Appendix No.10

A description of key activities of the project including

Title of the Operational Programme: Operational Programme Education for Competitiveness, Number and name of the support area: 2.4 Partnership and networks

Title: **The latest remote sensing technologies in the service of research, education and application for regional development**

Applicant: **Global Change Research Centre AS CR (**thereinafter **CVGZ)**

Brno 2011

CONTENTS:

Commentary on budget outside the key activities of the project

Aim of the project

The aim of the project is a synergy partnership based on cooperation of tertiary education institutions, research institutions, NGOs and SMEs **in order to deepen mutual cooperation and increase the knowledge potential for the application of the latest technologies of remote sensing** (RS) focused mainly on assessing the state of vegetation, eutrophication of water reservoirs, soil properties and temperature regimes of territories. All partners involved, each of whom represents one of the areas examined, seek to cooperate when transferring knowledge in order to fully exploit the potential of remote sensing methods. In tertiary education, non-profit and business sectors, the current dynamic development of remote sensing methods and related application options is still underestimated. The project objectives will be achieved in several phases. The first phase, which will be carried out through a series of workshops, aims at introducing the current remote sensing possibilities to the project partners. At the same time, there will be discussions on the application of these methods for the solution of specific partners' tasks, i. e. already specifically focused tasks on partial elements of land cover and their properties: soil (e. g. moisture conditions, humus content, temperature regime), open water surface (eutrophication, temperature regime), vegetation (diversification of species, the volume of biomass, medical condition, etc.); urbarial territory (temperature regime, structure). The second phase is based on fellowships at prestigious foreign institutions dealing with partial areas of remote sensing at the highest level (hyperspectral, thermal, LiDAR data). The acquired knowledge will be continuously transmitted among partners and target groups through workshops and joint professional impact publications. In the second year of the project, the partners will interactively develop the acquired knowledge through solving joint application tasks in various fields of the co-investigators, and disseminate this knowledge in the partner institutions. The project "The latest remote sensing technologies in the service of research, education and application for regional development" (abbreviated HYDAP) relies on the use of a developed infrastructure of the project CzechGlobe – Global Change Research Centre, from the OP 1.1 European Centres of Excellence, which will provide technical resources and capacities to acquire necessary data for the application and validation of knowledge acquired within the partnership. This will synergize the OP Research and Development for Innovations project focused on creating a high-end scientific infrastructure with the project providing access and transfer of knowledge in the field of remote sensing among research organizations, tertiary education institutions and public and business sector entities. **The project contributes to the development of knowledge and competences of workers of the involved partners and facilitates better use and transfer of research and development results into practice. Thereby it helps increase educational potential of regions in practical application of remote sensing methods.**

Project outputs: 1) a developed network of interdisciplinary teams focused on the use of remote sensing methods with links to excellent foreign institutions (establishing

long-term professional relationships at both national and international levels); 2) a data bank including methodologies for processing, accessible on-line for teaching purposes at universities; 3) a long lasting base of cooperation and partnership to address new joint projects.

Synergy Projects

What is unique is immediate synergy with three infrastructure projects supported by EU structural funds. The proposed project is directly connected to the outputs of the project CzechGlobe – Global Change Research Centre, which was supported from the funds of the OP Research and Development for Innovations, priority axis 1.1 European Centers of Excellence and whose investigator is the Global Change Research Centre of the AS CR p.r.i. CzechGlobe project focuses on the development of an infrastructure of a Center of Excellence specialized in the investigation of impacts of the global climate change (GCC) on biological and socio-economic systems. It is based on the applicant's long tradition in research and on priorities of the "Long-term basic research directions of the CR". The center has a strong relationship with international, mainly European, research activities within ESFRI (ICOS, EUFAR). The Coordinating Council of ICOS considers this project as an important Central European element of ICOS network which is supposed to perform the role of a training center and a coordinator of cooperation with (South) Eastern European countries. The center is a spatially distributed infrastructure consisting of networks of monitoring stations, a laboratory and experimental facilities for studying and modeling the impacts of the GCC in different hierarchical levels of the biosphere. To cover the variability of the CR territory, remote sensing methods will be used.

Another ESFRI infrastructure which will be followed by the HYDAP project, is the EUFAR project (www.eufar.net), which creates a platform for airborne research in Earth sciences. The standards that were established under the EUFAR project with regard to INSPIRE, will be also used for remote sensing data collection and archiving acquired from the HYDAP project. This will enable the introduction of international standards into practice in the Czech Republic as well. CzechGlobe and HYDAP projects synergize directly. One of them is focused on building a high-end scientific infrastructure and the other one on creating a communication platform. The platform aims at transferring the results acquired through the newly built infrastructure of a European Center of Excellence into the area of non-profit organizations, public sector bodies, business and higher education sectors.

Key Activity 1

Development of cooperation between universities, research institutions, non-profit and business sector in the field of remote sensing

The aim of the Key Activity is to develop cooperation between universities, research institutions, non-profit and business sectors and to transmit the latest knowledge on

the processing of hyperspectral (HS), thermal (TIR) and Lidar (LiDAR) data at high-end scientific workstations through foreign and domestic fellowships. The knowledge gained will be transferred to all target groups through interactive workshops, discussion panels and professional impact publications (included in the Evaluation of Research, Development and Innovation) which will represent a part of this activity's outputs.

The implementation of the Key Activity will involve all target groups. The outputs of Key Activity 1 are very closely linked to Key Activity 3.

The first part of the Key Activity is focused on introducing the entities involved in the project to the current situation in the processing of HS, TIR and LiDAR data. The workshops will include discussions on the application of these methods for the solution of the partner's specific tasks (land, water, vegetation, urban territory), harmonizing the solutions of these tasks, generating proposals for the submission of joint projects. The first part of the Key Activity will run from the start of the project 1st October 2012 until 28th February 2013.

The second part of the Key Activity will be devoted to gaining experience and increasing knowledge through fellowships at leading institutions abroad. The aim of the fellowships will be:

-enhancing the knowledge in acquisition, processing and utilization of various categories of data (HS, LiDAR and TIR) both alone and in their synergistic use (HS x TIR - evaluation of vegetation, soil, water; HS x LiDAR - evaluation of vegetation, soil; HS x LiDAR x TIR - evaluation of vegetation). Acquired knowledge and experience will be transferred to the target groups through interactive methods (workshops, teaching at universities), specialized texts (monographs) and publications in scientific journals with an impact factor.

- establishment of broader contacts at the visited workplaces enabling continued cooperation and involvement of HYDAP partners into international projects together with these top professionals and workplaces.

The second part of the Key Activity will run from 1st December 2012 to 30th June 2014.

1.1 KA1 Outputs - a detailed description

The opening conference attended by all project partners – meeting of the project **RS team of the CVGZ** (thereinafter **expert team**) with the representatives of the **Target group 1 - university academic staff** (thereinafter **CS1)** - and **Target group 2 - other professionals involved in education and research** (thereinafter **CS2**). The conference will be 3 days long with participation of a foreign expert from Colorado University (CIRES) with lectures summarizing the current use of different types of remote sensing data in various subject fields and the latest information on building a global geo-information database GEOSS. Subsequently, the representatives

of each of the partners involved in the project will present their lectures on the area of their activities and the expected benefits of remote sensing applications for their own subject field. Number of participants - 15 people from the expert team, 15 people from CS1 and 10 people from CS2. A total of 40 people.

Workshops:

Gradually, there will be 3-6-day-long workshops prepared by international experts giving lectures on acquisition, processing and interpretation of various types of data for the partners' purposes, or more precisely for the purposes of the studied landscape entities. The topics and contents of the workshops have already been pre-negotiated with the foreign partners and will be further specified based on the results of the discussions from the opening conference. The preparation of these workshops will, besides the foreign partners, involve the participation of the CVGZ RS expert team and depending on the investigated issues, also project partners professionally specialized in the topic. For example, the issue of soil evaluation from hyperspectral and TIR data will be provided by the RS research team of CVGZ, Biological Centre, University of South Bohemia, ENKI and a foreign partner of the Tel-Aviv University. Similarly, the workshops will go through all types of remote sensing data and assessments of vegetation, water, urban territories. The widest-ranging area in this direction will be the assessment of vegetation that covers a wide range of topics relevant to the vegetation cover of the CR: from the evaluation of agricultural cultures (estimated biomass, nutrient, water, temperature regime), across forests (stand structure, biomass content, health status) to wetland habitats (temperature regime, the intensity of water-logging, volume of biomass). In this case, the CVGZ RS research team will attempt to organize a workshop either with the participation of foreign experts from different institutions dealing with the issue using different methods of remote sensing, or with a foreign expert specialized in the given area of remote sensing methods who will provide introduction to their use across all the themes that are solved by the partners. The reasons for the second scenario are the time possibilities of the foreign experts, and therefore the chronological order of other workshops will be specified during the initiation of the project. The following itinerary of workshops lists the international partners, focus on the types of methods of remote sensing data and their use for the project partners' specializations:

I. Workshop for the acquisition, processing and utilization of HS data – a 6-day-long workshop attended by two experts from Boston University, one expert from Tel-Aviv University and an expert from Forschnungszentrum Jülich. The theme of the workshop will be basic introduction to the potential of hyperspectral data for different disciplines, methodological approaches and a discussion forum. Number of participants - 5 people from RS expert team, 8 people from CS1 (outside the expert team), 7 people from CS2 (outside the expert team). The total number of 20 people, out of which 15 are supported.

II. Workshop for the acquisition, processing and utilization of TIR data – a 4-day-long workshop, attended by two experts from the University of Colorado. The topic of the workshop consists in a basic introduction of the potential of TIR data for

different disciplines, methodological approaches and a discussion forum. Number of participants - the expert team Number of participants - 5 people from RS expert team, 8 people from CS1 (outside the expert team), 7 people from CS2 (outside the expert team). The total number of people - 20, out of which 15 are supported.

III. Workshop for the acquisition, processing and utilization of LiDAR data - a 5-day-long workshop, attended by two experts from the Boston University and the Idaho University. The topic of the workshop consists in a basic introduction of the potential of LIDAR data for different disciplines, methodological approaches and a discussion forum. Number of participants - 5 people from RS expert team, 8 people from CS1 (outside the expert team), 7 people from CS2 (outside the expert team). The total number of people - 20, out of which 15 are supported.

IV. Workshop of project partners - a 3-day-long workshop, attended by expert teams and all target groups. A recapitulation, summing up of the gain knowledge, and planning/harmonization of concrete research tasks dealing with application of the HS/LiDAR/TIR data for different landscape will be the main objectives of the workshop. Number of participants - 10 people from expert teams, 10 people from CS1, 15 people from CS2 (outside the expert team). The total number of supported people is 25.

Fellowships abroad:

Fellowships will be held at world-renowned scientific and research institutions. A more detailed description of their activities and involvement in the project is provided in Appendix No. 11. Given that the US workplaces are the most advanced in the required fields, their role in the project is irreplaceable, therefore half of the fellowships, i. e. 3, will be held outside Europe. There are top workplaces dealing with hypespectral data analyses in Europe as well, this is where the other half of fellowships will be held - Israel and Germany. The planned fellowships will be attended by a 2-4-member-team each. The team will be composed of members of the RS Research Team of CVGZ or of project partners outside the project expert team. The people from the target groups CS2 – Other workers involved in education and research - as well as CS3 - University students - will be supported. Findings will be transferred via specialized texts that will be prepared by the participants and will be passed over through specialized papers and contributions at workshops to other partners and other members of the target groups, incl. CS1 – University academic staff. To ensure the transfer of information, at least 2-member-teams are necessary because of substitutability reasons. The number of members also depends on the potential of different types of data for different disciplines, for example the hyperspectral data is practically usable in most of the partners' disciplines, while the TIR data only for specific tasks.

University of Idaho, Boise Center Aerospace Laboratory (BCAL), sec. Department of Geoscience, this laboratory will allow free (unlike European centers) extension of knowledge from the basic course with an emphasis on analytical procedures of methods of LiDAR data evaluation. The fellowship will be attended by 2 people from CS2 and 1 person from CS3. It will be a 10-day working visit.

Boston University, is one of the most prestigious institutions in the evaluation of vegetation based on remote sensing data. Interns will be involved in the development of processes of quantitative evaluation of biochemical and biophysical parameters of vegetation and the concept of spectral invariant prepared for NASA, which is based on the HS and LiDAR data. The expected benefit is linking the RS CVGZ research team with NASA projects and other international projects. The fellowship will be attended by 4 people from CS2. It will be a 12-day-long working visit.

University of Colorado (CIRES)- the fellowship will focus on introduction the evaluation of changes in ecosystems through different techniques connected to remote sensing data. The CIRES part as well as the group around prof. Carol Wessman are focused on multidisciplinary approaches to assess the impact of climate change on the behavior of ecosystems - a close correlation with the CzechGlobe activities. The fellowship will be attended by 2 people from CS2. It will be a 14-day-long working visit.

Tel-Aviv University, the fellowship will focus on practical introduction to the latest procedures for calibration of hyperspectral sensors during flights using ground measurements as one of the most effective techniques of otherwise very time consuming post processing of hyperspectral data. The method allows high-quality calibration of hyperspectral sensors in places that may not necessarily be in the immediate vicinity of the investigated area. The fellowship will be attended by 2 people from CS2. It will be a 10-day-long working visit.

Deutches Zentrum für Luft-und Raumfahrt (DLR-German Space Agency) –the interns will attend a course focused on atmospheric correction of hyperspectral data organized by DLR, which is, in terms of European context, the main pioneer in methods of atmospheric correction of hyperspectral data. The fellowship will be attended by 4 people from CS2 and 1 person from CS3. It will be a 5-day-long working visit.

Forschnungszentrum Jülich – Institute of Bio-and Geosciences – the fellowship will focus on the interpretation of a chlorophyll fluorescence signal, which is closely related to the assimilation activity of vegetation. The chlorophyll fluorescence signal can be used to interpret the health and functional status of various types of ecosystems based on hyperspectral data. The fellowship will be attended by 3 people from CS2. It will be a 14-day-long working visit.

National domestic fellowships

Within the project, ten 7-day-long fellowships for workers of the applicant will be organized. They will be held in the workplaces of the Biology Centre, University of South Bohemia and ENKI o.p.s. and reciprocally two 14-day-long fellowships for workers from the University of South Bohemia and two 14-day-long fellowships for workers of ENKI o.p.s. at CVGZ workplaces.

Estimated attendance at conferences within the project

The representatives of the expert team will participate in the following conferences

during the implementation of the project. The goal of their participation is their presentation of a paper on the latest approaches in the field of remote sensing and expanding cooperation with foreign institutions, which will serve as a base for joint research projects.

2013:

8th EARSeL WORKSHOP on IMAGING SPECTROSCOPY, Nantes, France (3 people)

5th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing WHISPERS, the conference is held on a regular basis, the exact date is not yet known, location EU, (3 people), SPIE Remote Sensing Conference is held on a regular basis, the exact date is not yet known, location EU, (3 people), FOSS4G Free and Open Source Software for Geospatial, the conference is held on a regular basis, the exact date is not yet known, location EU (2 people), conferences thematically focused on the project issues will be attended according to their current availability, location EU (2 people).

2014:

5th Workshop on hyperspectral Image and Signal Processing: Evolution in Remote Sensing, the Conference is held on a regular basis, the exact date is not yet known, location EU, (3 people), SPIE Remote Sensing Conference is held on a regular basis, the exact date is not yet known, location EU (2 people), IGARSS, Quebec, Canada, the conference is held on a regular basis, the exact date is not yet known (2 people), FOSS4G Free and Open Source Software for Geospatial, the conference is held on a regular basis, the exact date is not yet known, location US (2 people), conferences thematically focused on the project issues will be attended according to their current availability, location EU (2 people).

1.2 Territorial impact of KA1

The outputs of Key Activity 1 are intended for all target groups mainly from the South Moravian and South Bohemian regions, which directly participate in the project, but also for invited people from the Moravian-Silesian, Olomouc, Plzeň and Ústí regions. The workshops with the participation of foreign experts will be attended by academic staff of selected universities dealing with remote sensing: Masaryk University - Faculty of Science.

University of Ostrava – Faculty of Science, Palacký University in Olomouc - Faculty of Science, Jan Evangelista Purkyně University in Ústí nad Labem - Faculty of Environment, Faculty of Science, VSB - Technical University of Ostrava - Faculty of Mining and Geology, University of West Bohemia Plzeň - Faculty of Applied Sciences.

1.3 Target groups in relation to KA1

The outputs of Key Activity 1 are intended to all target groups of the project – i. e. university academic staff, other staff dealing with education (research) and university students as well as NGO workers and SMEs. As for CS1, 49 university academic staff

members will be supported in the first part of the activity (opening conference and workshops). As for CS2, 46 other professionals involved in education and research will be supported. All target groups will be actively involved in interactive workshops designed to introduce all participants to the current state in the processing and use of hyperspectral, thermal and LiDAR data in various fields focusing on the evaluation of phenomena and processes in the landscape. In the second part of the activity, which consists of fellowships abroad, 17 people from CS2 will be supported (Other professionals involved in education and research) and 2 people from CS3 (University students). All these target groups will be introduced during their fellowships abroad to the infrastructure and will enhance their knowledge in new areas of RS with the most advanced remote sensing techniques for hyperspectral data processing at world-renowned scientific institutions.

The main benefit for the specialists in remote sensing from the target groups 1 and 2 will be the enhancement of their knowledge in new areas of RS, and especially gaining insight into the partial issues of the project partners' disciplines. Other project partners will obtain basic information on the potential and possibilities of remote sensing for their discipline. This will be a good starting point for interdisciplinary communication, which will be more enhanced during the project by addressing specific problems and by further proposals of new joint projects. The greatest benefit of workshops and fellowships for CS3 University students will be gaining valuable theoretical insight into the latest trends in remote sensing and its applications, as well as the possibility to see the wider context of the disciplines of the project partners. This group can represent a source for recruiting new future colleagues for RS CVGZ and the project partners, either directly involved in CVGZ activities or through cooperation at their existing / new workstations. For professionals involved in education and research in the non-profit sector, the workshops will bring knowledge of methods, which will help enrich their existing "discipline" ways of dealing with research and application projects and increase their chances for participation in interdisciplinary projects. A part of the KA outputs is also the participation of CS1 and CS2 in planned conferences that represent a platform bringing together researchers engaged in the processing of hyperspectral data and associated issues. The conferences will be attended by a total of 20 people, out of which 6 people from CS1, 10 people from CS2 and 4 people from CS3.

Key activity 2

The implementation of a communication and interactive platform of Czech partners

The aim of the Key Activity is the implementation of mutual communication and an interactive platform that will ensure wide cooperation and mutual discussions when processing files of HS, TIR and LiDAR data acquired by the applicant's research team. New methodology for processing this data will be carried out as well as incorporation

of knowledge gained from workshops with foreign experts, from fellowships abroad and from specialists' knowledge from their subject fields. The prerequisite for effective partnerships is not just common sharing and development of knowledge gained so far, but also the involvement of all partners in the organization and technical guarantees for industry-focused discussion panels. In cooperation with project partners, the existing and acquired remote sensing knowledge will be interactively developed in order to solve joint research and application tasks in the disciplines of involved partners, and this knowledge will be further extended in the target groups.

All target groups will be involved in the implementation of Key Activity 2. KA2 outputs are, as well as for KA1, very closely linked to the Key Activity 3.

The Key Activity 2 will follow the first part of KA1 and will run simultaneously with KA3, i. e. from 03 / 2013 to 09 / 2014.

2.1 Outputs - detailed description

The discussion panels, which will also include follow-up workshops, are listed in the order they will be organized. Among various discussion panels there will be interactive discussions devoted to specific concerns according to the focus of disciplines/data across all involved entities and partial discipline-oriented discussions. The discipline diagram will be as follows.

In the first phase there will be an overview of the state of knowledge (state of the art) based on workshops with a foreign partner, including practical demonstrations and interdisciplinary consultations. During the discussion panel a key topic will be selected so that it is suitable for practical testing of a task on the scanned data. During the introductory courses (KA1) the specialists from the CR will be able to consult the results of their existing work with a foreign expert (during his/her visit to the Czech Republic, fellowship abroad, or via the Internet). Then there will be a workshop led by Czech entities (specialists in the given field), and solution of tasks associated with the use of hyperspectral / thermal / LiDAR analysis in various fields. They will include the implementation of a hyperspectral / thermal / LiDAR campaign used to collect data for the practical part of the courses. The data will be scanned for each individual scientific field (water surfaces, soil science, vegetation, etc.) within a suitable time period. Such areas will be selected which have been long monitored by Czech specialists of various expertise who wish to use the possibilities of remote sensing for monitoring the territory. Workers of involved entities will meet at consultations related to data processing. Consultations held in Brno will be handled flexibly. Regarding the consultations between more distant entities, short several day-long-visits will be used. For the consultation with foreign partners, mainly interactive Internet options will be used – Skype and the like.

Discussion panel No. 1- LiDAR data, its use in research and applications

The coordinator of the discussion panel will be the University of Technology in Brno, the consultants will be CVGZ, an expert from the University of Idaho and an expert from Boston University. The discussion panel will be attended by 8 members of the

expert team, 6 people from CS1, 8 people from CS2 and 4 people from CS3. A total of 18 people will be supported. The outcome of the discussion panel No. 1 will be shared knowledge on the utilization of LiDAR data for the assessment of land cover across disciplines (remote sensing x forestry, RS x agriculture, remote sensing x urbarial development); a manuscript publication from the test task; an input section regarding this topic in the forthcoming monograph of the project; outputs in terms of materials further usable in teaching and as data on a map server.

Discussion panel No. 2 - Use of remote sensing in the assessment of fresh-water reservoirs

The coordinator of the discussion panel will be RAWAT consulting s.r.o. and ENKI o.p.s., the consultants will be CVGZ experts, an expert from the University of Colorado, foreign institution specialized in issues dealing with water assessment using imaging spectroscopy methods. The discussion panel will be attended by 8 members of the expert team, 6 people from CS1, 8 people from CS2 and 4 people from CS3. A total of 18 people will be supported. The outcome of the discussion panel No.2 will be knowledge on using hyperspectral data for the assessment of open freshwater reservoirs; a manuscript publication from the test task; an input section regarding this topic in the forthcoming monograph of the project; outputs in terms of materials further usable in teaching and as data on a map server.

Discussion panel No. 3 - Evaluation of soil properties using remote sensing methods

The coordinator of the discussion panel will be the Biological Center and the University of South Bohemia, experts from CVGZ and an expert from Tel-Aviv University will play a role of consultants. The discussion panel will be attended by 8 members of the expert team, 7 people from CS1, 9 people from CS2 and 4 people from CS3. A total of 20 people will be supported. The outcome of the discussion panel No.3 will be knowledge on the use of hyperspectral and thermal data for assessing the soil properties of exposed soils also in combination with stands; a manuscript publication from the test task; an input section regarding this topic in the forthcoming monograph of the project; outputs in terms of materials further usable in teaching and as data on a map server.

Discussion panel No. 4 - Remote sensing for the evaluation of the functioning of agroecosystems in changing climatic conditions

The coordinator of the discussion panel will be the Mendel University and Daphne - Institute of Applied Ecology, the consultants will be experts from CVGZ and an expert from Forschungszentrum Jülich. The discussion panel will be attended by 8 members of the expert team, 7 people from CS1, 9 people from CS2 and 4 people from CS3. A total of 20 people will be supported. The outcome of the discussion panel No. 4 will be knowledge on the use of hyperspectral data to assess the current state of photosynthetic processes of stands based on the fluorescence signal from hyperspectral data that is accompanied by a TIR signal; a manuscript publication from the test task; an input section regarding this topic in the forthcoming monograph of

the project; outputs in terms of materials further usable in teaching and as data on a map server.

Discussion panel No. 5 - Synergistic use of airborne remote sensing data (HS, TIR, LiDAR) in the evaluation of vegetation

The coordinator of the discussion panel will be CVGZ, the consultants will be an expert from Boston University, an expert from Forschungszentrum Jülich and an expert from Tel-Aviv University. The discussion panel will be attended by 8 members of the expert team, 11 people from CS1, 16 people from CS2 and 8 people from CS3. A total of 35 people will be supported. The outcome of the discussion panel No.5 will be knowledge on simultaneous use; a manuscript publication from the test task; an input section regarding this topic in the forthcoming monograph of the project; outputs in terms of materials further usable in teaching and as data on a map server.

2.2 The territorial impact of KA2

The outputs of the Key Activity 2 are intended for all target groups mainly from the South Moravian and South Bohemian regions but also for invited people from the Moravian-Silesian, Olomouc, Plzeň and Ústí regions. Likewise in KA1, academics and Ph.D. university students engaged in remote sensing will be invited - Masaryk University, University of Ostrava, Palacký University in Olomouc, Jan Evangelista Purkyně University in Ústí nad Labem, VSB - Technical University of Ostrava, University of West Bohemia Plzeň - and NGOs and SMEs dealing with remote sensing applications (geodetic organization) with respect to capacity possibilities. Preferred will be those interested in continued involvement in the activities. Due to the retrospective availability of study materials and data from discussion panels on the Internet, the territorial impact will be much wider. However, any estimation at this point would be considered a speculation at the moment. Also the monograph that will be prepared should make theoretical knowledge available to a wider audience, mainly to university students and experts in remote sensing, since such study materials on the airborne remote sensing in the area of hyperspectral, TIR and LiDAR data are not yet available in the Czech Republic.

2.3 Target groups in relation to KA2

The outputs of Key Activity 2 are targeted to all target groups of the project – i. e. University academic staff, University students and Other staff dealing with education and research. On behalf of CS1 – Academic staff, 37 people will participate in the discussion panels. CS will be actively involved in interactive workshops which aim at introducing all participants to the current potential and possible use of hyperspectral, thermal and LiDAR data in partial (e. g. soil properties) as well as multi-disciplinary overlaps (vegetation x soil x water x climate). On behalf of CS3 - University students - 24 people will participate in the discussion panels, selected students will be involved in data collection campaigns, so that they have the opportunity to be actively drawn into the whole process of using remote sensing in the given field and thereby creating

an immediate connection to the project and increase their assertion in the labor market. The acquired knowledge will be also indirectly transferred to this target group through lectures at universities which are involved in the project (150 people). On behalf of CS2 - Other professionals involved in education and research - 50 people from the Academy of Sciences (public research institution) and non-profit organizations (NGOs) will participate in the discussion panels. As most NGOs have a broad interdisciplinary scope often tied to the evaluation of various aspects of the environment, discussion panels will allow them to gain an overview of current remote sensing possibilities in the field. Experts from public research institutions will, likewise the CS1, gain a comprehensive overview of the possibilities of using hyperspectral, LiDAR and thermal data in partial fields (e.g. soil properties) as well as in multi-disciplinary overlaps (vegetation x soil x water x climate).

Key Activity 3

Sharing the research infrastructure, processing materials for dissemination of acquired knowledge, the preparation of joint projects and development of an interactive interdisciplinary platform for universities, research institutions, non-profit and business sectors

The aim of the Key Activity is:

1 Presentation of results that were acquired based on workshops, discussion panels, fellowships abroad – the tool for achieving this objective will be making the materials from workshops with international experts accessible; presentation of results at conferences, publications in textbooks, publication of results in articles of impact journals; monographs published both electronically and as books.

2 Sharing research infrastructures both during the project and after its completion - through the use of research infrastructures of the CzechGlobe Centers of Excellence (high-end technology of hyperspectral and thermal scanners, airborne sensor carrier) and AdMaS (Advanced Materials, Structures and Technologies) linked through FAST (Faculty of Civil Engineering – Brno University of technology) VUT (full wave form LiDAR data-3D laser scanning).

3 Creating the conditions for the continuation of the interactive interdisciplinary platform also after the completion of the project - creation of an on-line database of sample data of remote sensing and ground surveys which will be available to the partners involved and to the group of University students; creation of a freely accessible map server with an overview of scanned HS data; 3 project proposals and their submission to the thematically relevant grant agencies.

The implementation of Key Activity 3 will involve all target groups. Key Activity 3 is very closely linked with the outputs of Key Activities 1 and 2, thus it will run throughout the duration of the project implementation – i. e. from 10 / 2012 to 09 /

2014.

3.1 Outputs - detailed description of KA3

The outputs of KA3 are closely linked to outputs of KA 1 and KA2, which are workshops, fellowships abroad, contributions at conferences, discussion panels. As for workshops and discussion panels organized for individual fields of RS data analysis, it is necessary to acquire the data first, whether through airborne or ground sensing data collection. This enables sharing the infrastructure of the Center of Excellence, whose output will be launching a virtual laboratory for analysis of hyperspectral, thermal and LiDAR data that will be used during the practical part of the discussion panels and workshops. The laboratory will accessible in any computer room using a remote access to the CVGZ server.

The results of workshops and panel discussions will be presented both in written and electronic form, with regards to their intended application:

Materials from workshops with international experts especially useful in teaching and after the project completion. ***Articles in conference proceedings***, where preliminary results from the discussion panels will be presented. ***Manuscripts of articles*** that will be submitted to review procedure during the project intended for impact journals (assessed by Evaluation of Research, Development and Innovation). The articles will focus on the methodological procedures and results for partial tasks solved at the discussion panels, i. e. oriented according to the data used and according to the evaluated elements of the landscape. **A monograph** focusing on the use of airborne imaging spectroscopy, LiDAR data, thermal data, and appropriate supporting measurement and processing methods for the purpose of evaluation of various elements of the land cover and its properties. ***Above mentioned data and results will be accessible on*** www.czechglobe.cz ***website***. ***Launch of an on-line database of remote sensing and ground surveys data, which arose as a result of discussion panels***. The database will be designed in accordance with the recommendations of the working group N6SP-Standards and Protocols of EUFAR FP7 project and will be available to the project partners. Sample tasks, based on discussion panels will be made available and generally accessible on-line also after the completion of the project (e. g. for teaching, research sector, and the like). Further, also a map server will be launched. It will be specialized in remote sensing with high spectral resolution, which will enable easier orientation in the captured image data and thereby searching of appropriate data sets in the database for further analysis (e. g. time series). ***3 projects submitted to grant agencies*** as a potential continuation of initiated cooperation between HYDAP partners, or even with the participation of foreign experts. The project topics will arise from the results of the discussion panels.

In the last month of the project investigation, there will be a ***3-day-long workshop*** with the participation of all project implementers and target groups. All achieved results will be assessed, procedures for cooperation will be presented and regular consultation activities between the project partners will be set up. Number of participants - 30 people from the expert team; besides the expert team, the workshop

will be attended by 15 people from CS1, 20 people from CS2 and 10 people from CS3. A total of 75 people.

Quantification of outputs

1 monograph- published in Czech and English

5 contributions in conference proceedings

3 manuscripts of articles submitted for review procedure during the project intended for impact journals

8 reports summarizing the findings from fellowships abroad

1 database for on-line sharing of hyperspectral data

3 jointly submitted projects

3.2 Territorial impact of KA3

The outputs of Key Activity 3 are intended for all target groups from the South Moravian, South Bohemian, Moravian-Silesian, Olomouc, Plzeň and Ústí regions. The database for on-line sharing of hypespectral data will be available to the following academic centers and universities: Masaryk University – Faculty of Science, University of Ostrava – Faculty of Science, Palacký University in Olomouc - Faculty of Science, Jan Evangelista Purkyně University in Ústí nad Labem - Faculty of Environment, Faculty of Science, VSB - Technical University of Ostrava - Faculty of Mining and Geology, University of West Bohemia Plzeň - Faculty of Applied Sciences.

Due to retrospective availability of materials from workshops with foreign experts and from discussion panels that will be further used for teaching, the territorial impact will be much wider. The monograph will make theoretical knowledge available to a wider audience, university students and experts in remote sensing.

All mentioned outcomes of the Key Activities are of a great benefit to the project compared with the current state, i. e. the materials on airborne RS in the area of hyperspectral, TIR and LiDAR data are not yet available in the Czech Republic.

3.3 Target groups in relation to KA3

KA 3 outputs are intended for all target groups CS1 – University academic staff, CS2 - Other professionals involved in education and research and CS3 - University students. Within the Key Activity there will be a 3-day-long workshop attended by 15 people from CS1, 20 people from CS2, and 10 people from CS3.

The benefit for the specialists in remote sensing from CS1 and CS2 will certainly be the acquisition of a comprehensive overview of the latest findings in the fields of remote sensing and especially the insight into the partial issues of the project partners' disciplines. These outputs will allow the creation of a theoretical-application base that will provide a theoretical access to the latest RS trends and its application, but also it will allow to see the wider context with disciplines of other subject fields involved in the project. Joint projects will become a starting point of interdisciplinary communication, which will be in the future enhanced by addressing specific tasks and by proposing new projects. Workers of NGOs will be enabled to enrich their existing "discipline" ways of dealing with research and application projects and increase their opportunities for participation in interdisciplinary projects. The benefit for CS3 - University students - will be the theoretical knowledge and application outputs in the form of an on-line database and a map server. Improving teaching processes will bring students' greater interest and deeper understanding, which will represent greater opportunities for cooperation with early scientists for the applicant. Gained knowledge will help all students improve their competitiveness on the labor market.