

DLR-DFD-GZS-C&S

## Projects (since 2013)

### On-going Projects

#### RIESGOS



The German research project **RIESGOS** (Multi-risk analysis and information system components for the Andes region) will address and elaborate novel scientific approaches related to the assessment of multi-hazards compound risk, including dynamic multi-hazard exposure and vulnerability analysis, aimed at the modelling of cascading and interaction effects for the Andean region in Chile, Ecuador and Peru.

Modular interactive web services will be developed and implemented in a flexible and scalable multi-risk information system demonstrator. This shall allow end-users from civil protection and disaster management authorities to simulate and analyse complex multi-risk scenarios with the ultimate goal of risk reduction and enhanced disaster management. The project team is considering scenarios for floods, landslides, volcanic eruptions, earthquakes, tsunamis and their mutual dependencies from the perspective of 'what would happen if...?'. This scenario-based approach can be integrated into a probabilistic risk assessment framework to ensure the cost-effectiveness of recommended strategies.

RIESGOS is funded by the German Federal Ministry of Education and Research as part of the funding measure "BMBF CLIENT II – International partnerships for sustainable innovations" of the framework programme "Research for Sustainable Development (FONA3)".

Project duration: 01.11.2017 – 31.10.2020.

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## SAUBER



Ziel von SAUBER (Satellitenbasiertes System zur Anzeige, Prognose und Simulation von Luftschadstoffen für eine nachhaltige Stadt- und Regionalentwicklung) ist es, eine Informationsplattform für eine nachhaltige Stadt- und Regionalentwicklung aufzubauen. Dabei sollen die in der Praxis bislang kaum genutzten Daten und Services des Raumfahrtprogramms Copernicus erschlossen und in digitale Dienste für eine nachhaltige Stadt- bzw. Regionalentwicklung überführt werden. Das Projekt wird vom Bundesministerium für Verkehr und digitale Infrastruktur (BMVI) gefördert und gehört zur Forschungsinitiative mFUND, die sich mit digitalen datenbasierten Anwendungen für die Mobilität 4.0 befasst.

Funded by BMVI

Projektdauer: 01.10.2018 – 30.09.2021.

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## meinGRÜN

The aim of „meinGruen“ is the development and testing of new information-based services in the context of urban green areas to foster a sustainable and healthy mobility through the development of innovative methods of data mining, data processing and data analysis. Results are provided through an open serviceinfrastructure for research and other users. Furthermore, a free of cost app will be developed which supports the selection of urban green areas and “green routing” as well as an internet-portal “green infrastructure” for selected pilot cities. Within the project, new and open user-generated geo-data are combined and enriched with satellite data from the Copernicus-programme. Thus, new approaches for data mining from social media data (e.g. Flickr, Instagram, Twitter) and remote sensing such as machine learning are developed, tested and evaluated. The developed routines, services and data are provided via mCLOUD or CODE-DE. Public administration profits by innovative and new information on urban green infrastructure, usage of green areas and their perception by citizens. The project facilitates scientific investigation of quality, access and use of urban green areas.

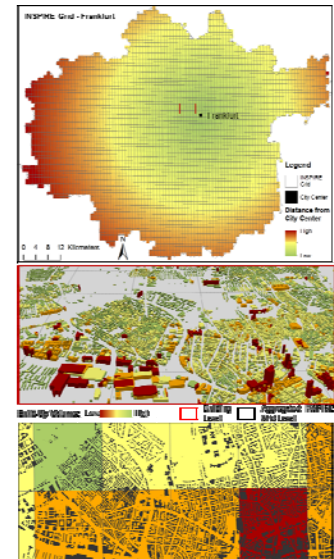
Funded by BMVI

Project duration: 01.11.2018 – 30.04.2021.

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## Where are the jobs?

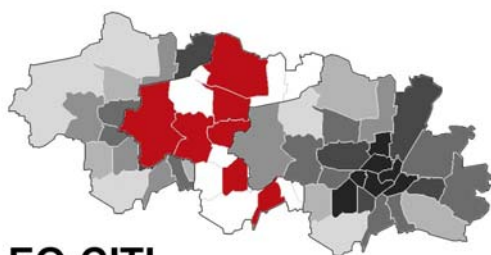
The processes of urbanization observed in recent decades are caused by two opposing trends: concentration and deconcentration. On the one hand, higher-quality economic functions were increasingly concentrated in metropolises and urban regions. On the other, complex regionalization processes took place within global urban regions, which favored the development of complex polycentric distributions of employment and corporate structures. The distribution patterns of these employment centers are not only verifiable with regard to employment structures itself, but are at the same time evident with respect to the urban morphology. Therefore, the project aims to develop new methodological approaches to identify economic centers in urban agglomerations based on physical parameters derived from Earth Observation data. By combining the spatially detected employment centers with locatable employment data, employment center distributions in Europe and North America are planned to be identified, compared and analyzed with regard to their actual pattern and historic development. A successful project would open the possibility to quantify and analyze employment center distributions in many cities, even on a global basis, in a spatially detailed and consistent way.



The project is carried out in cooperation with the Research Institute for Regional and Urban Development (ILS) in Dortmund.

Funded by Deutsche Forschungsgemeinschaft (DFG),  
Duration: 03/2019 - 09/2021

## EO-CITI

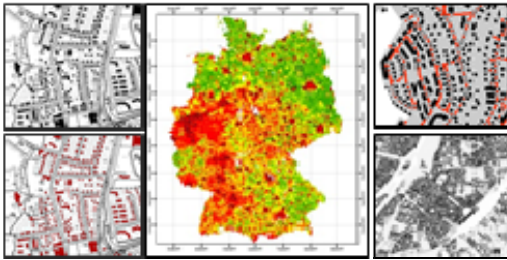


### EO-CITI

Continuous monitoring of cities with respect to parameters like imperviousness and urban structure is an ongoing research topic. Furthermore, this information is also relevant to local authorities (e.g., urban development and planning) and enterprises. The aim of EO-CITI (**Earth Observation for Monitoring of Imperviousness and Urban Structure Types in Cities**) is the development of consistent and area-wide products on imperviousness and urban structure types based on remote sensing imagery. In addition, automatic change detection methods enable cost-efficient updating of these data sets.

EO-CITI is conducted in cooperation with the SME SLU (Company for Remote Sensing and Environmental Research) and funded within the programme "SME innovative" of the German Federal Ministry of Education and Research (BMBF). Project duration: 01/2017 – 12/2018.

## ANSWER-KOMMUNAL



Im Rahmen des Projektes arbeitet das DFD gemeinsam mit dem DLR-Institut für Technische Thermodynamik (TT) und der Klimaschutz- und Energieagentur Baden-Württemberg GmbH (KEA) an der Entwicklung eines übertragbaren, standardisierten Analyse- und Ergebnisrasters für kommunale Wärmepläne. Dieses soll einen raschen Vergleich der Wärmepläne sowohl untereinander als auch mit den Zielen der Bundesregierung ermöglichen.

Für die Energiewende bedarf es einer nachhaltigen und kostengünstigen Wärmeversorgung. Diese beruht für Kommunen auf dem intelligenten Zusammenspiel von Energieeinsparung, Effizienzsteigerung und erneuerbaren Energien. Kommunale Wärmepläne sollen diese Herausforderung erfüllen und zielen darauf ab, die energetische Gebäudesanierung und eine effiziente Wärmeversorgung optimal miteinander zu verzahnen, Infrastrukturen wie Wärmenetze und Erdgasnetze koordiniert aus- bzw. rückzubauen, die Nutzung standortgebundener Energien langfristig zu sichern, sowie Investitionssicherheit bei Investoren zu schaffen.

The project is funded by the Federal Ministry of Economic Affairs and Energy (BMWi)  
(Duration 01.06.2017 – 31.12.2020)

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## MOVE

The objective of the PhD project is to investigate the impact of landscape patterns and structures on movement and behavior modes of white storks by following an interdisciplinary approach.

Remote sensing data will be used to generate comprehensive information on horizontal and vertical landscape structures from coarse to fine scale. In addition, behavior and movement modes of around 50 white storks during different life-history stages (e.g. breeding or migration) are going to be derived based on HR telemetry data. By systematically combining these datasets, ecological meaningful environmental variables which unambiguously influence behavior and movement during different life-history stages are expected to be identified. Furthermore, the influence respectively robustness of detected animal-environment relationships to varying spatial, temporal and thematic scale components is planned to be assessed.

The project is funded by a scholarship from the German Federal Environmental Foundation (DBU)  
(Duration 01.07.2016 - 30.06.2019)

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## STAGE



Influence of the surrounding urban environment on the health of the people in Germany

The living environment strongly affects the health of the people. Different influences have positive or negative influences on the health status of the population. However, these are not equally distributed in space. Furthermore, the socioeconomic status of the people determines the exposition to those environmental influences. In order to investigate the environmental justice in Germany, it is necessary to develop a new large-area spatial concept for the representation of health relevant environmental influences. The aim of this study is to use remote sensing and geo data to conceptualize the urban living environment. By utilizing social-scientific longitudinal survey data exemplary analyses of environmental justice in Germany are conducted in an interdisciplinary research setup. This combination of unique data sets allows for an examination of environmental justice in Germany on a new level of spatial detail.

The project is funded by a scholarship from the German Federal Environmental Foundation (DBU) (Duration 01.04.2017 - 31.03.2020)

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## pre\_DICT

### + pre\_DICT +

**PRE\_DICT** targets the development of methods for large-area seismic vulnerability assessment of built environments. It is intended to develop a sequential approach which detects settlement areas and extracts related morphological characteristics of the built environment from elevation measurements of the TanDEM-X mission on a global scale. Thereby, the proposed approach will build upon a generic delineation and characterization of homogeneous settlement structures. This information allows for a large-area seismic assessment in combination with ancillary information (e.g., from punctual in-situ sampling). A successful research would open the possibility to quantify probable earthquake damage for large areas in a spatially detailed and consistent way. Accordingly, hot spots of damage can be identified for the implementation of appropriate mitigation measures.

The project is funded by a Helmholtz-Gemeinschaft (HGF) and DLR (Duration 01.07.2016 - 30.06.2019)

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## HEIMDALL

The project aims at improving preparedness of societies to cope with complex crisis situations by means of providing integrated tools to support efficient response planning and the building of

realistic multidisciplinary scenarios. The project will design and develop a system for improving response planning strategies and scenario building and facilitating organizational coordination among many actors, integrating a wide range of support tools to be used operationally by a large variety of stakeholders (firefighting units, medical emergency services, police departments, civil protection units, command and control centres). The devised system shall integrate existing and newly developed tools to enhance the cooperation between autonomous systems (satellite-, sea-, land- and air-based) from different agencies as well as to consolidate the methodology for cross-border scenario-building. The project shall investigate the currently existing tools and methodologies with the involvement of local authorities and end users and provide mechanisms to enhance cooperation among all involved actors.

The project is funded by the European Commission  
(Duration 01.07.2016 - 30.06.2019)

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## ZKI-DE



As part of the **ZKI-DE Service**, the department of *Geo-Risks and Civil Security* provides scientific advice to the *German Federal Ministry of the Interior* in the field of remote sensing. A study on *"New Perspectives for Earth Observation through future commercial Micro- and Nanosatellites"* has so far been compiled. A second study on *"Alternative data sources of geodata for the Federal Government"* is currently underway.

Financed by: German Federal Ministry of the Interior (BMI), project term: January- December 2016

Beyond project research activities, the team is also involved in the activities of the **Center for Satellite Based Crisis Information (ZKI)** that provides a 24/7 service for the rapid provision, processing and analysis of satellite imagery during natural and environmental disasters, for humanitarian relief activities and civil security issues. The resulting satellite based information products are provided to relief organizations and public authorities worldwide and are freely available through the ZKI website (<http://www.zki.dlr.de>). Exploiting the synergies between operational services and R&D activities at DLR, a particular focus lies on technical development of methodologies and products in the context of satellite-based emergency response mapping.

Financed by: German Federal Ministry of the Interior (BMI)

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## Finalized Projects

### Polyzentralität deutscher Stadtregionen



The formation of polycentric urban regions represents one of the most striking structure changes in the last 30 years. Center structure of urban regions in Western industrial countries is described as complex, functional organized network of centres and sub-centres. The project (***Polyzentralität deutscher Stadtregionen - Entwicklung und Erprobung eines fernerkundungsgestützten Verfahrens zur Messung der morphologischen Polyzentralität***) examines the historical genesis of polycentric settlement structures and the current levels of polycentricity in four German metropolitan regions (Munich, Stuttgart, Cologne, Frankfurt). Therefore, new methodological instruments are developed and used, with which the center fabric over its functional and morphological dimension is addressed and makes the degree of polycentricity visible.

In cooperation with Institut für Landes- und Stadtentwicklungsforschung Dortmund (ILS)

Funded by Deutsche Forschungsgemeinschaft (DFG), Duration: 11/2012-09/2015

External Link: [http://www.ils-forschung.de/index.php?lang=de&s=forschungsprojekte\\_details&id=10](http://www.ils-forschung.de/index.php?lang=de&s=forschungsprojekte_details&id=10)

### sd-kama



The „**Smart Data for Management of Catastrophes**“ project aims to establish an information platform, which enables an up-to-date, targeted, and scalable disaster management. The platform will implement a tailored architecture for integration, processing, and analysis of “big data”.

sd-kama is funded by the *German Federal Ministry for Economic Affairs and Energy (BMWi)*, Duration: 1. April 2015 – 31. March 2018.



## DELIGHT



**DELIGHT (Delta Information System for Geoenvironmental and Human Habitat Transition):** The Yellow River Delta faces numerous challenges in the context of global change, e.g. intensification of aqua- and agriculture, rapid industrial development together with highly dynamic urbanization. In addition, available natural resources decrease due to growing demand as well as emerging impacts of climate change. The DELIGHT project contributes to this endeavor by providing relevant information to the local authorities in order to support sustainable development. *BMBF* project, duration 01.04.2013 – 31.03.2016.

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## GebäuDE-21



Uniform and nationwide geodata constitute an important basis in any kind of spatial data collection and analysis. In the context of register-based Census, detailed and up-to-date information about the urban structure and in particular building can help to draw targeted samples. This selection refers to a spatial selection of households as well as the ability to focus on residents of certain buildings and building structures. Measurements of the Earth's surface via satellite-based methods allow the production of a uniform and especially large data and information base about the physical nature of the Earth's surface. A combination of full-field geoinformation and satellite data enables the creation of three-dimensional building models. The research focuses on systematic investigation and validation of geobasis data and space-borne height measurements for the assessment of machine learning algorithms in the context of building types classification which describes the basis for an innovative spatial sampling of households in the context of the Census 2021.

In Kooperation mit Institut für ökologische Raumentwicklung,  
Gefördert durch: Bundesministerium des Innern (BMI), Laufzeit: 11/2015-09/2015

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## Alternative Datenquellen

New geo-spatial data sources are considered and tested for timely map-updating processes. In this context, various kinds of geographical data - from open source to commercial products – and geometrically highly resolved satellite imagery is used for updating topographical maps. Various semantic classes are addressed and mostly automated processing chains are developed and tested in terms of their spatial and thematic accuracy as well in the context of its economics.

In Cooperation with Bundesamt für Kartographie und Geodäsie,  
Funded by: Bundesministerium des Innern (BMI), Duration: 2015-2016

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## Chile Phase II & III



This **Chile pilot project** aims at the establishment of a sound concept and initial implementations of elements of a multi-hazard early warning system for Chile. It is intended to address a relevant variety of hazards such as earthquake, tsunamis, fires, floods etc. simultaneously. The project is funded by the *German Federal Ministry for Education and Research (BMBF)*. Duration 1 April 2015 – 31 March 2016.

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## Geoinformationsprodukt zur Bewertung der Exposition gegenüber Hochwasser und Sturm



A collective risk-taking eliminates the risk of the individual. In this context, the space is crucial to statistically assess the damage probabilities of natural hazards such as heavy rainfall and storm. Remote sensing data have the potential to contribute in the analysis of the risk exposure. Therefore, a method is sought to divide the landscape based on geomorphological parameters to geographically model exposure against natural hazards for insurance companies. Space-borne

satellite measurements and auxiliary geospatial data are synergistically used for the spatial zoning approach.

In Kooperation mit Abteilung Photogrammetrie und Bildanalyse am IMF und der Westfälischen Provinzial Versicherungs AG.

Gefördert von DLR-Technologiemarketing, Laufzeit: 10/2013-07/2015

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## SENSUM



As millions of people are exposed to natural hazards every year, the *Copernicus FP 7 project* “SENSUM – **Framework to integrate Space-based and in-situ sENSing for dynamic vUlnerability and recovery Monitoring**” responds to the urgent need to monitor and map time-dependent hazard and vulnerability components to support disaster management efforts. By the combination of earth observation and in-situ data collection for test sites in data-rich (Europe) and data-poor regions (Central Asia), the project aims to set a new standard for the continuous, multi-scale quantification of pre-disaster vulnerability and the monitoring post-disaster recovery. Under the lead of the German Research Center (GFZ) and in collaboration with a consortium of eight prominent international scientific institutions, the *main task of DLR lies in the development and application of a systematic cross-validation framework to validate spatial exposure information from global to local levels*. Duration 01/01/2013 – 31/12/2014.

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## CLIMB



### Climate Induced Changes on the Hydrology of Mediterranean Basins

CLIMB (Climate Induced Changes on the Hydrology of Mediterranean Basins) investigated climate induced changes on the hydrological cycle in the Mediterranean Region. CLIMB had a time horizon from 01/2010 to 02/2014 and was funded by the European Commission within the EU's 7<sup>th</sup> Framework Programme for Research (FP7). The DLR supported CLIMB in the fields of hydrological modelling and uncertainty analysis. Furthermore, in collaboration with social scientists the climate induced changes on the hydrology were translated into risks for the agricultural sector and Tourism. This information was used by users in the local water, agricultural and Tourism sectors as well as political decision makers and stakeholders to develop adaptation strategies and to give recommendations for a sustainable future water resource management.

## PROTECTS



In 2005, the establishment of core elements of a tsunami early warning system for the Indian Ocean with emphasis on Indonesia started within the framework of the GITEWS (German-Indonesian Tsunami Early Warning System) project. In this project, an early warning system was designed under the lead management of GFZ and a consortium of German research institutions (AWI, DLR, GVW, GEOMAR, KDM, BGR, UNU-EHS and GIZ). The system was handed over to Indonesia on 29 March, 2011. In PROTECTS a special training and education program was designed, following the work-up and installation phase in GITEWS. This phase was funded by the *BMBF* and was conducted together with GFZ, DLR, AWI and GIZ from *March 2001 until March 2014*. DLR-DFD contributed to PROTECTS with the thematic key aspects (1) decision support system and (2) risk modeling and contributions for disaster preparedness.

## KIBEX

### KIBEX

Kritische Infrastruktur  
und Bevölkerung(sschutz)  
im Kontext  
klimawandelbeeinflusster  
Extremwetterereignisse

(critical infrastructure and  
population/civil protection  
in the context of climate  
change related extreme  
events)

Within the framework of the KIBEX (**Kritische Infrastruktur und Bevölkerung(sschutz) im Kontext klimawandelbeeinflusster Extremwetterereignisse**) project, methods for the vulnerability assessment of population and critical infrastructure towards climate change related extreme events (high intensity rainfall events, storms, droughts and heat waves) will be developed with several representative communities in Germany. Thereby, the close cooperation with local actors (e.g., infrastructure operators, administration, protection agencies) plays an essential role, as important information can only be obtained on this level. The cooperation furthermore enables communities to actively participate in the process of developing action plans according to their needs, especially for disaster management and adaptation strategies.

In Kooperation mit: United Nations University – Environment & Human Security (UNU-EHS)

Gefördert durch: Bundesamt für Bevölkerungsschutz und Katastrophenhilfe (BBK), Laufzeit: 11/2009-06/2013

Externer Link: <https://www.ehs.unu.edu/article/read/kibex>

## SASSCAL



SASSCAL (**Southern African Science Service Centre for Climate Change and Adaptive Land Management**) is a joint initiative of Angola, Botswana, Namibia, South Africa, Zambia, and Germany, responding to the challenges of global change and is foreseen as the regional driver for innovation and knowledge exchange to enhance adaptive land use and sustainable economic development in Southern Africa under global change conditions. DLR-DFD contributes to SASSCAL with the subject area "*Remote Sensing applications for flood risk management*". Major aim here is to develop novel, applicable and transferable methodologies to provide information for effective flood management (flood monitoring and detection, emergency response and preparedness / prevention) based on remote sensing and risk assessment. The project is funded by *BMBF* from 11/2012 - 10/2017.

## WASCAL



WASCAL (**West African Science Service Center on Climate Change and Adapted Land Use**) is an international and inter-disciplinary research initiative which will contribute to protect people and the environment in Western Africa against negative impacts of climate change. The project is funded by the *German Federal Ministry for Education and Research (BMBF)* and has a time horizon from 10/2012 to 03/2017. The DLR is supporting WASCAL by using *remote sensing to create new knowledge about the distribution of exposed population and material assets in this region as well as characterising past drought events for drought hazard assessment*. In collaboration with social scientists, vulnerability and risk profiles are elaborated for the region which can be used by users in the local water and agricultural sectors as well as political decision makers and stakeholders to develop adaptation strategies.

## HGF-EOS



The "***Helmholtz Integrated Earth Observing System***" research network is intended to facilitate the work of scientists in depicting and modelling processes of earth, associated to the geosphere, hydrosphere, cryosphere, atmosphere and biosphere, spatially and temporally at high resolution and in monitoring the status and trends of the Earth system. Funding is primarily provided for PhD students. The project was funded by the HGF. Phase II: 1. August 2010 – 31 July 2013.

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***Last update: 2018-12-15***