidents. Visual presentation and complex overview of security objects and processes is provided by software categorized as the Geographic information system (GIS);

- **integrated communication system** – security communication system transmitting multimedia information (textual and numeric data, audio and visual information) between the command and control centers; among the teams and subjects responsible for the security. For instance, digital radio system, satellite communication system, security data transfer networks, CCTV monitoring systems.

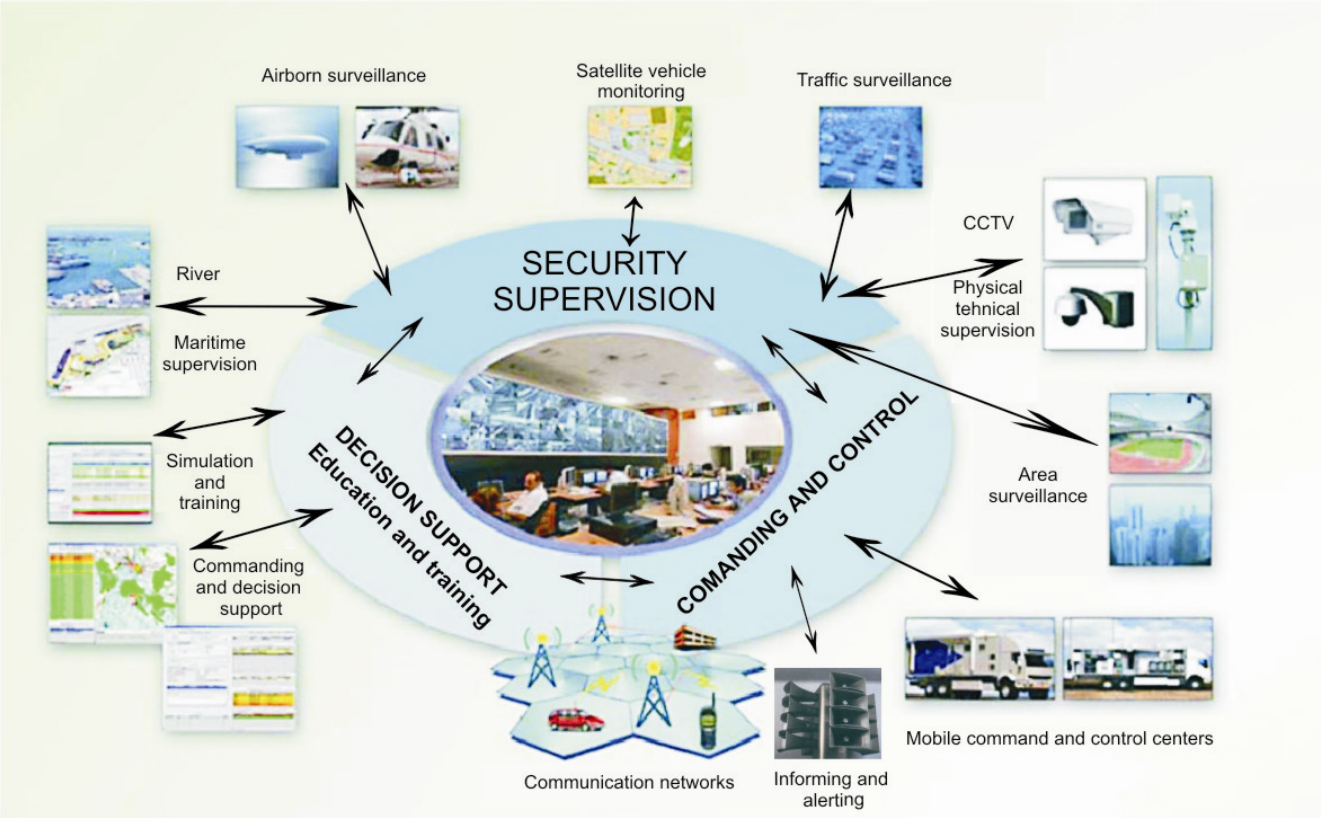

Figure 1: Integrated command-control system for security information management in dangerous goods transport, as well as for education and training of personnel and the population[31].

[31] The original scheme, made by the authors.

- **vast area surveillance system** – complex surveillance system covering the area and objects within, detecting incident events, activating warning alerts and provide information flow in real time setting; in the field of the events and incidents in vast areas. This is especially significant in the field of traffic and transport monitoring, with recognition of objects in space and detection of their unusual behavior. If the transport should pass through critical areas (urban environment, war- and terrorism-affected arease), the surveillance is being performed by setting up ad-hoc wireless sensor networks (BSM);

- **system for resource monitoring and management** – provides mechanisms for allocation and management of resources used in the security activities and responses to incident events;

- **physical-technical security system** – defines and protects transport facilities, road corridors, regions, etc. The system may contain area breach protection, fire protection, video surveillance (CCTV), access control, integrated barriers, protective illumination, etc, as well as an appropriate communication infrastructureČ

- **system for alarming and notification** – communication system for informing responsible subjects and public on incidents occurred, with suggestions of measures for alleviating the incident consequences;

- **simulation and training system** – provides a simulation of accident events and staff training for incident management. In addition, this system provides education and training of the population based on the simulation of various emergency situations.

EDUCATION AND TRAINING OF CITIZENS

The first issue we had noted during the preliminary research for the purpose of this paper is that the legislation and materials found on the Internet mostly relate to the transporters' obligations.

Available literature and legislation in subject field mostly cover standards, training for drivers and handlers of dangerous goods. Sources on warning methods for citizens potentially exposed to breakdown effects during the dangerous goods transport are very sparse.

One might say that it is justifiable, since those actions are to prevent accidents. Considering that such events cannot be fully controlled everyone who might potentially be exposed to the effects of explosion or propagation of dangerous fumes should be familiar with possible scenarios.

For the institutions to act preventively, besides production of urban development plans which must contain risk estimation in the event of dangerous goods transport, citizens must also be familiarized with the procedures and measures if the crisis event should occur.

In Table 4 there is identificated Hazardous Industries and Locations in Serbia.

Table 4: Identification of Hazardous Industries and Locations

	Company	Location	Goods	Class	Transport method
1	Duga	Viline vode	organic solvents	II	railway
2	Galenika	Batajnički drum	organic solvents	II	road
3	Dalija	Batajnički drum	organic solvents	II	road
4	Grmeč	Autoput, Zemun	organic solvents	II	road
5	Rekord	Rakovica	organic solvents	II	road
6	Rafinerija-Beograd	Pančevački put	oil derivates	III	road
7	Jugopetrol	Radnička	oil derivates	III	road, river
8	Beopetrol	Savska, Ostružnica	oil derivates	III	road
9	Tehnogas	R.Vujovića - Čoče, Rakovica	technical gasses	III	road
10	Petrolgas	Ovča	butane-propane concoction	III	railway
11	Grmeč-Balkan	Pančevački put	organic solvents	II	road
12	Šećerana - Vrenje	Radnička	ammoniac	I	railway
13	Tehnohemija	Viline vode	miscellaneous chemicals	II	railway
14	Beogradski vodovod	Makiš	chlorine	I	road
15	Beogradski vodovod	Bežanija	chlorine	I	road
16	Beogradski vodovod	Banovo Brdo	chlorine	I	road
17	BIP	Autoput, Beograd	ammoniac	I	road
18	Hempro	Autoput, Zemun	miscellaneous chemicals	II	road
19	Žel.stanica Dunav	Viline vode	miscellaneous chemicals	II	railway
20	Žel.stanica, Bgd	Savski most	miscellaneous chemicals	II	railway
21	Žel. stanica, Ovča	Ovča	miscellaneous chemicals	II	railway
22	Žel. stanica, Zemun	Zemun	miscellaneous chemicals	II	railway

Class of goods **I** – very toxic goods; Class of goods **II** – toxic goods; Class of goods **III** – flammable goods
Source: http://www.zdravlje.org.rs/ekoatlas/07at1.htm (20th March 2010.).

Table 4. shows that in the mere territory of Belgrade there are 22 registered locations being a potentially significant source of chemical fumes, i.e. the locations of explosion which may lead to heavy injuries of numerous citizens. Besides the individual risks, the effect multiplication also deserves some attention. An example of hypothetic situation combines railway transport with overhead viaduct, nearby bridge or storage where the waterway also carries dangerous load, etc.

Potential of ICT in the field of informing and education for citizens on possible situations and preparation for those is certainly not directing towards panic propagation; instead, its goal is to introduce the citizens to all elements that could contribute to their own security. Numerous forms of communication and information transfer are currently available for everyone.

Hardware prices had decreased in such an amount that even the poorest segments of society have cellular phones and computers. A comprehensive action to introduce the citizens with significance of timely acquisition of information for survival of their family and loved ones may be a good motive to engage the majority of population. Educative material may be distributed to all families in an appropriate multimedia form: CD or DVD. It is also possible to publish presentations on website and deliver its web address via an appropriate leaflet, thus simplifying the information distribution process.

Use of ICT enables, in addition to continuous collection of information on the transport of dangerous goods, appropriate decision-making for disaster management, as well as the possibility of education and training based on the simulation of various emergency situations. These activities are implemented using algorithms in the field of artificial intelligence, using the built-in knowledge base and database, as well as information about the disaster from the past.

The third part of this paper indicates that there is an option to almost instantly be informed on any accident, scope and type of contamination. For the information to be useful, a system must exist to timely react on receiving the information from the field. The informing an alarming system may also be efficient with use of electronic media. However, we believe that the option to create the network consisting of all cellular phones in the affected territory was not elaborated enough, which would inform everyone on necessary activities in real time setting.

Of course, implementation of this type of project has a prerequisite in strong institutional foundation with clearly defined strategy, both in national and local level. Existence of a permanent monitoring of potentially risky areas and territories with early warning system is a prerequisite. A readiness must exist, but accompanied with the capability to apply knowledge and innovations in establishing a flexible system for the efficient response in accident situation on all levels. Such a response is possible in the situation of mass accidents only if all potential actors are prepared for the conditions they might encounter.

In the field of roads used for dangerous goods transport, it is necessary to establish a special education program for the urban planners and designers, so their attention is brought towards the significance of standard application in designing new streets and buildings under their jurisdiction. Communal inspection offices must also be informed about their role in norms enforcing, to ensure that the field situation is in line with the office-designed one. Finally, the citizens must know which steps they should take on the first indication of danger, before obtaining detailed instructions to be forwarded after the full scale of that event is surveyed.

The most appropriate system for awareness building for citizens on significance of noted procedures is the system of education. Later on, via the local government institutions, participation of all citizens in basic forms of education should be assured, in order to enable them to independently monitor all changes published by the authorized institutions.

It is important to nurture the trust in system and people managing it, so that citizens would act as recommended in any given crisis situation. Direct communication between the citizens, local government and authorized state institution should flow via the persons professionally trained for work in the field and having certain qualities gaining citizens' confidence.

CONCLUSION

Availability of reaction plans for the accident situation in inhabited areas surrounding traffic routes used for dangerous goods transport is not satisfactory. General public is almost totally ignorant on procedures, what should be done and in which manner if such conditions are to occur.

When the accident situations plan are designed for the events of breakdowns in the area around traffic routes, all previous experiences from situations should be taken into account. The practice had shown that dangerous goods transport can potentially cause a great devastation and injuries of citizens nearby roads used for such purposes. Besides the waterways, road and railway traffic routes, risk estimation should also include processing of oil and gas pipelines.

ICT offers a great potential in subject field. Starting from model development for the event rollout projection and produced plans evaluation, down to the procedures for citizens in actual situations. Modern communication systems provide monitoring of risky transports, instant acquisition of parameters and swift reaction if the need should occur. An efficient system also covers preparation of citizens for the appropriate reaction, in line with the field situation. The modern media provide endless possibilities, starting from informing via radio and TV broadcasts, down to the educative materials which may be distributed via Internet or DVD/CD to every address.

The intention of the author of this paper is to demonstrate how ICT, in addition to continuous collection of information on the transport of hazardous materials and proper management of emergency situations, can be used for education and training based on the simulation of various emergency situations.

Failure to take measures in the field of planning and preparation of citizens for crisis situations which might be the consequence of traffic accidents in dangerous goods transport is a direct breach of the Law on Emergency Situations. The Law on Emergency Situations prescribes obligations for state and other organs and organizations regarding the situations that may be viewed in this field, as defined by the Law. The Article 3 Point 2 of this Law, among the other tasks, stipulates: *protection, being a set of preventive measures directed towards community resilience strengthening, remedying possible endangerment causes, decrease of natural disasters influence, prevention of other accidence and if such should occur, alleviating their consequences*; The same article, Point 8 stipulates: *organizing and empowering citizens for personal, mutual and collective protection*.

Defining the prerequisite of public disclosure, the Law prescribes that the data on hazards and acting of state institutions, province institutions, local government, and other protection and rescue institutions operation shall be public. The state administration organs, province organs, and local government organs must assure that the citizens dwelling in the area which may be affected by natural or other disaster are informed on danger.[32]

Presently, the only thing available to the average citizen of the Republic of Serbia is prescribed as obligatory are general recommendations on acting in disaster events, published on the website of the Ministry of the Internal Affairs[33].

In comparison with other state organs, this is indeed commendable; however, the plans for acting in crisis situations should urgently being developed, covering all possible scenarios for hazard zones with subsequent presentation to the citizens potentially endangered by actual crisis situations.

[32] Law of emergency situations of the Republic of Serbia, available at: http://www.mup.sr.gov.yu/cms/resursi.nsf/Zakon%20o%20vanrednim%20situacijama.pdf (25th March 2010.).
[33] Ministry of the Internal Affairs, sector for the protection and recovery: http://prezentacije.mup.gov.rs/sektorzazastituispasavanje/saveti.html (25th March 2010.).

BIBLIOGRAFY

1. Batarliene N. (2006): "*Location and control of cargo and vehicles with new technologies*"; Transport and Telecommunication, Vol 7, No 1

2. Canada: Transport, Infrastructure and Communities Portfolio: http://www.tc.gc.ca

3. Fisichela M., Targon V., Pandolfi A. (2006): *The framework for dangerous goods tracking and management – The Integrated Information System*; 5th Prague, AED Conference.

4. Law of emergency situations of the Republic of Serbia, available at:
5. *Economic security*, covering basic income earned by the "productive and lucrative work";
   http://www.mup.sr.gov.yu/cms/resursi.nsf/Zakon%20o%20vanrednim%20situacijama.pdf

6. Ministry of the Internal Affairs, sector for the protection and recovery:
   http://prezentacije.mup.gov.rs/sektorzazastituispasavanje/saveti.html

7. Russo F., Vitetta A., Rindone C., Delfino G., Quattrone A. (2008): *ITS for monitoring and estimating road accident probability for dangerous goods transport*; Association for European Transport and Contributors.

8. Simo Pasi (2008): *Statistics in focus 66/2008*. EUROSTAT, Luxembourg.

9. UNDP (1994): *Human Development Report*. Oxford University Press, New York – Oxford.