



**G**eographical **I**nformation **P**rocessing for  
**E**nvironmental **P**ollution-**R**elated **S**ecurity  
 within **U**rban **S**cale environments

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## MAY Progress Report – 2012

Report prepared by:

*Dr. Raffaele De Amicis, Fondazione Graphitech, Trento, Italy (NPD)*

Project Co-Directors:

*Prof. Radovan Stojanovic, University of Montenegro, Podgorica, Montenegro (PPD)*

*Mr. Doron Elhanani, EMESCO, Ha-Ayin, Israel*

*Dr. Andrej Skraba, University of Maribor, Kranj, Slovenia*

*Mr. Simon Berkowicz, Hebrew University of Jerusalem, Jerusalem, Israel*

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<b>Contributor(s)</b>	(in alphabetical order) Simon Berkowicz, Jerusalem, Israel; Raffaele De Amicis NDP, Trento, Italy; Alberto Debiasi, Trento, Italy; Doron Elhanani, Ha-Ayin, Israel ; Irene Facchin, Trento, Italy; Federico Prandi, Trento, Italy; Andrej Skraba, Kranj, Slovenia; Radovan Stojanovic, Podgorica, Montenegro.
<b>Partner in charge(s)</b>	Fondazione Graphitech (FG)
<b>Deliverable Editor(s)</b>	Raffaele De Amicis NDP, Trento, Italy; Irene Facchin, Trento, Italy.
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## 1. LIST OF ABBREVIATIONS

Acronym	Extended name
ALOHA	Areal Location of Hazardous Atmosphere
CETI	Centre for Ecotoxicological Research of Montenegro
CIP	Competitiveness and Innovation Framework Programme
DLL	Dynamic-Link Library
EC	European Commission
ERPG	Emergency Response Planning Guidelines
GIS	Geographical Information System
GUI	Graphical User Interface
HMZCG	Hydrological and Meteorological Service of Montenegro
HW	Hardware
KAP	Kombinat Aluminijuma Podgorica
IAC	Inter-Application Communication
ICT	Information and Communication Technologies
IDLH	Immediately Dangerous to Life and Health
LOC	Level of Concern
LPG	Liquefied Petroleum Gas
MoD	Ministry of Defence
NASA	National Aeronautics and Space Administration
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
NPD	NATO country Partner Director
PPD	Partner country Project Director
SAM	Sequence Alignment/Map
SfP	Science for Peace
SW	Software
TPP	Thermo power plant Pljevlja
UNFPA	United Nations Population Fund
UZN	Real Estate Administration of Montenegro
WCS	Web Coverage Service
WFS	Web Feature Service
WMS	Web Map Service
WP	Work Package
WPS	Web Processing Service



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## 2. PARTICIPANTS

### (a) Project Director (NPD)

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Raffaele De Amicis/Dr.	Managing Director, Fondazione Graphitech, Via alla Cascata 567E Povo – Trento, Italy	Tel. +39 0461 283397 Fax. +39 0461 283398 raffaele.de.amicis@graphitech.it

### (b) Partner country Project Director

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Radovan Stojanovic/Prof.	Professor, University of Montenegro, Faculty of Electrical Engineering, Cetinjski 81000 Podgorica, Montenegro	Tel. +382 69 428 209 Fax. +382 20 245 873 stox@ac.me

### (c) Project Co-Director

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Doron Elhanani/Mr.	President and Chief Executive Officer, EMESCO, 11 Ha-avoda St. POB 1423 Rosh Ha-Ayin 48017, Israel	Tel. +972-3-9015535 Fax. +972-3-9015537 edn5@012.net.il

### (d) Project Co-Director

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Simon Berkowicz/Mr.	Researcher, Hebrew University of Jerusalem, Institute for Earth Sciences, Edmond J. Safra Campus, Givat Ram, Jerusalem, Israel 91904	Tel. +972-2-658-4353 Fax. + 972-2-566-2581 berkowi@vms.huji.ac.il

### (e) Project Co-Director

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Andrej Škraba /Dr.	Assistant Professor, University of Maribor, Faculty of Organizational Sciences, Kidričeva cesta 55a, SI-4000 Kranj, Slovenia	Tel. +386(0)4 2374248 Fax. +386(0)4 2374299 andrej.skraba@fov.uni-mb.si

### 3. OVERVIEW ON THE PROJECT: BACKGROUND AND OBJECTIVES

The United Nations Population Fund (UNFPA) reported that since 2009 more than 3.3 billion people live in cities and towns. For the first time in human history, more than half of the planet's population resides in urban areas, with the negative effects particularly amplified in Africa and Asia. Predictions by UNFPA expect this number to rise to 5 billion, or 60%, by 2030. This additional population will generate increasing urban pollution caused by expanding industrialization, growing vehicle use, rising standards of living and other anthropomorphic activities.

Within this scenario, pollution resulting from expanded use of fossil fuels, large fires, and also chemical substances released as a consequence of industrial accidents or terrorist attacks, will have profound effects at the urban scale with major consequences in terms of public health, social security, and economic costs.

Thus 3 case studies were planned to be carried out during the project, all located in Podgorica, Montenegro. These case studies are related to aluminium oxide ( $Al_2O_3$ ) exposure - with the study of KAP, the main potentially polluting industry in the vicinity of Podgorica - pollution from high traffic levels in Podgorica – with simulations of different traffic scenarios (for more details, please consult section 6.1.2) – and forest protection and monitoring from fires. Indeed, in addition to industrial risks, high summer temperatures in Montenegro (especially in the southern and central regions), coupled with low precipitation or drought and insufficient forest-fire alerts, facilitate fire outbreaks.

Indeed, since these security problems underscores the need for new IT technologies, the improvement of preparedness, support in decision-making, and adequate management of disasters, the main goal of GEPSUS is to create a simulation system that can support operators during environmental emergencies connected with releases into the atmosphere of toxic chemical substances caused by either exceptional pollution levels or disasters.

Generally speaking, the main expectation within GEPSUS is to develop a model for an integrated system for environmental pollution-related disasters management based on a fusion of geographical information processing, computer modelling and simulation, and a credible decision-making system. This system should support emergency services in Montenegro to help them better respond to different air pollution-related incidents.

More specifically, the project's objectives are to model how urban layout influences aerial conditions; to develop methods to optimize urban planning to improve urban conditions and reduce pollution; to develop algorithms to detect and predict the emerging of pollutant patterns and their effect; to couple simulation with warning systems; to integrate modelling and simulating function within a software infrastructure based on interoperable standards; to develop a real time 3D GeoVisual Analytics client software to support crisis management; to validate results with the MoD of Montenegro.

Moreover, and since planning how to handle crisis at the urban scale is of key importance to deploy adequate response measures, the results of the project will be relevant to many areas and will contribute to improved security. GEPSUS will be adopted as a training tool by the Montenegro Ministry of Defence, one of the end-users of the project.

## 4. OUTLINE OF NATO-MONTENEGRO RELATIONSHIPS

Within the first progress report period, a critical situation emerged because the involvement and engagement of the Montenegrin Ministry of Defence was lacking. Therefore, the 2<sup>nd</sup> semester of the project objective was also dedicated to get the Montenegro MoD firmly active. So far, this commitment became more concrete although far from a real and mutual pledge towards the project objectives. In order to better understand the actual relationships between NATO and Montenegro, an analysis was performed, whose results are summarized below.

Montenegro joined the Partnership for Peace in December 2006 and since then has been engaged in an Intensified Dialogue with NATO on its membership aspirations and related reforms since April 2008, and was invited to join the Membership Action Plan (MAP) in December 2009.<sup>1</sup>

The cooperation with NATO through the programme Partnership for Peace was and still is the most important initiative, aimed at the cooperation of member states and other Euro-Atlantic countries in order to strengthen safety and stability. This cooperation represents for Montenegro a noteworthy opportunity to improve democratic values and membership in NATO. Indeed, as Montenegro's Annual National Program states, "*Montenegro sees NATO membership as the right model for reaching long-term stability, economic and social prosperity and fully shares the goals and values of Euro-Atlantic community.*"<sup>2</sup>

As a member of the Partnership for Peace (PfP) programme, Montenegro has many instruments to assist this process. Thus Montenegro decided to strengthen the reform focus by developing an Individual Partnership Action Plan (IPAP) in 2008, which then shifted into an Annual National Programme in 2010 and then in 2011, as summarized below.

The key areas of cooperation are:

- Security cooperation, i.e. participation in joint planning, training and military exercises.
- Defence and security sector reform.
- Civil emergency planning: to establish a national early warning system, build a national crisis situation centre and develop Montenegrin emergency response capabilities.
- Science and environment: Montenegro has received grant awards for a number of cooperative projects to increase scientific cooperation, in areas such as counter-terrorism, the removal of dangerous chemicals, environmental initiatives, seismic risk-hazard reduction projects and studies into the future of regional cooperation.
- Public information: higher degree of public access to information on the benefits on cooperation and membership with NATO.

Further details on these key areas will be presented in the following paragraphs.

Montenegro declared its independence from the State Union of Serbia and Montenegro on 3 June 2006, with a declaration of independence subsequently recognized by the European Union and the United Nations. At the same time, the National Defence Strategy of Montenegro for the strategic objective of Montenegro is to (a) become a full member of NATO and (b) become a member of the EU in the shortest possible time. With these goals in mind, Montenegro joined the NATO

<sup>1</sup> [http://www.nato.int/cps/en/natolive/topics\\_49736.htm](http://www.nato.int/cps/en/natolive/topics_49736.htm)

<sup>2</sup> *Montenegro Annual National Program*, 16 September 2010, pp. 2.





Partnership for Peace Programme and signed the Stabilization and Association Agreement with the EU (Government of Montenegro, 2008).

This happened because the Ministry of Defence believed that, by joining the collective security system, Montenegro would receive the strongest guarantees for its sovereignty and integrity. Moreover, the Montenegro government believes that its entry into NATO would have substantially strengthened its overall political position and democratic capacities. Furthermore, NATO membership was considered a step nearer to the EU, with the direct and indirect economic benefits that derives from such a relationship, i.e. financial assistance, and the possibility to improve economic ties and to increase the inflow of foreign investments<sup>3</sup>.

Indeed, according to Montenegro's 2008 National Security Strategy, "*since the process of joining the EU is a strategic priority of Montenegro, harmonization with the European Union's Common Foreign and Security Policy, as well as with the European Security and Defence Policy as its integral part will constitute the framework for the development of our attitudes towards regional, European and global issues.*"<sup>4</sup>

#### 4.1 Montenegro's capacity building

Following independence, Montenegro is undertaking a wide-ranging program of structural and institutional reforms. Capacity-building initiatives are implicitly, if not explicitly, based on assumptions of:

- a functioning market economy,
- a state administration equipped and empowered to perform certain regulatory functions,
- a framework of trilateral governance in which NGOs, the state and the market interact.

During the years 2010-2012, these objectives were to be achieved by Montenegro through different activities:

- First of all, concerning political and economic matters, Montenegro, in its 2010's Annual National Program, plans to:
  - o Establish bodies and institutions in charge of drafting plans and implementing actions within European and NATO integrations;
  - o Enhance the relations with neighbouring countries and other regions, as well as the cooperation with international organizations;
  - o Strengthen democracy and the rule of law through legislative regulation, as well as by completing its legislative framework and constitutional harmonization of existing laws;
  - o Reform its judiciary's independence, efficiency, institutional capacities for the implementation of reform laws;
  - o Strengthen Montenegro Parliament's legislative and oversight function through overall capacity development, in order to give a substantial contribution for a further strengthening of democracy and the economic environment (Law on Parliamentary Oversight in the Fields of Security and Defence);

<sup>3</sup> This paragraph is a liberal adaptation of data collected in the following websites:

<http://www.mip.gov.me/en/index.php/Directorate-for-NATO/relations-between-montenegro-and-nato.html>;

[http://www.nato.int/cps/en/natolive/topics\\_49736.htm](http://www.nato.int/cps/en/natolive/topics_49736.htm); and [http://en.wikipedia.org/wiki/Accession\\_of\\_Montenegro\\_to\\_NATO](http://en.wikipedia.org/wiki/Accession_of_Montenegro_to_NATO).

<sup>4</sup> Radević R., "The new National Security Strategy of Montenegro is accession to NATO", pp. 93.



- Strengthen the respect for human and minority rights with activities for reaching durable solutions to the refugee;
  - Fight against corruption and organized crime by increasing detention, investigation and prosecution of perpetrators, and with specialized anti-corruption and anti-crime units, as well as by strengthening the role of the Secretariat to the National Commission to fight Corruption and Organized Crime and the coordination role of the Directorate for Anticorruption Initiative (DACI); this is one of the key goals for Montenegro's Euro-Atlantic integration;
  - Fight against terrorism with weapons' trade control;
  - Achieve an economic development so as to maintain stable macroeconomic environments and to stimulate foreign direct investments in Montenegro. This will be achieved primarily through opening negotiations for signing new investment and economic cooperation agreements, as well as the consolidation of existing contracts with other countries;
  - Develop of micro- and small-size enterprises in the least industrialized areas;
  - Strengthen civil protection and rescue system for managing crisis;
  - Enhance scientific cooperation with NATO as well as environmental safety through the implementation of GEPSUS (Geographical information processing for Environmental Pollution – related Security within Urban Scale environments) project.
- Moreover, concerning military and defence matters, Montenegro plans to:
- Adapt its defence system with the development of a Long-term Defence Plan (DPR) so as to modernize and equip Montenegro's Army (through an optimal organizational structure so as to ensure greater efficiency), and develop human resources with education and training;
  - Apply standards in planning, financing, management and command for the aim of building the institutions and necessary infrastructures and developing capabilities in line with NATO and EU membership's requirements;
  - Develop of its military and crisis management capabilities;
  - Establish cooperation in the region;
  - Strengthen both national and regional security;
  - Improve MoD functionality, with a more rational personnel structure capable of performing tasks in line with modern requirements and challenges;
  - Increase its missions in Brussels and military-diplomatic offices and cooperation with the USA and Slovenia;
  - Develop a more effective defence resources management;
  - Enhance cooperation with all the elements of civil emergency system in response to natural and man-made disasters and other crisis situation, to which MoD and Montenegrin Army will give their contribution.
- Concerning the resources used, Montenegro aims at:
- Decreasing defence expenditures, as a result of the defence system reform and the Government's actions to cut public spending, and given the global economic and financial crisis.



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- On matters of security, Montenegro aims at:
  - o Harmonizing the Law on Secrecy of Data and the Law on Protection of Personal Data with the Free Access to Information Law, the adoption of the Instructions for Handling NATO and EU Data of Restricted Access, as well as the Instructions to assist in implementing the Decree on Detailed Requirements and Method of Implementing IT Protection of Restricted-Access Data;
  - o Continuing the exchange of restricted access data with NATO, as well as civil servants' training for working with and handling secret data;
  - o Establishing sub-registries of secret data for the need of Ministries and other state authorities;
  - o Continuing regular inspection supervisions;
  - o Continuing the review of the existing security policy and the rules in the areas of security of persons, security of data, INFOSEC and physical security, with a view of meeting the Partnership Goal "National Programme for Security Cooperation with NATO", as well as the actions towards the conclusion of bilateral agreements to regulate the exchange and protection of restricted data between Montenegro and other states and international organizations.
- Lastly, on legal matters, Montenegro plans at establishing a special expert team called the Legal Working Group, led by the Adviser to the Prime Minister for legal matters.

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## 5.1 Brief description of delays and obstacles found within the reporting period

As with any ambitious and cutting-edge project, unexpected problems or difficulties can arise, especially at the initial stage.

During the 2011 Podgorica meeting (28<sup>th</sup> of November – 3<sup>rd</sup> of December), the commitment of the MoD was renewed although not yet formalized. The GEPSUS NPD and the other members of the project were reassured that the MOD will take the part of “The (final) User” of GEPSUS system, as stated in the DoW, and will provide its full cooperation and support. Indeed, the Minister expressed his solid commitment to support the GEPSUS project by appointing a dedicated MOD Team composed by Mira Cerovic (Montenegrin MoD Deputy Minister), Maja Vuković (secretary of the MoD team) and Captain Igor Buric and allocating facilities for the installation of GEPSUS system. Moreover, the Montenegrin Ministry of Defence, Boro Vucinic, demonstrated this commitment through the reception and cooperation during meetings and presentations, and it was published in the local papers as well as announced in the local TV channels including an interview with GEPSUS project directors. An agreement document will be drafted by PPD Prof. Radovan Stojanovic and Deputy Minister MoD Ms. Mira Cerović, which then will be shared with the NPD Dr. Eng. Raffaele De Amicis for signing.

Notwithstanding technical activities, the consortium faced some issues highlighted by PPD Prof. Radovan Stojanovic. Quoting below extracts from his emails, he reported:

1. *“Problem with operational account. Temporary the operational account for Montenegrin team is on University of Montenegro. Such situation causes several problems that breaks the project activities:*
  - a. *It is very difficult to transfer money from University to MOD, even from travels. Namely, if transfer money to MOD account, it is practically account of Government and they will disappear in minute.*
  - b. *It is not eligible in Montenegro to open travel order in one institution from the employee in the second Institution or to pay through the travel order or by any other way as example someone coming in Montenegro for purpose of Project (as experts advisors from NATO countries).*
  - c. *It is not eligible to transfer money from University account to the personal accounts for the employee in the other Institution even for travel tickets and hotel accommodation.*
  - d. *It is not eligible to buy any item, even spare part, from University account if it is not overseen before (by plan) and incorporated in joint tender for purchasing organized by institution.*
  - e. *The situation for Israelian trip, regarding this was very nervous, and we needed all invoices from Israel, that increased prices and made us frustrated.*
  - f. *...*
  - g. *...*
  - h. *The same situation, even worst, is if we have any account under MOD.*
  - i. *The problem will increase in case of purchasing equipment, who will call the bid? Under which jurisdiction will be equipment both through the bid organized by one organization? Etc. etc.*
  - j. *Thus, I decided in consultation with Mira and MOD team to use “Exception” for 3.3 (page 7) Paragraph of handbook and to open operation account under jurisdiction of PPD for purpose of GEPSUS. Of course, after permission of NATO office. It will increase efficiency of work significantly. The account will be transparent and controlled by both Me (University) and MOD (Mira) with following all rules from Handbook. Q1: Thus, even it is not specified, I need agreement of NPD?”*

From Prof Radovan Stojanovic’s email, it appears that the Montenegrin team has problems using GEPSUS funds because of a number of legal constraints that are quite common within a public institution. Within this scenario, the NPD is not in favour to support the opening of a further bank

account under the jurisdiction of PPD, although NPD truly believe in the PPD good will. However, it could appear as an expedient to bypass legal constraints in Montenegro. The NPD could reconsider this option only following a formal request from the Rector of the Montenegro University, being the legal representative of the affiliated institution partner of GEPSUS project.

A similar and very proactive position has been stated by Dr. Berkowicz (Co-director) from the Hebrew University of Jerusalem, who suggested that an official letter from the Rector of the University of Montenegro should be sent to the NPD formally requesting for feedback and or suggestions by NATO on this matter, including written permission by NATO to approve the solutions suggested by the PPD. Alternatively, Dr. Berkowicz proposed to leave to the NPD the responsibilities to buy the needed flight tickets etc. for the University of Montenegro, as well as for the Montenegro MoD. This would mean that PPD funds are kept by the NPD and used only for the PPD purpose. Only minor expenses (taxis, some meals...) would have to be paid in advance by the traveller and returned subsequently. It is needless to say that the NATO SfP officer would have to approve this.

The second operational issue regards the fact that, up to now, it has not been possible to access any GEOdata from Montenegro, fundamentally for the implementation of the pilot foreseen by the GEPSUS project as well as for the R&D activities of the project itself.

The NPD proactive suggestion and recommendation is to draw up, as soon as possible, an Agreement between the University of Montenegro, the MoD and the GEPSUS project, to define duties and responsibilities, including persons and roles, of each party towards the project, and decide on the expenses that would be funded by NATO within the aim of the project (student fellowships, travel, hardware, software etc.). In this regard, the NPD will be glad to support the Montenegrin team in the definition of a so-called Mutual Cooperation Agreement. Indeed, the aforementioned agreement will sort out all the problems encountered so far.

This solution has been endorsed by Mr Elhanani (co-director) from EMESCO and is currently in progress.

This current situation, i.e. the impossibilities to collect and make available the GEOdata described in the deliverable D1.4 "Survey of existing data/service" within the GEPSUS team, is becoming a very critical issue. Indeed, if no solutions will be implemented to overcome the aforementioned issue, the project will have to be rescaled and the project pilot must be located elsewhere, wherever data will be available for the project, and therefore not in its original location (i.e. Podgorica, Montenegro). For this reason, the NPD is very concerned that the purchase of the new hardware planned for the pilot project will not be available for the final testing of the system if the pilot is moved to another location.

Again, as already said, the delay in receiving the required GEOdata from the Montenegro Real Estate Ministry and Ministry of Defence for Deliverable D1.4 "Survey of existing data/service" is becoming a critical issue. If for some reason the problem cannot be overcome in the coming 3 months, then the NPD will be in contact with NATO for alternative solutions. Thus, the NPD will delay the purchase of the new hardware planned for the pilot project until the matter is resolved.

Though, the scientific objectives concerning the simulation remain valid. However, in the present condition, it clearly emerges that the pilot as planned, i.e. in Podgorica, Montenegro, cannot be deployed due to lack of data. As fall back solution, the pilot could be deployed in Trentino, with support of Fondazione Graphitech and based on data made available by the Province of Trento. Moreover, the training activities can be carried on.



## 6. TECHNICAL PROGRESS

### 6.1 Accomplishments achieved as compared to the Project Plan

#### 6.1.1 Overall introduction

The GEPSUS project started with an effective kick-off meeting in Trento, Italy, 02-05 March, 2011. The main results achieved in the first year of the project can be summed up as described in the sections below. The team has been defining the architecture of the systems and its requirements in order to provide all relevant information for the development activities.

Fondazione Graphitech is leading the Project team, and the deliverables carried out in the context of the first work package were:

- Identification of project scenarios.
- Analysis of data and system specifications available from the various stakeholders in Montenegro.
- Definition of User Requirements.
- Definition of service, modelling and simulation requirements.
- Definition of software architecture.
- Definition of specifications related to the equipment and costs. These were defined in line with the budget and were drafted and agreed upon by all the partners in the review meeting held in July 2011 in Trento, Italy, at Graphitech offices.

Further activities have been carried out in the context of the second work package, namely:

- Investigation of existing modelling techniques and modelling activities in emergency situations with a focus on an incident occurring at an industrial plant.

Moreover, other activities have been carried out in the context of the third work package, namely:

- Rapid prototyping of models in Matlab.

Again, activities have been carried out in the context of the fourth work package, namely:

- Deployment of basic SDI.

In the context of the sixth work package, the activities carried out have been:

- A series of publications, from all the partners.
- A linkage with other initiatives carried out in the same reporting period.

The following sections provide a detailed analysis of the activities carried out within the second reporting period.

#### 6.1.2 Definition of use cases (Task.1.1)

This task has already been reported upon in full in the 1<sup>st</sup> Progress Report, since it was due in M6. Indeed, an extensive description of the different Use Cases foreseen by the several Pilots planned for GEPSUS, complementing the user requirements analysis, has been provided within the





deliverable D.1.1 “Use cases”. The goal of this deliverable was to clearly and analytically identify those Use Cases that will have to be performed at an operational stage in order for the Pilots to be considered successful. The objective was to identify the services and functionalities that best comply with the needs of the users with regard to their daily activities.

Moreover, in the second six-monthly reporting period, having not yet received any data concerning Montenegro as noted above,, a study on urban traffic simulation was carried out for the city of Trento, Italy. This activity was achieved with the contribution of a young student, Massimo Nicosia of the University of Trento. Further information can be found at the following address on Fondazione Graphitech website: <http://www.graphitech.it/GTEDU/principles-of-computer-graphics/2010-2011/129-massimo-nicosia>.

The application showed the virtual globe to the user and draws the Trento street network onto its surface. The results are the following:

- *Use case 1.* User selects the first type of emitter and places several of them clicking on some streets. When the user has finished placing the emitters, he/she quits the emitters-placing modality, then selects the second type of emitter and places one emitter clicking on a street. With the next click on a street the user sets the destination of the cars generated by that emitter.
- *Use case 2.* The user clicks on an emitter. A dialog box is prompted to the user who can change the parameters of the emitter, activate and deactivate or even remove it.
- *Use case 3.* The user places the emitters and clicks on a save option. The user can choose a file destination and the emitter’s setup is serialized into the file.
- *Use case 4.* The user loads the emitters from a file clicking on a load option. The application cleans the globe, resets the simulation and then displays the loaded emitters.
- The user can simulate queues and thus road congestion by placing an emitter generating slow moving cars at a fast rate. Cars generated by a destination-emitter will discard busy roads and perform alternative routes.

### 6.1.3 User requirements (Task.1.2)

This task has already been reported upon in full in the 1<sup>st</sup> Progress Report, since it was due in M6. Indeed, an extensive description of the aforementioned use requirements was provided within the deliverable D.1.2 “User requirements”. The goal of this deliverable was to identify User requirements – governments, municipalities, environmental Ministries/Agencies, and Home Front/Civil Defence Agencies as identified by the GEPUS System Users. This is in keeping with, the aim of GEPUS to provide decision-makers and operational staff with decision-support tools based on integration of advanced 3D simulation models within a GeoBrowser based on web services and designed to manage environmental pollution-related security events within urban scale environments and other emergency-related incidents.

However, observations made during the Podgorica’s, Montenegro, meeting (November-December 2011) reflected a need to reassess the current user requirements in order to make them more effective for the needs of the Montenegro Armed Forces - e.g. highlighting on the background maps areas of interest (such as army HQs, bases, camps), special symbols to mark Armed Forces (units, brigades, special forces,) army equipment\vehicles, type of activities (operational, training,



administrative, etc.), reporting formats, etc. As a result, the GEPSUS System should be developed with the view of being upgraded later by the University of Montenegro as the Command and Control system for the use of the Montenegrin Armed Forces.

Moreover, there is a need to define a method of operation by which GEPSUS capabilities will serve the requirements for risk assessment needs of the Montenegrin Emergency Sector as well. A possible solution could be that the Emergency Sector Operation Centre requests, or automatically receives, risk assessments results according to procedures from the MOD EMC that will be conducted within the GEPSUS system and compare it with its own risk assessments. The Emergency Sector Operation Room will report its risk assessment to MOD EMC. Such a risk assessment compression will support decision-makers in making crucial decisions. It was requested that the User will review the current Emesco User Requirements document and provide their inputs as soon as possible.

#### **6.1.4 Service, modelling and simulation requirements (Task.1.3)**

This task has already been reported upon in full in the 1<sup>st</sup> Progress Report, since it was due in M6. Indeed, an extensive description of the aforementioned requirements is provided within the deliverable D.1.3 “Service, modelling and simulation requirements”. This deliverable summarized the requirements for an integrated system for simulation of air pollution-related incidents. After assessing potential air pollution hazards in Montenegro (the test site) and an overview of stakeholders dealing with emergencies and response, the service, modelling and simulation requirements were presented. Then, the structure of GEPSUS system suitable for application in Montenegro was outlined. The preliminary results of the software, still under development, were presented using case studies.

#### **6.1.5 Survey of existing data / services (Task.1.4)**

This task was reported upon in full in the 1<sup>st</sup> Progress Report, since it was due in M6. Indeed, an extensive description of the aforementioned data/services is provided within the deliverable D.1.4 “Survey of Existing Data/Services”. This document reported an analysis of the different types of data and services provided by the different partners within the context of GEPSUS. The aim of the survey is to identify all the data and services available through the partners as public repositories as well as through other available sources.

#### **6.1.6 Software architecture (Task.1.5)**

The result of this task has been edited within a comprehensive deliverable called D.1.5 “Software architecture”, in which the software architecture of the GEPSUS toolkit was detailed. Indeed, the entire GEPSUS software architecture has been designed following a modular methodology based on a joint approach to data collection, processing and distribution of spatio-temporal data. This allows the creation of a logical multi-tier layer system between existing services, with a communication paradigm based on open source three-levels SOA (service oriented architecture).

Since one of the first aims of the project is to provide web-service-based access to data, the

entire GEPSUS architecture has been designed according to this multi-tier (layer) system where each component (service) interacts with the others through a set of messages written in a standard format.

At the lowest data level, all the different datasets are made available within the network by the different content providers; while on a higher level from a software perspective, the so-called middleware level, GEPSUS provides a number of web services that can expose data as well as processing functionalities in an interoperable manner.

### 6.1.7 Investigation of existing models (Task.2.1)

Within this task 2.1, the existing models and software for dispersion of air pollution were analysed and compared (Gaussian, Box, Lagrangian/Eularian, Semi-infinite and Neural Networks). For this purpose, existing references in electronic or printed form were used and examined, as well as existing software solutions (i.e., ALOHA, BREEZE, SCREEN3, AERMOD, TSCREEN, SLAB, ARCHIE, SAFER etc.). The main results of this analysis and comparison are given through the GEPSUS team published references (see more details in Section 5.7 “Visibility of SfP project”).

Moreover, a comparison of the developed Gaussian-ERMAK models with existing air pollution dispersion like the ALOHA package has been performed in order to validate the so-far developed models. The results are given in the report entitled “Comparison of the GEPSUS system with existing ALOHA software”. Indeed, for the purpose of communication with ALOHA, a special interface application was developed by the GEPSUS team. It uses ALOHA NOA32.dll file for IAC (Inter Application Communication). Thanks to this application, ALOHA can be used as a modelling machine for GEPSUS purposes, as well as to check the validity of GEPSUS software.

### 6.1.8 Rapid prototyping of models in Matlab (Task.3.1)

The result of this task has been edited within a comprehensive deliverable called D.2.1 “Matlab prototypes are used to assess modelling functionalities”, in which the University of Maribor and the University of Montenegro provided the rapid prototyping of air pollution dispersion models in Matlab as well as routing algorithms for evacuation. Moreover, the Gaussian and ERMAK models were implemented in Matlab and the Box and Navier-Stokes models have been considered.

However, in this phase of implementation, the Gaussian as well as the ERMAK models were found the most suitable for a fast simulation execution. In addition, developments in the field of air-pollution and the routing for the emergency vehicles has been considered and implemented.

The developed software model has been extended with the possibility to automatically enter input data. For this purpose, special protocols and devices are developed. A GEPSUS generator/emulator V.1.1 of input data has the possibility to send data acquired from meteo stations directly to the modelling host, or to send the data previously stored into its memory. For now, the generator/emulator sends meteo data as wind speed and wind direction, but soon it will be upgraded with other parameters such as source description, geometry, emission rate etc. After developing the prototype in MATLAB, the overall MATLAB model is converted in C++ code

obtaining the first stand-alone GEPSUS version of the modelling and simulation software, GEPSUS MOD V.C.01. The application is connected to Google Earth through the interface “kml” file. Each change in plume shape and direction are automatically visualized over Google Earth in real-time.

### 6.1.9 Deployment basic SDI (Task.4.1)

During the period of this 2<sup>nd</sup> report, the design of the Spatial Data Infrastructure (SDI) was performed following the indications contained into the deliverables “1.4 Survey of existing data” and “1.5 Software architecture” already described. More specifically, Graphitech developed the software components necessary to deploy the Spatial Data Infrastructure (SDI) of GEPSUS within the 2<sup>nd</sup> project period. This has included customisation of a number of OWS (Open Geospatial Consortium Web Services) based on industry-standards including, but not limited to, Web Mapping Services (WMS). In addition, a further service was developed by Graphitech to allow interoperable provision of simulation functionalities. In particular, Graphitech has adapted existing technologies from the EU-funded project BRISEIDE (ICT-PSP <http://www.briseide.eu/>) to allow simulation of fire-front evolution over time via interoperable OGC (Open Geospatial Consortium) protocol WPS (Web Processing Service). The software component has been developed in the context of BRISEIDE by EPSILON International, a Greek company specialised in GIS applications. This represents a valuable example of cooperation and transfer of know-how between the two projects, both coordinated by Graphitech.

The integration activity that will allow support of modelling functionalities developed by University of Montenegro and University of Maribor has already started and is currently in progress.

Last but not least, Graphitech developed the first version of GEPSUS 3D client, which has been already deployed both as standalone application and as a web-based applet.

The aforementioned software infrastructure has been tested with datasets from the area of Trento, where GEOdata are readily available by Graphitech.

The SDI is one of the fundamental components of the GEPSUS project and is devoted to provide services to the client. The component of the SDI will be constituted by Mapserver, batch system, and WPS server. This consists of a logical layer between existing services, exposing data and functionalities via SOAP or through OGC communication protocols such as WMS, WFS, and WPS etc. The selected platform to implement the GEPSUS SDI is Geoserver, which is a map open source software server written in Java that publishes geospatial services for the GEPSUS project (for time-enabled datasets) and that allows users to share and edit geospatial data. GeoServer is the OGC reference implementation of the Web Map Service (WMS), Web Feature Service (WFS) and Web Coverage Service (WCS) standards.

The work focused on the set-up of a server infrastructure in order to deploy the SDI. In particular, the fitting between the data surveyed, characteristics (format, dimension, final purpose), and the infrastructure was performed. Furthermore, considering the GEPSUS goal, the set-up of the services (WMS, WFS, and WCS) has been completed.

This solution, based on FOSS, permits the building of a powerful geospatial Web Services so as to provide the following operative solutions:



- OGC-Standard services exposure: to allow the integration of SDI datasets and expose them as OGC-Standard interfaces.
- SDI Service: to provide data consumption layer, centralizing all SDI base/value-added services references.
- Authentication/Authorization: to provide protection methods, rights management and profiling in a distributed SDI architecture.
- Logging and monitoring: to support SDI infrastructure operative steps for performance improvement and system stability check.

The next step, once having received the collected data, will be to fill the SDI repository (PostGIS) and deploy the services allowing access to GEPSUS users based on the abovementioned architecture.

### 6.1.10 Publications (Task.6.1)

A more detailed list is available in Section 6.7 “Visibility of SfP project”.

### 6.1.11 Linkage with other initiatives (Task.6.2)

The main association with other project initiatives is related to the EU ICT/PSP project BRISEIDE ([www.briseide.eu](http://www.briseide.eu)). This project aimed to develop new spatio-temporal services for civil protection. The GEPSUS project obtained the permission to use the results obtained from BRISEIDE taking into account the best practices in terms of data ingestion services and services deployment, including client functionalities. Furthermore, the GEPSUS simulation model once deployed as WPS services can also be accessed into the BRISEIDE infrastructure.

Moreover, the participation of the Project Director, Dr. De Amicis, to the 3rd GEO European Projects Workshop (Istanbul, 18-19 November 2011) was a way to link the GEPSUS project with other European and International projects. The main objective of the workshop was to shape the contribution of Europe and European Research in the implementation of the Global Earth Observation System of Systems (GEOSS). The workshop intended to further extend the effort to develop collaboration between European Commission projects relevant to Earth Observation funded through the Seventh Framework Programme for research and technological development and the GEO initiative.

Within dissemination, exploitation and awareness, Montenegro was also very active in linkage with other Institutions. In the second 6 months of the project, the contacts were established with the following institutions: Agency for environmental protection in Montenegro, Sector for Emergency of Montenegro, Municipality Emergency Centre of Podgorica, Ambulance Emergency Centre, Montenegrin Academy of Science and Arts. Also, cooperation was established with similar projects existing in Montenegro such as BalkanGEONet, <http://www.balkangeo.net/>. GEPSUS was invited to the BalkanGEONet workshop, with a special presentation given by Prof. Stojanovic, [http://balkangeo.net/index.php?option=com\\_content&view=article&id=98:importance-of-geo-initiatives-and-montenegrin-capacities-in-this-area&catid=52:news&Itemid=65](http://balkangeo.net/index.php?option=com_content&view=article&id=98:importance-of-geo-initiatives-and-montenegrin-capacities-in-this-area&catid=52:news&Itemid=65).

Moreover, during the Podgorica’s technical meeting, NPD Prof. De Amicis met with Montenegrin Coordinator for BalkanGEONet, Prof. I. Djurovic, and tried to establishing closer cooperation

between the two projects. In addition, the GEPSUS PPD Prof. Stojanovic becomes a Member of the BalkanGEONet Advisory Board.

## 6.2 Actions to ensure the implementation of end-results

For purposes of on-going and future implementation, the **Montenegrin Team** carried out the following activities:

- Daily communication between members of the GEPSUS Montenegrin team within and with the GEPSUS consortium and NPD by e-mail or Skype.
- Weekly meetings with MoD (End User).
- Weekly communication with stakeholders in Podgorica dealing with emergencies.
- Monthly presentation of achieved results in front of the Montenegrin Team stakeholders and other interested parties.
- Information and cooperation with the Montenegrin Government and NATO structures in Montenegro.
- Establishment of a quality scheme for monitoring the project progress.
- Producing written documents; notes and memos after meetings and partial reports.
- Checking all obtained results (experimental and theoretical).
- Following all rules and recommendations from the SfP handbook.
- Including more young scientists in the project.

Moreover, partner **University of Maribor** contacted and informed the Slovenian Ministry of Defence about the GEPSUS project with the proposition of a possible “follow-up” project.

Apart from various technical activities, **Fondazione Graphitech** has been engaged in the management of the project, to ensure the correct development of the project’s goals in compliance with the work plans and ensuring the highest standards in terms of organization and technical development. Graphitech performed the following tasks:

- Promoting regular discussions and sharing of experiences among the partners through regular teleconference and continuous cooperation.
- Technical supervision of technology functionalities as planned and quality assurance and assessment/evaluation of technology results.
- Coordination of reporting activities and editing of periodic report.
- Promotion of University courses on the project theme.

## 6.3 Milestones for the next six months

For the next reporting period, the milestones are to:

- Provide the first version of simulation software and initial testing of the system.
- Define the decision support system.
- Give the first integration of the overall system framework.
- Provide the first version of meteorological and chemical stations and their integration into a system.
- Define and complete the teaching and learning material for training.





- Conduct a study of current emergency organizations (stakeholders) in Montenegro, including Government entities, emergency response forces, facilities, equipment, procedures, plans, training, exercising, etc.
- Prepare design guidelines for establishing the MoD Emergency Management Centre based on EMESCO's concept document and fit to the allocated facilities and user's method of operation.
- Update the preliminary operational user requirements for the GEPUS system.
- Update the current use cases in line with the updated operational requirements.
- Train members of the Montenegrin team and young scientists in Italy, Israel or Slovenia.
- Train the MoD personnel and other target groups in Montenegro to use the system deployed.
- Conduct a seminar to Montenegrin emergency response stakeholders concerning management of emergency incidents methodology and staff work.
- Present emergency management issues to the user's authorities and decision-makers.

Furthermore, other further operational activities are planned to:

- Design the executive project for Control and Training Centres.
- Deploy the Centres to operational status.

Last but not least, other horizontal activities are planned, including:

- Dissemination of the project at national and international level.
- Links with similar projects and planning for future projects in the same area.
- Publishing the results at a national and international level.
- Quality control and project management.

Moreover, the first of the Training Meeting as scheduled in the DoW was held in Israel between the 11<sup>th</sup> and the 17<sup>th</sup> of March 2012. Detailed information on this meeting will be given and expenses will enter the budget during the next reporting period only.

It is important to mention that the training meeting in Israel was arranged through a series of high-level meeting and visits to private firms, public utilities and Israeli governmental authorities of interest for the project. Each meeting had strong focus in terms of security from both a strategic, technological and operational standpoint. The agenda was defined in agreement with the NPD in order to produce an effective visit yet limiting the financial impact on the project.

#### 6.4 Involvement of young scientists in the project

The various partners have involved a large number of young scientists as detailed below.

Partner	Young scientist name and involvement type
<b>Fondazione Graphitech</b>	<ul style="list-style-type: none"> <li>- <b>Stefano Piffer</b>, MSc in electrical engineering, has worked on the design of the system architecture and has supervised the deliverables due during the first reporting period.</li> <li>- <b>Marco Calderan</b>, MSc in computer science, has worked on the definition of the requirements and has cooperated on the definition of the system architecture.</li> <li>- <b>Alberto Debiasi</b>, MSc in computer science, has contributed to the initial requirements and to the definition of the system architecture. Mr. Debiasi has</li> </ul>

also started his PhD studies with the main focus on geovisualisation.

- **Michele Andreoli**, BSc in computer science, has supported dissemination activities through setup of the project website and social networks.
- **Umberto di Staso**, MSc in computer science, has contributed with the development of a device for displaying geographical information through a GameEngine optimized for being carried out on mobile devices (tablet...).
- **Massimo Nicosia**, student in computer science, has contributed to the definition of use cases with his study on urban traffic simulation of Trento's city.

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In the previous 6 months, the GEPSUS project continued with involving young scientists. In all, 9 young scientists were active:

- **Lazarevic Marinela**, Specialist in ICT, worked on mathematical modelling in Matlab under her MSc thesis connected to GEPSUS. She presented the initial results at a Regional ICT conference and had a presentation at the Workshop.
- **Lazarevic Nikola**, Specialist in ICT, worked on designing MATLAB GUI under his MSc thesis connected to GEPSUS. He presented the initial results at a national ICT conference and had a presentation at the Workshop.
- **Knezevic Jelena**, Dipl. ing. of chemical technology, advisor in the Ministry of Ecology, worked intensively on collecting data from TPP – Pljevlja. She submitted her MSc thesis on the simulation of air pollution dispersion for the Pljevlja Region, had a presentation at a Workshop and contributed in one research paper.
- **Popovic Vladimir**, Dipl. ing. in electronics, worked on designing portable telemetric stations compatible with ALOHA. He completed a microprocessor emulator of weather conditions compatible with SAM protocol. Also, he worked on exporting simulation results to a web-based geo-browser.
- **Kovacevic Jovan**, Dipl. ing. in electronics, together with Vladimir Popovic, worked on designing portable telemetric stations compatible with ALOHA. Also, he trained people to work with ALOHA.
- **Dragovic Marko**, Dipl. ing. in computer technology, worked on improving a Gaussian model. Moreover, he developed MATLAB based software, and compared the initial results with the ALOHA dispersion model. He completed his diploma work within GEPSUS, and presented his work to the MoD.
- **Maja Vuković**, BSc in public relations, worked on organizational, management and dissemination issues, organization of trainings and visits as well as daily communication between members.
- **Maja Skuric**, MSc in organizational sciences, worked on decision-making and implementing algorithms in artificial intelligence.
- **Sasa Knezevic**, Dipl. ing. in computer sciences, worked on measurement systems and integration of portable meteo-stations into simulation system.

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- **Matic Luznar**, University of Maribor, Faculty of Organizational Sciences, presented his diploma thesis proposition entitled "Development of a system for presentation of evacuation plan in Google Earth".
- Mag. **Maja Škurić**, from the University of Montenegro, Maritime Faculty, visited the Laboratory for Cybernetics and Decision Support Systems from 30.1.2012 to 1.3.2012 for a research visit. She worked on the routing algorithm development for the GEPSUS project.



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## 6.5 Major Travel

Partner	Person data, reason of the travel and benefits for the project
<b>Fondazione Graphitech</b>	<ul style="list-style-type: none"> <li>- Raffaele De Amicis, Stefano Piffer, Federico Prandi, and Alberto Debiassi travelled to <b>Podgorica</b> for the project meeting held between 27 November and 2 December 2011.</li> <li>- Raffaele De Amicis, Federico Prandi and Giuseppe Conti travelled to <b>Tel Aviv, Israel</b>, for the project training meeting between the 11<sup>th</sup> and the 17<sup>th</sup> of March 2012.</li> </ul>
<b>University of Montenegro</b>	<p>Travel by the Montenegrin side included the technical and working meetings, attendance of conferences, local travels and trainings. The emphasis was on both training of young scientific and training of the end user.</p> <p>International travels:</p> <ul style="list-style-type: none"> <li>- Maja Skuric, young scientist, <b>University of Maribor</b>, Faculty of Organizational Sciences, <b>Kranj</b>, February – March 2012, 30 days.</li> <li>- Radovan Stojanovic (PPD), Mira Cerovic (Deputy Minister of MOD of Montenegro), Igor Buric (Chief of Computer Centre of MOD of Montenegro), and Maja Vuković (Secretary of GEPUS and representative of MOD) travelled to <b>Israel</b> for the project training meeting, from 11/03/2012 to 16/03/2012.</li> </ul> <p>Domestic travels:</p> <ul style="list-style-type: none"> <li>- Marko Dragovic (young scientist), Vladimir Popovic (young scientist), Jovan Kovacevic (young scientist), and Sasa Knezevic (young scientist), participated to the Conference Information Technology (IT), <b>Zabljak, Montenegro</b>, 28/02/2012-02/03/2012.</li> <li>- Radovan Stojanovic, <b>Bar-Kotor</b>, 07-12-2011, audit of chemical storage facilities.</li> <li>- Radovan Stojanovic, <b>Pljevlja</b>, 02-02-2012, audit of TPP.</li> </ul>
<b>University of Maribor</b>	<ul style="list-style-type: none"> <li>- Doc. Dr. Davorin Kofjač spent 17.10.2011 – 20.10.2011 at the <b>University of Montenegro</b>, Faculty of Electrical Engineering, developing routing algorithms.</li> <li>- Doc. Dr. Andrej Škraba participated in the GEPUS Technical Meeting in <b>Podgorica, Montenegro</b>, 28.11.2011 – 2.12.2011.</li> <li>- Doc. Dr. Andrej Škraba participated in MATHMOD 2012 - 7th <b>Vienna</b> International Conference on Mathematical Modelling, February 15 - 17, 2012, presenting the achievements of the GEPUS project.</li> </ul>
<b>Hebrew University of Jerusalem</b>	<ul style="list-style-type: none"> <li>- Simon Berkowicz: No overseas travel. Internal travel to participate in the GEPUS <b>Tel Aviv training meeting</b>, March 11-17, 2012.</li> </ul>

## 6.6 Visit by experts/advisors and NATO consultant (topics covered and any impact on the work plans)

No visits planned at this initial stage of the project. However, from March 14-16, 2011, **Dr Chris De Wispelaere**, Director of the NATO SfP Programme, visited Montenegro and had a working meeting with PPD (Prof. Stojanovic).

## 6.7 Visibility of SfP project

The visibility of the project was quite high during the first six months, as reported in the 1<sup>st</sup> Progress Report.

During the previous six months, the activities on providing visibility to the project were very intensive. They were mainly targeted for the partner country Montenegro in order to introduce target groups about project progress and their achievements as well as to increase public awareness about the Science for Peace Programme. The main activities should be summarized in scientific and non-scientific publications.

### 6.7.1 Scientific Publications

A number of publications were prepared in the context of the project, all clearly acknowledging the SfP programme. A detailed list is provided below.

#### Peer-reviewed book chapters

- (Under review). R. De Amicis, G. Conti, F. Prandi, S. Piffer, A. Debiasi, M. Calderan, D. Taglioni, R. Stojanović, A. Škraba, D. Elhanani, S. Berkowicz (2012). *GEOINT applications for homeland security*. In: "Effective Surveillance for Homeland Security: Balancing Technology and Social Issues". CRC Press / Taylor & Francis.

#### Papers in peer-reviewed international journals

- R. Stojanović, A. Škraba, S. Berkowicz, R.D. Amicis, D. Elhanani, G. Conti, D. Kofjač, M. Dragović, N. Lekić and Gojko Nikolić, *GEPSUS: Simulation-Based Decision Making System for Air Pollution Accidents*, accepted for publication in "International Journal of Organisation Sciences – Organizacija", ISSN 1581-1832.

#### Papers in peer-reviewed international monographs

- R. Stojanović, A. Škraba, N. Lekić, R. D. Amicis, G. Conti, D. Elhanani and S. Berkowicz, *Integration of system simulation and Geographical Information Processing for air-pollution emergency situations control and decision-making*, In: "Advances in Simulation-Based Decision Support", Vol. II, Edited by M. Kljajic and G. Lasker, Published by The International Institute for Advanced Studies in Systems Research and Cybernetics, Canada, pp. 31-35. *Awarded Conference best paper*.

#### Papers in peer-reviewed international conferences

- A. Škraba, R. Stojanović, R. D. Amicis, S. Berkowicz, G. Conti, D. Elhanani, N. Lekić, M. Dragović, D. Kofjac. *Integrating air-pollution dispersion simulation models and GIS for urban air-pollution emergency management: Electronic source*. V: Felix Breirenecker (ur.), Trocjh, Inge (ur.). "7th Vienna Conference on Mathematical Modelling", February 15-17, 2012, Vienna University of Technology, Austria. MATHMOD Vienna 2012: full paper preprint volume, (Argesim Report, no. S38). Vienna: Argesim, cop. 2012, 4 p.
- R. Stojanović, A. Škraba, M. Senegačnik, N. Lekić, *Development of simulation system for crisis mitigation in the case of emergency situations – Air pollution dispersions*, "Proceedings of the 30th Annual International Conference on Organizational Science Development Future Organization", Portoroz, Slovenia, 2011.

- R. Stojanović, A. Škraba, N. Lekić, R. D. Amicis, G. Conti, D. Elhanani, S. Berkowicz, M. Bren, *Development of simulation system for air-pollution emergency management*, "IEEE Conference CCSIE-2011", London, July, 2011. *Awarded best conference paper.*
- R. Stojanović, A. Škraba, R. De Amicis, G. Conti, D. Elhanani, S. Berkowicz, J. Knežević, G. Nikolić, I. Vujačić, and P. Djurašković, *Development of real-time response system for air pollution dispersion accidents in urban areas*, "16th International Symposium on Environmental Pollution and its Impact on Life in the Mediterranean Region", September 24-27, 2011, Ioannina, Greece.
- R. Stojanović, A. Škraba, R. De Amicis, G. Conti, D. Elhanani, S. Berkowicz, G. Nikolić, D. Kofjač, M. Dragović, N. Lekić, M. Senegačnik, and B. Vavtar, *Development of a decision support system for air pollution accidents management using simulation models*, "31st annual International Conference on Organizational Science Development", Portoroz, Slovenia, 21-23, March 2012.
- M. Dragovic, R. Stojanović, A. Škraba, D. Blečić, M. Cerović, and G. Nikolić, *Simulation of air dispersion from industrial sources in Matlab*, "IT-2012, International Symposium on Information Technologies", Zabljak 2012, Montenegro, 26/02-03/03/2012.

#### **Papers in peer-reviewed national conferences**

- M. Lazarevic, N. Lazarevic, R. Stojanovic, A. Skraba, M. Senegacnik, *The simulation of air pollution dispersion with example in MATLAB* (in Serbian), "Proceedings of 16th International Symposium of IT", Zabljak, Montenegro, Feb. 2011, pp. 134-138.

#### **Diploma thesis (M.Sc.)**

In the previous 6 months, 2 MSc thesis were completed and defended:

- Marinela Lazarevic, young scientist in GEPUS, *Computer based modelling of air pollutant*, MSc thesis defended on 10.02.2012 at University of Montenegro.
- Nikola Lazarevic, young scientist in GEPUS, *Computer based visualization of air pollutants*, MSc thesis defended on 29.03.2012 at University of Montenegro.

Four more MSc theses are under construction (V. Popovic, M. Dragovic and J. Knezevic, J. Kovacevic).

#### **Papers in round table proceedings**

- R. Stojanovic, R. D. Amicis, D. Elhanani, *Modelling and simulation of air pollutants in urban areas during accident situations*, Proceedings of "Environment Protection and NATO", pp. 63-73, Agency for Environmental Protection of Montenegro, 2012.

#### **Paper in monographs**

- R. Stojanović, A. Škraba, S. Berkowitz, R. D. Amicis, D. Elhanani, G. Conti and D. Kofjač, *GIS-based System for Air-Pollution Management*, Monograph of Montenegrin Academy of Sciences and Arts (MASA), in print.

Many of the above publications, together with dissemination/visibility documents, can be found in the project website [www.graphitech.it/gepus](http://www.graphitech.it/gepus).

## 6.7.2 Non-Scientific Publications

- Participation in “Importance of GEO initiatives and Montenegrin capacities in this area”; the Scientific meeting organized by the BalkanGEONet project in association of Montenegrin Academy of Sciences and Arts (MASA), 17 October 2011 – MASA, Podgorica. The presentation given by PPD Prof. R. Stojanovic can be found within the following link: [http://balkangeo.net/index.php?option=com\\_content&view=article&id=98:importance-of-geo-initiatives-and-montenegrin-capacities-in-this-area&catid=52:news&Itemid=65](http://balkangeo.net/index.php?option=com_content&view=article&id=98:importance-of-geo-initiatives-and-montenegrin-capacities-in-this-area&catid=52:news&Itemid=65)
- Participation at Conference NATO “Programme Science for Peace”, organized by the Government of Montenegro and Faculty for State and European Studies, November 7<sup>th</sup> 2011, Conference opened by the Ministry of Science of Montenegro and PPD Prof. Stojanovic was one of the panellists. Young scientist (stipend) Marko Dragovic gave a presentation about the GEPSUS system. See: [http://www.google.me/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=10&ved=0CHMQFjAJ&url=http%3A%2F%2Fwww.mna.gov.me%2FResourceManager%2FFileDownload.aspx%3Frid%3D88087%26rType%3D2&ei=inpxT7rDB4LFswbN\\_ejpDQ&usq=AFQjCNEvkkayhwI9FPweRIsIXlpVyBUtug&sig2=yUqls6A9R94TdEzmpaQ23w, http://www.fdes.me/content/otvorena-konferencija-nato-program-%E2%80%99Enauka-za-mir-i-bezbednost](http://www.google.me/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=10&ved=0CHMQFjAJ&url=http%3A%2F%2Fwww.mna.gov.me%2FResourceManager%2FFileDownload.aspx%3Frid%3D88087%26rType%3D2&ei=inpxT7rDB4LFswbN_ejpDQ&usq=AFQjCNEvkkayhwI9FPweRIsIXlpVyBUtug&sig2=yUqls6A9R94TdEzmpaQ23w, http://www.fdes.me/content/otvorena-konferencija-nato-program-%E2%80%99Enauka-za-mir-i-bezbednost)
- GEPSUS project was co-organizer of training for BULCOD (NATO Codification software system). The training was organized within the MoD and University of Montenegro from 11-14/12/2011. <http://www.gov.me/naslovna/vijesti-iz-ministarstava/110497/Pocela-obuka-za-BULCOD.html>.
- Journal of Montenegrin Army “Partner”, Vol. 43 December 2011, published a special article on “Towards better security through the simulation of catastrophic events”, pp. 13-14.
- <http://www.google.me/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=19&ved=0CF4QFjAIOAo&url=http%3A%2F%2Fwww.odbrana.gov.me%2FResourceManager%2FFileDownload.aspx%3Frid%3D92275%26rType%3D2&ei=BoZxT6K6MsTCswaMxo32DQ&usq=AFQjCNFse58ZF6onQYmriZawqGzYc7Q5Rw&sig2=7EIM7zUEX5gCEflw-6QeQ>
- The GEPSUS team lead by NPD Prof. Raffaele De Amicis together with PPD Prof. Radovan Stojanovic and Mr Doron Elhanani, participated in thematic presentations in the Round Table “Environment Protection and NATO” organized by the Government of Montenegro and Agency for Environmental Protection. 01/12/2011.
- <http://www.epa.org.me/index.php/en/activities/401-zavren-okrugli-sto-zatita-ivotna-sredine-i-nato>.
- Representatives of the GEPSUS team, Prof. Gojko Nikolic and stipend Marko Dragovic, participated in the Round Table “The importance and possibilities of participation of civil sector in the process of Euro-Atlantic integrations”, organized by the Government of Montenegro and Faculty for State and European Studies. 14/03/2012. Marko Dragovic gave a presentation about the GEPSUS project. <http://www.fdes.me/sites/default/files/Agenda%20-%20Nact%20-%20Okrugli%20sto%20-%20NATO%20-%202013.03.2012..pdf>
- During the GEPSUS Technical Meeting from 28/11/2011 to 02/12/2011 all Montenegrin and regional media broadcasted information about GEPSUS and its activities. Some of them are:



- Government of Montenegro, launched information about GEPSUS meeting: <http://www.gov.me/naslovna/vijesti-iz-ministarstava/110226/Ministar-nauke-Prof-dr-Sanja-Vlahovic-primila-delegaciju-GEPSUS-projekta-koji-se-realizuje-u-okviru-NATO-programa-Nauka-za-mir.html>
- Ministry of Science launched information about the visit of the GEPSUS delegation to the Minister of Science of Montenegro, Prof. Sanja Vlahovic: <http://www.mna.gov.me/vijesti/110226/Ministar-nauke-Prof-dr-Sanja-Vlahovic-primila-delegaciju-GEPSUS-projekta-koji-se-realizuje-u-okviru-NATO-programa-Nauka-za-mir.html>
- Ministry of Defence actively followed the GEPSUS meeting including a visit of the GEPSUS team to the Ministry of Defence Mr Boro Vucinic: <http://www.odbrana.gov.me/vijesti/110241/Prezentacija-GEPSUS-projekta.html>, <http://www.odbrana.gov.me/vijesti/110136/Ministar-Vucinic-primio-delegaciju-koja-u-okviru-NATO-programa-Nauka-za-mir-realizuje-GEPSUS-projekat.html>
- A special exercise of the Army of Montenegro organized for the GEPSUS project was very prominently covered in the TV, radio and internet media. The exercises were led by Mrs Mira Cerovic, Deputy Minister of MOD. <http://www.vojska.me/izvjestaji-izjave-aktivnosti/823-prezentacija-gepsus-projekta>
- The biggest daily newspapers such as Vijest, Dan and Pobjeda had special articles on the GEPSUS meeting and GEPSUS project : <http://www.vijesti.me/vijesti/u-crnoj-gori-sjediste-nato-centra-simulaciju-elementarnih-katastrofa-clanak-49201>, <http://www.dan.co.me/?nivo=3&rubrika=Drustvo&clanak=309157&datum=2011-11-30>, [http://www.pobjeda.me/pobjeda\\_listalica/16511/index.html#/8/zoomed](http://www.pobjeda.me/pobjeda_listalica/16511/index.html#/8/zoomed)
- Independent Internet portals launched information on the GEPESUS project. <http://www.portalanalitika.me/ekonomija/vijesti/43929-crna-gora-sjedite-nato-centra-za-simulaciju-elementarnih-katastrofa-.html>, <http://www.cafemontenegro.com/index.php?group=23&news=214225>
- MoD launched official information on its web site after the training/visit to Israel: <http://www.odbrana.gov.me/vijesti/112776/Posjeta-crnogorske-delegacije-Izraelu-u-okviru-NATO-GEPSUS-projekta.htm>

## 6.8 Technical and administrative difficulties encountered and actions taken to overcome them

During the second six months, the Montenegrin team faced the following problems:

- The KAP Aluminum Plant may close because of the very bad economic situation. In the meantime, the GEPSUS consortium switched to the Thermo Power Plant – Pljevlja as an alternative case study, and where cooperation has been obtained.
- National contributions to the project were very-low, except notably the contribution in infrastructure by the MoD. Namely, Montenegro university and the corresponding ministries do not contribute to the project. Even scholarship fees for the stipends are paid by Montenegro and the PPD. No contributions for trainings or travels.
- This administrative issue was already described within Paragraph 5.1.



### 6.9 Changes, if any, in project personnel in any of the participating organizations

Partner	Change to personnel
Graphitech	<p>The only significant change in the staff involved in the technical activities of the project is the fact that Mr. Marco Calderan left the company. However, two other young scientists were hired.</p> <ul style="list-style-type: none"> <li>- <b>Umberto di Staso</b></li> <li>- <b>Massimo Nicosia</b></li> </ul>
University of Montenegro	<p>Several changes in personnel were made in the Montenegrin Team because of internal changes within the MoD. The MoD representatives, Mr Drasko Jovanovic (former Minister of Defence) and Mr Igor Vujacic (contact person from the MoD), were replaced by <b>Mrs Mira Cerovic</b> (actual Deputy Minister), <b>Mr Igor Buric</b> (ICT expert) and <b>Mrs Maja Vuković</b>. A new student member of the GEPUS was <b>Mrs Maja Skuric</b>.</p>

### 6.10 Changes, if any, in project plan and their expected impact on budget and schedule

During the second 6 months of the project implementation, the need to rebalance the budget for Montenegro has been noticed. The main change is reflected in the increased amount for "Domestic Travels" of 600 EUR. The reasons are: changing case study location from Podgorica (KAP) to Pljevlje (TPP), 180 km north of Podgorica. Also, the intention to extend project results to the entire Montenegro. The additional reason is the participation at Conferences within Montenegro (young researcher) to disseminate GEPUS results. The same amount (600 EUR) has been decreased from "Project-specific consumables and spare parts". Changes by categories are given in the attached financial sheet (see SfP NATO BUDGET TABLE).

## 7. FINANCIAL STATUS

### 7.1 Annexes 4a: SfP NATO BUDGET TABLES

#### A) FONDAZIONE GRAPHITECH

Project number: SfP - 983510	Project short title: SfP -	GEPUS
Report date: 20 April 2012	Duration of the Project <sup>1</sup> : 30 months	March 2011 - October 2013
Project Co-Director: <i>Raffaele De Amicis, Trento, Italy</i>		

Detailed Budget Breakdown <i>(to be completed in EUR<sup>2</sup>)</i>	ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	<i>(1) from start 03.03.2011 until 19.04. (current year)<sup>2</sup></i>	<i>(2) for the following six months</i>	<i>(3) for the following period until project's end</i>	
<b>(a) Equipment</b>				
<b>Subtotal "Equipment"</b>				
<b>(b) Computers - Software</b>				
<b>Subtotal "Computers - Software"</b>				
<b>(c) Training</b>				
<b>Subtotal "Training "</b>				
<b>(d1) Books and Journals <i>(global figure)</i></b>		1.500	3.000	
<b>(d2) Publications <i>(global figure)</i></b>		500	1.000	
<b>Subtotal "Books - Publications"</b>		<b>2.000</b>	<b>4.000</b>	
<b>(e) Experts - Advisors</b>		2.000	4.000	
<b>Subtotal "Experts - Advisors "</b>		<b>2.000</b>	<b>4.000</b>	
<b>(f) Travel</b>		1.635	6.000	<i>Local travel costs of Israel March 2012 training meeting to be entered in next reporting period</i>
<i>Project Meeting and MoD Training Workshop Montenegro</i>	7.365			
<b>Subtotal "Travel"</b>	<b>7.365</b>	<b>1.635</b>	<b>6.000</b>	
<b>(g) Consumables - Spare parts:</b>				
<b>Subtotal "Consumables - Spare parts"</b>				
<b>(h) Other costs and (i) stipends <i>(specify)</i></b>				
<b>Subtotal "Other costs"</b>				
<b>TOTAL (1), (2), (3) :</b>	<b>7.365</b>	<b>5.635</b>	<b>14.000</b>	
<b>CURRENT COST OUTLOOK = (1)+(2)+(3)</b>	<b>27.000</b>			



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## B) UNIVERSITY OF MONTENEGRO

Project number: SfP - 983510	Project short title: SfP -	GEPUS
Report date: 20 April 2012	Duration of the Project <sup>1</sup> : 30 months	March 2011 - October 2013
Project Co-Director: <i>Radovan Stojanovic, Podgorica, Montenegro</i>		

Detailed Budget Breakdown (to be completed in EUR <sup>2</sup> )	ACTUAL EXPENDITURES		FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start 03.03.2011 until 19.04. (current year) <sup>2</sup>	(2) for the following six months	(3) for the following period until project's end		
<b>(a) Equipment</b>					
<i>Portable meteorological stations</i>	0	6.000			
<i>Portable chemical parameters station</i>	0	4.000			
<i>Communication devices for sensors and station</i>	0	2.000			
<b>Subtotal "Equipment"</b>	0	<b>12.000</b>	<b>0</b>		
<b>(b) Computers - Software</b>					
<i>HW - Servers</i>	0	15.085			
<i>HW - Visualization Systems</i>	0	16.513			
<i>HW - Clients</i>	0	16.988			
<i>HW - Mobile Devices</i>		5.143			
<i>HW - Support Infrastructures</i>	0	7.571			
<i>SW - Licenses</i>	0	14.000			
<i>IT - Support Services</i>	0	2.700			
<b>Subtotal "Computers - Software"</b>	0	<b>78.000</b>	<b>0</b>		
<b>(c) Training</b>					
<i>Training of Montenegrin team members in Israel, Italy or Slovenia, 6 weeks in all.</i>	5.000	5.000	5.000		
<b>Subtotal "Training "</b>	<b>5.000</b>	<b>5.000</b>	<b>5.000</b>		
<b>(d1) Books and Journals (global figure)</b>	0	400	200		



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(d2) Publications (global figure)	1.026	1.000	294	
<b>Subtotal "Books - Publications"</b>	<b>1.206</b>	<b>1.400</b>	<b>494</b>	
<b>(e) Experts - Advisors</b>				
Visit of NATO expert from field of interest to Montenegro in term of knowledge transfer and tasks definition, max 10 day.	0	5.000	2.500	
<b>Subtotal "Experts - Advisors "</b>	<b>0</b>	<b>5.000</b>	<b>2.500</b>	
<b>(f) Travel</b>				
Travel abroad (within the region of NATO, Partner and Mediterranean Dialogue countries) for meetings, consultation, and attendance at conferences, seminars, dissemination and workshops.	3.816	4.684	2.500	
Domestic travel by train, aeroplane or bus and by car in order to carry out specific task.	717	633	250	
<b>Subtotal "Travel"</b>	<b>4.533</b>	<b>5.317</b>	<b>2.750</b>	
<b>(g) Consumables - Spare parts:</b>				
Project-specific consumables and spare parts	192	1.108	600	
Miscellaneous or unexpected expenses	1.458	1.839	1.203	
Transport costs (shipment of a procurement)	0	300	200	
Leasing line service for communication between project locations.	0	200	300	
<b>Subtotal "Consumables - Spare parts"</b>	<b>1.650</b>	<b>3.447</b>	<b>2.303</b>	
<b>(h) Other costs and (i) stipends</b>				
Stipends for young researchers ( 3 postgraduate students over project duration)	3.000	6.000	3.600	
<b>Subtotal "Other costs"</b>	<b>3.000</b>	<b>6.000</b>	<b>3.600</b>	
<b>TOTAL (1), (2), (3) :</b>	<b>15.389</b>	<b>116.164</b>	<b>16.647</b>	
<b>CURRENT COST OUTLOOK =(1)+(2)+(3)</b>	<b>148.200</b>			



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### C) EMESCO

Project number: SfP - 983510	Project short title: SfP -	GEPUS
Report date: 20 April 2012	Duration of the Project <sup>1</sup> : 30 months	March 2011 – October 2013
Project Co-Director: <i>Doron Elhanani, Ha-ayin, Israel</i>		

Detailed Budget Breakdown (to be completed in EUR <sup>3</sup> )	ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start 03.03.2011 until 19.04. (current year) <sup>2</sup>	(2) for the following six months	(3) for the following period until project's end	
<b>(a) Equipment</b>				
4 GPS devices	1.926	642	0	
Projector	0	1.013	0	
Lcd Screen 50"	2.061	0	0	
<b>Subtotal "Equipment"</b>	<b>3.987</b>	<b>1.655</b>	<b>0</b>	
Exercise software + licence: Specific exercise preparation management system	15.000	0	0	
4-laptop computers Israel - dedicated to simulation trials	6.000	0	0	
Server	2.000	0	0	
<b>Subtotal "Computers - Software"</b>	<b>23.000</b>	<b>0</b>	<b>0</b>	
<b>(c) Training</b>				
(c) Training (Incl. Travel & Accommodations)	0	0	0	
Training of co-director in Montenegro Incl. Workshop	0	5.000	0	
Training of co-director in Montenegro	0	2.500	2.500	
Training of co-director in Montenegro	0	0	5.000	
<b>Subtotal "Training "</b>	<b>0</b>	<b>7.500</b>	<b>7.500</b>	
<b>(d1) Books and Journals (global figure)</b>	0	858	1.500	
<b>(d2) Publications (global figure)</b>	0	1.500	4.500	
<b>Subtotal "Books - Publications"</b>	<b>0</b>	<b>2.358</b>	<b>6.000</b>	
<b>(e) Experts - Advisors</b>				
Visit of NATO countries expert from field of interest to Israel in term of knowledge transfer and tasks definition	0	2.500	0	
Visit of NATO expert from field of interest to Israel in order to examine the trials preparations	0	2.500	0	
Visit of NATO expert from field of interest to Israel in order to check the evaluation tools	0	0	2.500	



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<b>Subtotal "Experts - Advisors "</b>	<b>0</b>	<b>5.000</b>	<b>2.500</b>	
<b>(f) Travel</b>				
<i>travel abroad (within the region of NATO, Partner and Mediterranean Dialogue countries) for meetings, consultation, and attendance at conferences, seminars and workshops. (Montenegro)</i>	7.279	1.750	1.971	<i>Local travel costs of Israel March 2012 training meeting to be entered in next reporting period</i>
<i>Domestic travel by train, aeroplane or bus and by car in order to carry out specific task (Montenegro)</i>	0	250	750	
<b>Subtotal "Travel"</b>	<b>7.279</b>	<b>2.000</b>	<b>2.721</b>	
<b>(g) Consumables - Spare parts:</b>				
<i>Project-specific consumables and spare parts</i>	0	0	0	
<i>Miscellaneous or unexpected expenses</i>	829	1.171	4.000	
<b>Subtotal "Consumables - Spare parts"</b>	<b>829</b>	<b>1.171</b>	<b>4.000</b>	
<b>(h) Other costs and (i) stipends (specify)</b>	0	0	0	
<i>Stipends for young researchers ( 3 postgraduate students over project duration)</i>	0	0	0	
<b>Subtotal "Other costs"</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<b>TOTAL (1), (2), (3) :</b>	<b>35.095</b>	<b>19.684</b>	<b>22.721</b>	
<b>CURRENT COST OUTLOOK = (1)+(2)+(3)</b>	<b>77.500</b>			



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## D) UNIVERSITY OF MARIBOR

Project number: SfP - 983510	Project short title: SfP -	GEPUS
Report date: 20 April 2012	Duration of the Project <sup>1</sup> : 30 months	March 2011 - October 2013
Project Co-Director: <i>Andrej Skraba, Kranj, Slovenia</i>		

Detailed Budget Breakdown (to be completed in EUR <sup>2</sup> )	ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start 03.03.2011 until 19.04. (current year) <sup>2</sup>	(2) for the following six months	(3) for the following period until project's end	
<b>(a) Equipment</b>				
<b>Subtotal "Equipment"</b>	0	0	0	
<b>Subtotal "Computers - Software"</b>	0	0	0	
<b>(c) Training</b>				
<b>Subtotal "Training "</b>	0	0	0	
<b>(d1) Books and Journals (global figure)</b>				
<b>(d2) Publications (global figure)</b>				
<b>Subtotal "Books - Publications"</b>	0	0	0	
<b>(e) Experts - Advisors</b>				
<b>Subtotal "Experts - Advisors "</b>	0	0	0	
<b>(f) Travel</b>				
<i>Travel abroad (within the region of NATO, Partner and Mediterranean Dialogue countries) for meetings, consultation, and attendance at conferences, seminars and workshops.</i>	3.902	2.000	2.598	<i>Local travel costs of Israel March 2012 training meeting to be entered in next reporting period</i>
<b>Subtotal "Travel"</b>	<b>3.902</b>	<b>2.000</b>	<b>2.598</b>	
<b>(g) Consumables - Spare parts:</b>				
<i>Project-specific consumables and spare parts</i>	0	0	0	
<i>Miscellaneous or unexpected expenses</i>	0	500	1.000	
<b>Subtotal "Consumables - Spare parts"</b>	0	500	1.000	
<b>(h) Other costs and (i) stipends (specify)</b>				
<i>Stipends for young researchers ( 3 postgraduate students over project duration)</i>	0	0	0	
<b>Subtotal "Other costs"</b>	0	0	0	
<b>TOTAL (1), (2), (3) :</b>	<b>3.902</b>	<b>2.500</b>	<b>3.598</b>	
<b>CURRENT COST OUTLOOK = (1)+(2)+(3)</b>	<b>10.000</b>			



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## E) HEBREW UNIVERSITY OF JERUSALEM

Project number: SfP - 983510	Project short title: SfP -	GEPUS
Report date: 20 April 2012	Duration of the Project <sup>1</sup> : 30 months	March 2011 - October 2013
Project Co-Director: (Simon Berkowicz, Jerusalem, Israel)		

Detailed Budget Breakdown (to be completed in EUR <sup>3</sup> )	ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start 03.03.2011 until 19.04. (current year) <sup>2</sup>	(2) for the following six months	(3) for the following period until project's end	
<b>(a) Equipment</b>				
<b>Subtotal "Equipment"</b>	0	0	0	
<b>Subtotal "Computers - Software"</b>	0	0	0	
<b>(c) Training</b>				
<b>Subtotal "Training "</b>	0	0	0	
<b>(d1) Books and Journals (global figure)</b>	0	75	75	
<b>(d2) Publications (global figure)</b>	0	75	75	
<b>Subtotal "Books - Publications"</b>	0	150	150	
<b>(e) Experts - Advisors</b>				
<b>Subtotal "Experts - Advisors "</b>	0	0	0	
<b>(f) Travel</b>				
<i>travel abroad (within the region of NATO, Partner and Mediterranean Dialogue countries) for meetings, consultation, and attendance at conferences, seminars and workshops. (Montenegro)</i>	1.002	2.403	2.295	Local travel costs of Israel March 2012 training meeting to be entered in next reporting period
<b>Subtotal "Travel"</b>	1.002	2.403	2.295	
<b>(g) Consumables - Spare parts:</b>				
<i>Project-specific consumables and spare parts</i>	0	0	0	
<i>Miscellaneous or unexpected expenses</i>	21	100	179	
<b>Subtotal "Consumables - Spare parts"</b>	21	100	179	
<b>(h) Other costs and (i) stipends (specify)</b>				
<i>Stipends for young researchers ( 3 postgraduate students over project duration)</i>	0	0	0	
<b>Subtotal "Other costs"</b>	0	0	0	
<b>TOTAL (1), (2), (3) :</b>	1.023	2.653	2.624	
<b>CURRENT COST OUTLOOK =(1)+(2)+(3)</b>	6.300			



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## 7.2 Annex 4B: SfP NATO BUDGET SUMMARY TABLE

Project number: SfP - 983510	Project short title: SfP - GEOGRAPHICAL INFORMATION PROCESSING FOR ENVIRONMENTAL POLLUTION-RELATED SECURITY WITH URBAN SCALE ENVIRONMENTS (GEPSUS)
Report date: 20-04-2012	Duration of the Project <sup>1</sup> : March 2011 - October 2013
The Project is in the year (please indicate): 1 - 2 - 3	

Breakdown per Project Co-Director (to be completed in EUR <sup>3</sup> )			ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in financial planning compared to the approved Project Plan
Project Co-Director's name, city, country	APPROVED BUDGET: Total year 1-3	CURRENT COST OUTLOOK: Total year 1 - 3	from start 03.03.2011 until 19.04. (current year) <sup>2</sup>	for the following 6 months	for the following period until project's end	
<i>Dr. Raffaele De Amicis, Trento, Italy</i>	27.000	27.000	7.365	5.635	14.000	<i>Local travel costs of Israel March 2012 training meeting to be entered in next reporting period</i>
<i>Prof. Radovan Stojanovic, Podgorica, Montenegro</i>	148.200	148.200	15.389	116.164	16.647	<i>Local travel costs of Israel March 2012 training meeting to be entered in next reporting period</i>
<i>Mr. Doron Elhanani, Rosh Ha-Ayin, Israel</i>	77.500	77.500	35.095	19.684	22.721	<i>Local travel costs of Israel March 2012 training meeting to be entered in next reporting period</i>
<i>Dr. Andrej Skraba, Kranj, Slovenia</i>	10.000	10.000	3.902	2.500	3.598	
<i>Mr. Simon Berkowicz, Jerusalem, Israel</i>	6.300	6.300	1.023	2.653	2.624	<i>Local travel costs of Israel March 2012 training meeting to be entered in next reporting period</i>
<b>TOTAL (must be identical with TOTALs given in 'Breakdown per item'):</b>	<b>269.000</b>	<b>269.000</b>	<b>62.774</b>	<b>146.636</b>	<b>59.590</b>	



Breakdown per item (to be completed in EUR <sup>3</sup> )			ACTUAL EXPENDITURES	FORECAST EXPENDITURES		
Item	APPROVED BUDGET: Total year 1-3	CURRENT COST OUTLOOK: Total year 1 - 3	from start 03.03.2011 until 19.04. (current year) <sup>2</sup>	for the following 6 months	for the following period until project's end	Comments on changes, if any, in financial planning compared to the approved Project Plan
(a) Equipment	17.642	17.642	3.987	13.655	0	
(b) Computers - Software	101.000	101.000	23.000	78.000	0	
(c) Training	30.000	30.000	5.000	12.500	12.500	
(d) Books - Publications	17.758	17.758	1.206	5.908	10.644	
(e) Experts - Advisors	21.000	21.000	0	12.000	9.000	
(f) Travel	56.979	56.979	24.081	13.355	16.364	
(g) Consumables - Spare parts	12.021	12.021	2.500	5.218	7.482	
(h) Other costs and (i) stipends	12.600	12.600	3.000	6.000	3.600	
<b>TOTAL :</b>	<b>269.000</b>	<b>269.000</b>	<b>62.774</b>	<b>146.636</b>	<b>59.590</b>	



*This project  
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## 8. CRITERIA FOR SUCCESS TABLE

Project number: SfP - 983510	Project short title: SfP - GEPSUS
Report date: 20-04-2012	Duration of the Project <sup>1</sup> : March 2011 - October 2013
The Project is in the year <sup>2</sup> : 1 – 2 – 3 – 4	

<b>Criteria for Success as approved with the first Grant Letter on: (03-12-2010)</b>	<b>%</b>	<b>Criteria for Success: Achievements as at 31.03.2012 (changes should be reflected here)</b>	<b>%</b>
1) Development of software components (as web-processing services – WPS) capable to simulate macro-level and micro-level pollutant spread.	15%	1) Development of software components (as web-processing services – WPS) capable to simulate macro-level and micro-level pollutant spread.	5%
2) Development of system dynamics model capable to provide proactive feedback by learning from user's previous decisions within similar contexts.	10%	2) Development of system dynamics model capable to provide proactive feedback by learning from user's previous decisions within similar contexts.	10%
<b>3) Interfacing the web-processing services (WPS) developed with existing SDI or OGC services available from the user.</b>	<b>25%</b>	<b>3) Interfacing the web-processing services (WPS) developed with existing SDI or OGC services available from the Trentino Geo dataset.</b>	<b>30%</b>
4) Interfacing of models with real-time data available through existing sensor networks available.	15%	4) Interfacing of models with real-time data available through existing sensor networks available.	5%
5) Modelling of trigger alarm conditions following environmental pollution.	10%	5) Modelling of trigger alarm conditions following environmental pollution.	10%
6) Interactive graphic representation of pollution levels within a 3D environment.	0%	6) Interactive graphic representation of pollution levels within a 3D environment.	0%
7) Definition of service level agreement for the web-services developed ensuring the parameters involved to determine the quality of services.	0%	7) Definition of service level agreement for the web-services developed ensuring the parameters involved to determine the quality of services.	0%
8) Definition of training strategy and training of personnel at Montenegrin Ministry of Defence.	10%	8) Definition of training strategy and training of personnel at Montenegrin Ministry of Defence.	10%
9) Advertisement and awareness campaign within national and international media and scientific publication channels and Publications in peer reviewed journals.	5%	9) Advertisement and awareness campaign within national and international media and scientific publication channels and Publications in peer reviewed journals.	20%
10) Definition of a business model for future use of results.	5%	10) Definition of a business model for future use of results.	0%
11) Organization of workshops and training sessions.	5%	11) Organization of workshops and training sessions.	10%
12) System use by Montenegrin MoD staff.	0%	12) System use by Montenegrin MoD staff.	0%
<b>TOTAL :</b>	<b>100%</b>	<b>TOTAL <sup>4</sup> :</b>	<b>100%</b>



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## 9. SUMMARY REPORT

### SfP 983510– GEPSUS

#### **Geographical information processing for Environmental Pollution-related Security within Urban Scale environments**

Project Co-Directors: *Dr. Raffaele De Amicis, Fondazione Graphitech, Trento, Italy (NPD)*  
*Prof. Radovan Stojanovic, University of Montenegro, Podgorica, Montenegro (PPD)*  
*Mr. Doron Elhanani, EMESCO, Ha-Ayin, Israel*  
*Dr. Andrej Skraba, University of Maribor, Kranj, Slovenia*  
*Mr. Simon Berkowicz, Hebrew University of Jerusalem, Jerusalem, Israel*

Approval Date: 3<sup>rd</sup> December 2010      Effective Date: 3<sup>rd</sup> March 2011  
 Duration: 3 years until 20<sup>th</sup> of October 2013  
 NATO Budget: 269,000 EUR

Information about the SfP Project through Internet: [www.graphitech.it/gepsus](http://www.graphitech.it/gepsus)

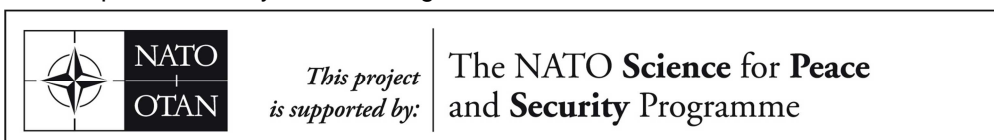
#### 9.1 Abstract of Research

The project aims at delivering a feasibility study on the influence of spatial parameters of buildings on aeration conditions. It also develops methods to evaluate aeration conditions and to optimize urban planning, in order to reduce the impact of pollutant dispersion within urban environments. Indeed, planning how to handle acute crises at the urban scale caused by exceptional pollution levels as well as by pollutants released during a terrorist attack within an urban environment is of key importance to deploy adequate countermeasures following terrorist attacks. Moreover, the impact of modelling and simulation tools is very high both in social and economic terms as the availability of simulation and training tools can potentially save lives.

In such a context, GEPSUS will support crisis managers and decision-makers to access a wide range of geographical information and simulation results in real time, so as to better deploy the most appropriate countermeasures by developing an integrated IT system to monitor and manage environmental information and to simulate the effects of the spread of pollutants at an urban scale. For this reason, GEPSUS will use and process 3D Geographic Information (GI) available on the territory on a vast scale through the use of early warning sensor technologies to create simulations used to predict consequences of pollutant agents according to factors such as aeration conditions, temperature and moisture conditions etc.

#### 9.2 Major Objectives

- GEPSUS intends to develop a novel IT system capable of simulating the effects of the distribution of air pollutants within an urban environment. The following approach will be followed:
  - The lead partners from the *University of Maribor* and *University of Montenegro* will foster scientific research in the field of sensing and modelling of environmental factors at the urban scale.
  - Concurrently, the *Hebrew University of Jerusalem* partner will provide the aforementioned partners with guidelines related to local-climate and topo-climate controls of air movement/stability.
  - The results will be integrated within an existing web-based IT infrastructure for environmental control and management, already developed by *Fondazione Graphitech*, which is based on open interoperable standards as defined by the OGC and INSPIRE EU directive.
  - This will ensure that results of the simulation will be readily deployed and tested by the final users (Ministry of Defence of Montenegro) with the support of EMESCO.
- In order to study and improve aeration conditions of an urban area GEPSUS will:
  - Evaluate existing scientific and practical experience in the evaluation of pollutant spread according to aeration conditions, outlining significant effects on local climate and microclimate landscapes caused by urban settings.



- Adapt the most suitable model for Podgorica to simulate the influence on dispersion of pollutants using factors such as building distribution and configuration, street layout, predominant weather conditions, energy balance, etc. Specific attention will be paid to modelling how the distribution of pollutants can be affected by urban layouts and by local to micro-level winds.
- To improve sensing technologies and an early warning system, GEPSUS will develop:
  - A mathematical model of sensor architecture and their outputs for various pollutants and explosives (University of Montenegro).
  - An algorithm to be developed by the University of Maribor for clustering self-learning examples based on the principle of similar events, results and users' specifications.
- GEPSUS will be adopted as a training tool by the Montenegrin Ministry of Defence.

### 9.3 Overview of Achievements since the Start of the Project until 30 September 2012

- WP1 has been completed, the user requirements have been defined in detail, and the technical specifications within comprehensive software architecture has been delivered.
- Several existing mathematical models for air pollution dispersion were improved and adapted to the needs of the project. Those were developed as software as well as other software for communication with existing models and displaying threat zones and other instructions on a standard geobrowser. Developed software/routines were tested on real cases.
- The scheme and hardware requirements to issue the international bid for the procurement activities for Montenegro have been defined, and the code of conduct for issuing the international bid has been agreed upon.
- The publication and dissemination activities for GEPSUS have been very intense and many future opportunities for new collaboration have been realised in the scientific community.

Payments through NATO Funds: **62.774** EUR

### 9.4 Milestones for the Next Six Months

- Design the Data Centre.
- Training of MoD personnel of Montenegro to use the tools for monitoring.
- Modelling phase.
- Defining the decision-support system.

### 9.5 Implementation of Results

The first implemented results include selection of a mathematical model to define threat zones, including exact concentration levels, threat classes and geo-location.

The system will be installed and managed directly by trained personnel of the MoD of Montenegro, who will be able to work with specific monitoring software in the field of air pollution dispersion.

The hardware architecture used will be based on parallel processing in order to provide timely results to the rescue crew, which is of vital importance. One must note that the developed system is a near-real-time system.

### 9.6 Other Collaborating Institutions

- ISPRA (Istituto Superiore per la Protezione e Ricerca Ambientale), Italy.
- Trentino Civil Protection Agency, Italy.
- Emergency protection centre of Podgorica, Podgorica, Montenegro

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Companies and other organisations interested in providing funds for commercialisation of project results can request further information from the Project Co-Directors or from the SfP Programme Director ([www.nato.int/science](http://www.nato.int/science) "How to contact us"). Release of information requires Co-Directors' authorisation.

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Abbreviations: (give full expression for all abbreviations which occur in this summary)

MoD = Ministry of Defence

