

**INFORMATION SOCIETY TECHNOLOGIES
(IST)
PROGRAMME**



Contract for: Support Measures

Annex 1 - "Description of Work"

Project acronym: **EUDEM2**
Project full title: **The EU in humanitarian DEMining, Phase 2.
State-of-the-art on Humanitarian Demining
Technologies, Products, Services and Practices in
Europe.**
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1 PROJECT SUMMARY

1.1 OBJECTIVES

EUDEM2 aims at supporting the EU RTD&D consortia and policy makers, and the humanitarian demining community. The approach is an active one whereby actors are contacted directly either by interviews, questionnaires, demands for inputs to the knowledge base and for participation to workshops.

EUDEM2 will: 1) structure, analyse and disseminate information on technology, R&D, mine action procedures; 2) update existing **EUDEM** results on technology maturity and extend, restructure the **EUDEM** web data base; 3) conduct a broad scope technology survey; 4) pro-actively identify transferable technologies from other applications towards humanitarian demining; 5) create expert internet fora on real bottlenecks, potentialities and amount of work needed for the transfer of new technologies; 6) identify actors with promising technologies; 7) distribute information towards working groups on a common theme in R&D or a specific demining activity; 8) collaborate with organizations like JRC, EU:DGs, JMU, UN.

1.2 DESCRIPTION OF THE WORK

The **EUDEM** project produced a publicly accessible and on-line updateable data base containing information provided by various actors (about 120 entries) in the field of humanitarian demining, and a final report on state-of-the-art technology and its maturity for application in humanitarian demining. The focus was on the EU but also an overview of the main funded US research projects was included. Currently 50 interviews with key players in the field of humanitarian demining (HD) have been typed out and revised by the interviewees themselves - their analysis will serve for discussion in workshops within **EUDEM2**.

The **EUDEM2** projects intends to (1) update the results of **EUDEM**, (2) improve their exploitation and extend their usefulness by keeping them up to date and making them more complete, (3) intensify the **EUDEM** activities as follows:

- (a) Broad scope technology survey on new technology having potentially interesting capabilities for HD;
- (b) Further identification of institutes, universities and companies that are offering interested pieces of technology that have not yet been brought into relation with HD;
- (c) Organisation of an information desk service to individuals and organisations with as a priority the support to ongoing EC funded projects and EU R&D policy makers;
- (d) Restructuring the **EUDEM** data base according to themes and working groups;

- (e) Organisation of 3 specialised workshops;
- (f) Technology expert fora including end users, for the assessment of the real impediments to bringing new technologies closer to HD tests, and for the identification of the real advantages/limitations of future deployment in the field;
- (g) Linking of the **EUDEM** website and database with the ARIS website and other information repositories, worldwide;
- (h) Timely and sustained dissemination of verified information on technology and evolving insights;
- (i) Continuation of the strategy of active information collection, by interviews, questionnaires, and request for database input, etc...

1.3 MILESTONES (M) & RESULTS (R)

- **M1** Kick-off Meeting report (m1)
- **M2** Updated EUDEM database (m6)
- **M3** EUDEM2 Concept Meeting with the Advisory Panel (m7)
- **M4** Information Retrieval Facility (m10)
- **M5** Expanded EUDEM website and database and with all relevant information organized for easy navigation (m12)
- **M6** Technology Survey Intermediate Results (m24). This milestone will contain:
 - General screening of new **technologies**, not yet used for humanitarian de-mining, that can undergo **some technical feasibility testing**,
 - Proposing **new combinations of physical principles and the associated technologies** for humanitarian de-mining,
 - **Convincing some of the new technology providers** from the studied application domains to consider the possibilities for **technology transfer into the field of humanitarian de-mining**.
- **M7** Technology implementation Plan (**D13**) (m34)

Results

- Providing initial **system requirements and outlining the development steps** to make new technologies useful for humanitarian de-mining purposes in a short or a mid-long timeframe (WP400)
- Identifying **if some promising technologies are NOT or only partially applicable** within the field of humanitarian de-mining and report (WP400)
- Providing a **comprehensive and technically motivated overview of the potentials** of each technology studied (WP800)
- **Confronting our findings** with the **opinions** of representatives of the **end-user community, the military community, the research community and the technological community** (WP800)

1.4 RISK ANALYSIS AND MITIGATION PLAN

Possible Risks:

- Lack of cooperation from contacted parties, e.g. NATO/defence bodies, former EC projects (especially the operational ones) or end users, leading to missing or incomplete information;
- Difficulty in convincing (commercial) organisations to transfer technologies to humanitarian demining;
- Difficulty in finding new and/or promising technologies suitable for humanitarian demining;

All the mentioned risks will be analysed with the help of the Advisory Panel (See Section Management) and solutions will be adopted, some of which are summarized below.

Risk Mitigation Strategies:

- Lack of cooperation: Appropriate use of Advisory Panel, regular meetings with Commission representatives (also favoured by the close proximity of the principal contractor) as well as a careful and balanced choice of the Advisory Panel experts;
- Participation in major conferences and workshops, monitoring of humanitarian demining related forum;
- Lack of cooperation: Pro-active role and use of direct interviews, also helpful to facilitate the retrieval of sensitive information;
- Lack of cooperation from other EU-DG's and military organisations: clear mandate from the DG-INFOS and key military contacts;
- Lack of cooperation: Information dissemination also during the interviews themselves (knowledge transmitted to interviewee), to increase mutual trust;
- Clear information dissemination policy;
- Whenever full information access will turn out to be too difficult maximise use of partial data;
- Fast and effective internal information exchange (small and lean project, partners well known to each other and to the scientific community), and resulting quick reaction time.

1.5 CRITICAL PATH ANALYSIS

Analysis of the critical path throughout the project evolution reveals the following workpackage's (Inputs/Outputs) that require particular attention (see Gantt Chart).

The critical path in time for the **EUDEM2** project starts with workpackage **WP200-Requirements & Concepts** and the Concept Meeting with the Advisory Panel, in which the project direction and scope will be refined.

Task *WP330 Information Retrieval Facility* is critical by itself. The realization of this task depends on the available information, and the implementation difficulties (interface/software) which are due to the different sources of information (data bases, web sites, etc ...) and their coherence/completeness. A *GO/ NO GO (M4) review is planned* for this task at Month 10.

WP400 Technology Survey is critical and depends on the inputs from *WP600 Interviews* as well as the available scientific/technology information. This is the reason for splitting it into several tasks.

2 PROJECT OBJECTIVES

2.1 INFORMATION GATHERING, ANALYSIS AND DISSEMINATION

"Conduct a **broad scope technology survey** through **active, continuous and targeted information collection, analysis, and dissemination via appropriate channels**". **EUDEM2** will serve as a **central pool** for information exchange concerning (1) the current state-of-the-art in technology and its degree of maturity with respect to demonstrated capabilities of usage in the field, and (2) the future technologies emerging from fundamental and applied research. **EUDEM2** will put emphasis on Europe in particular, but will extend its technology survey to the rest of the world (e.g. in order to integrate Canadian, US and other efforts outside Europe).

EUDEM2 will substantially contribute to bridging the communication gap between R&D and fieldwork. It will actively foster the concept that End Users are required to be part of RTD&D projects, but need to be given a greater responsibility in all the phases of R&D projects to ensure continuing realism.

2.2 SUPPORT TO ONGOING AND NEW PROJECTS BY EXPANDING THE IMPACT OF EUDEMI EFFORT

A continuation of the **EUDEMI** effort addresses a **NEED** within the R&D Humanitarian Demining community. The EC has adopted the policy of (1) making the R&D efforts more coherent, and (2) speeding up the time from R&D to deployment in the field by focusing on the Balkan area. In this context it is essential to **SUPPORT** the various actors in humanitarian demining with selected, verified, **continuously collected and targeted information, disseminated via easily accessible channels**. For obvious reasons of objectivity, and minimal constraints related to protection of know-how and industrial and/or military confidential information, a consortium of universities that have shown a high involvement and integration in the area seems appropriate to carry out this task.

For ongoing research projects, it is very important that duplication of efforts is avoided, therefore "information sharing" is one of the primary objectives of **EUDEM**. **Rapid dissemination** is also extremely important, because of the **complex and fatly evolving** nature of humanitarian demining scenarios, and because humanitarian demining technology is still a relatively young "industrial activity". **Attention will be paid to economical aspects and markets** whilst looking at R&D as a part of the integral process from fundamental research, through demonstrator tests, validation, extensive field testing, productionisation and development in the field (see also Sections 2.3 and 2.4).

2.3 ANALYSIS OF APPLICATION AREAS WITH POTENTIAL SPIN-OFFS TOWARDS HD

Many technologies that are currently emerging from R&D and new equipment that has reached a certain stage of maturity in other application domains have not yet been brought into relation with humanitarian demining, although they are potentially capable of triggering major breakthroughs. Considering that the market for humanitarian demining equipment is very limited and identifying a lack of interest from large companies in making the considerable investments for developing and productionising the results of R&D, **EUDEM2** should be seen as **a pro-active measure to identify transferable technologies from other application domains towards humanitarian demining**. The existence of this potential has been widely acknowledged by the R&D community on humanitarian demining. Workshops are being organised to bring actors of diverse domains together, but their results stay superficial due to lack of continued effort and co-ordination. Rarely the identified technologies, are analysed in sufficient depth and monitored on a continuous basis. **Identification and analysis of mature technologies via direct and repeat interviews of organisations not yet directly related to landmine detection is a major goal of EUDEM2. The project will carry out a broad survey action and issue documented recommendations about the appropriateness to start a more detailed Technology survey for some specific techniques having a very high potential to provoke a major breakthrough in humanitarian demining.** Among the areas which will certainly be surveyed we find e.g. non-destructive testing (NdT), airport surveillance, bio-technologies, biological sensors, the agro-alimentary technologies, remote sensing for agriculture and land cover identification, etc. Technologies that are currently in use but at present not financially supported for R&D, will be investigated as well, e.g. mechanical demining, including vegetation cutters, etc.

The technology survey activity within **EUDEM2** will look for technology that could respond to the several types of mine action activities as specified by the UN (Level 1 surveys, Level 2 surveys and area reduction, mine clearance, Level 3 surveys and Quality Control). Along with the new technologies, **EUDEM2** will also actively motivate new players from industry and academia to enter the domain of humanitarian demining. Central is **to detect technologies that could lead to significant breakthroughs in both industrial and societal terms**. These activities will be carried out in close collaboration with selected scientific/technological and demining experts.

2.4 ANALYSIS OF CURRENT HD EC-RTD PROJECTS WITH POTENTIAL SPIN-OFFS TOWARDS OTHER APPLICATIONS

Many technologies that are currently being investigated for Humanitarian Demining have not yet been brought into relation with other application domains, e.g. the use of GPR for archeology. Considering that the market for humanitarian demining equipment is very limited and identifying a lack of interest from large companies in making the considerable investments for developing and productionising the results of their RTD,

EUDEM2 should be seen as a **pro-active measure to identify transferable HD technologies to other application domains.**

2.5 CREATION OF EXPERT INTERNET FORA

A forum, organised via co-operative work tools over the Internet will be started, to acquire more insight in bottlenecks, potentiality and amount of work to be done for the transfer of new technology towards humanitarian demining. The disseminated results should allow for making decisions whether it is appropriate to start up a more focused technology survey on certain technology areas or not (see also previous Sections).

2.6 DISTRIBUTION OF INFORMATION TOWARDS WORKING GROUPS AND CLUSTERS

Information **will be analysed and disseminated** to working groups involved in humanitarian demining. These working groups consist of people with a common theme in RTD or other activities related to humanitarian demining, e.g. mechanical demining. The working groups could use the **EUDEM web** pages as a **large information centre** that supports, fosters and facilitates novel forms of interaction between players and information available.

A central aim will clearly be to **encourage the rapid adoption and transfer of technologies, experiences on the field and know-how gathered** from past and present RTD results. **Rapid evaluation and take-up of new RTD results is pushed** since information is openly available to all parties involved in the different working groups.

This "information" will consist of providing through Internet inside information from the:

- (1) Repeat Interviews carried out,
- (2) Reports from conferences and workshops attended,
- (3) New and existing articles,
- (4) References on topics of recurrent and general interest for the R&D community,
- (5) Frequently asked questions.

This could include amongst others: current demining SOP (Standard Operating Procedures) used by NGOs and commercial end-users, and their source of origin; existing lists of deminer needs and requirements; existing test facilities (e.g. TNO, FOA, Thomson-CSF, JRC...) and corresponding contact points; lists of national and international contact points for technical questions on humanitarian demining R&D; lists of national contact points or sources of appropriate mine replicas for test purposes (often very difficult to obtain); a table featuring the roles/tasks and competencies of the key players in the domain, ...

2.7 COLLABORATION WITH OTHER ONGOING INITIATIVES

It needs to be underlined that in order to ensure efficiency, it is necessary to **closely collaborate and exchange information with other European** (JRC, EC DG's) and **supranational and international organisations** (UN, Geneva Center, JMU, NATO, WEU, ...) at all times. This necessity has been discussed amongst the above listed organizations in order to define a clear role for **EUDEM2** with respect to these organizations during several occasions, e.g. the latest JMU-UN workshop in April 2000.

2.8 MEASURABLE OBJECTIVES – MINIMUM LEVEL OF SUCCESS

The success of the EUDEM concept could be measured against the following items:

- **EUDEM Website:** i) Number of hits. ii) Links to the Website. iii) Availability (server uptime); iv) attendance to electronic fora;
- **Workshops:** i) Attendance (qualified attendance by end users and EC R&D projects). ii) Topics discussed;
- **Help Desk:** i) Use of the service. ii) Response efficiency;
- **Interviews:** i) Number. ii) Spectrum: a large number in each category in order to have a significant statistical representation, and wide views for subsequent confrontation/ discussion.

For this kind of support measure it is difficult to come up with precise figures at this stage. However, based on previous experience we estimate as minimum level of success:

- **EUDEM Website:** i, ii) After 15 months (M5+3 months) at least on average some hundred (say 300) hits per month, and **EUDEM** Website linked from most other major Websites of interest (humanitarian demining). iii) Server downtime (due to upgrades, maintenance) limited to 10-15%.
- **Workshops:** i) Attendance: at least 2-3 major European NGOs active in humanitarian demining as well as most of the current EC R&D projects (and possibly past ones as well). ii) Workshop #1: at least 2 of the indicated topics discussed in detail.
- **Help Desk:** i) About 5-10 requests per month after 6 to 12 months. ii) Provide in 75% of cases a useful reply within 48 hours (2 working days);
- **Interviews:** i, ii) Will try to repeat all the EUDEM interviews (except for organisations having “disappeared” or changed objectives, e.g. the LOTUS project, or where a change in strategy makes sense). Contact all major European defence organisations and NGOs active in humanitarian demining, ideally twice during the project.

3 PARTICIPANT LIST

The **EUDEM2** project will be carried out by three closely collaborating university departments, **EPFL (LAP)**, **TUG (MEED)** and **VUB (ETRO)**, as this formula was already successfully applied during the previous **EUDEM** project and current bilateral projects between the mentioned universities

Part. Role	Nr	Participant Name	Part. Short name	Co untry	Date enter project	Date exit project
CO	1	Vrije Universiteit Brussel	VUB	B	Start of project	End of project
CR	2	Ecole Polytechnique de Lausanne	EPFL	CH	Start of project	End of project
CR	3	Technical University of Gdańsk	TUG	PL	Start of project	End of project

(1) The **VUB** will assure in particular most of the project management tasks (organization of travel and meetings, and the workshops), the administrative follow-up of the project, the maintenance of the database, the organization of the workshops which will be held in Brussels, and most contacts with the Commission's services. The **VUB** with their expertise in Humanitarian Demining Technologies and Practices, will be responsible for the major technical aspects of the proposal and in particular the planed Technology Survey (see Section 9). (2) The **EPFL** will assure in particular the interface to **EPFL** knowledge and know-how accumulated since the beginning of the humanitarian demining related activities, most of the Support Tasks (direct support and reference material, see Section 9), and a substantial part of the contacts with the Geneva International Centre on Humanitarian Demining (GICHD). (3) The **TUG** with their expertise in theoretical and technological aspects in impedance tomography and IR thermography, applicable to medicine and ecology, will assure in depth study of the transfer of these technologies towards Humanitarian Demining (see Section 9 – Technology Survey). Moreover with their expertise in physical principles, they will contribute to the analysis of existing mature technologies in Remote Sensing, Non-destructive Testing and Evaluation, which could be transferred to HD. All other project tasks (see Section 9) are in common, with some of them (e.g. conference attendance) being assigned during the projects to one partner or the other according to the best use of resources at that time.

4 CONTRIBUTION TO PROGRAMME/KEY ACTION OBJECTIVES

4.1 TOOL FOR WORKING GROUPS/CLUSTERS

EUDEM2 is a typical support measure aiming at the **rapid adoption and transfer of technologies, field experiences, and know-how gathered from past and present R&D results**. We believe that **EUDEM2** fits very well into IST-2000-I.4.2 and IST 2000-VIII-1.2. as a **"tool for working groups"**. The present set up of the **EUDEM** database will be adapted by structuring the information so that actors are grouped into different working groups. As a consequence, working groups will be formed around "themes" (manual demining, mechanical demining, GPR, NQR, IR, Airborne etc.). **EUDEM2** can serve as a systematic information repository for members of a particular working group and towards other working groups. **The latter should forge links between the working groups. Rapid evaluation and take-up of new RTD results is promoted** since all results are openly available to all parties involved in the complete Humanitarian Demining scene.

4.2 NOVEL SERVICE

EUDEM2 contributes to the objectives of the IST programme by providing a **novel service** to the R&D policy makers within the EU and the running and new demining research projects, sponsored by the EU or by other sources. **EUDEM2** indeed not only **provides an overview of the current situation** but also tries to integrate the state-of-the-art technologies.

4.3 TECHNOLOGY SURVEY

In addition to the goals of the IST-2000-I.4.2: "develop new and enhanced existing IST solutions using data fusion and smart sensor technologies for humanitarian demining", **EUDEM2** will conduct a broad scope survey. The **EUDEM2**-team will try to understand the physical principles behind the researched technologies in depth in order to see the transferability to the HD domain. Doing so should enable us to identify and analyse mature technologies that are related or not yet directly related to landmine detection and address currently other markets. This will lead to innovation, novel products and techniques. It should also enable integration of state-of-the-art technology into systems that are currently tested or used in humanitarian demining.

Another central ingredient will be to look closely into techniques that do not involve direct human contact (as does humanitarian de-mining today). Doing this could free deminers from the existing traditional spatial constraints and enhance their safety.

We feel that the **EUDEM2** proposal has the following merits with respect to the objectives of the programme:

- *Emphasis on the support of ongoing EC-IST efforts.* In the European Policy Objectives the need to *investigate technological developments, policy and research and confront them with each other*, is stressed.
- *Clustering of the previous results and ongoing work* in order to reinforce and harmonise complementary projects without exclusion of new players from industry and academia.
- *Independence from industrial and/or political pressure groups and good working relations with many players of the present humanitarian-demining scene.*
- *Emphasis on the reusability of information, as well as data collection, analysis and dissemination; to aid affordable improvements of speed, safety and efficiency of humanitarian demining.* Information exchange already takes place in an active and fluent way.
- *Emphasis on openness and free information dissemination*, also at international level is a must for solving the global mine problem.
- *Contributing to an increased economical viability of (1) productionisation of technology for humanitarian demining and (2) field exploitation of this technology.*

5 RELATION TO PROGRAMME

5.1 INNOVATIVE ACTION

As *innovation* is a key word for the Workprogramme 2000, we want to stress that **EUDEM2** is certainly innovative as a project. During **EUDEM** information, which had never before been assembled coherently, was collected and placed on a central and public place on the world-wide web. **A need for this kind of analysed information provided via the database was expressed on several occasions**, both from the European Commission's side as from developers/researchers of the Humanitarian Demining community and other related research or industrial communities.

5.2 PROVIDING INFORMATION

A positive feedback on the **EUDEM** report, which provides a critically analysed overview of technologies, practices and services that were around in Europe during the **EUDEM** survey, was heard repetitively. **EUDEM** is well known, since daily requests for information are made, even 11 months after the termination of the first phase. **Providing information by redirecting requests to the correct person is a major task for the EUDEM-members (until today)**. Due to the short time frame of the **EUDEM** project (6 months) **much more information is to be collected and all information present needs updating**. The need to continue the effort is critical; otherwise the former effort will be lost.

5.3 SERVICE FOR WORKING GROUPS / CLUSTERS

Next to active and targeted collection, analysis, assembling and distribution of information, **EUDEM2 aims at adding value to the information gathered**. Through critical analysis, based on a close follow-up of most activities taking place within the humanitarian demining world, **information distributed will be more accessible and ready to use for the working groups**.

5.4 CONNECTING PEOPLE

EUDEM2 aims not only at providing information but also at **connecting people** so that collaboration can be streamlined more effectively. **EUDEM2** will not only facilitate interaction between members of working groups but provides true support via the information distributed. Indeed, currently running projects do sometimes display a lack of knowledge of each other's activities and of previous or related efforts, as well as a partial lack of the real end user requirements.

5.5 ORGANIZING WORKSHOPS

The **workshops**, which are scheduled around the end of each year, will bring people together on an annual basis. Organising more meetings is not justified since other initiators are also continuing to set-up workshops. Therefore **EUDEM2** opts for connecting to existing initiatives (via ARIS, JMU, CCMAT etc.) by providing support and by collection and distribution of necessary information on a publicly accessible "event" server.

5.6 FOSTER COLLABORATION

Concerning **co-operation**, **EUDEM2** will closely collaborate and exchange information with other European (JRC and other DGs than DGXIII) or supranational organisations (e.g. UN, Geneva Center, JMU, Canadian Centre for Mine Action Technology - CCMAT) at all times.

6 COMMUNITY ADDED VALUE AND CONTRIBUTION TO EC POLICIES.

EUDEM2 deals with support to European R&D and Demonstration projects on HUMANITARIAN DEMINING.

The general public's awareness of the landmine problem has constantly grown in the last 5-10 years, and so has the response of the international community. Political activities have culminated in the signature in 1997 of the Ottawa ban treaty. At the convention, the European Union (EU) committed to reinforce its efforts in helping afflicted nations clear their land of these deadly weapons, in particular in the Stability Pact Region.

The Stability Pact concentrates mainly on 5 Southeastern European countries being: Croatia, Bosnia & Herzegovina, Albania (border), Kosovo and Macedonia. This resulted from a political response by the EU to the Kosovo crisis and the political and economical problem in the Balkan area. All European countries, WE, Russia, Japan, and Canada, the UN, OSCE, Council of Europe, IMF, and World Bank adopted it in June 99. It is a working instrument for countries, international organisations and international financial institutions to make a contribution to peace, stability and economic development in the region. The EU has a key-role in developing programmes for strengthening democracy, revitalizing the economy and developing contractual ties between the countries in the region.

Certainly in financial terms and probably also in land area Croatia & Bosnia Herzegovina suffer from the worst mine problem in the world. Several thousands square kilometres of land are suspected to be contaminated with mines or UXO. With clearance currently costing on average between 2 US\$ and 5 US\$ per square meter and about 50 sq kilometres of land cleared in the last 5 years (of which only a small proportion has been fully checked and certified to be safe), progress is awfully slow. In these countries a real need exists for new technologies. **EUDEM2** is actively investigating which new technologies could be of use in South-East Europe.

We recall briefly that the EC is already heavily committed to helping mine afflicted countries, and is indeed among the world's leaders in supporting mine programmes, and also provides support for organisations such as the UN and the International Committee of the Red Cross (ICRC). Indeed, since 1992 the European Union has dedicated over 180 million EURO to its mine actions. In 1998, in particular, mine action programmes were supported by the EU in Afghanistan (1.55 million EURO), Angola (1.42), Bosnia (2.3), Cambodia (4.3), Croatia (1.0), Iraq (2.25), Laos (2.7) for a total of 15.5 million EURO (this does not include support to ICRC for 8 MEURO).

Particular emphasis is now being put in assisting the economic and social rehabilitation of the Stability Pact region by facilitating delivery of new IST technologies that will help clear all mines in the area in a 10-15 year time frame.

A number of initiatives in the field of humanitarian demining related R&D are indeed ongoing, even if not necessarily always in a well structured and optimal way, and *the overall European picture is not always clear*. This is where **EUDEM2 will contribute to the implementation of the EC's policy on humanitarian demining: by providing direct support to ongoing R&D projects and scientific and technical support to Community policies**. This will help better focus on available resources, improving efficiency and reducing the duplication of efforts in R&D programmes on humanitarian demining at national and EU level, as well as increase transparency in the communication between the projects, the end users and the donors, and between the projects themselves.

The Standing Committee of Experts on Technologies for Mine Action (**SCETMA**) stressed the problem of the co-existence of a wide variety of types of mines in the Balkan area: metallic/minimum metal, bounding mines and, other trip wire activated mines. This problem cannot be solved through the individual clearance of each mine (tedious), or through the global clearance of the area. The main problem is therefore to detect the different types of mines and to discriminate between them and other buried objects or residues.

The operators or end-users therefore insisted on the need to improve adaptable and polyvalent equipment, which should be tested under real conditions. Since to date this equipment is not available on the market and many initiatives to produce equipment that answers these demands, controlled and targeted information sharing is a must.

It is our opinion that **EUDEM2** is an activity that has to be carried out at **European rather than national level**, because an important part of current (non defence related) R&D is already carried out at supranational level. Besides it appears unlikely that resources could be brought up at national level to carry out a similar wide-ranging set of activities. Also, active interaction with other players in the field is essential.

The complementary **EUDEM2** team can provide this support based on past and current experience and knowledge gathered during **EUDEM** and before. The **EUDEM** activity was never really stopped but rather continued on a low profile so rapid take up, which deems necessary for ongoing and future EC-initiatives is feasible. Links were made and collaboration with other institutes has been ongoing and has fostered trust and willingness to effectively share information in an efficient way.

7 CONTRIBUTION TO COMMUNITY SOCIAL OBJECTIVES

We already underlined that the EC is already heavily committed to helping mine afflicted countries, a commitment which includes humanitarian demining related civilian R&D. Indeed, *civil research* activities have started at the EU level during FP4 within the HPCN domain of the Information Technologies (IT) programme, as well as by the DGVIII (GIS, airborne minefield detection, survey of mechanically assisted de-mining), to promote industrial R&D activities in Europe in support of humanitarian demining operations world-wide. These projects aim at *researching, developing and testing new systems for detecting anti-personnel landmines*, and to bring advanced equipment to the field in 2-4 years to improve speed, cost and safety of demining operations, without compromising on the rigid security standards.

Three *ESPRIT R&D* projects started in early 1998 and *six* more in early 1999 (see also Table 1), for a total EC funding of about 15 MEURO. These R&D projects are supported by a set of activities carried out in common, which include testing and evaluation, surveys, and data collection (the previous *EUDEM* project was one of them).

A new set of projects are now about to be reviewed within FP5 by DG INFSO, with the objective of “*supporting the development of smart sensors and data fusion in the context of new mine clearance technologies*”. ***Particular emphasis is being put in assisting the economic and social rehabilitation of the Stability Pact region by facilitating delivery of new IST technologies that will help clear all mines in the area in a 10-15 year time frame.***

Given the situation in the Balkan today (four years have passed since the end of the war, and most clearance work is still dedicated to short-term emergency priorities), speed is an extremely important factor. Manual de-mining in the Balkan is not only expensive to maintain. It also seems not feasible to clear the contaminated area before another decade is over, at the current speed. For the case of this area in southeast Europe especially, accidents have taken deminers' lives on very regular basis during the de-mining process.

Apart from deaths caused by mines, the major effect is the denial of access to resources. Priorities are to clear: houses and yards, clearance around power lines, water supplies, roads, bridges, and essential infrastructure, railways, roads and factories. Agricultural land, especially land for seed production and forests are the last priorities.

At present still many people in the Stability Pact Region have been unable to return to their homes. If these refugees could return to cleared areas, large sums could be saved.

Not only residential houses, but also schools, health care institutions, hospitals, factories and other public offices have been rendered unusable by the mine and UXO contamination. Costs of these aspects are more difficult to calculate, but the total number of people affected can be counted easily. Due to lack of educational facilities there is a great loss of educated people, which undermines the generation of a needed workforce that contributes to rehabilitation and development of post-war nations.

For manual clearance (MD and/or probing), which happens mostly at present in the area, many problems have been encountered. Part of the soil has a high mineral content causing continuous indications from most detectors. Household refuses such as metal cans, bottle tops, screws are causing problems when clearing next to houses and since there was heavy fighting and bombardments in many areas shells, grenade fragmentation and mine form a problem, which can **nullify** the advantages of metal detectors.

All the above aspects indicate there is a great need to get the mine-problem over with as soon as possible. Therefore there is a great need for faster clearance. A central point in the Work programme 2000 for this IST call is that "workers and enterprises should be freed from spatial, temporal and other constraints that impede creativity, productivity and co-operation" and that the quality of life has to be sustained. For the Balkan area, these objectives can only be made possible as soon as the area is made free of landmines again.

It is by providing support to a new set of projects and to the ongoing ones, as well as by providing scientific and technical support to Community policies, that **EUDEM2** wants to help implementing the social objectives of the Community regarding mine afflicted countries. A better understanding of the problem parameters and of the end user's requirements, as well as increased support to the projects and communications between them and the end users, should indeed allow focusing on appropriate solutions. The latter will in turn help speeding up demining operations, and therefore increase the region's economic growth and stability.

The following table very briefly summarises the largest European R&D projects on humanitarian demining, as well as some primarily defence oriented projects. The complex scenario of this relatively young "industry" (and therefore rapidly evolving) is evident. Note that the new EC-RTD projects are not included.

	Prime contractor	Sensors	Start	Duration, Partners*	Comments
GEODE	Dassault	pulse GPR (EMRAD), FMCW GPR? (ELTA) + MD (Förster) + IR (Marconi)	Jan. 98	15, 4P + 2A	Vehicle
MINEREC	EMRAD	GPR (EMRAD)	Jan. 98	18, 2P	GPR array, real time
Airborne minefield detection in Mozambique	ITC	ZeissLMK2000(optical), LeicaRC30(optical), VOS80C(digital), ReconCA860(thermal), AES-1(SAR)	Feb. 98	18, 12P	Pilot project EC DG VIII + some EC countries
HOPE	Vallon	pulse MD (Vallon) + stepped frequency (imaging) GPR (RST) + radiometer (DLR)	Jan. 99	24, 7P + 7A	Portable
PICE	Celsius Tech	pulse MD (Schiebel) + stepped frequency (no imaging) GPR (Celsius Tech)	Jan. 99	24, 5P + 4A	Portable
INFIELD	Detexis	pulse GPR (ERA) + continuous wave MD (Ebinger) + radiometer (ERA?)	Jan. 99	18, 3P + 1A	Portable
LOTUS	Detexis	pulse GPR (EMRAD) + MD (Foerster) + IR (Marconi)	Jan. 99	36, 4P + 1A	Vehicle
DEMINE	TUI	GPR (all)	Feb. 99	24, 6P	GPR only
MINESEYE	EPPRA	neutron (EPPRA) + digital MD (?)	Feb. 99	30, 5P	Portable, vehicle
HOM2000	TNO	GPR, MD, IR, ...		National Dutch project	Mostly Hum. Dem.
HUDEM	RMA	GPR, MD, IR, robotics, ...		National Belgian project	Purely Hum. Dem. mostly academia
-----	FOA	GPR, MD, IR, multi-spectral, explosive det. ...		National Swedish project	Mostly Hum. Dem. Portable, Airborne
EXPLODET	INFN	TNA, FNA	1998	36, 10P	Purely Hum. Dem
(several projects)	DERA	GPR, UWB, MD, IR, pol. IR, NQR, mm wave, ...		UK MoD sponsored	(nearly entirely) Defence: Portable, Vehicle, Airborne
MMSR, DMH	MaK, BGT (?)	GPR, MD, IR, multispectral, ...		German MoD sponsored	Defence: Vehicle, Airborne
(several projects)	Detexis?	GPR, MD, IR, ...		French DGA sponsored	Defence: Vehicle, Airborne

Table 1. Largest European R&D projects on humanitarian demining, as well as some defence oriented projects.

NOTE: DERA: Defence and Research Evaluation Agency (UK), Detexis: Thomson-CSF Detexis, FOA: Swedish Defence Research Establishment, INFN: Italian National Institute for Nuclear Physics, RMA: Royal Military Academy (Brussels), TNO: Netherlands Organisation for Applied Scientific Research, TUI: Techn. Universität Ilmenau (Germany).

*: P: Partner, A: Associate

8 ECONOMIC DEVELOPMENT AND S&T PROSPECTS

8.1 DISSEMINATION OF RESULTS

The central dissemination aim, as one of the key-objectives of **EUDEM2**, has already been extensively detailed in the previous sections of this proposal. All the results of activities organised (assembling lists of interest to the demining community, follow up and reporting of conferences and workshops, organisation of workshops, etc...) will be placed on the World Wide Web, in order to reach a global audience.

Active dissemination will also be carried out whenever appropriate at selected conference (including the annual workshop organised within the framework of **EUDEM2**). Journals of interest to humanitarian demining (JMU, DTIF) will also be targeted, and ARIS2 channels exploited. Each partner will take care in particular of internal dissemination in the respective country of origin.

8.2 EXPLOITATION OF THE EUDEM DATABASE AND WEBSITE

Plans to exploit the project results, in particular the database, website and online information desk, as well as other products and services identified during the course of the project (e.g. evaluation of specific technologies), will be drafted during WP350, in view of obtaining sufficient visibility to attract funding from Demining Companies and/or institutional parties.

8.3 S&T PROSPECTS

Considering that the market for humanitarian demining equipment is very limited and identifying a lack of interest from large companies in making the considerable investments for developing and productionising the results of R&D, a pro-active measure such as the technology survey is required for identifying transferable technologies from other application domains towards humanitarian demining. This activity goes beyond satisfying a purely academic interest by identifying and convincing **new technology providers** from the studied application domains to transfer technology into the field of humanitarian de-mining. Conversely, *spin-offs from humanitarian demining projects to other application domains* will also be studied.

Competitiveness will be stimulated since all working groups involved will get a constant input through the support action of **EUDEM2**. More visibility will be provided in particular to EC projects, as well as for new technologies as a whole. An indirect gain will consist in helping to avoid duplication of efforts.

For the ***EUDEM*** participants and for those that will invest themselves in the analysis of information the vast past experience will be of great use. Stimulation is constantly fostered by the constant exploration of the Humanitarian Demining industry and possible other industries. Being engaged to a support measure, as ***EUDEM2*** will keep the participants informed of what is going on in- and outside the Humanitarian Demining scene. Therefore it should also lead to elaborated creativity in our own laboratory.

9 WORKPLAN

9.1 WORKPLAN STRUCTURE

This workplan describes the activities foreseen for **EUDEM2**. The overall work with respect to the **EUDEM2** objectives is divided into 8 work packages specified in the following paragraphs:

9.1.1 Information Gathering, Analysis and Dissemination

The actively collected information, which will be disseminated after thorough analysis will be placed on the web site and in the database as described in "*WP300- Dissemination and Exploitation*".

The methodology used for achieving these objectives is described in the methodology section underneath. The existing database will be updated and organised in a user-friendly way (e.g. per (1) themes: GPR, IR, MD etc., (2) groups: end-users, industrial organisations, research centers, etc., (3) others if relevant). This will lead to easy navigation and search for targeted information.

The web site will include regular reporting of conferences and workshops attended within the domain of humanitarian demining in collaboration with ARIS, JMU and other supporting activities. Next to this, bibliographical news will be maintained and distributed.

A facility will be added to the Website of **EUDEM2**, where EC-RTD project results and lessons learned will be inventoried; this information will be retrievable on simple queries. In addition we will try to make retrievable, on simple queries, information on EU-Operational HD projects. It is understood that the analysis of such data is not up to **EUDEM2**, nor that existing information will be rebuilt (e.g. database at JRC-Ispra).

WP600 Interviews deals with the repeat interviews. Selected interviews will be held in order to collect other than factual data, which can be collected through questionnaires. Ideas captured during the search can be confronted and discussed in detail. This method of repetitive interviewing allows us to verify and put into perspective which information is relevant and reliable for distribution. The interviews will be made available after formal approval of the interviewees.

9.1.2 Support

Support of ongoing EC-RTD activities plays an important role in **EUDEM2** as a continuous activity. *WP500 Support Task* is dedicated to this task. Requests can be made

for information and **EUDEM2** will either directly provide the information or direct the user to the source where the information can be found. This will help to avoid duplication in research and speed up the research processes undertaken during RTD. The **EUDEM2** team will respond/acknowledge simple queries within 48 hours (2 working days). Complex cases will be treated within a maximum of a week. Contacts with existing online consultation services, such as Enviro2B, will be made and synergy developed will be exploited.

9.1.3 Technology Survey

Considering that the market for humanitarian demining equipment is very limited and after identifying a lack of interest from large companies in making the considerable investments for developing and productionising the results of R&D, an action is required for identifying transferable technologies from other application domains towards humanitarian demining. Analysis of the various ongoing initiatives aiming at increasing the overall efficiency of humanitarian demining, reveals that none of them include a co-ordinated and continuous effort to address this issue. The variety of tasks required in Mine Clearance Operations, and the structuring of their goals as expressed in the UN international Standards for Humanitarian Mine Clearance Operations (Level 1 Surveys, Level 2 Surveys including area reduction, mine clearance, Level 3 surveys including quality control) opens perspectives for brand new technology approaches. The existence of this potential has been widely acknowledged by the R&D community on humanitarian demining. Workshops are being organised to bring actors of diverse domains together, but their results stay superficial due to lack of continued effort and co-ordination. Rarely the identified technologies, are analysed in sufficient depth, up to a point where a realistic project plan can be made for the transfer of know how and for the study of the adaptations needed to meet the requirements of humanitarian demining. No analysis is made on the actual amount of effort required, no solid work plans are prepared, no physical feasibility tests are organised, no systematic analysis of the possible operational procedures is made, etc. Current practises, such as the use of dogs, mechanical demining have never been researched thoroughly. To our knowledge some interesting initiatives have been undertaken by e.g. the German Federal Foreign Office, Handicap International and the Geneva Centre for producing reports on demining tool boxes, demining material and its usage. A more in depth study in close collaboration with the above mentioned organisations will be a task for the **EUDEM2**-team. The technology survey activity will be carried out worldwide, through literature analysis, direct contacts and participation to international conferences. *WP400 Technology Survey* should help bridging the gap between identified potential and feasibility tests as well as RTD projects.

9.1.4 Distribution of targeted information towards Working Groups/Clusters

Targeted information collected during WP300, WP400, WP500, WP600 and WP700 will be distributed towards the working groups and clusters. This should enable the working groups and clusters to collaborate and use the results obtained by **EUDEM2** and other working groups so that duplication is again avoided and research activities can be speeded up. Information will be shared within and between groups so that valuable opinions of others will serve everyone involved.

EUDEM2 will act as a catalyst for clustering activities. It will analyse previous and current EC-RTD projects on HD, define cluster themes, and helps DG-INFSO preparing 2 yearly cluster meetings, with key partners that are involved in the ongoing EC-RTD projects, on specific focus. This task is described in *WP540 CLUSTERS ORGANIZATION* and *Section 10 Clustering*. It is understood that the cost of bringing key partners and appropriate speakers as well as of the rapporteur will be born by the DG-INFSO.

9.1.5 Workshops

In order to confront opinions captured during the technology surveys and the interviews and to foster collaboration between the R&D and the demining communities, workshops (WP700) will be organized at the end of each year of the project. The reports and recommendations will be made available through WP300.

9.1.6 Evaluation & Assessment

At each phase of the project, the **EUDEM2** performance will be evaluated against the concept and technical specifications (see *WP120 Evaluation & Assessment*). This will be done in particular at regular intervals and/or for specific events, i.e. after each Milestone, EUDEM2 Workshop, during and after the half-year meetings with DG-INFSO and the regular meetings scheduled with the Advisory Panel. End-user (“customer”) feedback – for example during Interviews, Support Tasks activities (e.g. the Help Desk) and Workshops – will be an integral part of the evaluation process as well as DG-INFSO and Advisory Panel input (e.g. for the validation of deliverables). The output of this continuous evaluation will be fed back directly to the project management and corrective actions taken where necessary.

We will monitor in particular all the defined measures of success (see Section Measurable Objectives – Minimum Level of Success) as well as the risks mentioned under “Risk Analysis” (See Section Management).

9.2 METHODOLOGY

9.2.1 Development Phases

The project has been structured in eight workpackages following a development cycle with the following main phases:

- **Requirements and Concepts:** Detailed specifications of the EUDEM2 concept.
- **The EUDEM2 implementation:** realisation and/or enhancement of the existing Web and Database components. Implement the Support Task and Interviews.
- **End-user qualification:** through the Support Task, Database and Workshops, evaluation and validation.

As already defined the Milestones and the half-year reviews with the DG-INFISO as well as the meetings with the Advisory Panel will be used for the evaluation of each phase.

9.2.2 Information Definition

EUDEM2 will have to be “end user” oriented to be effective, whereby our “end users” are represented by interested parties within the EU, the European humanitarian demining R&D community, and the actual deminers in the field. The information searched will therefore be defined early in the project, leaving the possibility of changing priorities according to evolving needs open.

The option of forming thematic end user groups, i.e. groups of persons or institutions having a common interest in one of the topics of a predefined list (for example manual demining, or mechanical demining, or GPR, or NQR, etc.) will be explored. The 3 different levels of current mine action will be used as a basis for defining the user groups which will be subdivided according to the practices used (e.g. mechanical, manual demining, dogs, etc.), and the research themes addressed (e.g. GPR, IR, MD, data fusion, etc.). This will allow targeted information collection and dissemination.

As databases become quickly obsolete, updates are required on a regular basis and will be guaranteed during the entire project.

9.2.3 Information Collection

The **EUDEMI** survey confirmed that people are usually rather open for discussions and information exchange, but that it is often necessary **to establish direct contacts** and

actively search for information. Information collection will therefore be carried out as a combination of **literature reviews, telephone contacts, questionnaires** where appropriate, **repeat face-to-face interviews** – most information collected during the interviews has been indeed very valuable in order to get a clear perspective of certain technologies and opinions – and **attendance to conferences and workshops** dealing with humanitarian demining related topics (not limited to R&D aspects).

All organisations listed in the present **EUDEM** database will be **re-contacted** with a request to **update** their entries¹. They will be informed about the **future initiatives** of **EUDEM2**.

New actors that were not reached in the **EUDEM** project will be contacted in **EUDEM2**.

As the search goes on we foresee to come across **new technologies (Technology Survey)**, from other application domains e.g. non-destructive testing (NdT), airport surveillance, bio-technologies, biological sensors, the agro-alimentary technologies, remote sensing for agriculture and land cover identification, etc. **EUDEM2** should lead to a close investigation starting from existing EC-RTD programs and networks related to this issue, such as NOSE, CLAWAR, etc. The technology survey activity will be carried out worldwide, through literature analysis, direct contacts and participation to international conferences. The methods for this are based on initial contacts with experts in the selected domain, complemented by existing literature. This leads to a first, coarse description of the technology ("higher level view", understandable for non-specialists) and of its strengths and weaknesses.

Next to interviews and personal contacts it is necessary to participate to crucial **workshops/conferences** and meetings, in order to remain informed about all available information.

Other sources such as the MgM mailing list, JMU, UWA, GICHD, ARIS, UN etc. will be constantly monitored so that information offered will be as complete as possible.

This approach will aid to information collection targeted on a given topic, to reply to a specific request or to investigate a given theme upon request of the working groups, the Commission or other users.

During **EUDEMI** we have been in contact with defence research centres such as TNO, FOI, DERA and WEU. We will reinforce our links to these institutions through direct and maintained contacts as well as through the help of the Advisory Panel members. These contacts will be extended worldwide: Canada, US, Australia and Japan.

¹ During the first two months the current subscribed actors of the database will be contacted and information will be updated on a daily basis by a mailing, using both Internet and ordinary mail.

9.2.4 Information Analysis

The **EUDEM2** team has already similar previous experience in particular survey actions and information analysis. The most useful pieces of information will be filtered out, and “executive summaries” will be provided for the reports. Information will be grouped into classes, according to the predefined user needs (see above), with priority to the Commission’s RTD&D programmes as well as the requirements of the ongoing projects and those about to start. Where necessary, input from external specialists will be requested.

Emphasis will be put on the **structuring of useful information** by providing categories, short profiles of sites and/or organisations, short document summaries, etc. The user should be able to quickly understand which information is available, and to get an idea of its contents and value. It could also be envisaged to collect a few “*key references*” for each major topic of interest.

9.2.5 Information Dissemination

Information dissemination will be carried out with the same spirit of openness already displayed during the previous **EUDEM** survey, i.e. making available as much material as possible.

Appropriate information dissemination channels will also have to be agreed upon. We foresee extensive use of the Internet, for example via the already existing **EUDEM** site (<http://www.eudem.vub.ac.be/>); whenever it is appropriate, mirror copies can be made available, either as several homepages or as a complete site (e.g. at VUB, DG INFSO and ARIS (as a separate node). Other dissemination channels include electronic mails or fax/letter where necessary, and CD-ROM copies where justified (for example for copies of web sites, or video material). Part of the dissemination itself will take place in a natural way during the interviews, as indeed already happened during EUDEM.

The **EUDEM** database has been purposefully kept simple to have maximal user friendliness. This will be a central element for the elaborated **EUDEM2** site since pictures and fancy web pages cause a lot of downloading problems, which harms the user friendliness.

9.2.6 Collaboration and Visits

Repeated collaboration and exchange of information with other European (JRC and other DGs than DGXIII) or supranational organisations (UN, Geneva Center, JMU, Canadian

Centre for Mine Action Technology – CCMAT) will be organised at all times. It will be necessary to fulfil an active role by participating in relevant workshops and working groups on the issue, and exchange visits to discuss the role of **EUDEM2** among the already existing roles of the organisations mentioned above, so that fluent collaboration can be established in a bi-directional way. The **EUDEM2** team will also stay in touch with the individual ongoing projects.

Visits to certain organisations will take place during the course of the project. We will try to group necessary visits as much as possible to limit the costs involved.

9.2.7 Working Groups/Clusters

The present set up of the database can be easily adapted if we group all actors into different **working groups**, being: national governing bodies (ministries), international governing bodies (European Commission, Geneva Center, UN, etc.), NGO's and commercial demining organisations, research institutes, commercial/industrial R&D, ... Next to that, other working groups can be formed around certain "themes" (manual demining, mechanical demining, GPR, NQR etc.)

9.2.8 Technology Survey

The technology survey consists in three main tasks:

- Literature-based analysis of limitations of technologies under research for HD (current RTD projects)
- Spin-off's for the technologies under research for HD (current RTD projects)
- Identification of new technologies not directly related to HD

We describe the typical Technology Survey "Life Cycle", applicable to groups of technologies in addition to individual ones:

- 1) Identification of technologies of interest and possible priority ranking (from literature analysis).
- 2) Initial contacts with experts in the selected domain, complemented by existing literature. This leads to a first, coarse description of the technology ("higher level view", understandable for non-specialists) and of its strengths and weaknesses.
- 3) Visits of companies and institutions dealing with the technology. Emphasis should also be placed on understanding how the technology is tested (testing methodology, success criteria) and on checking possible developments already carried out in the defence sector (documented but not available to the large public). During this phase direct contacts, coupled to an active search for information, are a major priority.

- 4) In depth analysis of the technology ("lower level") and of recent technological progress. For the in depth analysis we will seek advice from experts in the relevant domains. Technology assessment via a "maturity table", containing information on: technology maturity, equipment performances (especially detection rate), existing and/or projected cost, weight, size, response time, etc.
- 5) Assessment of compatibility to demining needs and circumstances. Evaluation of cost and feasibility of adapting the equipment to the deminer's needs and to the peculiarities of humanitarian demining applications (environmental conditions, single sided sensor deployment, ergonomics, sensitivity...), and of the real "potential" of the technology for humanitarian demining applications. Again the advice from relevant demining experts will be sought.
- 6) Document the final findings and allow for feedback, especially by other experts (see above); seek the deminers' advice wherever appropriate.
- 7) Information dissemination via appropriate channels. Organise workshops or business partnership fora, if a promising approach has been analysed.

9.3 WORK AND RESOURCES

9.3.1 Workpackage List

WP #	Workpackage title	Lead contractor	Person-Months	Start Month	End Month	Deliverable
100	PROJECT MANAGEMENT	CO1	6.7	m1	m36	D1,D2,D3,D4,D5,D6
110	<i>PROJECT CO-ORDINATION</i>	CO1	4.7			
120	<i>TECHNICAL COORDINATION</i>	CO1	2			
200	REQUIREMENTS & CONCEPT	CO1	5.5	m1	m7	D7, D8
210	<i>EUDEM WEBSITE & DATABASE</i>	CO1	1			
220	<i>INFORMATION RETRIEVAL FACILITY</i>	CO1	1.5			
230	<i>TECHNOLOGY SURVEY</i>	CO1	1			
240	<i>SUPPORT TASK</i>	CR1	1			
250	<i>INTERVIEWS</i>	CR1	1			
300	DISSEMINATION & EXPLOITATION	CO1	10	m3	m34	
310	<i>EUDEM WEBSITE</i>	CO1	2			
320	<i>EUDEM DATABASE</i>	CO1	1.5			D10
330	<i>INFORMATION RETRIEVAL FACILITY</i>	CO1	3.5			D11
340	<i>WORKSHOPS & CONFERENCE REPORTING</i>	CR1	1.5			
350	<i>EXPLOITATION PLAN</i>	CO1	1.5			D9, D12, D13
400	TECHNOLOGY SURVEY	CO1	17	m7	m34	D14, D15
410	<i>MECHANICAL SYSTEMS</i>	CO1	2			
420	<i>BIOSENSORS</i>	CO1	2			
430	<i>NDT&NDE</i>	CO1	5			
440	<i>CHEMICAL SENSORS</i>	CO1	2			
450	<i>REMOTE SENSING</i>	CO1	4			
460	<i>OTHER</i>	CO1	2			
500	SUPPORT TASKS	CR1	9.5	m4	m34	D16, D17
510	<i>INFORMATION DESK</i>	CR1	4			D17
520	<i>REFERENCE MATERIAL</i>	CR1	1			
530	<i>CLUSTERS ORGANIZATION</i>	CO1	3.5			D16
540	<i>EC-RTD PROJECTS REPRESENTATION</i>	CO1	1			
600	INTERVIEWS	CO1	6	m7	m34	D18, D19
700	WORKSHOP ORGANISATION & REPORTING	CO1	5.5	m12	m35	
710	<i>WORKSHOP #1</i>	CO1	1.8			D20
720	<i>WORKSHOP #2</i>	CO1	1.9			D21
730	<i>WORKSHOP #3</i>	CO1	1.7			D22
800	FINAL REPORTING	CO1	3.5	m35	m36	D23
900	EVALUATION & ASSESSMENT	CO1	1.5	m8	m36	
	TOTAL		65.2			

9.4 WORKPACKAGE DESCRIPTION

9.4.1 Project Management

Workpackage number :	WP1: Project Management		
Start date or starting event:	M1		
Participant number:	VUB	EPFL	TUG
Person-months per participant:	4.7	1.5	0.5

Objectives

- Lead the project to achieve commitments: delay, cost, technical results
- Ensure the compliance with the technical project objectives and the coherence of the whole project
- Check the contents and results of the project at each phase

Description of work

WP110: Project Coordination

- Internal administrative management including decision making, exchange of information and contractual issues
- External administrative management including liaison and contractual issues with the EU
- External communication for interviews and workshops: planning, appointments, mailing, etc

WP120: Technical Coordination

Conduct with the **Advisory Panel regular meetings for:**

- project progress: technical reviews and validation of deliverables
- technical progress reporting to the EU
- workshops preparation and interventions during the workshops
- follow-up of the implementation of **EUDEM2**.

Deliverables

- D1** Half year Management Report 1
- D2** Yearly Report 1
- D3** Half year Management Report 2
- D4** Yearly Report 2
- D5** Half year Management Report 3
- D6** Yearly Report 3

Milestones and expected result

M1 Kick-off Meeting report

Note that the half year reporting D1, D3, D5: will include the progress as well as a summary on the activities on Support Tasks (WP500) and a summary of for a discussions

The yearly reports D2, D4, and D6 will include also the evaluation and assessment of the **EUDEM2**

9.4.2 Requirements & Concept

Workpackage number :	WP2: Requirements & Concept		
Start date or starting event:	M1		
Participant number:	VUB	EPFL	TUG
Person-months per participant:	3.5	1.5	0.5

Objectives

Detailed specifications of the *EUDEM2* concept

Description of work

WP210: EUDEM Website & Database

- Define the requirements & concepts for the web and database (content/structure/access)

WP220: Information Retrieval Facility

- Define the concept of Information retrieval from different sources
- Establish the system requirements to implement this concept for EU RTD and operational HD projects databases and web sites

WP230: Technology Survey

- Identification of technologies of interest
- Initial contacts with experts/companies/universities
- Bibliography search

WP240: Support Tasks

- Define the requirements & concepts for the information desk
- Define themes for clusters and working groups

WP250: Interviews

- Summarize the previous interviews
- Initial contact with the previous interviewees
- Identify new players
- Build the interviews themes and agenda

Deliverables

D7 Project Presentation

D8 Report on EUDEM2 Concept

Milestones and expected result

M3 *EUDEM2* Concept Meeting with the advisory panel

EUDEM2 Concept Report

9.4.3 Dissemination & Exploitation

Workpackage number :	WP3: Dissemination & Exploitation
Start date or starting event:	M3
Participant number:	VUB EPFL
Person-months per participant:	6 4

Objectives

Update, maintain and expand the already existing EUDEM database (<http://www.eudem.vub.ac.be/>) and Web pages. The online database needs updating and expanding in order to remain a complete and user-friendly tool to the working groups supported and the outside world.

Description of work

WP310: EUDEM Website & Internet Forum

Consolidation of existing material and dissemination via the *EUDEMI* Web pages. Amongst other topics:

- i) List of Internet links.
- ii) Publications (commented whenever possible).
- iii) *EUDEM* interviews. Make available the results of the interviews after approval of the interviewees.
- iv) Information Retrieval Facility

WP320: EUDEM Database

Database and Web pages **maintenance and updating:**

- Constant updating on the already existing information;
- New invitations for making entries to actors which are not present now;
- Re-arranging the entries so that the information gathered becomes more transparent to its user. **Address file with all contacted actors:** the existing file will have to be put into a user-friendly format..

WP330: Information Retrieval Facility

- Implementation of *web retrieval facilities* for EU RTD and operational HD projects databases and web sites
- Test the effectiveness of this approach for project results analysis and lessons learned

WP340: Workshop & Conference Reporting

- Make available the reports on the attended Workshops & Conferences

WP350: Exploitation Plan

- Development of plans for the exploitation of the EUDEM web and Database
- Description of products and services and their competitive advantages (see WP400)
- Analysis of feature developments (see WP400)
- Analysis of spin-off's of the current EC-RTD HD projects

Deliverables

D9 Dissemination & use plan; **D10** Database & Website Final Report
D11 Information Retrieval Facility Report
D12 Exploitation Intermediate Report; **D13** Technology Implementation Plan.

Milestones and expected result

M2 EUDEM database Update
M4 Information Retrieval Facility
M5 Expand EUDEM database and web site with all relevant information organized for easy navigation
M7 Technology implementation Plan (**D13**)

9.4.4 Technology Survey

Workpackage number :	WP4: Technology Survey		
Start date or starting event:	M7		
Participant number:	VUB	EPFL	TUG
Person-months per participant:	6	5	6

Objectives

- *Identifying* and *analysing* technologies that are currently not directly related to landmine detection, with the aim of *identifying the most promising ones for humanitarian demining*.
- Estimation of *associated time frames* and efforts needed for the transfer of the most promising technologies towards humanitarian demining.
- Concentrating on technologies that could yield *significant breakthroughs* in both industrial and societal terms, by *actively involving new players from industry and academia*.
- Organization of an **expert fora** for co-operative consensus building on specific new technologies
- **Identify spin-off's** for technologies under research (current EC-RTD projects)

Description of work

The technology survey process should be based on an active and targeted information collection and analysis. To be more precise, the work carried out consists of

- Identification of technology areas (literature based analysis), the main actors and information sources (existing reports, databases), primarily by carrying out selected interviews, and visits of companies and institutes.
- In-depth knowledge to be gained by expert opinions.
- Confrontation of the findings with the opinions of representatives of the end-user community.
- Assessment of the compatibility of the identified technologies to demining needs and circumstances. Evaluation of cost and feasibility of adapting the equipment to the deminer's needs and to the peculiarities of humanitarian demining applications (environmental conditions, sensor deployment, ergonomics, sensitivity...), and of the real "potential" of the technology for humanitarian demining applications.
- Documentation of the findings and collection of the feedback, especially from technology experts and deminers, whenever appropriate.
- Information dissemination via appropriate ARIS channels. Organization of workshops.
- Organisation of expert fora and business partnership forum for the most promising technology.
- Literature-based analysis of limitations of technologies under research (current EC-RTD projects)

WP410: Mechanical Systems

WP420: Biosensors

WP430: Non Destructive Testing & Non Destructive Evaluation

WP440: Chemical Sensors

WP450: Remote Sensing

WP460: Other

Deliverables

D14 Technology Survey Report 1; **D15** Technology Survey Report 2

Milestones and expected result

M6 Technology Survey Intermediate Results

State-of-the-art of maturity of new and existing technologies available online

9.4.5 Support Tasks

Workpackage number :	<i>WP5: Support Tasks</i>
Start date or starting event:	M4
Participant number:	VUB EPFL
Person-months per participant:	4.1 5.5

Objectives

- Provide direct support and reference material on topics of recurrent and general interest to R&D on humanitarian demining through the information desk service
- Support the ongoing projects and interested parties within the EU.
- Assist and support DG-INFISO to foster clustering activities

Description of work

WP510: Information Desk

- Provide an “**Information Desk**” service to individuals/organizations, with priority to the ongoing EC funded projects, looking for specific technical information or knowledge.

WP520: Reference Material

Provide a collection of **reference material** – without duplicating information or existing efforts – on **topics of recurrent and general interest** for the R&D community, such as:

- i) Current demining **SOP** (*Standard Operating Procedures*) used by NGOs and commercial end users, and their source of origin;
- ii) Existing lists of **deminer needs and requirements**;
- iii) Existing **test facilities** (e.g. TNO, FOI, Thomson-CSF, JRC...) and corresponding contact points;
- iv) If possible a list of **national and international contact points** for technical questions on humanitarian demining R&D;
- v) If possible a list of national contact points or sources of appropriate **mine replicas** for test purposes (often very difficult to obtain);
- vi) A table featuring the **roles/tasks or competences of the key players** in the domain so that users can find more easily where to turn to when a certain problem or question appears.

WP530: Clusters Organization (see Section 10 Clustering)

- Analysis of the current EC-RTD projects and definition of cluster themes and cluster groups
- Organizing 2 yearly cluster meetings on behalf of DG INFISO in terms of logistic (themes, contact persons and rapporteurs definition as well as preparing the meetings: invitations, mailing, etc..)
- Helping the DG-INFISO on reporting the Clusters meetings
- It could also be of interest, in particular when the next EU call for proposals will be made public, to create a repository, either internal or public (to be defined, and to be considered only if this functionality is not already available at the EU), for **expressions of interest** (for example of organisations looking for partners or offering their specific expertise).

WP540: EC-RTD projects Representation

Represent and present EC-RTD projects and DG-INFISO activities in selected conferences or workshops
Using either the projects public information or a clear mandate from the projects

Deliverables

- D16** Clusters themes;
- D17** Final Report on Support Task

Milestones and expected result

The reporting of WP510, 520 and 540 will be included in the half year management reports.

9.4.6 Interviews

Workpackage number :	WP6: Interviews
Start date or starting event:	M7
Participant number:	VUB EPFL
Person-months per participant:	4 2

Objectives

- Re-interview the actors which have been interviewed during the first EUDEM-phase, and confront their previous/new ideas
- Interview of new actors
- Analyse & Disseminate the interview results

Description of work

The **EUDEM** survey confirmed that people are usually rather open for discussions and information exchange, but that it is often necessary to establish **direct contacts** and **actively search for information**. Hence the need to carry out interviews. Appointments will be made, grouped in same countries and combined with attendance to workshops or conferences, whenever possible. Good and sound planning is a must.

The **interviews** will be **studied in depth** and ideas will be **compared and confronted** in an **anonymous** way. Reactions on certain visions will lead to a **final confrontation** during the first **workshop**.

Deliverables

D18 Interviews Intermediate Report;
D19 Interviews Final Report

Milestones and expected result

Note: Separate report of interviews conducted will be made available gradually during the project..

9.4.7 Workshop Organisation & Reporting

Workpackage number :	WP7: Workshop Organisation & Reporting		
Start date or starting event:	M12		
Participant number:	VUB	EPFL	TUG
Person-months per participant:	4.5	0.5	0.5

Objectives

Organize and hold a first workshop, mainly concentrating on topics extracted from the already existing interviews. Report on the workshop results. Organize and host two other workshops for reporting on Technology Survey

Description of work

WP710: Workshop #1 Organisation & Reporting

The existing interviews will be analysed and most interesting quotes will be gathered for a confrontation of the representatives of the different working groups (formed of the research community involved in humanitarian demining, the end-users (NGOs), and companies that are producing tools for humanitarian demining). The participants will be chosen according to the subjects having the greatest relevance at workshop time for the humanitarian demining R&D community and the Commission, and not having already been covered in similar events. Ideally all Commission services active in humanitarian demining tasks should be represented. Rapporteurs will be invited to summarize topics of general interest, which are likely to include some of the following:

- Overview of European humanitarian demining R&D (outline, achievements, lessons learned);
- Presentations from some of the EC financed R&D projects;
- Overview of the experience of the end users involved in the R&D projects;
- Overview of field experience and testing.

Other possible topics include: Developments in IT applications and needs; "Niche" applications, and topics not covered by other similar events (e.g. mechanically assisted demining).

WP720: Workshop #2 Organization & Reporting

Organize and hold a workshop at the end of the 2nd working year of the project, in order to gather some people met for discussion during this year. The topic of the workshop will depend on the results of the technology survey. Report on the workshop results.

Interviews carried out, literature, people met on workshops or conferences who have new and inventive ideas will be invited for a workshop at the end of each year during the project to exchange these ideas and come up with guidelines and recommendations for future work within the field of humanitarian demining.

WP720: Workshop #2 Organization & Reporting

Organize and hold at the end of the 3rd working year of the project a workshop, in order to gather some people met discussion during this year. The final or third year workshop could also be used to make an overview of the advances made during the three year project. The evaluation of how **EUDEM2** has served its purposes will be an issue on the agenda of this last workshop. Report on the workshop results.

All interviews carried out, literature consulted, people met on workshops or conferences who have new and innovative ideas during the three year search will be invited for a workshop at the end of the final year of the project to exchange ideas and come up with guidelines and recommendations for future work within the field of humanitarian demining. Advances will be evaluated by the different working groups and also the way of how **EUDEM2** helped to these advances.

Deliverables

D20 Report Workshop #1; **D21** Report Workshop #2; **D22** Report Workshop #3

Milestones and expected result

Each workshop report will contains a summary of topics of general interest, conclusions, recommendations and participants presentations

9.4.8 Final Reporting

Workpackage number :	WP8: Final Reporting		
Start date or starting event:	M35		
Participant number:	VUB	EPFL	TUG
Person-months per participant:	2	1	0.5

Objectives

Summarise all previously described deliverables (the most important issues, the lessons learned and the perspectives for the future) in a Final Report.

Description of work

The final report will include an analysis of the contents of the database, complete overview of all interviews carried out, the interviews typed-up, the analysis of new technologies met and their perspectives for the future, maturity table of technologies, spin-off's of the current EC-RTD projects on HD, general conclusions and discussions, guideline and recommendations for the future of Humanitarian Demining related R&D.

Deliverables

D23: Final & Synthesized Report

Milestones and expected result

At the end of three years all presently ongoing projects will have been finished and the new projects will have been on their way for quite some time. This should open new perspectives for the future and ongoing research within the domain. *EUDEM2* will aim at openness and dissemination of information, including the final report. This final report will be made available on the Internet as soon as approval of the report by the European Commission has been obtained.

9.4.9 Evaluation & Assessment

Workpackage number:	WP9: Evaluation & Assessment	
Start date or starting event:	M8	
Participant number:	VUB	EPFL
Person-months per participant:	1	0.5

Objectives

This task will be conducted with the help of the Advisory Panel

- Ensure the compliance with the technical project objectives and the coherence of the whole project
- Checking process of the indicators for success
- Evaluate and assess the project at each phase

Description of work

At each phase of the project, the **EUDEM2** performance will be evaluated against the concept and technical specifications. This will be done in particular at regular intervals and/or for specific events, i.e. after each Milestone, **EUDEM2** Workshop, during and after the half-year meetings with DG-INFISO and the regular meetings scheduled with the Advisory Panel. The output of this continuous evaluation will be fed back directly to the project management and corrective actions taken where necessary (Quality Control and Assurance). We will monitor in particular all the defined measures of success (see Section Measurable Objectives – Minimum Level of Success) as well as the risks mentioned under “Risk Analysis and Mitigation Plan”

In particular with the help of the Advisory Panel:

- Preparation of the deliverables
- Documents/Reports approbation
- Checking process of the indicators for success: forum success; # of entries in the DB, # of contacts info desk; success of the interviews, information retrieval facility
- Quality assurance

Deliverables

See yearly reports (D2, D4, D6)

Milestones and expected result

The yearly reports D2, D4, and D6 will include also the evaluation and assessment results of the **EUDEM2**

9.5 DELIVERABLES LIST

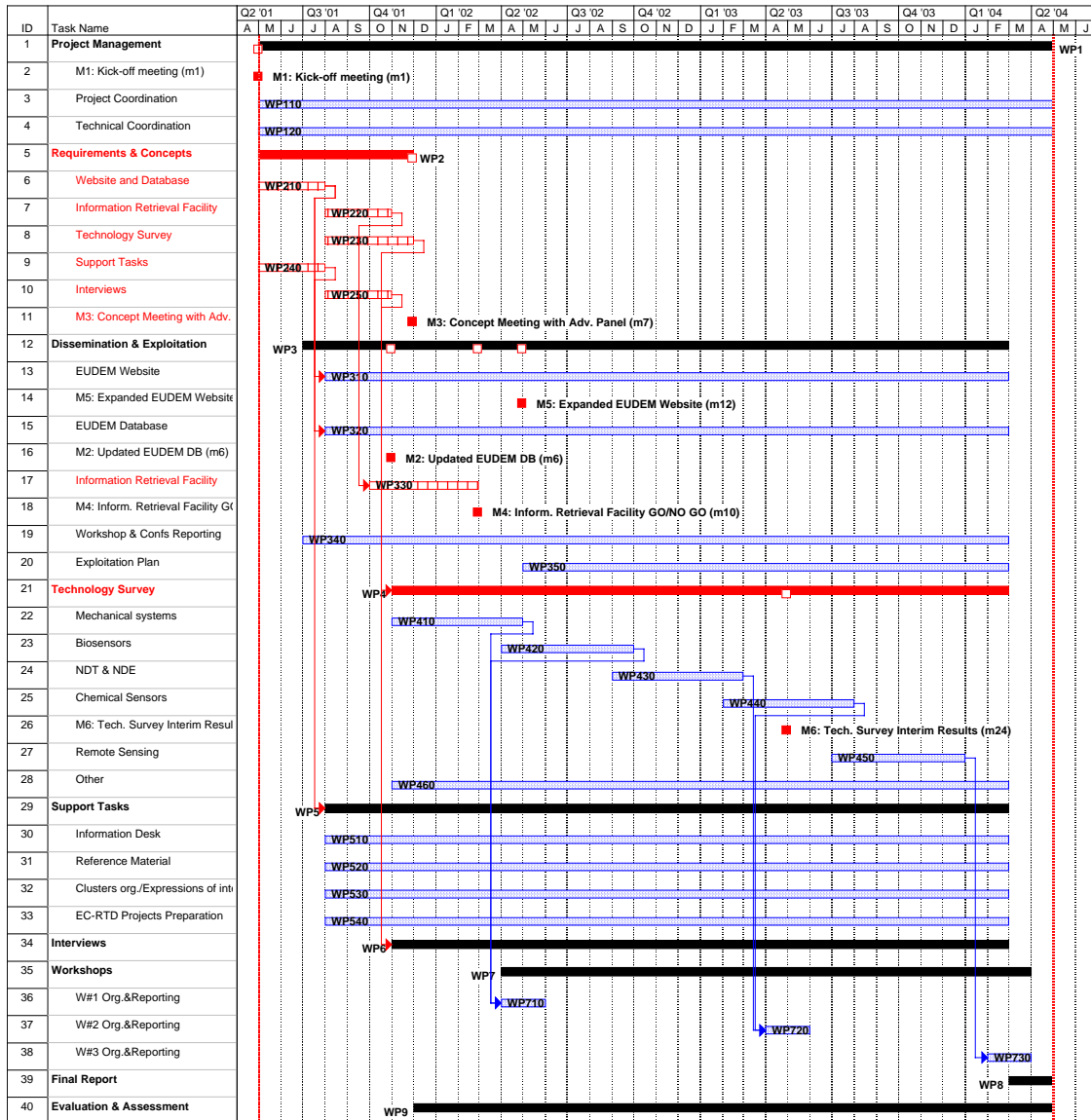
Del. no.	Deliverable name	WP no.	Lead participant	Del. type*	Security**	Delivery (proj. month)
D1,D3, D5	Half-yearly Management Reports	WP100	CO	Report	Rest1	6, 18, 30
D2,D4, D6	(Edited) Annual Reports	WP100	CO	Report	(Pub)Rest1	12, 24, 36
D7	Project Presentation		CO	Web	Pub	4
D8	Requirements & Concept Final Report	WP200	CO	Report	Rest1	7
D9	Dissemination & Use Plan	WP350	CO	Report	Rest1	6
D10	DB & Website Final Report	WP310 WP320	CO	DB, Web	Pub	32
D11	Information Retrieval Facility Report	WP330	CO	Web	Rest1	9
D12	Exploitation Intermediate Report	WP350	CO	Report	Rest1	24
D13	Technology Implementation Plan	WP350	CO	Report	Rest1	34
D14	Tech Survey Report 1	WP410 WP420	CO	Report	Rest1/Pub*	18
D15	Tech Survey Report 2	WP430 -460	CO	Report	Rest1/Pub*	34
D16	Cluster themes	WP530	CO	Report	Pub	7
D17	Support Tasks Final Report	WP5	CR1	Report	Rest2	34
D18	Interviews Intermediate Report	WP6	CO	Report	Rest2	18
D19	Interviews Final Report	WP6	CO	Report	Rest2	34
D20	Report Workshop #1	WP710	CO	Workshop	Pub	14
D21	Report Workshop #2	WP720	CO	Workshop	Pub	26
D22	Report Workshop #3	WP730	CO	Workshop	Pub	35
D23	EUDEM2 Final Report	WP8	CO	Report	Rest1/Pub*	36

Rest1: Restricted circulation (only members of the consortium) and Commission services

Rest2: Restricted circulation (to a group specified by the consortium) and Commission services

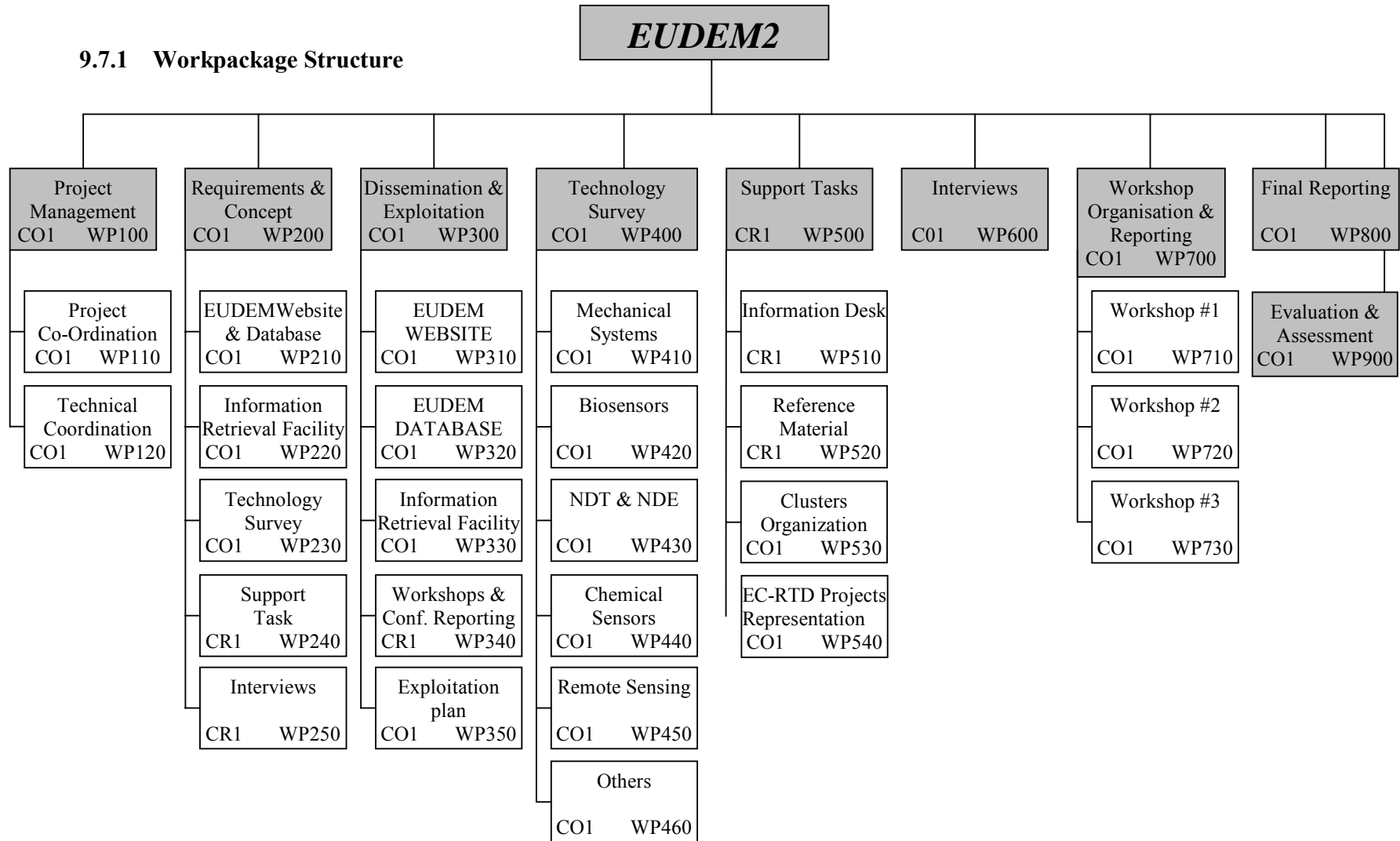
Pub*: Part of the report might be confidential if requested by the contributing industries and/or research institutes

9.6 PROJECT PLANNING AND TIME TABLE

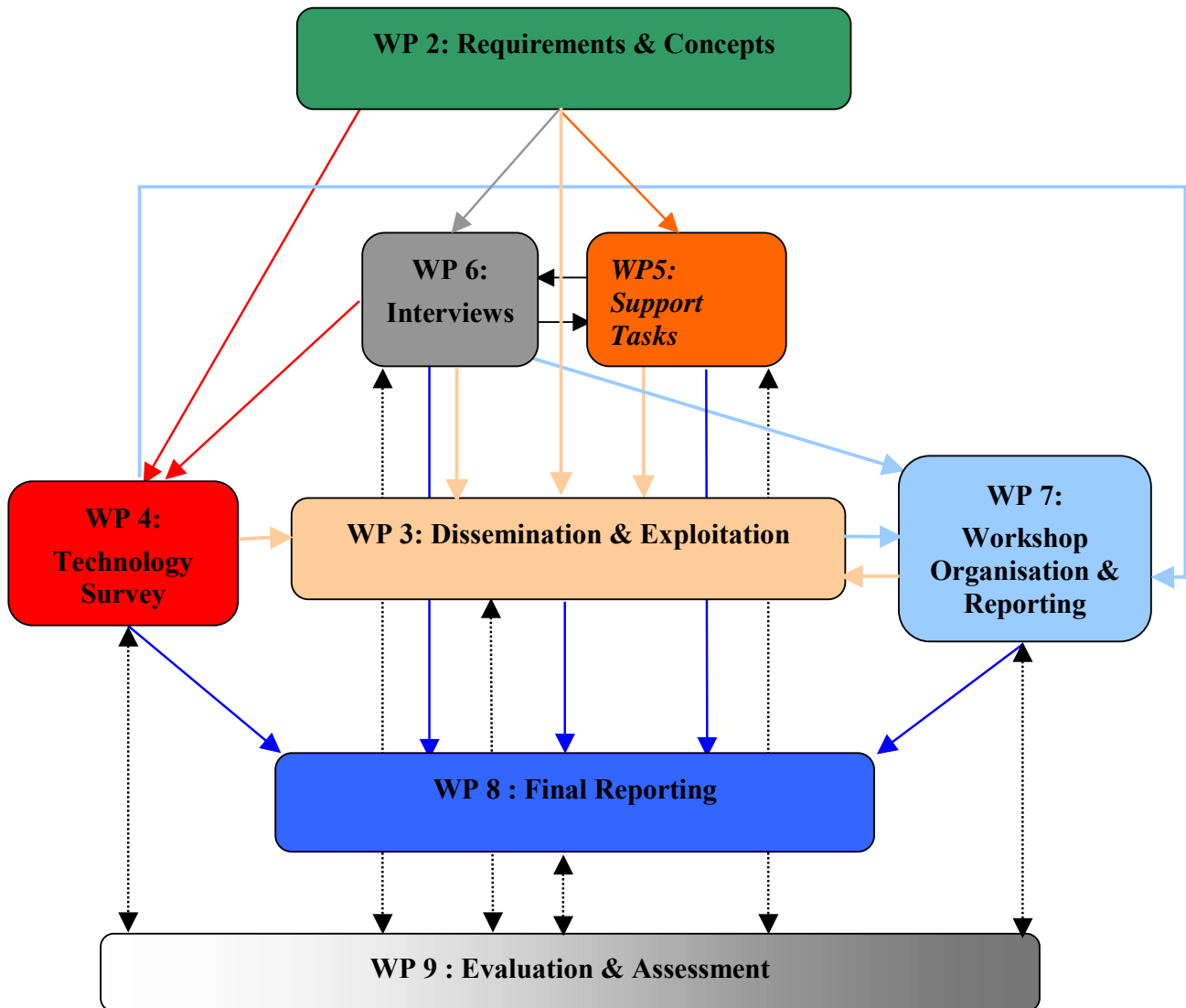


9.7 GRAPHICAL REPRESENTATION OF PROJECT COMPONENTS

9.7.1 Workpackage Structure



9.7.2 Workpackage Hierarchy



9.8 PROJECT MANAGEMENT

Two closely collaborating university departments, namely VUB, EPFL, and TUG will carry out the EUDEM2 project. This formula was already successfully applied during the previous **EUDEM** era involving VUB and EPFL.

The coordinating university (VUB) is the interface towards the European Commission concerning reporting on the technical progress of the project. It is responsible for organizing the activities.

A technical coordination team, composed of Prof. Jan Cornelis (VUB), Prof. Paolo Ienne (EPFL), Prof. JERZY WTOREK (TUG) and Prof. Hichem Sahli (the project coordinator) and the **Advisory Panel**, will provide project steering, quality assurance, and decide on policies regarding information dissemination.

The communication within the consortium will mainly rely on electronic mail, technical and management meetings, and exchange of personnel. This type of communication has already been successful in previous EPFL-VUB joint collaborations on mine detection technology, in particular the former **EUDEMI** project, and the current collaboration between TUG and VUB in the framework of a bilateral project. It is in fact part of a communication and information exchange flow, which is already in place between the three organizations.

Quality will be assured with the help of the previously mentioned information flow, and in particular with frequent interactions with the DG-INFSO. Half-year meetings will be organized. The latter will definitely profit from the VUB's physical proximity. The fact of relying on a small experienced team, as well as focused goals, should also contribute to guaranteeing the project's overall quality.

Furthermore, experts will guide the consortium throughout the project as explained underneath.

Advisory Panel:

The input of the consortium will be **complemented with inputs of an Advisory Panel**, which will consist of **representatives (experts) from the end-user community and HD business, research institutes, industry, military and technology domains** with two rotating seats for experts that can be chosen according to the subject dealt with during the technology survey. The Advisory Panel will:

- (a) Conduct **regular meetings** with the consortium on the **project progress/evaluation& assessment**,
- (b) **Advise for the preparation of the deliverables**,

- (c) **Intervene whilst the workshops**, as well as
 - (d) **Follow the implementation of *EUDEM2***.
- The Advisory Panel will be established at the starting of the project (kick-off meeting).

Experts:

During the technology survey, the consortium will employ the service of independent experts to conduct the “depth analysis of the technology” in the relevant domains of the Technology Survey. The list of experts will be **established at the end of WP200 Requirements & Concepts**.

10 CLUSTERING

EUDEM2 will support the clustering effort of the DG-INFSO by organizing cluster meetings (2 per year) in the field of Humanitarian Demining RTD. Such an activity comprises:

- Analysing the ongoing projects to define tasks and themes that would be addressed on a common approach,
- Choosing and contacting key partners, from ongoing EC-RTD projects, that are involved in these tasks,
- Organizing the venue on behalf of DG-INFSO in terms of logistic. The cost of bringing key partners and appropriate speakers as well as of the rapporteur will be born by the Commission,
- Insuring an appropriate synthesis and publishing quality of the meeting report together with the rapporteur.

11 OTHER CONTRACTUAL CONDITIONS

11.1 EXPERTS

The payment of the technology survey experts is mentioned under "Subcontracting/External Services Costs"

11.2 EXPERTS & ADVISORY PANEL TRAVEL COSTS

The travel costs of the Advisory Panel for meetings with the consortium and attendance to the organized workshops are mentioned under "Other Significant Project Costs".

The travel costs of the Experts for the Technology Survey for meetings with the consortium and attendance to the organized workshops are mentioned under "Other Significant Project Costs".

11.3 WORKSHOP ORGANIZATION COSTS

The costs of the workshops: coffee beaks, lunches and dinners are mentioned under "Other Significant Project Costs".

11.4 EUROPEAN AND INTERNATIONAL CONFERENCES

The consortium planned to attend the following European and International Conferences and Workshops.

Year 2 0 0 1

- Orlando SPIE AeroSense, April
- Workshop on technology for mine action, Liu Centre for the Study of Global Issues, University of British Columbia, Vancouver, Canada, 4-5 June (DTIF workshop)
- 7th International Symposium on Analysis and Detection of Explosives, 25-28 June, Edinburgh, UK (org.: DERA)
- 7th International Workshop on Applications of Nuclear Techniques, Crete, 17-23 June (org.: Western Kentucky Univ.)
- MATEST 2001, NdT in environment protection (with priority Antipersonnel Landmine Detection), Dubrovnik, Croatia, 23-25 September
- ARIS HD Course for scientist/technicians, field visit
- ARIS Workshops
- NDRF workshops/conferences

Year 2 0 0 2

- Orlando SPIE AeroSense, April
- Ninth International Conference on GPR, Santa Barbara, California, USA. 29 April – 2 May
- 8th International Workshop on Applications of Nuclear Techniques, Crete, June ?
- 8th European Conference on Non-Destructive Testing, Barcelona, June 17-21 (session Landmines Detection)
- (SPIE) International Conference on Subsurface and Surface Sensing and Imaging Technologies and Applications, 29 July – 3 Aug., San Diego
- Field visit Balkans and/or outside EC (SE Asia, Africa)
- ARIS Workshops
- NDRF workshops/conferences

Year 2 0 0 3

- Orlando SPIE AeroSense, April
- 9th International Workshop on Applications of Nuclear Techniques, Crete, June ?
- (SPIE) International Conference on Subsurface and Surface Sensing and Imaging Technologies and Applications, July/August, US?
- Field visit Balkans and/or outside EC (SE Asia, Africa)
- NDRF workshops/conferences

Year 2 0 0 4

- Orlando SPIE AeroSense, April
- NDRF workshops/conferences

OTHER conferences of potential interest:

- One or two visits to JMU (USA)
- Workshops organized by JMU (USA)
- Australian-American Joint Conference on the Technologies of Mines and Mine Countermeasures (last: March 2001, Sydney, Australia)
- DOD UXO/Countermine Forum, April, US, annual (USA)

- IGARSS – International Geoscience and Remote Sensing Symposium (outside Europe: 2001 Australia)
- Monterey conferences, every 18 months
- Gordon Research Conferences –USA (on the detection of illicit substances)
- JRC Seminars and technical Workshops (not all at JRC-ISPRA)

12 SUPPLEMENTARY REPORTS AND CONCERTATION ACTIVITY: OTHER ACTION-SPECIFIC CONDITIONS

13 OTHER CONSIDERATIONS

APPENDIX A – CONSORTIUM DESCRIPTION

A1 THE CONSORTIUM

The consortium consists of three Research Organisations partners. The partners know each other's from earlier EC-projects, various international actions and bilateral projects.

Nr	Organisation	Country	Role	Competence
1	Vrije Universiteit Brussel	Belgiumn	Co-ordinator	Research/Academic
2	Ecole Polytechnique de Lausanne	Switzerland	Partner	Research/Academic
3	Technical University of Gdańsk	Poland	Partner	Research/Academic

Table: Organisations involved in the *EUDEM* project.

The *EUDEM2* project will be carried out by three closely collaborating university departments: the **EPFL (LAP)**, **TUG (MEED)** and **VUB (ETRO)**, as this formula was already successfully applied during the previous *EUDEM* project and the current bilateral projects.

(1) The **VUB** will assure in particular most of the project management tasks (organization of travel and meetings, and the workshops), the administrative follow-up of the project, the maintenance of the database, the organization of the workshops which will be held in Brussels, and most contacts with the Commission's services. The **VUB** with their expertise in Humanitarian Demining Technologies and Practices, will be responsible for the major technical aspects of the proposal and in particular the planed Technology Survey (see Section 9). (2) The **EPFL** will assure in particular the interface to **EPFL** knowledge and know-how accumulated since the beginning of the humanitarian demining related activities, most of the Support Tasks (direct support and reference material, see Section 9), and a substantial part of the contacts with the Geneva International Centre on Humanitarian Demining (GICHD). (3) The **TUG** with their expertise in theoretical and technological aspects in impedance tomography and IR thermography, applicable to medicine and ecology, will assure in depth study of the transfer of these technologies towards Humanitarian Demining (see Section 9 – Technology Survey). Moreover with their expertise in physical principles, they will contribute to the analysis of existing mature technologies in Remote Sensing and Non-destructive Testing and Evaluation, which could be transferred to HD.

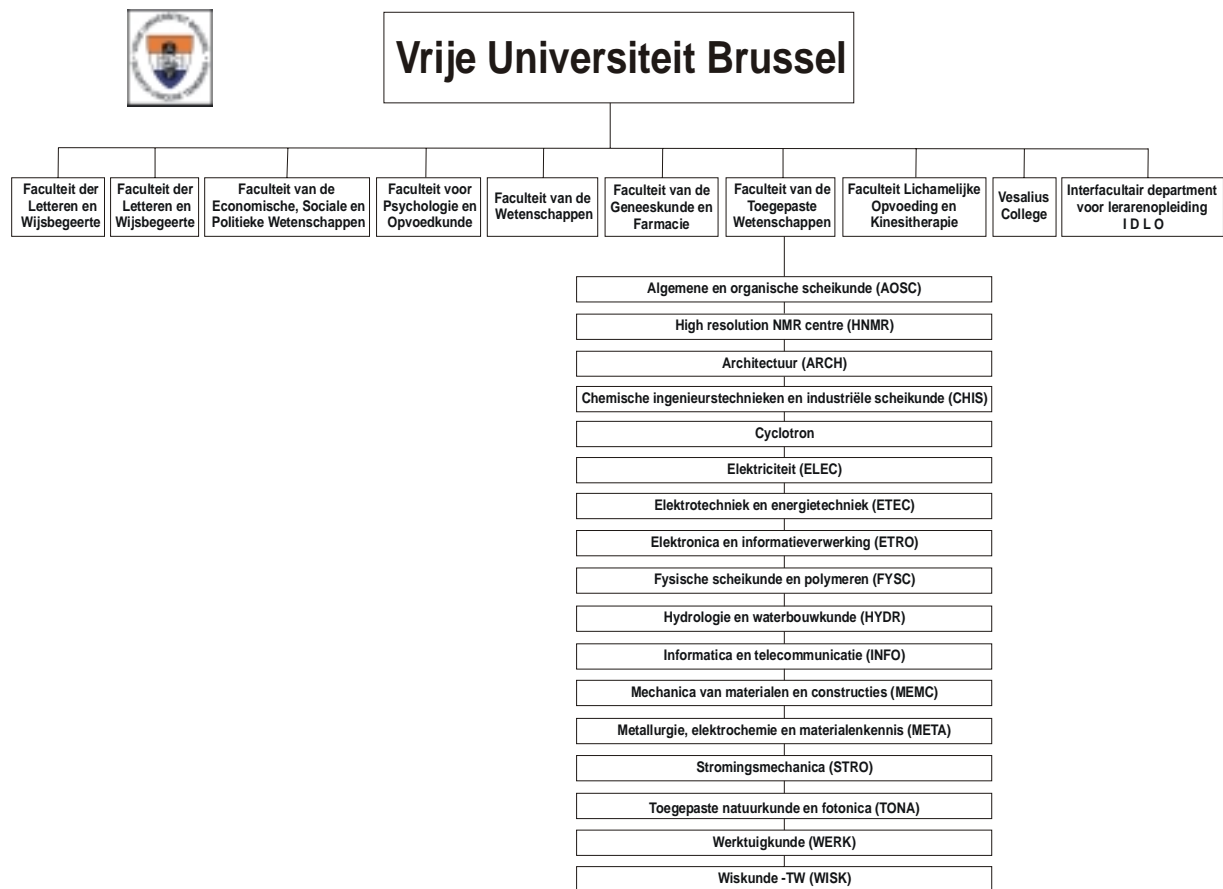
All other project tasks (see Section 9) are in common, with some of them (e.g. conference attendance) being assigned during the projects to one partner or the other according to the best use of resources at that time.

Both **VUB** and **EPFL** partners have experience in de-mining technology R&D projects, have carried out survey activities, and have already worked on the analysis and dissemination of information related to humanitarian de-mining. We recall in particular the **EUDEM** survey carried out in 1999, during which about 50 main players, active in several aspects of de-mining/mine action, were personally visited in 10 European countries and nearly 200 more were contacted by mail. The **EUDEM** database was set-up and populated during the survey. It attempts – together with the **EUDEM** report – at giving an overview of the European offer within the field of humanitarian demining and to serve as a common data repository and a practical search tool for all actors in the demining sector. The contacts established during the survey will obviously be helpful for the further work, and help in a fast start of **EUDEM2**.

VUB and **TUG** partners have a long-term collaboration in medical imaging since more than 6 years. Currently they are involved in a bilateral project on the exploration of Electrical Impedance Tomography (EIT) as a novel method for subsurface detection of shallowly buried objects, with its application to humanitarian land mine detection.

A1.1 VUB-ETRO

Legal name of the Institute: **Vrije Universiteit Brussel (VUB)**
 Legal name of the Department: **Electronica en Informatieverwerking (ETRO)**
 Web site address: <http://www.etro.vub.ac.be>



Organization Chart

VUB-ETRO, the Electronics and Information Processing Dept. of the Vrije Universiteit Brussel.

VUB-ETRO consists of 37 members, including 4 full professors, 3 part-time professors, 3 educational assistants, 2 technicians, 1 secretary, 1 research coordinator, 4 IMEC researchers, a network manager, PhD grant holders, and several researchers appointed on a project basis. The primary roles of the ETRO department are:

Education in Electronics and Digital Signal Processing (circuit design, components

models and technology, CAD and implementation techniques, digital signal processing, digital image processing and computer vision, pattern recognition, medical imaging and medical image processing),

Research and Development on three major topics: *opto- and micro-electronics* circuits, devices and technology (LAMI) on the one hand, and on the other hand the processing of information for the cases of *speech* signals (DSSP) and of *digital images and video* (IRIS). Together, these three topics within ETRO are covering a wide range of generic technologies in the field of Information Technology, which cannot be dealt with separately when the real world applications of the “information society” are envisaged.

Starting from the main activity in image/video processing and machine vision, the IRIS group has extended its *research* towards various application domains of Information Technology. Research themes include: the design of image analysis algorithms and optimisation of processing architectures, image and video compression, data visualisation, pattern recognition, tracking based on visual cues, and various applications. Besides medical imaging - the oldest application domain of the group, substantial activities are in satellite image processing, tele-radiology, anti-personnel mine and minefield detection, machine vision for automotive applications, localisation and tracking of objects on digital maps, and different types of image/video compression for applications like mobile communication, multimedia, medical imaging, publishing, remote sensing,

Expertise and experience of VUB-ETRO in humanitarian demining R&D

VUB-ETRO stepped into the field of humanitarian mine-and minefield detection, about 5 years ago, with the goal of contributing to the optimisation of detection algorithms and equipment. VUB-ETRO is actively involved in the development of signal/image processing, pattern recognition techniques and data fusion for landmine detection, and airborne minefield survey. Currently the department is concentrating on Metal Detectors, Ground Penetrating Radar, and Visible/NearIR/IR/Multi-spectral/ Cameras. Emphasis is mainly placed on improving detection capabilities of these modalities:

To enhance the performance of mine detection using electromagnetic induction devices, improvements are pursued in the processing of Metal Detector signals with the aim of target detection, localization and false alarm rate reduction. In particular methods for determining the position (including depth), shape, size and material parameters of a hidden metallic object are under investigation.

The research on GPR is mainly focused on digital filtering (linear and non-linear), deconvolution and system identification (parametric and non-parametric) methods for clutter, air-ground interface reflection, and antenna cross-talk removal from the scattered radar data. Classification methods are developed, for distinguishing between different objects using features extracted from the data. Different imaging techniques such as synthetic-aperture processing (SAR), migration and phased array processing are being developed.

Two research lines encompassing the IR sensing modality are under investigation: (1) dynamic thermography studies to passively detect subtle variations in the soil in the vicinity of a mine, and (2) polarimetric IR sensing, which uses a co- and cross-polarised signal to detect smooth surfaces and bodies of revolution (i.e. typically man-made objects) on the ground surface. Also in multi-spectral imaging, ETRO has experience not exclusively limited to humanitarian demining (e.g. satellite/medical image analysis).

PAST AND ONGOING PROJECTS OF IMEC-ETRO IN HUMANITARIAN DEMINING R&D

National Projects

Title & Time frame	Funding	Amount	Promoters & Partners
Numerical issues in tomographic shallow subsurface imaging with application to land mine detection (1/10/00-30/9/05) Contract: GOA20	VUB (in the framework of concerted research action)	50.000.000 BF	H. Sahli, J. Cornelis, ETRO-VUB
Advanced Global System to eliminate Antpersonal Landmines (ANGEL) 1999 – 2004 ongoing	DWTC	2.000.000 BF for 1999-2001 travel costs (meetings, workshops, conferences)	H. Sahli, ETRO-VUB <u>In Process</u>
On the exploration of Electrical Impedance Tomography (EIT) as a novel method for subsurface detection of shallowly buried objects – with application to humanitarian landmine detection. (2000-2004)	Flemish Community	3.970.000. BeF	J. Cornelis, ETRO-VUB, B. De Moor, ESAT-KU Leuven, J. Wtorek; TU Gdansk <u>In Process</u>
Stabilized deconvolution for inverse problems, applied to linear (Magnetic Resonance Imaging) and non-linear (Ground Penetrating Radar Imaging) Image reconstruction. (1/1/01-31/12/04) Contract: G.0072.01	FWO	5.595.000 BF	J. Cornelis, H. Sahli, I. Lemahieu, W. Philips (RU Gent)
Experimental Methods for Anti-personnel Mines detection (1/1/97-31/12/01)	VUB Research Council	4.870.000 BF	E. Nyssen, H. Sahli, ETRO-VUB D. Van Hemelrijck, Y. Baudoin, WERK-VUB
Deminage humanitaire -	Belgian Federal	5.500.000 BF +	M. Acheroy (SIC,

HUDEM-Humanitaire Ontmijningsmethoden (1/10/96-30/9/01)	Ministry of Defense	2.000.000BF (PhD grants)	RMA, I. Lemahieu (ELIS-RUG), P. Van Ham (SLN, ULB) J. Cornelis, H.Sahli, ETRO-VUB
Change Detection in satellite image sequences for Minefield delineation (1/4/99-30/6/01) Contract: T4/03/55	Flemish Ministry for Research Policy	700.000 BF	Jan Cornelis, ETRO-VUB
Scientific research for Humanitarian Demining (1/3/97-28/2/99)	Renaissance, RMA	960.000 BF (PhD grant)	J. Cornelis

International projects

Title & Time frame	Funding	Amount	Promoters & Partners
Airborne Minefield Area Reduction (ARC) Contract: IST-2000-25300	EU-IST	277 722 KEuro	<u>H. Sahli</u> IMEC-ETRO
Concept for Low-risk Efficient Area Reduction based on the fusion of Advanced Sensor Technologies (CLEARFAST) Contract: IST-2000-25173	EU-IST	224 772 KEuro	<u>J. Cornelis</u> IMEC-ETRO
Improved cost-efficient surface penetrating radar detector with system on chip solution for humanitarian demining (DEMINE) (1/2/99-31/1/01) Contract: EP29902	ESPRIT4-DG III	6.293.024 BF 100% (AC)	<u>H. Sahli</u> , ETRO-VUB
Pilot project: Minefield Detection in Mozambique (1/1/98-31/12/99) Contract: REG/661-97/2	EU: DG 8	2.500.000 BF (EU) + 3.400.000 BF (matching funds Ministry Foreign Affairs)	<u>J. van Genderen (ITC)</u> , B. Zeller (CAE Aviation), P. Barath (SSS), J.Longson (EOS), P.Bullus (Reicon Optical), R. Mota (Geograf), W. Philippe (Aerodata), M. Acheroy (Renaissance), J. Cornelis, H.Sahli (VUB)
State of the art of technology for humanitarian Demining (EUDEM) (1/12/98-31/7/99) Contract 501853	EU-DG III Tender	61.000 € 100%	J. Cornelis, ETRO-VUB

C.V Key Personnel

KARIN DE BRUYN: holds a degree in Communication Science from the Vrije Universiteit Brussel, and took up the coordinating role in the **EUDEM** project for both the collection of data and the administrative side of the project. As a licensed specialist in communication science, she will add professionalism to the **EUDEM2** project on both interpersonal and written communications - such as the questionnaires and the interviews, and she will manage the analysis of data from the database. Coupled to that, as a social scientist, she can make use of her background to look closely into "other" aspects that are not directly related to the "technical side" but more to the "social-economical segments" of the information gathered on the studied technologies, practices and services. On the administrative side she will be the contact person for all matters.

JAN CORNELIS: MD in Electrotechnical Engineering (Option Electronics) in 1973; PhD in Applied Sciences in 1980, IMEC-ETRO, Belgium.

Jan Cornelis is a Professor at IMEC-ETRO, teaching electronics, digital image processing, and medical imaging, at the Faculty of Applied Sciences. He is Head of the Department "Electronics and Information Processing - ETRO" and he co-ordinates the research group IRIS on Image Processing and Machine Vision within the ETRO Department. He is a Member of the Board of Directors of IMEC (Inter-university Micro Electronics Centre – Leuven, Belgium), and Chairman of the Research Council of the Faculty of Applied Sciences at IMEC-ETRO. Currently he is chairman of the "Image Processing Systems" research community (FWO - *National Foundation of Scientific Research*), composed of the image processing laboratories in Belgium. His research work evolved from medical instrumentation and ECG signal analysis, towards medical image analysis, various applications of pattern recognition in remote sensing and industrial inspection. Current scientific interests are directed towards "mine and minefield detection as an application of pattern recognition and imaging", as well as image and video compression. He is author/co-author of approximately 250 publications in International conference proceedings, books and journals. He has participated in several EU projects and co-ordinated four of them as a prime contractor.

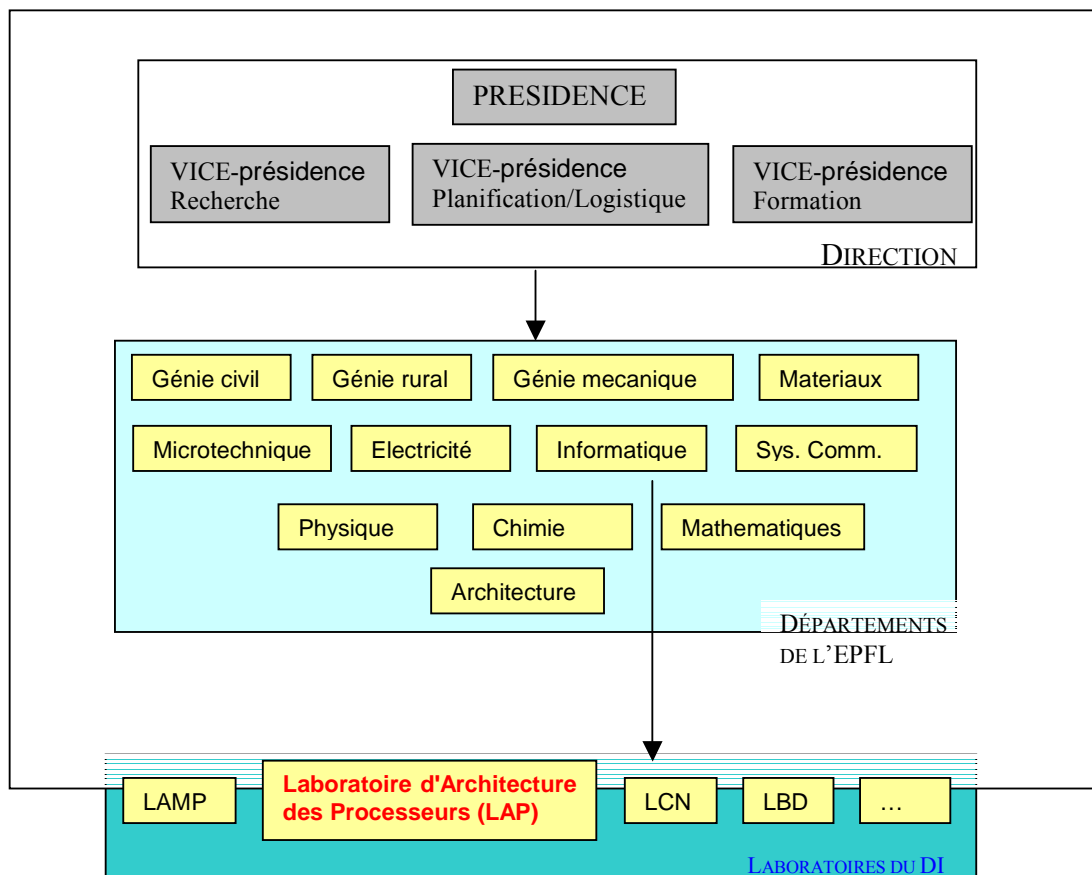
HICHEM SAHLI: received the PhD degree in Computer Science in 1991, from the École Nationale Supérieure de Physique, Strasbourg, France.

From 1988 to 1991 he was "Attaché d'enseignement et de recherche" at the Computer Science department of the University Louis Pasteur, Strasbourg. From 1991 to 1995 he was "Chargé de Recherche" in the CAD and Robotics dept. at the École des Mines de Paris. In 1996 he joined the faculty of Applied Sciences, Department of Electronics and Information Processing (ETRO), Vrije Universiteit Brussel (VUBC-ETRO), where he is currently Professor, coordinator of the Machine Vision and the Mine Detection research teams at ETRO. His previous and current work has spanned a range of topics in machine vision including image segmentation (texture, grey-level and multispectral), multiscale image analysis, motion analysis, stereo-vision, motion & structure estimation and pattern

recognition. Since 5 years he is supervising the ETRO activities on Humanitarian Demining by focusing on the application of computer vision and pattern recognition techniques to landmine detection and airborne minefield detection. Since 1996 he is author/co-author of approximately 25 publications in International conference proceedings and journals. He is participating in several EU projects related to landmine detection, where he is coordinating the ETRO contributions.

A1.2 EPFL

Legal name of the Organisation: **Ecole polytechnique fédérale de Lausanne (EPFL)**
Legal name of the Laboratory: **Laboratoire d'Architecture des Processeurs (LAP)**
Web site address: <http://diwww.epfl.ch/lap/>
(see also <http://diwww.epfl.ch/lami/detec/>)



EPFL Organization Chart

Expertise and experience of the EPFL in humanitarian demining R&D

The De-mining Technology Center project at the EPFL-LAMI (Microcomputing Laboratory) has been supported in 1996 and 1997 by the Foundation Pro Victimis in Geneva, by the Swiss Federal Department of Foreign Affairs and by the EPFL. This activity was triggered in 1994 by John Walker, founder of Autodesk, who encouraged and supported the development of the Pemex robot, built by Ph. Maechler in 1994-1995, who also carried out, together with Prof. Nicoud, initial survey, information collection

and redistribution activities. A number of conferences were attended and the WAPM'95 workshop was organised in Lausanne.

DeTeC was staffed with 5 engineers until the end of 1997 (plus the support of the LAMI), and had three main objectives:

- Evaluate by the end of 1997 a Ground Penetrating Radar (GPR) sensor by doing extensive data acquisition on real fields, in order to better understand how to develop a system that reduces significantly the false alarm rate. A sand box with a Cartesian mechanism for moving the sensor over the buried objects was built and extensively used to test different sensors. It has now been transferred to the VUB in Brussels. A visit in Cambodia, November 1996, has allowed to see the field conditions and prepare the data acquisition campaign carried out in November 1997. The corresponding raw data files are available on the Web and on CD-ROM for the persons interested to develop image processing and recognition algorithms. Several research groups have used this data.
- Participate in long term research projects at the international level for developing better de-mining technologies (bio-sensors, low cost GPR, image processing, sensor fusion, robots, navigation sensors, etc.).
- Encourage exchange of information on de-mining technologies, through the Web and the related scientific conferences. Document research projects, promote the good ideas and help for their test on the field and their industrialisation.

The last objective in particular led to several survey papers, to the organisation of 1995 WAPM Workshop at the EPFL and the SusDem97 Workshop in Zagreb, as well as to the set-up of a large Web site containing amongst other things an extensive list of links. Contact lists were also produced and regularly updated.

As from 1998 activities have been continued mainly by Claudio Bruschini in collaboration with the VUB. They have led in particular to the participation in the **EUDEM** survey, to field visits in Croatia and Bosnia-Herzegovina, as well as to research work in the field of metal detectors and systems for the direct detection of explosives. Studies have been also carried out at the EPFL's physics department on the detection of explosives via Nuclear Quadrupole Resonance (NQR).

C.V Key Personnel

CLAUDIO BRUSCHINI holds a degree from the Univ. of Genoa, Department of Physics. He visited Croatia during EUDEM, amongst many other European countries, and established an extensive background knowledge and good contacts with all types of actors within the field of humanitarian demining. He previously worked both at EPFL

(DeTeC project) and at VUB (elaboration of a test site for mine detection sensors at VUB, using the GPR and gantry system provided by the EPFL). He is currently preparing a PhD on "Improvements of metal detectors for humanitarian demining", under the supervision of Prof. Hichem Sahli (VUB). The exchange of know-how and preparation of joint conference participations is a continuous process between EPFL and VUB.

The Microcomputing Laboratory (LAMI) has hosted Claudio Bruschini and DeTeC activities until the end of August 2000, when Prof. Nicoud retired. A new unit (Processor Architecture Laboratory, LAP) has started in July 2000 headed by Prof. Ienne and will host Claudio Bruschini during the present project.

JEAN-DANIEL NICLOUD: diplôme d'Ingénieur physicien, license ès Sciences mathématiques, doctorat è Sciences techniques (1970). Professor at the Swiss Federal Institute of Technology and Director of "Laboratoire de Microinformatique". His interest for humanitarian demining has started in 1994 with the development of the PEMEX robot. Initial survey activities were carried out and the WAPM'95 workshop was organised in Lausanne during the summer of 1995. Humanitarian demining activities at LAMI concentrated then within the DETEC project –1995-1997– on the development of a sensor suite for anti-personnel mine detection. DETEC also actively supported the exchange of information on demining technologies. The DETEC system and the sensors were then transferred to the VUB and the collaboration VUB-EPFL was intensified and bolstered with the *EUDEM* survey.

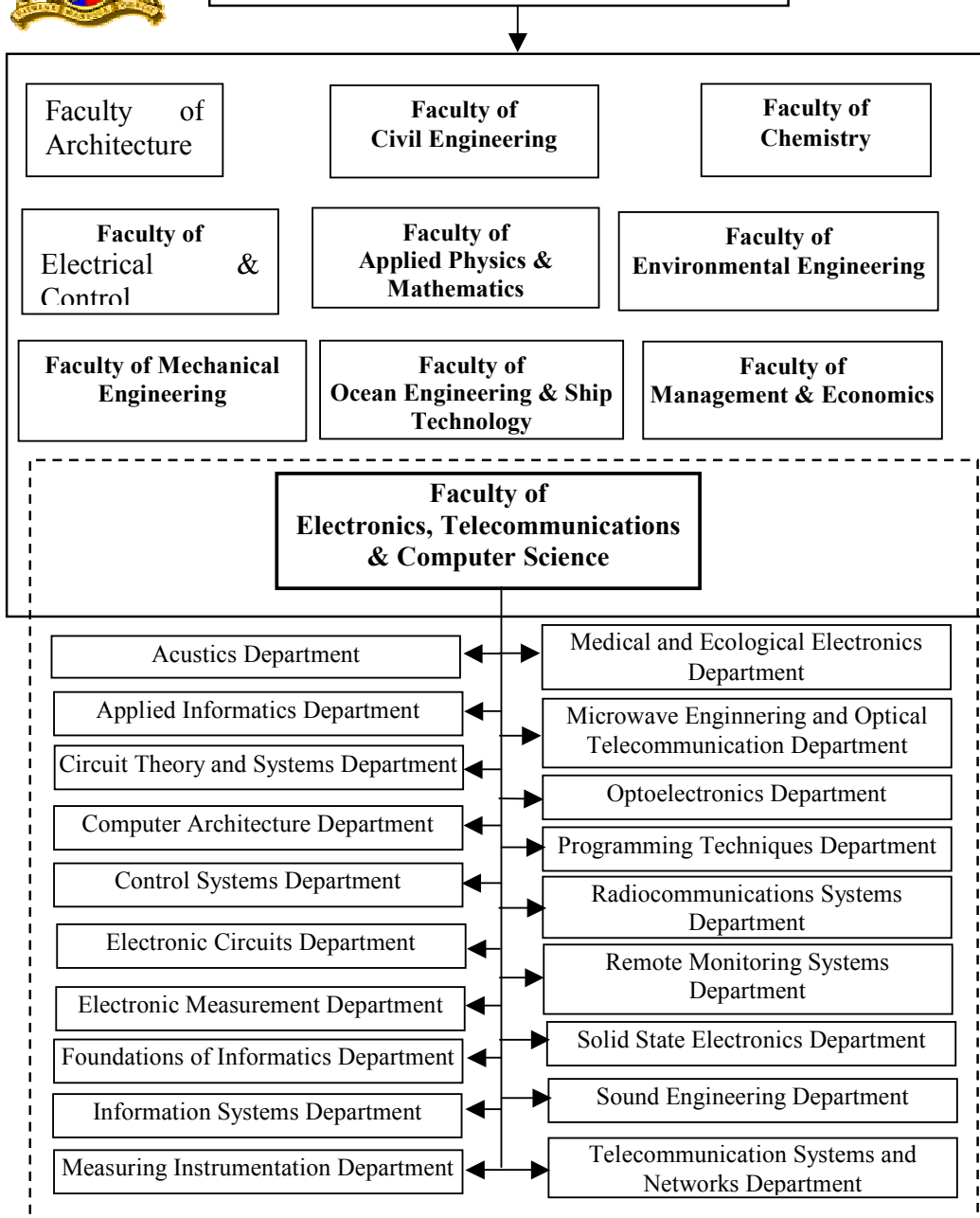
PAOLO IENNE: has received in 1991 a Laurea in Ingegneria Elettronica from Politecnico di Milano (I) with a thesis on functional testability analysis of digital circuits. He received in 1996 a PhD from the Swiss Federal Institute of Technology of Lausanne (CH) for his work on systolic architectures for matrix-based computations. Between 1996 and June 2000 he was with Infineon Technologies (formerly Siemens Semiconductors) in Munich (D) where he headed the group developing embedded SRAMs and ROMs for the company's logic products. He joined the Swiss Federal Institute of Technology of Lausanne in July 2000 as the director of a new laboratory on processor architecture (LAP). His main research interests are customisable embedded processors, datapath generation methodologies, and computer arithmetic's.

A1.3 TUG

Legal name of the Institute: *Politechnika Gdanska (TUG)*
Legal name of Department: *Katedra Elektroniki Medycznej i Ekologicznej (MEED)*
Web site address: www.pg.gda.pl, www-med.eti.pg.gda.pl



Technical University of Gdańsk



Electronics, Telecommunication and Computer Science Faculty of the Technical University of Gdańsk (www.eti.pg.gda.pl)

The Faculty of **E.T.I.** has been assigned Category 1, Poland's highest, by the Committee for Scientific Research, a governmental body in charge of the co-ordination of scientific efforts in Poland. This fact stems from the recognition both of the high level of research work conducted at the Faculty and of the activity and advancement of professional careers of its academic staff. The credit for the Faculty's continued high reputation should go to all its 19 Departments, employing a total of 180 academic teachers, which includes 11 holding full Professorship, 23 holding a post-Ph.D. degree of D.Sc. (of which 13 are appointed to the post of Professor at the Technical University of Gdańsk) and 85 Ph.D. holders.

The **TUG-MEED** Medical and Ecological Electronics Department of The Electronics, Telecommunication and Computer Science Faculty (Technical University of Gdansk) (www-med.eti.pg.gda.pl), consists of 19 members including 1 full professor, 4 assistant professors, 5 educational assistants, 3 technicians, 1 secretary and 5 PhD students.

Education: Medical Electronics, Ecological Electronics and Informatics in Medicine. The lectures include variety of subjects e.g., Digital Signal Processing, Digital Image Processing, Medical Imaging, Sensors, Remote Sensing, Pattern Recognition, Medical Databases, etc.

Research and Development on the new methods of imaging applicable to medicine and ecology. Medical and Ecological Electronics Department led intensive study on new imaging technologies with possible application to medicine and ecology. In general, this study can be described as an inverse problem for different techniques (eg. electrocardiography, magneto-cardiography, tomography, etc). Recently, the main research is directed into impedance tomography and IR thermography. Both techniques can be potentially considered as technologies applicable into demining. In the area of impedance tomography the following projects, both national and granted by TUG have been led:

- Method of excitation patterns in impedance mammography
- Algorithms of multifrequency impedance tomography
- 3-D reconstruction methods for impedance mammography
- Fast reconstruction algorithm for objects of axial symmetry
- Impedance process tomography applied to detection of bubbles in fluids
- Fast algorithms for static and differential reconstruction

As the result of study conducted in MEED in the area of impedance tomography two systems, containing 65 electrodes and the other 124 active electrodes, have been developed. With slight modifications it is possible to apply this technology in model study of demining problems.

Another basic branch of study conducted in MEED is devoted to development of thermography technology including so-called active thermography and thermal

tomography. With methods, especially the former one, have been successfully applied into non-contacting examination of layered structures, e.g. estimation of processes undergoing in healthy and burnt human skin.

Expertise and experience of TUG-MEED in humanitarian demining R&D

MEED is involved since one year on the exploration of Electrical Impedance Tomography (EIT) as a novel method for subsurface detection of shallowly buried objects -with the application to humanitarian land mine detection-.

C.V Key Personnel

JERZY WTOREK: The title MSc he obtained from Faculty of Electronics, Technical University of Gdansk in 1976. He received a PhD from Faculty of Electronics (Technical University of Gdansk) for the dissertation titled: "Application of electrical impedance technique to lower extremities examination" in 1986. He has been involved in many projects concerning application of impedance technique as a novel method for human body visualisation, eg. Electrical Impedance Tomography as applied to breast cancer detection (project of Polish Research Council). Currently, he is co-ordinator of bilateral project titled: On the exploration of Electrical Impedance Tomography (EIT) as a novel method for subsurface detection of shallowly buried objects -With application to humanitarian land mine detection-. He has published as author/co-author more than 100 publications in international conference proceeding and journals and books.

ARTUR POLINSKI: has received M. Sc. Eng. in 1994 in biomedical electronics from the Technical University of Gdansk, Faculty of Electronics and M. Sc. in mathematics from the University of Gdansk, Faculty of Mathematics and Physics in 1997. He received in 1999 a PhD from the Technical University of Gdansk, Faculty of Electronics Telecommunication and Informatics for dissertation titled "Electroimpedance diagnostic of limbs". Now, his is working as an assistant professor at the Faculty of Applied Physics and Mathematics (Technical University of Gdansk). His scientific research focus on stability and convergence of Finite Difference Method and application of Finite Element Method in modelling of electrical diagnostic methods in medicine and also for modelling tomographic application in mine detection.