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I. Preface

This strategy guides how the Interfaculty Department for Geoinformatics – Z_GIS (in short: “Z_GIS”) continues to enhance the quality of research carried out within the Department. It is based on an objective analysis of the recent core competencies in the identified research areas as well as an analysis of the intended development options. The strategy takes particularly into account the international environment in the research field of Geoinformatics and Geographic Information Science and positions Z_GIS to be competitive.

Z_GIS understands its interdisciplinary positioning in the University’s organization as guiding principle. Geoinformatics and its tools serve as integration point for information from different disciplines with social or natural science foci. Additionally, Geoinformatics acts as transfer discipline that extends existing methods for spatial analysis components. These extended methods are then applied to domains of interest with the objective of gaining a deeper understanding of spatial aspects of social and natural phenomena.

Since interdisciplinarity is an integral aspect of the Geoinformatics field, Z_GIS developed strengths in systemic thinking, the interaction with multiple user groups or target communities and work in multi-disciplinary teams. These competences are applied in projects, which provide funding to the majority of staff members. Z_GIS has a long-term experience in self-sustaining organization and developed competences in fund raising, marketing, and branding.

Geoinformatics is the science (and sometimes considered the ‘art’) to deal with spatial information. This stretches from capturing data to classification and to context-dependent creation of information in support of spatial decisions. Technically, this involves storage, processing, portrayal and dissemination, including the infrastructure necessary to secure optimal use, of this information. Geoinformatics is highly overlapping and interconnected with the term Geographic Information Science (GIScience). In this interdisciplinary research field Z_GIS seeks to understand the nature of geographic phenomena and of geographic information while providing theoretical foundations for Geographic Information Systems (GIS).

II. Vision and general approach

a. Vision

Z_GIS consists of a pool of Geographic information (GI) scientists, GI engineers and domain specialists, who pursue basic and applied research projects. The exchange among theoretical and applied perspectives is stimulating for all. The methodological knowledge enriched with a diversified domain expertise provides a fertile ground for the development of new methods and applications thereof. Z_GIS achieves to act as a think tank for geospatial information generation in natural and social spheres.

The overarching vision and common denominator of the research projects carried out at Z_GIS is to reach a better understanding of social and natural phenomena in their spatial manifestations. To reach this goal, a sequence from data collection to analysis and application is followed. This sequence is not a linear process, rather a cyclic one, as capturing devices and analysis techniques mutually generate new development needs. The analysis component involves the development of new methods, the improvement of technology and data infrastructure and the application of GIS. A specific third research component covers the communication of spatial information for education and dissemination purposes. The research areas discussed in this strategy document can be grouped into the main categories of data capturing and sensing, analysis and information extraction, as well communication and education (Fig. 1, left). In a series of recent peer-reviewed articles the Z_GIS’ approach to Geoinformatics and GIScience as common denominator among and between
various disciplines, acting as a facilitator for interdisciplinary research has been manifested. In particular, it has been demonstrated how the spatial view and spatial methodologies facilitate a bridge which spans from the physical environment to social phenomena and from sensing of probes to sophisticated spatial analysis and visualizations of complex phenomena.

b. General approach: the knowledge cycle

The knowledge cycle of research areas within Z_GIS generally consists of three interconnected components: methods, domains and outreach (Fig. 1, right). Z_GIS has a strong methodological focus aiming to develop, improve and apply methods and methodologies. At the same time Z_GIS has a strong history of education and outreach. Innovation mostly comes from combining and transferring methods from and utilizing tools across domains. A developed method undergoes a feedback loop that involves improvement, adaptation, extension of the related mindset. A newly developed method can be directly used in domain applications. This serves as proof-of-concept, for benchmarking, and for validation. Since the development and application of methods take place in one location, the transfer of insights is fostered, from the use of methods back to their development and from a successful application to another application. Outreach activities complement the knowledge cycle as described in the next sub-chapter.

c. The institutional approach

Z_GIS is an active member of research communication platforms as both participant and organizer. Z_GIS annually organizes the well-reputed AGIT and GI Forum conferences in Salzburg as well as workshops and short intensive programs at varying locations. Staff members are well linked to the scientific community which is indicated by invitations to keynote presentations, board memberships in scientific journals, project review activities and invitations to supervise or examine PhD students outside Salzburg. As stated above and as manifested in the knowledge cycle, education is a major activity included in the outreach component. Core elements of this approach are:

- Z_GIS introduces research elements gained from applied and fundamental research projects in the Masters Applied Geoinformatics, thus striving for a ‘science-led education’.
- Since its foundation in 1988 outreach and dissemination activities have been a vital element of Z_GIS. The yearly AGIT and GI-Forum symposia are the flagships of a wide portfolio of national and international outreach activities.
- The UNIGIS educational programs expand the educational efforts to professionals and international contexts.

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The Doctoral College GIScience strengthens the basic research component of Z_GIS. These are only some highlights of recent expertise which is important to mention for understanding the research strategy.

### III. Methodological competences

Z_GIS unifies technical expertise and methodological competence having contributed to the body of knowledge through syllabus design and contributions to educational networks including the initiation of such networks.

<table>
<thead>
<tr>
<th>#</th>
<th>Methodological competence</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Geographic information concepts (events, processes, objects, fields, relations, distance, vagueness)</td>
<td>G / GI</td>
</tr>
<tr>
<td>2</td>
<td>Geodata acquisition (field mapping, remote sensing, in situ sensing, UAS, crowdsourcing)</td>
<td>GI</td>
</tr>
<tr>
<td>3</td>
<td>Sensor networks</td>
<td>GI</td>
</tr>
<tr>
<td>4</td>
<td>Data models (tessellation data models, object data models, ER modeling)</td>
<td>GI / CS</td>
</tr>
<tr>
<td>5</td>
<td>Spatial database design and management (relational DBMS, object-oriented)</td>
<td>CS</td>
</tr>
<tr>
<td>6</td>
<td>Database query and SQL</td>
<td>CS</td>
</tr>
<tr>
<td>7</td>
<td>Semantics, ontologies knowledge representation</td>
<td>CS / GI</td>
</tr>
<tr>
<td>8</td>
<td>Spatial data/information infrastructures</td>
<td>GI</td>
</tr>
<tr>
<td>9</td>
<td>OGC web services and web processing</td>
<td>GI</td>
</tr>
<tr>
<td>10</td>
<td>Network analysis (least-cost path, flow modelling)</td>
<td>GI</td>
</tr>
<tr>
<td>11</td>
<td>Process modelling and simulation</td>
<td>G / GI / CS</td>
</tr>
<tr>
<td>12</td>
<td>Geostatistics (graphical, stochastic, Bayesian) and landscape metrics</td>
<td>S / GI</td>
</tr>
<tr>
<td>13</td>
<td>Spatial statistics (sampling, semi-variograms, kriging)</td>
<td>S / GI</td>
</tr>
<tr>
<td>14</td>
<td>Spatial analysis (distance, point patterns, spatial clusters, multidimensional, multi-criterion evaluation, surface analysis)</td>
<td>GI</td>
</tr>
<tr>
<td>15</td>
<td>Cartographic representation and map design</td>
<td>GI / C</td>
</tr>
<tr>
<td>16</td>
<td>Accuracy and uncertainty modelling</td>
<td>GI</td>
</tr>
<tr>
<td>17</td>
<td>Spatio-temporal GIS</td>
<td>GI</td>
</tr>
<tr>
<td>18</td>
<td>Surface and DEM analysis</td>
<td>GI</td>
</tr>
<tr>
<td>19</td>
<td>Scientific visualisation (3D animations, globe viewers)</td>
<td>GI / CS</td>
</tr>
<tr>
<td>20</td>
<td>Decision support tools</td>
<td>GI / CS</td>
</tr>
<tr>
<td>21</td>
<td>Spatial indicator development</td>
<td>GI / G / S</td>
</tr>
<tr>
<td>22</td>
<td>Image pre-processing and enhancement (ortho-rectification, pan-sharpening, atmospheric correction)</td>
<td>RS</td>
</tr>
<tr>
<td>23</td>
<td>Image classification (unsupervised, supervised, advanced classifiers)</td>
<td>RS</td>
</tr>
<tr>
<td>24</td>
<td>Information extraction (optical, Radar, Lidar, hyperspectral) etc.</td>
<td>RS</td>
</tr>
<tr>
<td>25</td>
<td>Object-based image analysis</td>
<td>RS</td>
</tr>
<tr>
<td>26</td>
<td>Application development</td>
<td>CS</td>
</tr>
<tr>
<td>27</td>
<td>Geo-media pedagogy</td>
<td>GI / P</td>
</tr>
</tbody>
</table>

Table 1. Z_GIS methodological core competencies (G = Geography, GI = Geoinformatics, CS = Computer Science, S = Statistics, C = Cartography, RS = Remote Sensing (incl. image processing), P = Pedagogy

### IV. Domain expertise

Based on its interdisciplinarity, Z_GIS offers a broad variety of domain competencies. This diversity in thematic expertise is a critical element for any collaborative project efforts. While domain competence is a pre-requisite to effectively communicate with the respective communities, the utilization of GI methods in a spatial view (GI for ‘domain xy’) will remain the core strategy.
The following table lists domain competencies with related projects and activities which exist within Z_GIS at the beginning of the year 2013. Note that for the sake of clarity, each project is assigned to one domain only. This list serves as a testimony for the plausibility of the strategic research areas in the annex of this document. The topics are listed here sequentially but are highly interrelated. While they are already – as of spring 2013 – partially organized in thematic fields (e.g. vulnerability, disaster risk reduction and public health / health research), they will particularly serve as a home base for the strategic research areas described in this document. The fields of thematic competencies are like anchor points in an interdisciplinary research environment. These ‘anchors’, as oftentimes proved in the research history of Z_GIS, are vital in establishing new partnerships as a critical interface in terms of mutual understanding, experience, and speaking the ‘same language’.

Some of the thematic fields such as disaster/emergency management and humanitarian action support are well grounded in operational service environments providing geospatial information services targeted to specific user needs (public administrations, UN bodies, NGOs, etc.).

<table>
<thead>
<tr>
<th>Domain</th>
<th>Related projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscapes, ecosystems &amp; biodiversity</td>
<td>MSMONINAA*, FFH Basiserhebung, KnowLand</td>
</tr>
<tr>
<td>Forest management</td>
<td>OBIALP*</td>
</tr>
<tr>
<td>Water and soil</td>
<td>SMART*</td>
</tr>
<tr>
<td>Vulnerability</td>
<td>MOVE*, HF</td>
</tr>
<tr>
<td>Disaster risk reduction</td>
<td>SALIMA*, Know4DRR, DIPECHO-SEA*, UN-SPIDER</td>
</tr>
<tr>
<td>Climate change adaptation</td>
<td>HF, C3Alps*, UNEP Sahel</td>
</tr>
<tr>
<td>Human security</td>
<td>G-SEXTANT, G-NEXT*</td>
</tr>
<tr>
<td>Health</td>
<td>Healthy Futures</td>
</tr>
<tr>
<td>Nano particles</td>
<td>Nanolyse</td>
</tr>
<tr>
<td>Regional planning</td>
<td>SUSE, EULE</td>
</tr>
<tr>
<td>Urban planning, city models</td>
<td>EULE, Autodesk Coop</td>
</tr>
<tr>
<td>Humanitarian action</td>
<td>MSF.Info*, E04HumEn</td>
</tr>
<tr>
<td>Climate models</td>
<td>CHANGES</td>
</tr>
<tr>
<td>Geohazards</td>
<td>iSlide, SAFER</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>ENERGEO, ThermoMap</td>
</tr>
<tr>
<td>Critical infrastructures</td>
<td>SESAAM*</td>
</tr>
<tr>
<td>Geomedia in citizenship education</td>
<td>digital-earth.eu*, SPACIT*</td>
</tr>
<tr>
<td>Geomedia in science education</td>
<td>iGuess2*, GEOKOM-PEP, youthMap5020</td>
</tr>
<tr>
<td>Development topics</td>
<td>CIG-UCM*, BrahmaTWinn, emGIS*</td>
</tr>
<tr>
<td>Mobility and traffic</td>
<td>InterEVENT, Easy Rider</td>
</tr>
<tr>
<td>Neurodegenerative processes</td>
<td>GeoMS</td>
</tr>
</tbody>
</table>

2 * = and all related precursor projects
V. Analysis: matching of methodological and domain competencies

In several workshops held between November 2012 and March 2013 and based on several feedback loops the existing competencies were analysed in order to define future research fields.

Based on this process eight strategic research areas (RA) were identified. As noted above, these areas were chosen because they represent the points of intersection between the core methodological and domain competencies. They also cover human and natural environments. While research is being conducted in each of these areas, important gaps as well as overlaps exist. All research areas are society-relevant.

Within all research areas basic and applied research will be carried out. Next to methodological developments and scientific achievements Z_GIS wants to contribute to a deeper understanding the physical environment and the human society – and in particular the human-environment nexus.

Therefore, the USP (unique selling proposition) of Z_GIS is the combination of:

- Basic and applied research,
- cutting edge research focusing on the eight strategic fields,
- embedded in the described knowledge cycle.

In this respect Z_GIS is different from most University institutes and departments. Here, there is a tradition in projects chains which reach from fundamental research via applied R&D to teaching and outreach.

Within the following five years this USP needs to be strengthened, sharpened and better communicated to the scientific and wider public.
Elements of this strategy include:

- New methods / developments are planned in a way that they can be utilized in **domain applications** (proof-of-concept, benchmarking, validation, etc.), either directly or after several steps along this chain (e.g. from a FWF-funded basic research project to a FP7 project to an outreach activity or educational measurement).

- Z_GIS needs to maintain and further improve a **creative setting** which allows to cross-link and to combine methods and tools from one domain to another. Feedback loops shall be made more explicit and frameworks shall be named more explicitly. This shall lead to further improvement, adaptation, and extension of mind-sets.

- The pool of GI engineers and GI scientists must remain **well balanced**. Human resource development shall support a mutual cross-fertilizing between domains and fields.

- This interdisciplinarity shall **exude methods** and methodologies to other disciplines and departments within PLUS.

- The long-term experience being a partially **self-sustaining organization** (fund raising, marketing, branding) shall be maintained and qualitatively adopted to the setting of an Interdisciplinary Department.

- The research shall allow for **transparency of projects** even in highly dynamic and complex fields. For instance, when climate change scenarios are applied and adaptation capacities and vulnerabilities are modelled, inter- and transdisciplinary methods and systemic thinking necessitates multiple user groups/views and targeted communication of results to different communities (domain- and scale-wise). This is methodologically a cross-cutting expertise—beyond the eight strategic research fields.

- Research communication **platforms** are further developed. This includes own conferences, and workshops as well as individual board memberships, etc.

- Science communication to a wider public including secondary education will supported as integral part of research.

- Since the number of combinations of methodological and domain expertise increases the number of possible links between them ‘exponentially’, Z_GIS will carry out projects more **strategically planned** as in the past.

In doing so, Z_GIS strives for being recognized as the **think tank** for geospatial information handling in natural and social spheres in Europe.

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The following research areas have been identified in an iterative discussion among senior researchers of Z_GIS. Each research area is under the responsibility of one or two scientists. Other staff members (e.g. project collaborators) can be involved in a particular project context or, beyond that, by forming a working group (WG). A formal installation of WPs is to be seen independently from the status of this document. Each research area has specific **scientific objectives**, the fulfilment of which can be assessed by a set of **measurable indicators**. A short abstract characterizes each research area.
Annex I: The strategic research areas

Eight Research Areas (RA)

(1) Object-based Image Analysis (OBIA)
(2) Integrated Spatial Indicators
(3) Multidimensional modelling & simulation across scales
(4) Landscape Lab
(5) GIScience Lab
(6) GIS in Transportation and Mobility
(7) Geographic Information Infrastructure (GII)
(8) Geo-media Pedagogy

(1) Object-based Image Analysis (OBIA)

- **Contact:** S Lang, D Tiede
- **Researchers involved:** P Füreder, D Höblinger, C Eisank, A Osberger, S d’Oleire-Oltermanns, F Lüthje, P Hofmann, T Blaschke, I Tomljenovic, B Friedl, T Strasser
- **Collaborators:** University of Applied Sciences, Salzburg (S Wegenkittl), Department of Computer Science (A Uhl), DLR Germany (E Schöpfer), PUC-Rio Brazil (R Feitosa), INPE Brazil (H Kux, G Camaro), University of Calgary Canada (G Hay, G Castilla), A Baraldi

**Scope and overall aim:**

Object-based image analysis (OBIA) is at the interface between remote sensing, image processing, and GI analysis. Emphasizing spatial, structural and hierarchical features it focuses, but is not limited to geographical high-resolution imagery from Earth observation (EO) sources. In both methodological and conceptual terms Z_GIS has greatly contributed to the emerging field of object-based image analysis. We branded the term and some of the key concepts and started a series of international scientific conferences. Z_GIS published a number of key publications in refereed journals, and having compiled

3 Contact persons and Researchers involved are Z_GIS members
and edited the world's largest compendium on OBIA with critical reviews on established and new conceptual insights and emerging application domains.

The research area OBIA aims at methodological improvements of the overall approach and specific elements such as rule set robustness and transferability, accuracy assessment, change detection. The group working on OBIA will ascertain Z_GIS’ international leading role in this field by continuing and intensifying cooperation with the world’s leading OBIA software provider Trimble Geospatial and other actors in the open source domain (e.g. PUC Rio de Janeiro, Brazil). High-level journal publications on both conceptual and applied aspects, including in non-geographical domains, will further increase the visibility and impact of the working group globally.

Keywords: spatial concepts, knowledge representation, hierarchy, rule-based production systems, (very) high resolution image data, automation

The R&D activities of the workgroup "Object-based Image Analysis (OBIA)" should contribute to the achievement of the following objectives:

<table>
<thead>
<tr>
<th>Scientific / technological objectives</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Further) Conceptual development of the OBIA approach, methodological foundation</td>
<td>3 major journal publications which are well received in the community: GEON, ESP-tool.02, Paradigm shift Visibility in the OBIA community, exchange of researchers/international collaboration</td>
</tr>
<tr>
<td>Methodological developments:</td>
<td>4-6 internal workshops / year on methodological issues (conceptual and methodological discussions, sharing of developments, regular updates of PhD progress, development of common publications.)</td>
</tr>
<tr>
<td>- Further development of class modelling approaches</td>
<td>Project implementation and results: ABIA, G-SEXTANT, iSlide with related publications</td>
</tr>
<tr>
<td>- Development of automated change detection and object update algorithms</td>
<td></td>
</tr>
<tr>
<td>- Development and implementation of object-based accuracy assessment methods</td>
<td></td>
</tr>
<tr>
<td>- Development of robustness measures for transferable rule sets</td>
<td></td>
</tr>
<tr>
<td>Increased level of automation in operational geoinformation services (GMES/Copernicus or bilateral research agreements (MSF))</td>
<td></td>
</tr>
<tr>
<td>Continuation of TIP (Trimble Imaging Innovation Program) and related strategic setup</td>
<td>Licensing scheme is maintained</td>
</tr>
<tr>
<td>Establishing a Christian-Doppler Laboratory on OBIA</td>
<td>supporting commitments from industry (e.g. Trimble), proposal prepared in Q1/2014, submitted in Q3/2014</td>
</tr>
<tr>
<td>Specific OBIA developments in the open-source domain in collaboration with PUC and INPE, Brazil</td>
<td>Staff exchange in the frame of Science without Borders in Q2/2014</td>
</tr>
<tr>
<td>Integrate SIAM software in OBIA workflows</td>
<td>SIAM to be implemented as operational module in SELIAT service Q2/2014</td>
</tr>
<tr>
<td>Transfer of methodological pool to integrate image and non-image (continuous) geodata</td>
<td>Proof-of-concept, successful usage in Integrated spatial indicators: FWF Project</td>
</tr>
<tr>
<td>Transfer to non-geo scales and application domains</td>
<td>high-level summary publication in interdisciplinary journal &quot;Nature&quot;-type</td>
</tr>
<tr>
<td>Transfer of methodological pool to different applications domains</td>
<td>Project implementation and results: FWF project iSlide Publications planned</td>
</tr>
</tbody>
</table>
| Exchange with other Z_GIS research areas, specifically: | - Integrated spatial indicators  
- Geographic Information Infrastructure (web-based OBIA geoprocessing)  
- Multidimensional modelling and simulation across scales  
- Landscape lab |

**Integrated Spatial Indicators**

- **Contact:** S Kienberger, P Zeil
- **Researchers involved:** M Hagenlocher, L Pernkopf, S Lang, G Ahamer, D Tiede, R Speikermann, K Breinl
- **Collaborators:** iSPACE (T Prinz), UNU-EHS (J Birkmann), EURAC (S Schneiderbauer, M Zebisch), BICC (L Wirkus), Harvard School of Public Health (M Castro)

**Scope and overall aim:**

Global challenges require an advanced spatial and integrated understanding of potential harm. To measure, monitor, and represent the constantly increasing complexity of environmental and societal processes, innovative methods are needed which consider true spatial characteristics, as well as quantitative and qualitative notions. There is a growing challenge to better understand critical emerging patterns and underlying processes in a systemic and synoptic way. The research area ‘integrated spatial indicators’ develops methods to spatially represent complex phenomena at different spatial and temporal scale levels. The aim is to develop new indicator-based approaches which consider true spatial distributions, are hierarchical and decomposable, but also provide an integrated view of a specific phenomenon.

To achieve this we will build on new and established concepts in GIScience, such as object-based analysis, composite indicator development as well as spatial statistics. This will be realised through applied research in different international case studies, the publications of scientific results in peer-reviewed journals and through the exchange and proof-of-concept with a variety of users. Benefits will arise from a new way of approaching multi-faceted challenges in the context of disaster risk reduction, public health, and landscape ecology. Building on but not only limited to these application domains it will provide decision makers with relevant tools to tackle the ‘big picture’ rather than looking at isolated aspects only. Current and future activities create a sound conceptual approach for integrated spatial indicators; enhance associated workflows and tools, and develop ideas and approaches for visual and cartographic exploration. This is currently done in the context of vulnerability assessments for disaster risk reduction, public health, climate change adaptation as well as sensitivity analysis for landscape ecology where opportunities exist to expand to other conceptual approaches (adaptation, risk, resilience, etc). Specific exchange is envisaged with the research areas OBIA, GII and GIScience lab.

**Keywords:** spatial analysis, composite indicators, decision support, scaling, spatial metrics, monitoring

The R&D activities of the workgroup “Integrated Spatial Indicators” should contribute to the achievement of the following objectives:
<table>
<thead>
<tr>
<th><strong>Scientific / technological objectives</strong></th>
<th><strong>Indicators</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual geon approach to be established, which provides the basis for the development of spatially, integrated indicators ('integrated geons')</td>
<td>3 major journal articles which are well received in the community: geon (SL et al); Benchmarking Paper on ISI (SK et al.); Paper on policy context - Identification of future research needs in integrated spatial indicators (development of an internal 'strategy research paper') - Improve visibility in the wider indicators research community through participation in workshops, conferences and dedicated meetings</td>
</tr>
<tr>
<td>Development and continuous enhancement of workflows and tools to model composite geons (through the integration of methods applied in OBIA, but also wider domains of spatial analysis and geostatistics)</td>
<td>- Further enhancement of workflow into a building block structure to be published as journal Publication; Geon workflow 2.0 - Integration of work within PhD thesis topics of M Hagenlocher and L Pernkopf (papers to be expected), - Acquisition of a research project dedicated to enhancements in concepts and methods on integrated geons (FWF etc) - 4-6- internal workshops on 'integrated spatial indicators' (conceptual and methodological discussions, regular updates of PhD progress, workflow development, development of strategy paper…)</td>
</tr>
<tr>
<td>Conceptual development of innovative visualisation and exploration tools, and benchmarking of approaches with users</td>
<td>- Explorative tools as online applications available - Integration within related project deliverables: e.g. KNOW-4-DRR, HEALTHY FUTURES</td>
</tr>
<tr>
<td>Application in established fields of studies (<em>disaster risk reduction, vector-borne diseases, environmental impact analysis</em>) and exploration of new areas</td>
<td>- Integration of work in different research projects</td>
</tr>
<tr>
<td>Exchange with other Z_GIS research areas, specifically</td>
<td>- OBIA - Geographic Information Infrastructure - Multidimensional modelling and simulation across scales - GlScience Lab</td>
</tr>
</tbody>
</table>

(3) **Multidimensional modelling and simulation across scales**

- **Contact**: R Marschallinger, G Wallentin
- **Researchers involved**: P Hofmann, F Zobl, C Jandrisevits
- **Collaborators**: PMU Salzburg (J Kraus), Klinikum rechts der Isar München (M Mühla), Univ. Texas CT Lab (R Ketcham), TU München (J Kruhl, K Thuro), Naturhistor. Museum Wien (G Höck, A Lukeneder), Univ. Southampton (PM Atkinson), Stanford Univ. School of Earth Sciences (A Boucher)
**Scope and overall aim:**

The research area 'Multidimensional modelling and simulation across scales' starts from established geoinformatics concepts and transfers them to a broad range of 2D+t / 3D+t application domains. Results from this strategic research area are expected to deliver new insights into spatial processes and to advance conceptual frameworks of spatio-temporal approaches in GiScience.

With the roots in Geography, GIScience traditionally has focused on 2D or 2.5D geographical scales, ranging from local to global environments on the Earth surface. GIS data models still commonly handle the 3rd (z) dimension of true volumetric models and the 4th (temporal, t) dimension as attributes in a 2D world. Yet, our world is 3D, volume-oriented and it is constantly changing!

Our aim is to advance the existing methodological and algorithmic basis of Geoinformatics to incorporate multiple dimensions and scales and to couple these multidimensional methods for spatial data handling with temporal process models for the simulation of spatio-temporal processes. Depending on the research question, a range of simulation approaches are available, including agent-based, object-based, system-dynamical and data-driven models.

- Today, a wealth of spatial data exists in the classical geographic scales. Abundant high-resolution 2D(+t) data provide almost continuous ‘live’ coverage of spatial processes on the Earth surface. **Geosimulation** serves as a virtual laboratory to reproduce supposed underlying processes of observed spatio-temporal phenomena and to draft scenarios for future developments. Thus geosimulation contributes to the understanding and the prediction of our continuously changing environment.

- In contrast, subsurface 3D(+t) data are sparse and only locally available. Here, reliable and efficient 3D/4D modelling, interpolation and simulation algorithms are mandatory to fill the spatial/spatiotemporal “gaps” in the respective modelling universes. Methodologically, classical as well as multiple-point **geostatistics** plays a central role in providing stochastic-based estimation and simulation of spatial and space-time data and associated uncertainty.

- Towards the micro-end of the technically accessible 3D(+t) scale range, recent advances in computed tomography make the fine structure of geo-materials accessible in detail. Object based image analysis in its multidimensional flavour (“xD-OBIA”) is essential for meaningful classification of geoscience data in the micro scale: expert knowledge can be successfully incorporated in the classification process to build precise 3D microstructure models.

**Keywords:** Interdisciplinary, multiscale, multidimensional, process modelling, process simulation

The R&D activities of the workgroup "Multidimensional modelling and simulation across scales" should contribute to the achievement of the following objectives:

<table>
<thead>
<tr>
<th>Scientific / technological objectives</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>General view: 2d+t, 3d+t processes – inter-disciplinary analysis, modeling and simulation in and beyond the ranges of classical scale levels.</td>
<td><strong>Chairing/organizing</strong> relevant geoinformatics sessions at international meetings (IAMG 2014 Delhi).</td>
</tr>
<tr>
<td>3D+t simulation as virtual laboratories for the investigation of environments that can only be sparsely sampled, such as subsurface processes.</td>
<td><strong>Publications</strong> (with C. Jandrisevits): <em>Calibrating 3D subsurface geology scenarios with hydrological model response</em> (AJES, J. Hydrology). <strong>ROI generator for SGEMS (Computers &amp; Geosci.)</strong> <strong>Publication:</strong> <em>Simulation of airflow through natural caves</em></td>
</tr>
<tr>
<td>Integrating LIDAR and CAD for improved decision making in engineering geology</td>
<td><strong>Publication:</strong> Combining subsurface LIDAR and CAD for optimal borehole positioning. (J. Engineering Geology)</td>
</tr>
<tr>
<td>Applicability and limitations of statistical models in process simulation.</td>
<td><strong>Publication:</strong> <em>Spatio-temporal distribution of invasive plant species</em></td>
</tr>
<tr>
<td>Integrating OBIA with recent geostatistical approaches (OBIA for MP geostatistics training)</td>
<td><strong>Publication:</strong> <em>Mathematical Geosciences</em></td>
</tr>
<tr>
<td><strong>3D Structural Geology implications from microcomputed tomography and OBIA</strong></td>
<td><strong>Publications:</strong> Computers &amp; Geosciences</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Reloading petrographic microscopy with OBIA</strong></td>
<td><strong>Project</strong> application at Austrian Science Fund <strong>Publication:</strong> Microscopy, Computers &amp; Geosciences</td>
</tr>
<tr>
<td><strong>Geostatistics and OBIA applied to 3D+t MRT of neurodegenerative diseases</strong></td>
<td><strong>Publication:</strong> Spatial Statistics Journal, J. Neuroimaging, Multiple Sclerosis Journal, RISE Project CDK</td>
</tr>
<tr>
<td><strong>Exchange with other Z_GIS research areas, specifically OBIA</strong></td>
<td></td>
</tr>
</tbody>
</table>

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### (4) Landscape Lab

- **Contact:** H Klug
- **Researchers involved:** A Kmoch, C Juhasz, L Morper-Busch, M Kerschbaumer
- **Collaborators:** Auckland University of Technology, GNS Sciences Ltd., University of Innsbruck, [municipality Koppl], Institute for Meteorology and Geodynamics (ZAMG), Hydrological Service Federal State Salzburg, iSPACE

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**Scope and overall aim:**

*The Landscape Lab’s mission is the understanding and modelling of natural resources taking into account societal needs by applying and further developing GIScience and spatial-temporal analytical tools. The group uses EO data and spatial information in combination with holistic integrated modelling systems for the assessment, monitoring, planning and management of landscape phenomena, as well as for their sustainable use, development and restoration under global change. This integrates process-oriented modelling at landscape scale and exploitation of standard's compliant sensor observation services for in situ assessments of natural phenomena. For completion of the process chain from single measurements to final products results are publicly distributed using standard compliant WebGIS services for searching, discovering, viewing, analysing, distributing, and downloading spatial-temporal datasets.*

*Understanding landscape structure, pattern and processes including flows of substances, matter, energy and information and their interrelations are key foci for backcasting, near real time analysis, forecasting, and monitoring of landscape resources. In particular, assessments based on harmonised inventories, remote sensing imageries and in situ operational sensors provide data to be turned into ready-to-understand information.*

*Understanding, schematising and process-oriented modelling of processes is more than combining and analysing a range of spatially referenced datasets. Expert knowledge is required to comprehend the underlying process drivers, influencing factors and principles of interaction within the landscape system which are very complex and bear many feedback loops.*

*The Landscape Lab working group is contributing to the analysis of highly complex landscape dynamics to advance sustainable planning and management of landscape resources and ecosystem services while meeting societal needs. Working across scientific disciplines and involving locals*
requires transdisciplinary concepts. Thus, the working group is focussed on two main concepts: the Leitbild and the geon concept. Both are strongly interconnected and equipped with integrated holistic toolkits. Knowledge at the interface of the atmosphere, pedosphere, hydrosphere, biosphere and anthroposphere is transported using latest web technologies and standards such as web map and catalogue services.

The working group is contributing to the planning, management and analysis of:

- Ecosystem Services
- Integrated Water Resources Management
- Climate Change

Projects in the last decade demonstrate that this highly dynamic scientific area continues to be increasingly demanded by industry, government and NGOs.

Keywords: landscape, soil, hydrology, climatology, GIS, remote sensing, OGC, ecosystem services

The R&D activities of the workgroup “Landscape Lab” should contribute to the achievement of the following objectives:

<table>
<thead>
<tr>
<th>Scientific / technological objectives</th>
<th>Indicators</th>
</tr>
</thead>
</table>
| Development, improvement, and transfer of methodological founded landscape development approaches integrating non-scientific expert knowledge | **Journal Article**: ThermoMap Case European Outline Map (Bertermann, Klug Morper Busch; 2013)  
**Journal Article**: ThermoMap Case Study Paper (Bertermann et al.; 2013)  
**Journal Article**: Alpine Ecosystem Services (Gret Regamey et al.; 2013)  
**Journal Article**: Integrating the Leitbild and Geon approach (Klug …; 2014)  
**Book Chapter (Springer)**: Local climate regulation capacities and services (Klug; 2014) |
| Advancing an operational energy autarchic low cost sensor network | **Field setup**: sensor network in the Mondsee catchment; 2014  
**Project Deliverable**: SMART |
| Increased level of climate/relief/land use/soil/water process automation with operational and accessible Geoinformation | **Journal Article**: Phosphorus flows in the Mondsee catchment (Klug, Kerschbaumer, 2013/14)  
**Proposal**: FWF proposal with University of Innsbruck; due: autumn 2013 |
| Advancing integrated online based visualization, data retrieval and data processing systems | **Journal Article**: ThermoMap Viewer (Morper-Busch, Klug, Bertermann; 2013)  
**Journal Article**: An OGC web services framework for hydrology to improve data access and visualisation in New Zealand (Klug, Kmoch; 2013)  
**Journal Article**: Integrated spatial visualisation approaches for the characterisation of New Zealand’s groundwater systems (Kmoch, Klug, White; 2013)  
**Journal Article**: Using SOS and WaterML2.0 for |
integrated hydrological assessments (Klug, Kmoch; 2013)

Exchange with other Z_GIS research areas, specifically:

- Geographic Information Infrastructure (GII)
- OBIA

(5) GIScience Lab

- **Contact:** T Blaschke, E Beinat
- **Researchers involved:** group 1: E Haslauer, H Merschdorf, T Lampoldshammer, NN. (Doct. Position 10/2013); group 2: I Sitko, B Hawelka, P Kazakopoulos, P Ranacher
- **Collaborators:** iSPACE (M Mittlböck, J. Scholz), Univ. of Heidelberg (B Resch, G Sagl)

Scope and overall aim:

The research area tackles the role of spatial realms in the light of the recent adaptation of spatial concepts in conventional practices and for mass user applications. The overarching research perspective is to address the "science behind the systems" rather than the hype caused by virtual globes such as Google Earth and related fast technology-driven developments. In particular, we want to investigate how behaviour in real worlds is reflected in virtual worlds and vice versa. We work interdisciplinary in a way that we will identify those domains of inquiry that share objects of study and we will investigate values, terms, concepts and assumptions governed by a certain set of rules and categories guiding the pursuit of knowledge.

GIS data will become more and more granular and utilizable for place-based or person-centred information on the Quality of Life (QoL). In co-operations with the Research Studio iSPACE and with the GIScience group, University of Heidelberg, we will explore a range of technologies which are able to sense, directly or indirectly, a variety of environmental, human and social phenomena. Such sensing technologies generate vast and rapidly increasing volumes of digital sensor data. It is claimed that this data may at least partially reflect the dynamics of both environmental and social phenomena in remarkable spatial and temporal detail, thus open novel research opportunities also for the GIScience domain. Several empirical studies shall be carried out for urban areas. Conceptually, the methods described would work everywhere where the information content is 'dense enough' to characterize people and their environment at a micro-scale.

**Keywords:** Quality of Life, smart city, Live Geography, human sensing, collective sensing, geosimulation, geovisualization

The R&D activities of the workgroup "GIScience Lab" should contribute to the achievement of the following objectives:
<table>
<thead>
<tr>
<th>Scientific / technological objectives</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>definition of a coherent terminology (starting from the heterogeneously used terms ‘Live City’, ‘smart city’, ‘Live Geography’, ‘human spaces’)</td>
<td>Workshop Q4/2013, short paper as “communication” or “boundary crossings” (TIBG) in 2014</td>
</tr>
<tr>
<td>apply and develop further GIScience principles, such as the enumeration of possible (topological) relationships between events or features and the construction of objects, to non-physical objects such as zones which represent potentials, feelings, emotions, or quality of life (QoL);</td>
<td>Two internal workshops with Psychology and with Sport Sciences Organize intern. pre-conference workshop at AGILE, GIScience’14 or GI-Forum. First draft article Submit proposal to FWF in 2014</td>
</tr>
<tr>
<td>Confront citizens with personally relevant, contextual spatial information and investigate how this information influences perception</td>
<td>Field experiment together with Dept. of Psychology in 2014, publication of results, follow-up project proposal</td>
</tr>
<tr>
<td>Define the kind of insights to be expected through place-based GIScience applications. Investigate the integration of a) simulation-based modelling, b) agent-based modelling, c) backcasting methods</td>
<td>Stakeholder interviews in Salzburg &amp; Vienna three sub-studies 2014 three respective journal publications 2015</td>
</tr>
<tr>
<td>Investigate/demonstrate the potential of geosensing/human sensing technologies for pervasive GIScience applications</td>
<td>Q4/2013: small empirical study Salzburg 2014: transfer Vienna study (iSPACE) to other cities 2015: three journal articles submitted based on empirical studies</td>
</tr>
</tbody>
</table>

(6) GIS in Transportation and Mobility

- **Contact:** B Zagel, M Loidl
- **Researchers involved:** B Bretz
- **Collaborators:** Trafficon (S Krampe); iSPACE (T Prinz)

**Scope and overall aim:**

Mobility and transportation are highly complex domains which require interdisciplinary and multi-perspective efforts to be dealt with. The increasing ecological, economic or social challenges, especially in an urban context, can only be met by integrated approaches. Geographic information science and systems can serve as platform for the development of concepts and methods for intelligent, future-oriented mobility and transportation solutions.

Spatial information technologies can be utilized in modelling, planning, and design of Intelligent Transport Systems (ITS) and related traffic information and management systems. Based on our expertise in geospatial science, we develop and provide generic concepts and models (solutions) for various applications in the domains of network-based data modelling and analysis, mobility and traffic management and planning.

In order to contribute to sustainable developments and facilitate an interdisciplinary exchange of knowledge, the workgroup aims to establish and improve a tight network of stakeholders, experts and users from academia, administration and the private sector.
Keywords: GIS-T, mobility, transportation, network modelling, network analysis, linear referencing

The R&D activities of the workgroup "GIS in Mobility and Transportation' should contribute to the achievement of the following objectives:

<table>
<thead>
<tr>
<th>Scientific / technological objectives</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development and improvement of advanced network models and analysis in GI systems</td>
<td>Project application at KLIEN Fond 2013-2014</td>
</tr>
<tr>
<td>Contribution to the development of integrated network data platforms and linear referencing systems</td>
<td>Project application Interreg 2013 with Trafficon Workshop &quot;Merging Cross border Network datasets&quot; (Q1/2014)</td>
</tr>
<tr>
<td>Collection, integration and analysis of mobility relevant data from different sources for monitoring and management tasks (e.g. COP)</td>
<td>Project application (Mobility – FFG)</td>
</tr>
<tr>
<td>Indicator-based assessment of road network quality for different target groups Spatio-temporal analysis of mobility data sets</td>
<td>Project application at KLIEN Fond 2013-2014 Journal publication (e.g. JTRB, Transaction in GIS) and active conference contribution in 2014 Transfer to application domains PhD Thesis Loidl 2014-16</td>
</tr>
<tr>
<td>GIS-based contributions to mobility planning processes</td>
<td>Project application (Mobility – FFG) with iSpace Journal publication (2015, JTRB), active conference contribution (HEUREKA, VeloCity 2014)</td>
</tr>
</tbody>
</table>

(7) Geographic Information Infrastructure

- **Contact**: B HOFER, E WEINKE, J STROBL
- **Researchers involved**: K ATZMANSTORFER, M BELGIU, L MORPER-BUSCH, R SCHÖRGOFFER
- **Collaborators**: iSPACE (M Mittlböck)

**Scope and overall aim:**

The research area “Geographic Information Infrastructure” focuses on improving the provision, visualization and analysis of spatial data on the web. This includes research on the following domains:

- **Spatial Data Infrastructures** (SDI) to improve the provision and accessibility of data in a standardized way;  
- **Geoprocessing Web** to support interoperable and collaborative geoprocessing to analyse data online through web processing services;  
- **Web-Mapping** to provide an interface to visualize spatial data and supports the communication of spatial information.

In both conceptual and implementation terms Z_GIS has been involved in several projects to research and build up spatial system architectures and Web-Mapping frontends. Further research focuses on the enhancement of existing models, approaches and concepts.
**Keywords:** spatial data infrastructures, online geoprocessing, web mapping, web services, e-Science, Standards

The R&D activities of the workgroup “Geographic Information Infrastructure” should contribute to the achievement of the following objectives:

<table>
<thead>
<tr>
<th>Scientific / technological objectives</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modelling and conceptual development of advanced spatial data infrastructures and web frontends based on developments in various projects within different application domains (habitat and species monitoring, security, policy modelling etc.). Recommendation for concept standardization will be developed for different application domains.</td>
<td>- journal publications in 2014-2015 (e.g. Computers and Geosciences); - planned proposals in national programs (eg. FFG, netidee, etc.) and European programs (e.g. HORIZON 2020) with industry and company cooperations in 2013-2015</td>
</tr>
<tr>
<td>Investigation of online geoprocessing from the user and application perspective.</td>
<td>- Submission to journal with SCI-impact factor in 2013: Review article on the geoprocessing web with a focus on users and applications. - Submission to peer-reviewed conference in 2013: A case study showing the transfer of a desktop GIS workflow into the geoprocessing web. - Submission to journal with SCI-impact factor in 2014 and follow-up article in 2015: User interface considerations for the geoprocessing web with the intention to increase the use of existing functionality. - Development of a project proposal with planned submission to FWF in 2015.</td>
</tr>
<tr>
<td>Exchange with other Z_GIS research areas specifically with:</td>
<td>- Object-based Image Analysis (OBIA) - Landscape Lab - Integrated spatial indicators</td>
</tr>
</tbody>
</table>

(8) **Geo-media Pedagogy**

- **Contact:** TJEKEL
- **Researchers involved:** R VOGLER Sabine HENNIG, Nicole FERBER

Scope and overall aim:

The research area investigates various dimensions of GI Society defining educational needs and developing relevant pedagogical concepts. It does so by doing basic research in the fields of citizenship and science education and linking them with an explicitly spatial view. Applied R&D refers to the development and implementation of learning modules for non-professionals like students in secondary education and (in-service) teachers as well as the general public. Hence transfer to secondary teachers
as main target group is central to the R&D agenda of the working group. Research, development and transfer activities are in the following areas:

- Development of pedagogical approaches, more specifically, refining and evaluating the spatial citizenship concept
- Spatial representation and reflexivity as basis for informed everyday geomedia use.
- GIS in Science Education (‘Spatial thinking’), especially developing support strategies for hypotheses generation
- Target group specific needs and communication strategies, emphasis on non-professionals.

**Keywords:** geomedia; geography education; spatial citizenship; science education

The R&D activities of the workgroup “Geomedia Pedagogy” should contribute to the achievement of the following objectives:

<table>
<thead>
<tr>
<th>Scientific / technological objectives</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refining and transfer of spatial citizenship concept &amp; competencies to teachers and policy makers</td>
<td>Journal publications: JGHE or EnvPD; GUID</td>
</tr>
<tr>
<td>Development &amp; Evaluation of Learning environments using geomedia</td>
<td>Project implementation (SPACIT), relevant teacher journals; Edited Reader: Learning environments (2013/14); (European &amp; national) teacher training;</td>
</tr>
<tr>
<td>Spatial representation &amp; reflexivity</td>
<td>Book chapters in: Reflexive Kartenarbeit; journals: GUID/GW-U</td>
</tr>
<tr>
<td>Target group specific user needs of geomedia: Users with special needs, the elderly etc.</td>
<td>Conference/journal publications</td>
</tr>
</tbody>
</table>
Annex II: Current research projects
[This list does not include the Doctorate College „GiScience“ as well as some projects that commenced after the issuing date]

EC 7th Research Framework Programme (FP-7)

**EnerGEO**
Earth Observation for monitoring and assessment of the environmental impact of energy use  
Instrument: FP7-ENV  
Collaborative Project, 12 partners  
Duration: 2009-2013, Role: Partner  
Project volume: 6 MEUR  
Z_GIS share: 496,000 EUR  
Contact: Peter Zeil  
> [www.energeo-project.eu](http://www.energeo-project.eu)

**G-NEXT**
GMES pre-operational Security services for supporting External action  
Instrument: FP7-SPACE  
Collaboration Project  
Duration: 2013-2015, Role: partner  
Project volume: 4.0 MEUR  
Z_GIS share: 280,000 EUR  
Contact: Peter Zeil  

**G-SEXTANT**
Service Provision of Geospatial Intelligence in EU External Actions Support  
Instrument: FP7-SPACE  
Collaboration Project, 14 partners  
Duration: 2013-2014, Role: partner  
Project volume: 4.0 MEUR  
Z_GIS share: 373,950 EUR  
Contact: Dirk Tiede  

**MILESECURE-2050**
Multidimensional Impact of the Low-carbon European Strategy on Energy Security, and Socio-Economic Dimension up to 2050 perspective  
Instrument: FP7-Socio Economic Sciences and Humanities  
Collaboration Project, 11 partners  
Duration: 2013-2015, Role: partner  
Project volume: 3 MEUR  
Z_GIS share: 176,300 EUR  
Contact: Euro Beinat  

**ThermoMap**
Area mapping of superficial geothermic resources by soil and groundwater data  
Instrument: FP7-ICT-PSP  
Pilot Type B, 11 partners  
Duration: 2010-2013, Role: WP Leader  
Project volume: 1.9 MEUR  
Z_GIS share: 224,915 EUR  
Contact: Stefan Lang  
> [www.thermomap-project.eu](http://www.thermomap-project.eu)

**MS.MONINA**
Multi-scale Service for Monitoring NATURA 2000 Habitats of European Community Interest  
Instrument: FP7-SPACE  
Collaborative Project (small or medium), 18 partners  
Duration: 2010-2013  
Role: Coordinator  
Project volume: 2 MEUR  
Z_GIS share: 334,456 EUR  
Contact: Stefan Lang  
> [www.ms-monina.eu](http://www.ms-monina.eu)
Healthy Futures
Health, environmental change and adaptive capacity: mapping, examining and anticipating future risks of water-related vector-borne diseases in eastern Africa
Instrument: FP7 ENV
Collaborative Project, 15 partners
Duration: 2011-2014, Role: Partner
Project volume: 3.3 MEUR
Z_GIS share: 218,700 EUR
Contact: Stefan Kienberger
> www.healthyfutures.eu

TIRAMISU
Toolbox Implementation for Removal of Anti-Personal Mines Subminitions and UXO
Instrument: FP7 SEC
Collaborative Project, 25 Partner
Duration: 2011-2015, Role: Partner
Project volume: 15 MEUR
Z_GIS share: 246,000 EUR
Contact: Peter Zeil
> www.fp7-tiramisu.eu/

GRAAL
GME S and Regions - Awareness & Access Link - Fostering downstream services and links with Regions
Instrument: FP7 SPACE
Coordinated Action (CA), 10 partners
Duration: 2011-2013, Role: Partner
Project volume: 1.0 MEUR
Z_GIS share: 46,400 EUR
Contact: Peter Zeil
> www.zgis.at/research

BRAGMA
Bridging Actions for GMES and AFRICA
Instrument: FP7-SPACE
CSA, 11 Partners
Duration: 2012-2013, Role: Partner
Project volume: 1 M EUR
Z_GIS share: 61,000 EUR
Contact: Peter Zeil
> www.zgis.at/research

CHANGES
Changing hydro-meteorological risks as analyzed by a new generation of European scientists
Instrument: FP7 PEO PLE
Initial Training Network (ITN)
Duration: 2011-2014
Role: Partner & host
Contact: Peter Zeil
> www.changes-itn.eu

EC-EFRE
C3 Alps
Capitalising Climate Change Knowledge for Adaptation in the Alpine Space
Instrument: EFRE-AlpineSpace
Duration: 2012-2014
Role: Partner
Project volume: 2.2 M EUR
Z_GIS share: 170,000 EUR
Contact: Hermann Klug
> www.portal.c3alps.eu/
**EC DG Home Affairs**

**UpsideDownProject**  
_Spatial MetaData Protection for the Underground Critical Infrastructures_  
Instrument: EC DG Home Affairs  
CSA, 14 Partners  
Duration: 2013-2014, Role: Partner  
Project volume: 750,000 EUR  
Z_GIS share: 25,000 EUR  
Contact: Bernhard Bretz  
> www.upsidedownprotect.eu/

**European Space Agency (ESA)**

**SELIAT**  
_Safe Emergency Landing in Alpine Terrain_  
Instrument: ESA ARTES 20 - IAP  
Duration: 2013-2014, Role: Coordinator  
Project volume: 330,000 EUR  
Z_GIS share: 180,000 EUR  
Contact: Florian Albrecht  
> iap.esa.int/transport/seliat

**Austrian Research Promotion Agency - FFG**

**EO4HumEn**  
_EO-based services to support humanitarian operations: monitoring population and natural resources in refugee/IDP camps_  
Instrument: FFG – ASAP (Austrian Space Application Programme)  
Duration: 2013-2016, Role: Coordinator  
Project volume: 476,382 EUR  
Z_GIS share: 254,500 EUR  
Contact: Stefan Lang  
> www.zgis.at/research/project-current

**alpS**  
Centre for Climate Change Adaptation Technologies  
Instrument: FFG-COMET, K1 Zentrum  
Duration: 2010-2015, Role: Partner  
Project volume: 52 MEUR  
Z_GIS share: 55,000 EUR  
Contact: Stefan Lang  
> www.alp-s.at

**Austrian Science Fund – FWF**

**iSlide**  
_Integrated Semi-automated Landslide Delineation, Classification and Evaluation_  
Instrument: FWF, Stand-alone project  
Duration: 2013-2015, Role: Coordinator  
Project volume: 230,400 EUR  
Contact: Thomas Blaschke, Daniel Hölbling  
> islide.zgis.net

**ABIA**  
Agent Based Image Analysis  
Instrument: FWF, Stand-alone project  
Duration: 2013-2016, Role: Coordinator  
Project volume: 275,000 EUR  
Z_GIS share: 225,000 EUR  
Contact: Thomas Blaschke, Peter Hofmann  
> www.zgis.at/abia
Institutional Funding

**OBIALP**
EO-based tools for automated extraction of stressed forest areas
- Instrument: Austrian Academy of Sciences, OeAW DOC-fFORTE
- Duration: 2012-2015
- Project volume: 90,000 EUR
- Contact: Antonia Osberger
  > www.zgis.at/research

**LRT und Arten**
Basiserhebung von Lebensraumtypen und Arten von gemeinschaftlicher Bedeutung in Österreich
- Duration: 2012-2013
- Instrument: Republik Österreich
- Duration: 2010-2013, Role: Partner
- Project volume: 1.7 MEUR
- Z_GIS share: 182,084 EUR
- Contact: Elisabeth Weinke

**Easy Rider II**
Radroutenplaner für die EuRegio
- Instrument: Interreg IV A Euregio Kleinprojekt
- Duration: 2013, Role: Coordinator
- Project volume: 23,000 EUR
- Z_GIS share: 14,000 EUR
- Contact: Bernhard Zagel, Martin Loidl

**Climate-Friendly Climate Research**
Instrument: BMWF JPI Climate
- Duration: 2012-2013
- Role: Partner
- Project volume: 58,000 EUR
- ZGIS share: 10,000 EUR
- Contact person: Bernhard Zagel
- Project website:
  http://ccca.boku.ac.at/verantwortung

**DRR-SA**
Information and Knowledge Management System South Africa and Indian Ocean Region
- Instrument: Foundation COOPI - Cooperazione Internazionale / DG ECHO
- Duration: 2012-2014
- Role: Partner
- Z_GIS share: 21,300 EUR
- Contact person: Stefan Kienberger, Elisabeth Weinke

**EO-based information services in support of humanitarian operations**
Instrument
Karl-Kahane-Stiftung
- Duration: 2012-2015
- Role: Beneficiary
- Z_GIS share: 135,000 EUR
- Contact: Petra Füreder
  > www.zgis.at/research

**SMART**
Smart aquifer characterisation
- Instrument: New Zealand Ministry of Science and Innovation
- Duration: 2011-2017, Role: Beneficiary
- Z_GIS share: 500,000 EUR
- Contact: Hermann Klug
  > www.smart-project.info/