# New perspectives of combined data sets from multiple remote sensing and terrestrial data networks for environmental information"


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www.google.de

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# New Perspectives of Combined Data Sets from Multiple Remote Sensing and Terrestrial Data Networks for Environmental Information

## Challenges

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To manage the challenges and to advance the process towards the sustainability development goals

Data and spatial information technology will be of vital importance in this process

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Data will have a widespread effect

1. monitor changes
2. manage risks and hazards
3. drive economical and technical innovations

# One important source are data from remote sensing

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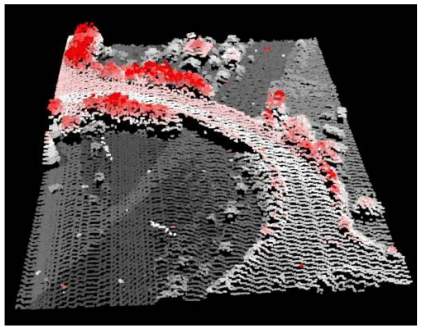
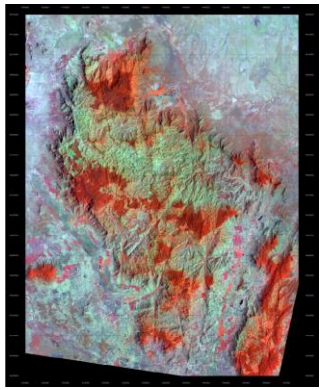
**Sensors**

**Aerial photographs**

**Laserscanner**



**Satellite data**



**Radar**

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Huge amount of remote sensing data are available today!

# Earth observation satellites

Since 2000 around 100 new satellites launched

**Imaging passive systems**
Multispectral imaging systems
Hyperspectral imaging systems
**Imaging active systems**
RADAR SAR
LiDAR
**Non imaging active systems**
Microwave altimeter
Laser altimeter
Scatterometer

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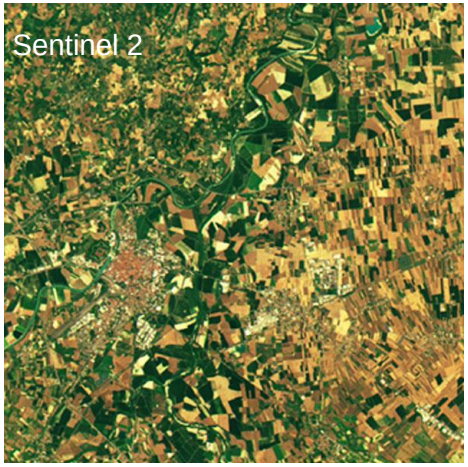
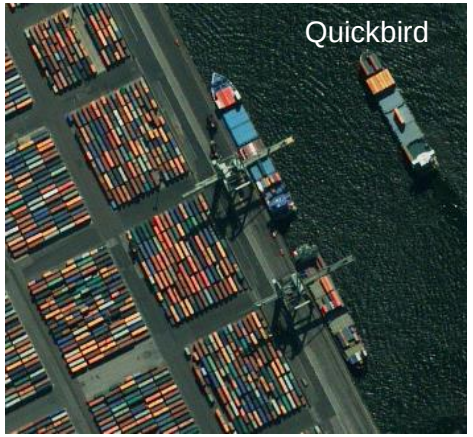
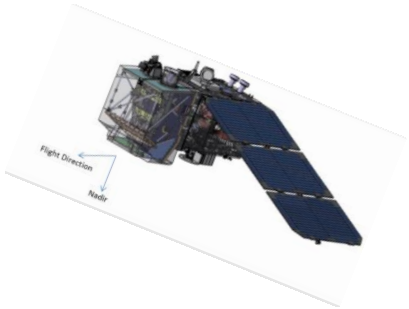



Airbus Defense and Space 2016










**Today**

| | |
|---|---|
| Spatial resolution | 50 cm to km |
| Radiometric resolution | 8 to 12 bit |
| Temporal resolution | daily to few days |
| Spectral resolution | few to hundreds of bands |

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# Value of remote sensing data has increased

3-D data
High spatial resolution
High time resolution
High spectral resolution
Different platforms
Operational availability
software,processing and storage capacity

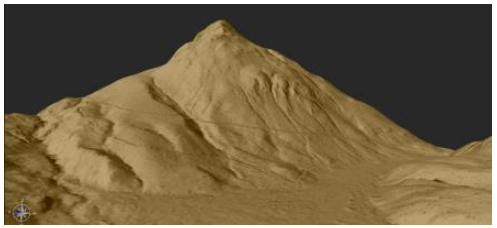
# 3-D information is of high value

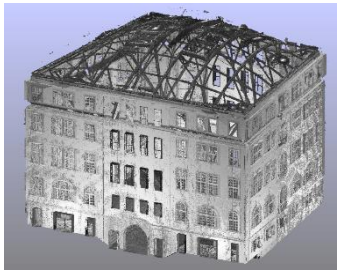
Terrain

Surface

Vegetation

Objects





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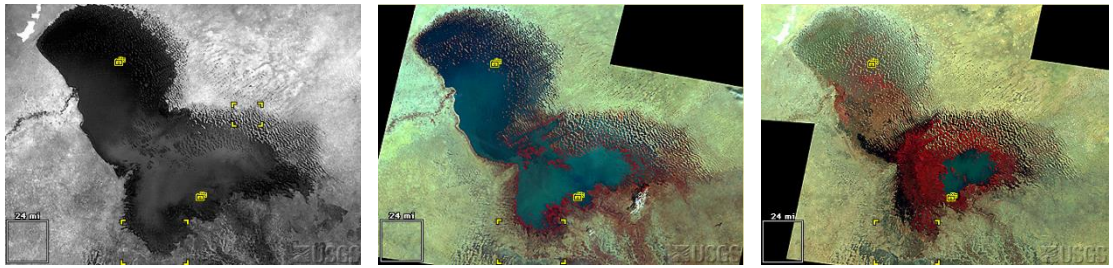

Tschad lake

Endangerment of water resources

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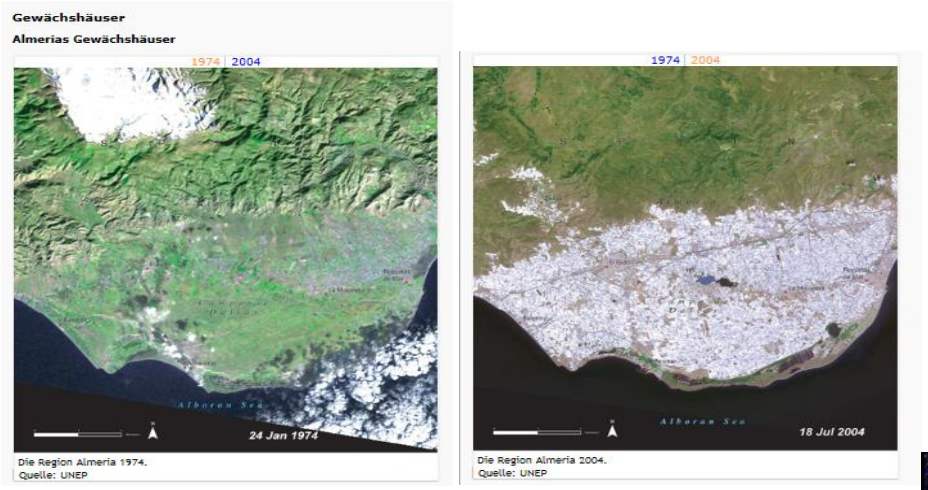
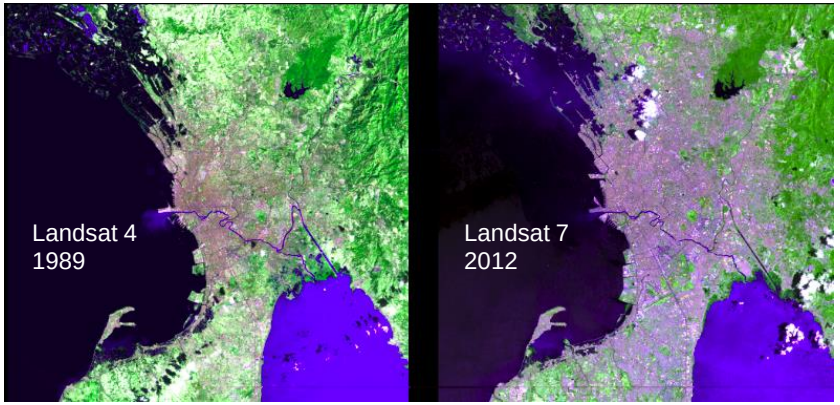



www.seos-project.euaccess 2014

Landuse change and land consumption




Manila
www.landsat.usgs.gov/gallery 2015

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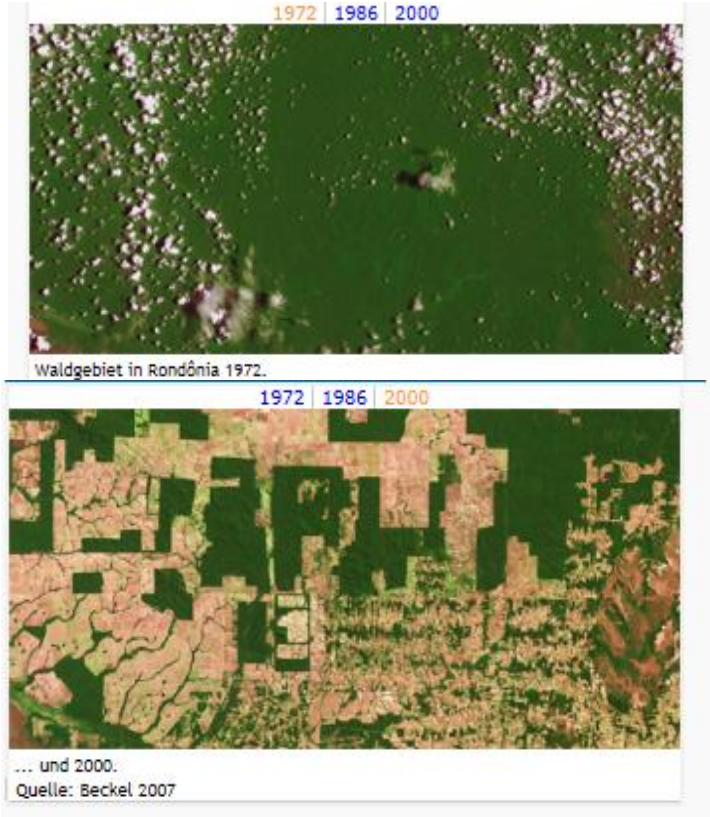


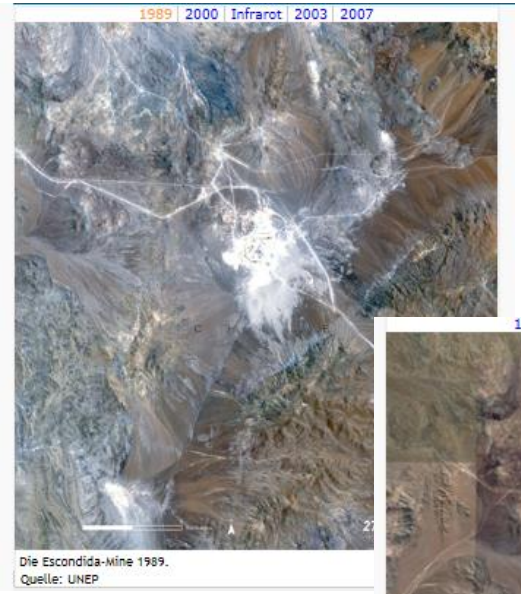


Overuse of resources

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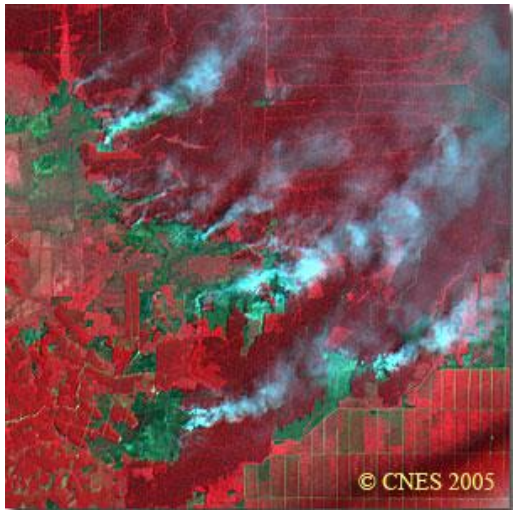
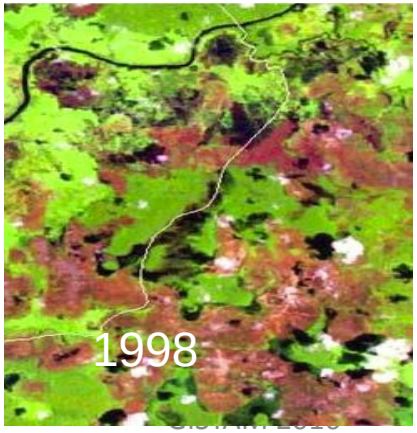
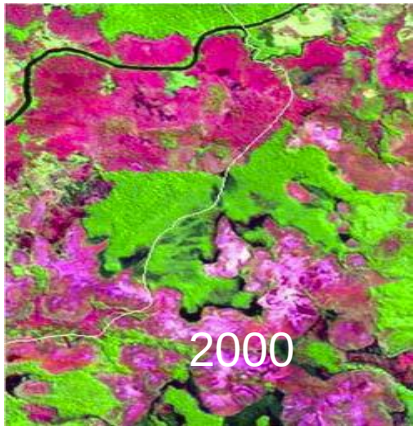
Über Frankreich.
Quelle: NASA Visible Earth




Indonesia
Sumatra


Kalimantan

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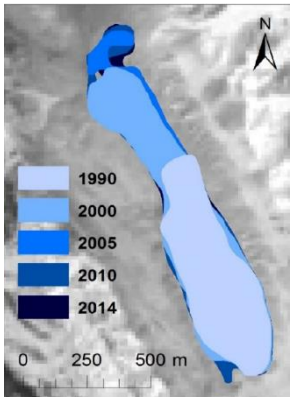
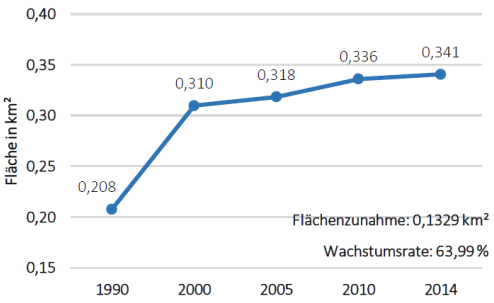
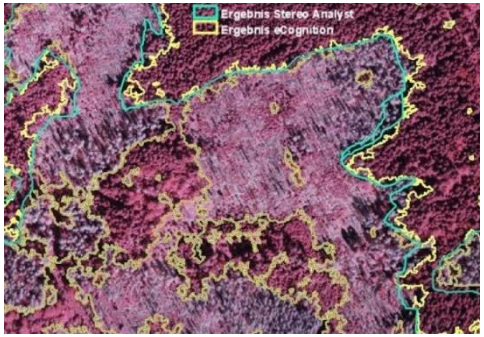
## Change of glacier lakes in Sikkim Himalaya



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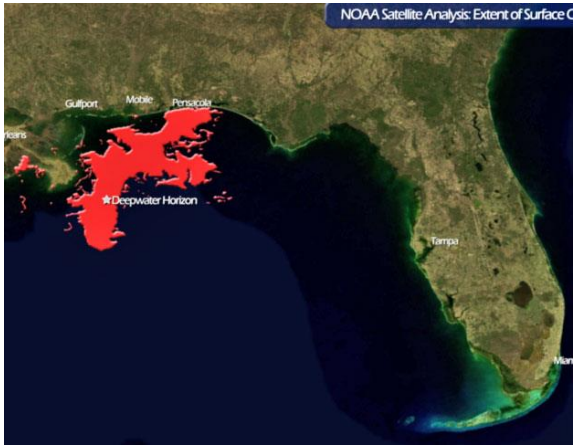

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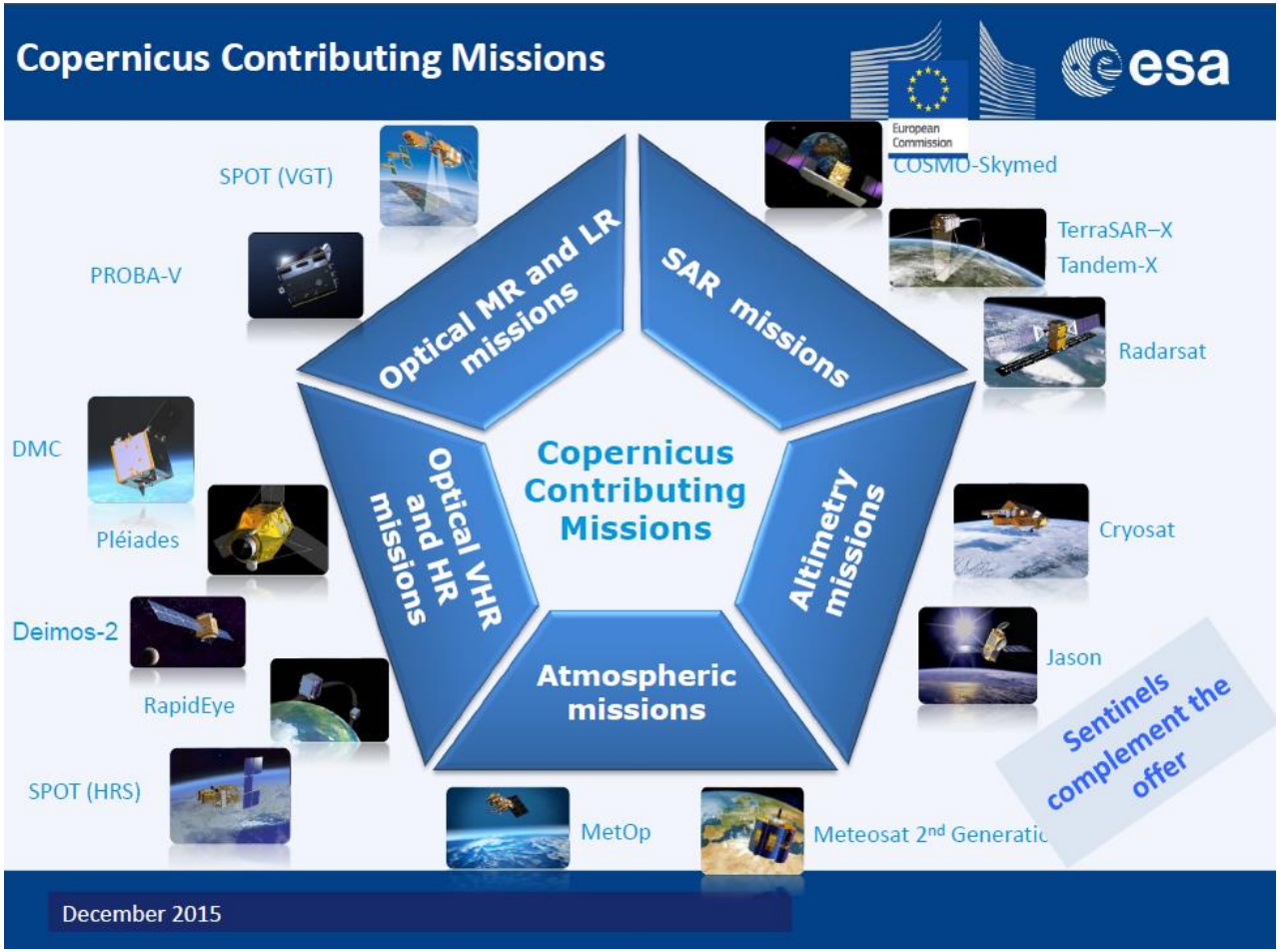

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It is recognized that data from remote sensing in combination with terrestrial data networks is needed for environmental management

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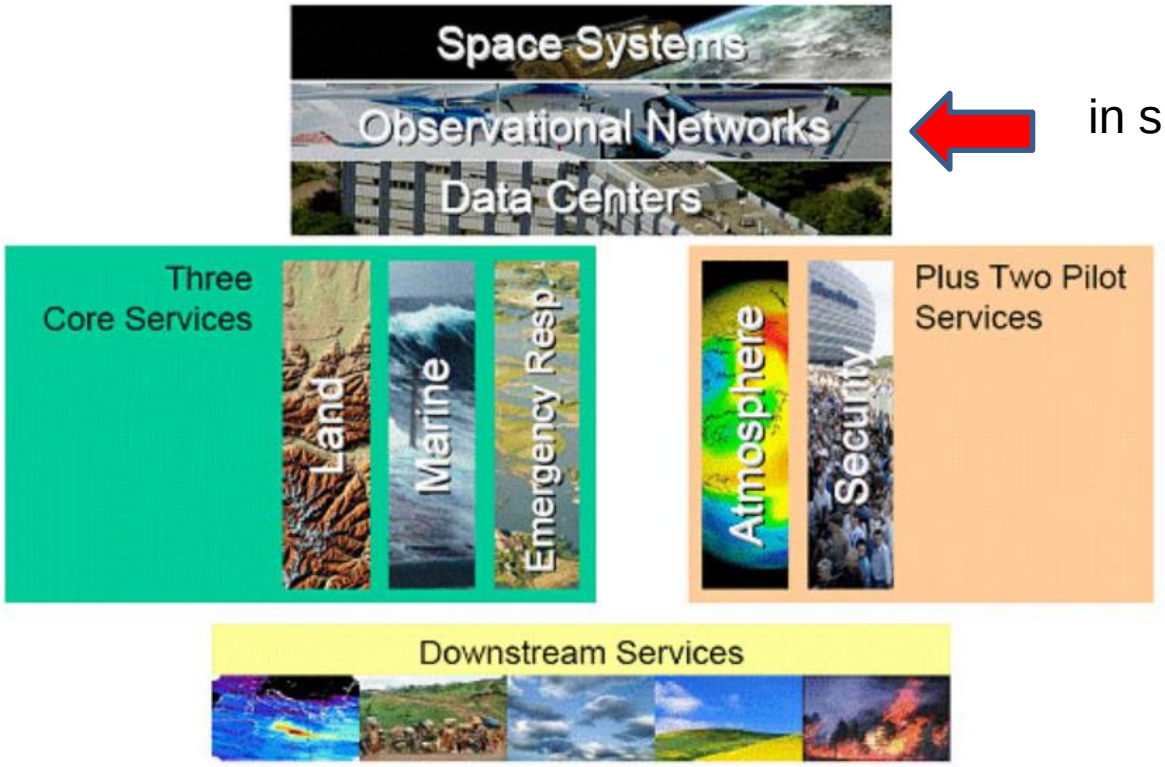

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## in situ component

Airborne measurement campaign



GAW climate network

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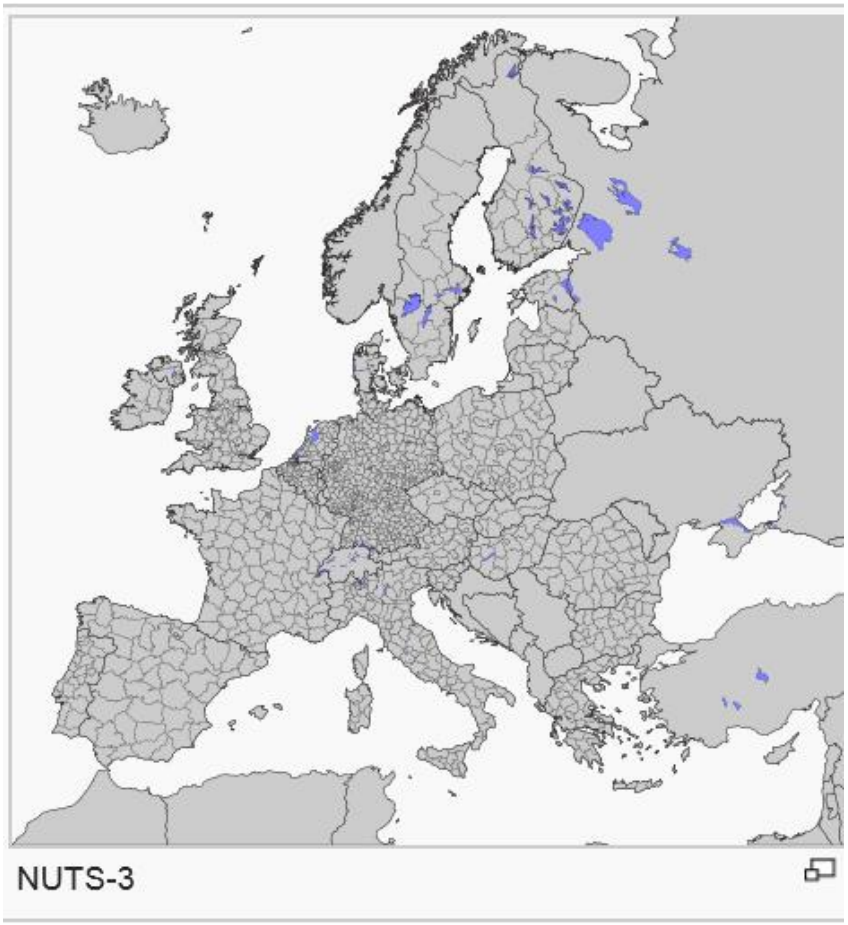


Eurostat has a huge value of statistical data

All data are related to the NUTS region on three different levels

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European network on International Cooperative program on assessment and monitoring of airpollution effects on forests (30 years)

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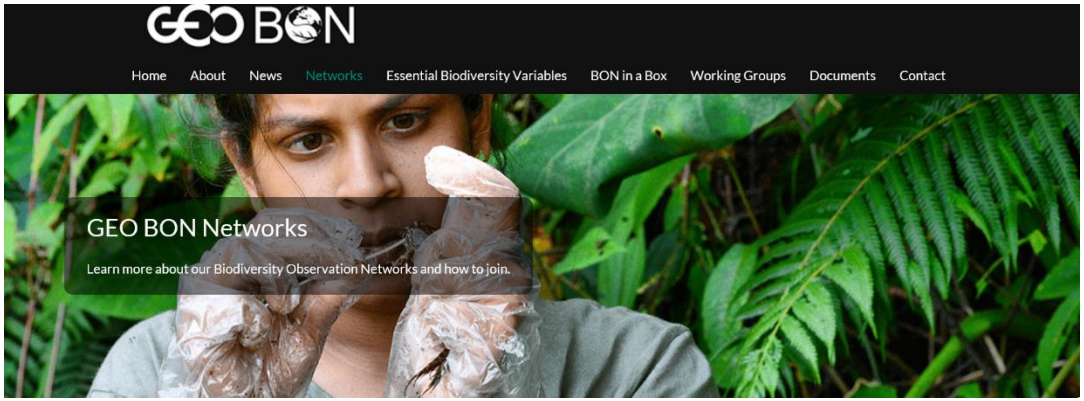
## biodiversity observation systems Geo-Bon



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Combination of remote sensing data with in situ data networks

Increases the value of information

# For what do we need terrestrial networks?

Calibration
Validation

Imputation
Regression

Fusion of information to produce new information

Modelling

# Bio-economy?

## Biomass production and conversion into value added products

Food
Feed
Bio-based products
Bio-energy

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***Europe***

| Bio-product category | Bio-products | Market volume "Bio" 2010 [1] | Projected market volume "Bio" 2020 [1] [2] |
|---|---|---|---|
| **Bio-based plastics** (European Bioplastics) | Short-life/ disposable applications (PLA, PHA, Starch Blends, Cellulosics) | 110.000 | 1.280.000 |
| | Durable applications | 150.000 | |
| | Engineering Polymers | | 740.000 |
| | Modified PLA, Cellulosics | | |
| | Polyolefines (2012) | | 530.000 |
| | Starch based alloys | not marketed | 260.000 |
| | **TOTAL** | **260.000** | **2.810.000** |
| **Biodegradable and bio-based plastics** (BASF SE) | Waste & shopping bags | 30.000 | 260.000 |
| | Tableware | 3.000 | 33.000 |
| | Bio mulch for agriculture | 2.000 | 40.000 |
| | **TOTAL** | **35.000** | **333.000** |
| **Bio-lubricants (2008)** (Fuchs Petrolub AG) | Hydraulic Fluids | 68.000 | 230.000 |
| | Chainsaw Lubricants | 29.000 | 40.000 |
| | Mould Release Agents | 9.000 | 30.000 |
| | Other oils | 31.000 | 120.000 |
| | **TOTAL** | **137.000** | **420.000** |
| **Bio-composites** (nova-Institut, 2012) | Compression moulding: | | |
| | - with natural fibres | 40.000 | 120.000 |
| | - with cotton fibres | 100.000 | 100.000 |
| | - with wood fibres | 50.000 | 150.000 |
| | Extrusion and injection moulding | | |
| | Wood Plastic Composites: | 167.000 | 450.000 |
| | - with natural fibres | 5.000 | 100.000 |
| | **TOTAL** | **372.000** | **920.000** |
| **Bio-solvents** [3] | (2012) | **630.000** | [4] |
| **Bio-surfactants** [3] | (2012) | **1.520.000** | [4] |

1) In tons
2) All figures for 2020 are based on estimations
3) Figures by Industries & Agro-Ressources IAR
4) To be estimated by respective CEFIC sector groups

Source: Busch and Wittmeyer, Current market situation 2010 and market forcast 2020

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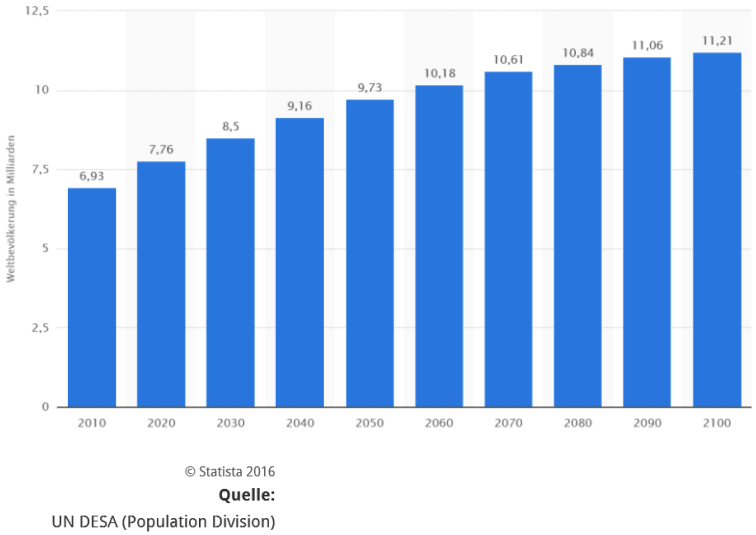
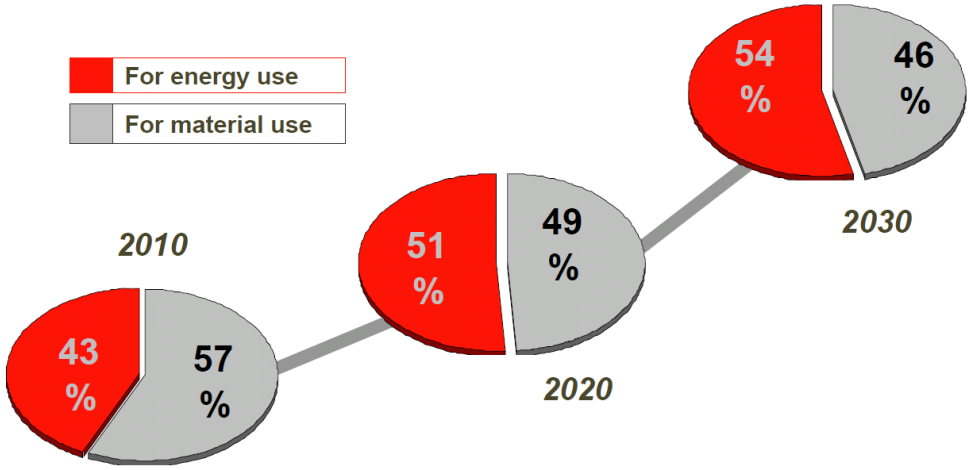
3.9 Mio m³ wood production
50% for energy use
2030 year 2.7 Mrd people will be dependent on wood as energy source



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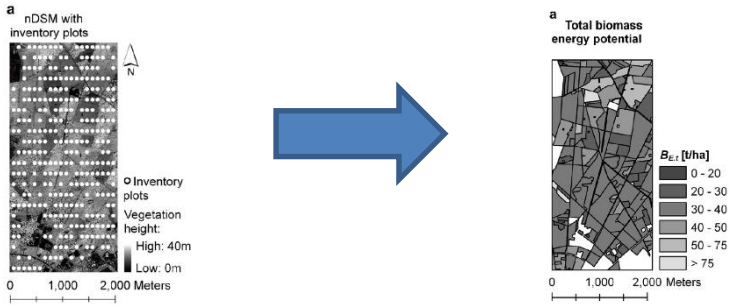
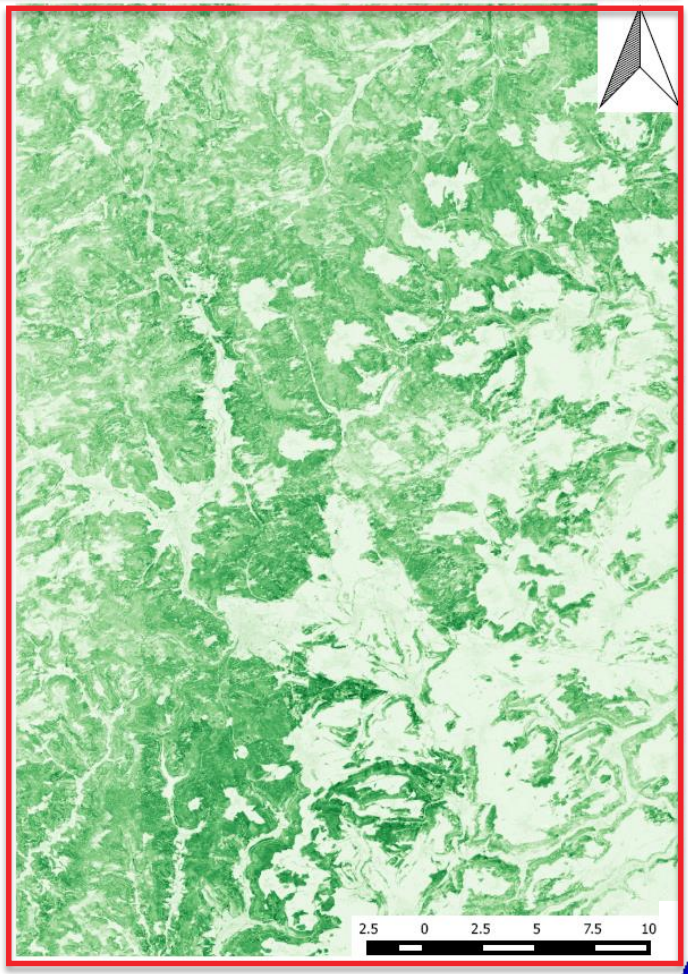
## Assessment of AGB for large areas

**above ground woody biomass mapping Baden-Württemberg**

NFI sample plot measurement on the ground




Street maps
Topograhie
Protection maps
Owner structure information
Used wood residues today



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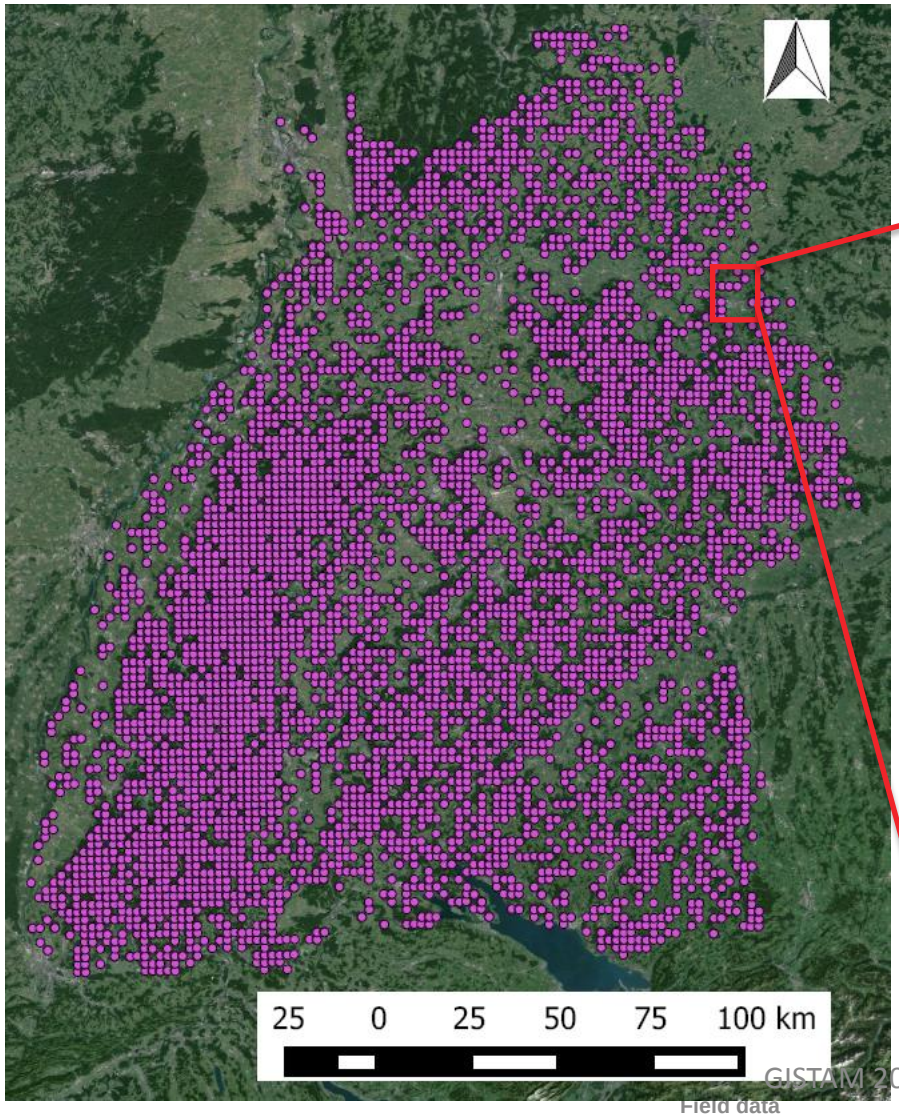
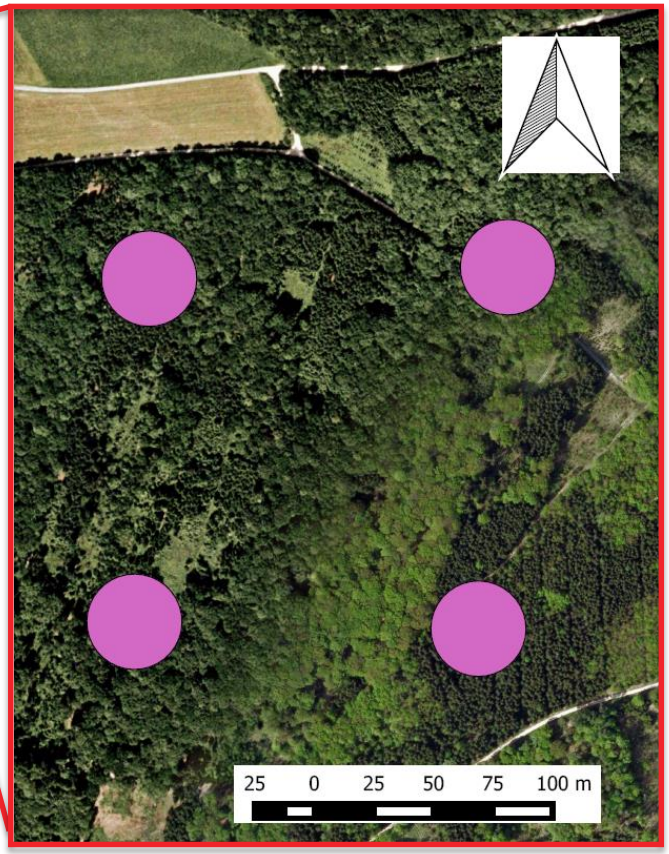



Ground truth reference data
(NFI of Germany)




Falsified coordinates

# City Climate Modeling

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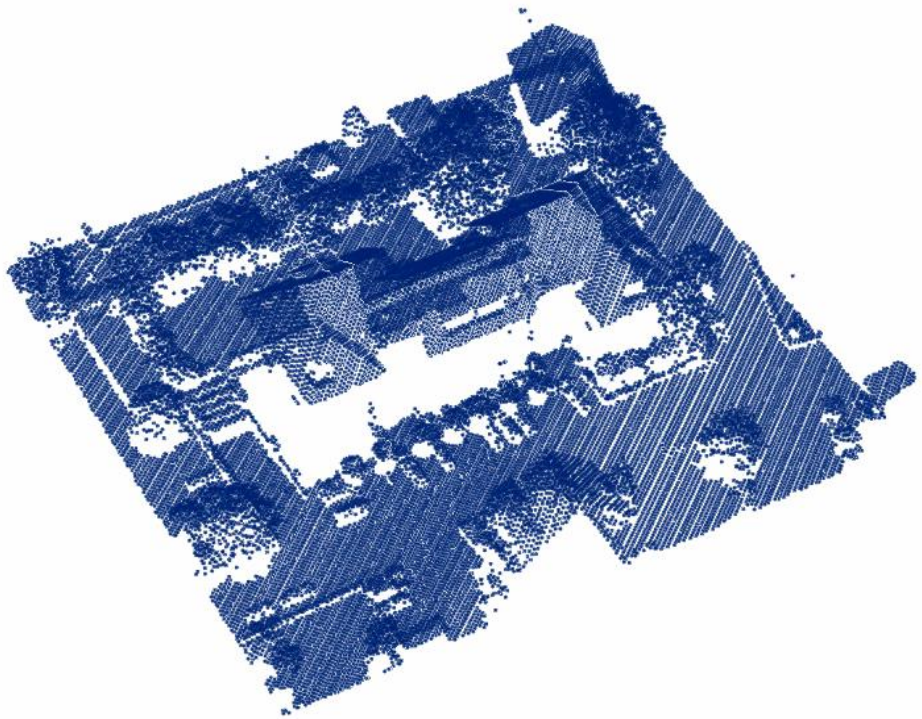
- City Model:
  - Ground Elevation ( Digital Terrain Model)
  - 3D Buildings Model
  - Trees
- Street and pavement areas (Ground Cover)
- Meteorological data
  - Temperature
  - Humidity
  - Wind (Speed and Direction)
  - …

➢ From LiDAR

➢ From Surveying department

➢ City Atmospheric Net Station

## City Models



Yousef and Koch 2010

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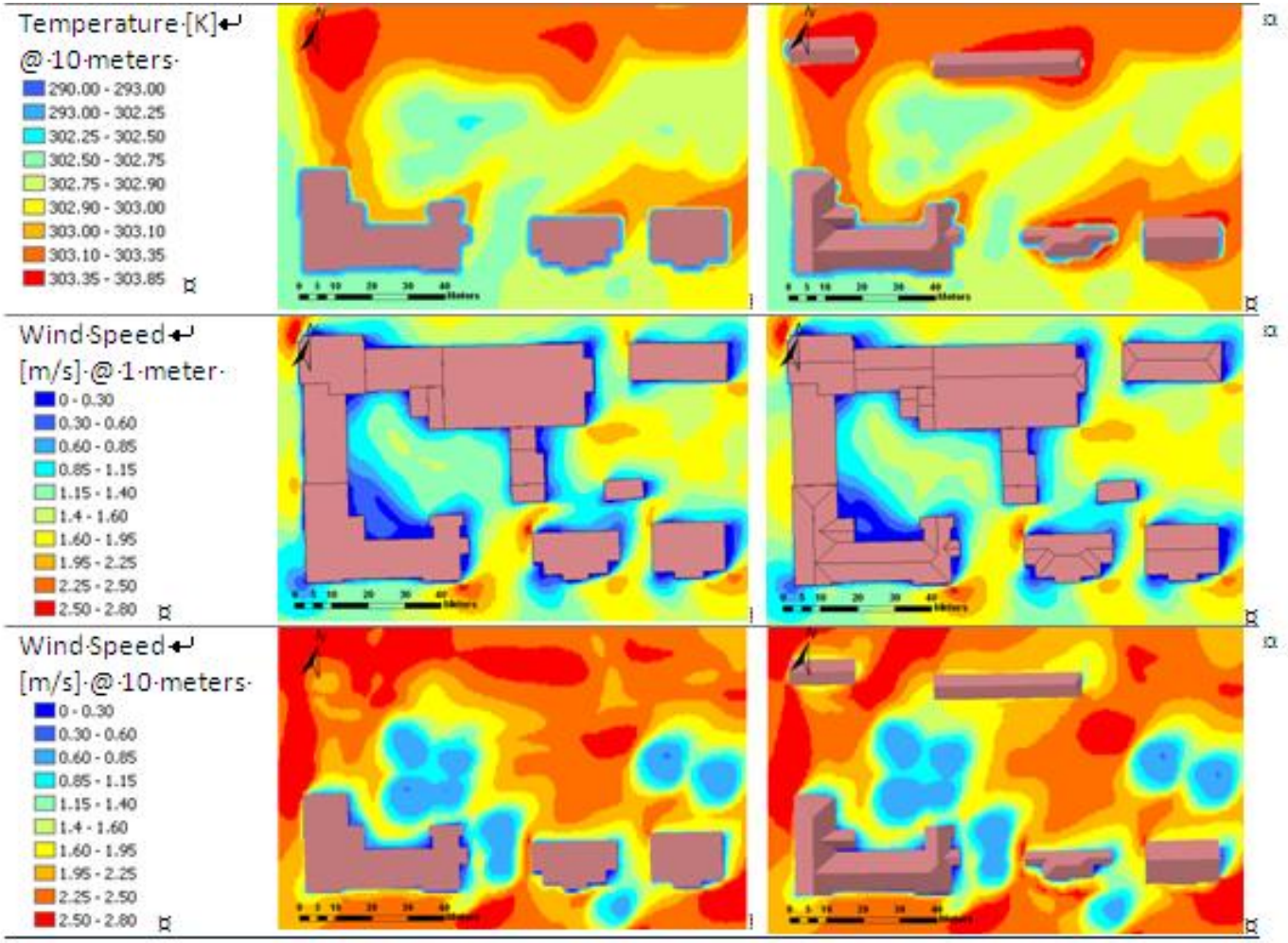


**City climate**

lidar based city models

Block model left
Real model right

Climate models

Yousef 2010, Felis

# Roof modelling
# for photovoltaic suitability

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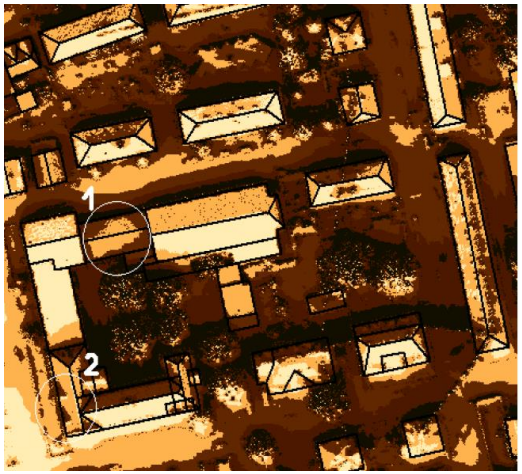
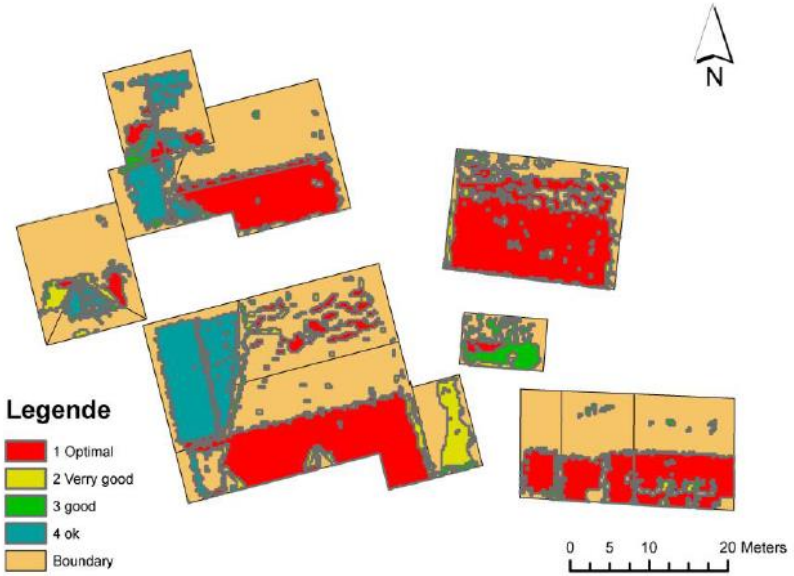



Shadow situation




Roof quality for PV

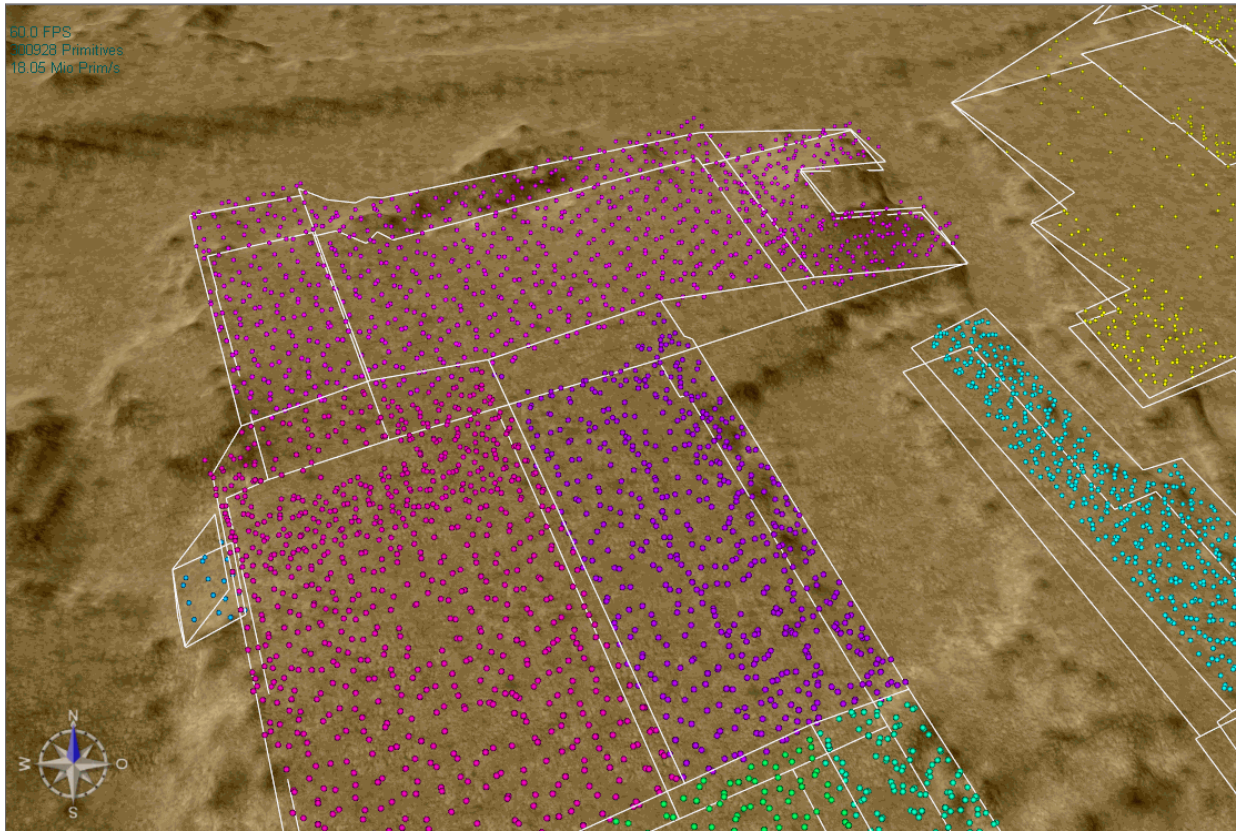
# Processing steps for PV suitibility withinTreesVis

aerial Stereophotos (point cloud)

building polygons from line map (BP) (white)

digital terrain modell (DTM) (brown)

data on incident solar radiation



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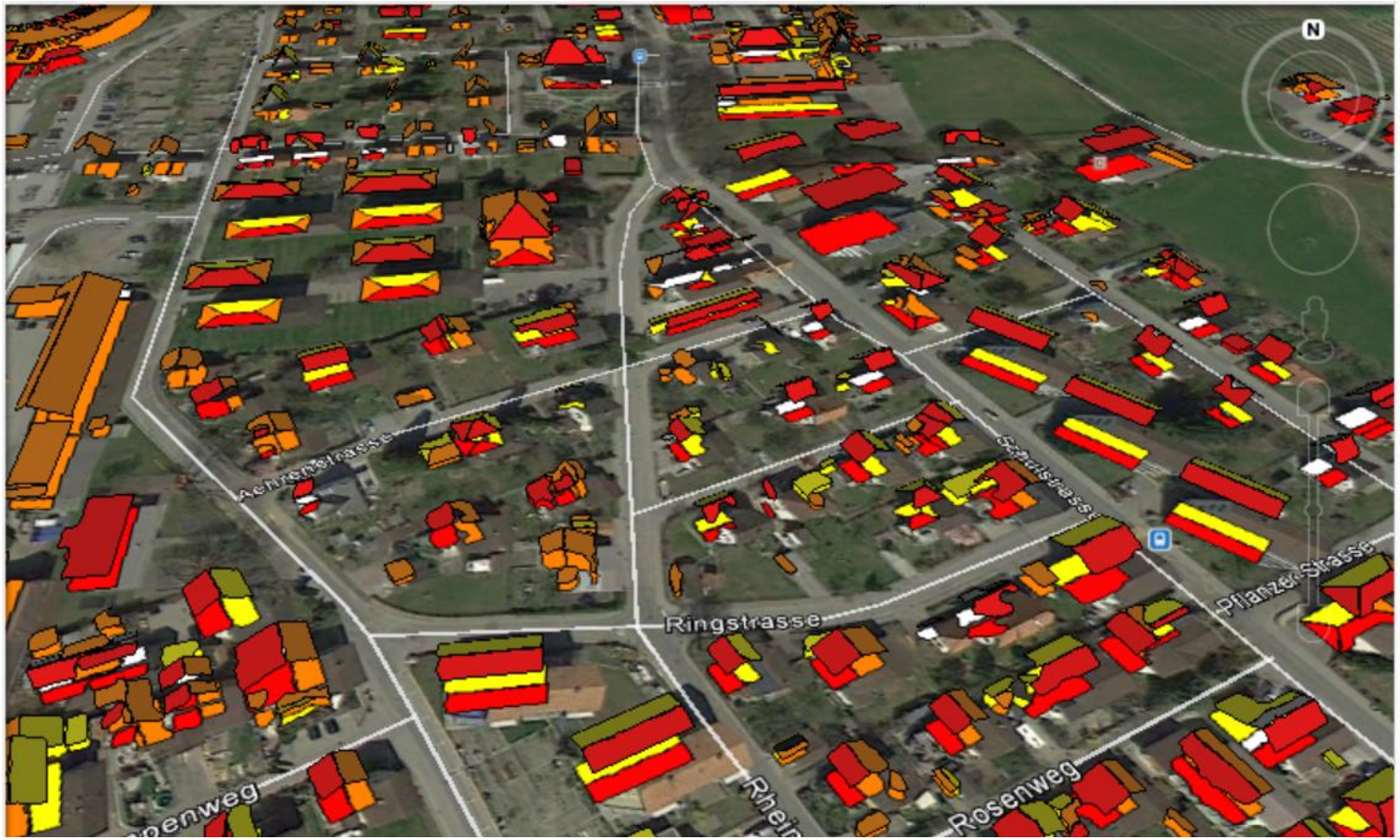

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# Global stress classification system for materials used in solar energy applications

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Fraunhofer
ISE

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Corrosion of metal constructions

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Different effects of extreme degradation

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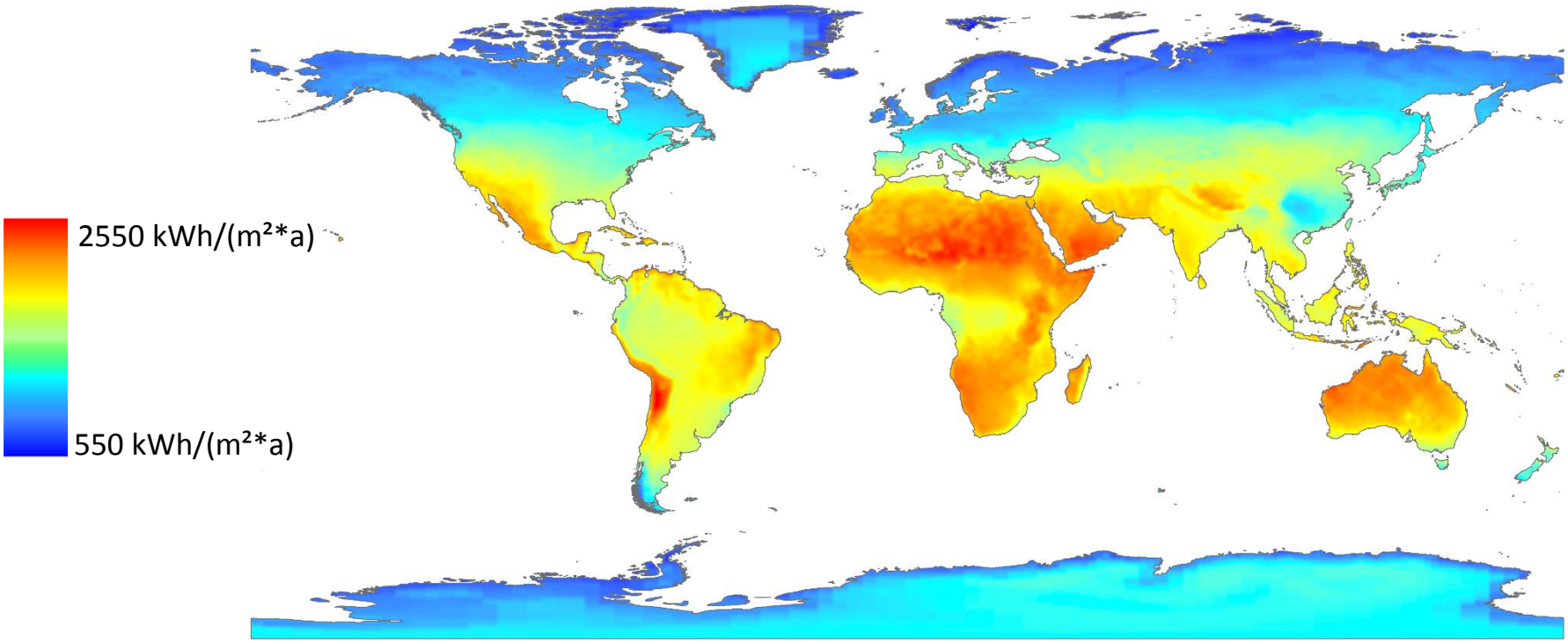


Average global horizontal irradiation – Energy potential

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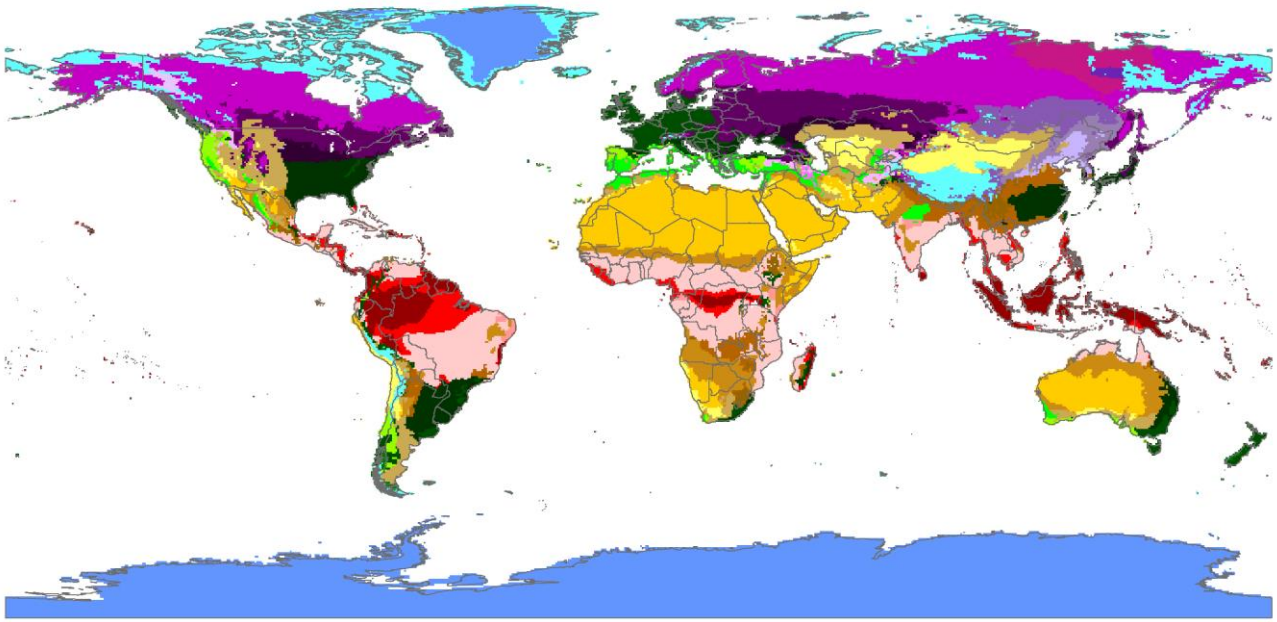

Köppen-Geiger climate classification

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Af | BWk | Cfa | Csa | Cwa | Dfa | Dsa | Dwa | EF |
| Am | AWh | Cfb | Csb | Cwb | Dfb | Dsb | Dwb | ET |
| As | BSk | Cfc | Csc | Cwc | Dfc | Dsc | Dwc | |
| Aw | BSh | | | | Dfd | | Dwd | |

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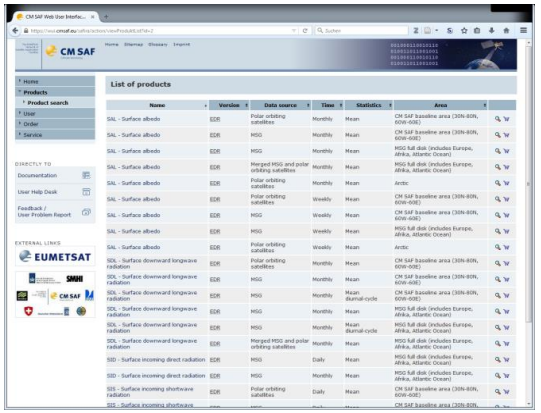


CM SAF
Climate Monitoring

Fraunhofer
ISE

NASA

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

opernicus
The European Earth Observation Programme

esa

EUMETSAT

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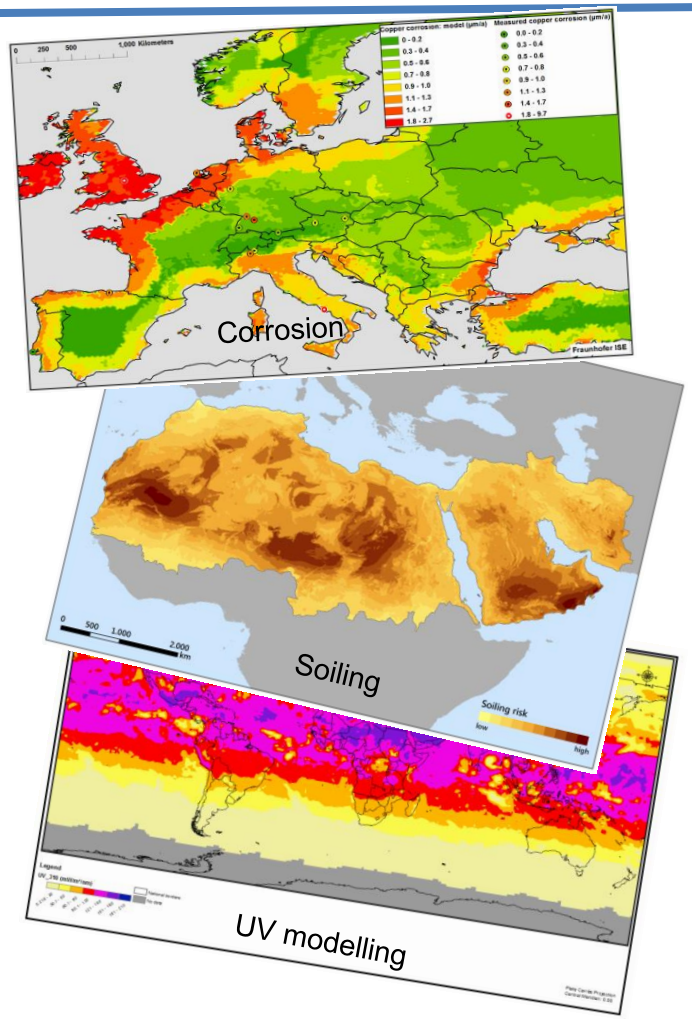


## Development of one unified global stress classification system for solar energy applications

- Optimized planning and operation
- Stress zone adapted materials
- Stress zone adapted test procedures
- International standardization

**Sustainable use of solar energy**

# Target audience