Smart Altitude WebGIS – Geodata Sources and Hierarchy

1 Ski Resorts

1.1 Key Performance Indicators (KPI)

Key Performance Indicators (KPIs) of Case Study Areas are measureable values that demonstrate how effectively the ski resort is achieving key business objectives – these values are Smart Altitude Project Results. Detail information on how these values are calculated can be found on WIKIAlps (see http://www.wikialps.eu/lib/exe/fetch.php?media=wiki:smart-altitude_wi-emt_evaluation-report_final_xxx.pdf).

1.1.1 Overall Ski-Resort KPI (OV)

This value is designed as average of scores from the 8 following KPIs;
Unit: 1-5 Weighted average of scores from Energy Efficiency, Energy Economy, Sustainability, Energy Management, Smart Grid, Adaptation to Climate Change, Self-Evaluation, Future Outlook sections (partially applying a Benchmarking Methodology).
Format: Polygons.

1.1.2 Energy Efficiency (E_EF)

Unit: 1-5 Weighted average of scores from Energy Efficiency KPIs (Benchmarking Methodology).
Format: Polygons.

1.1.3 Energy Economy (E_EC)

Unit: 1-5 Weighted average of scores from Energy Economy KPIs (Benchmarking Methodology).
Format: Polygons.

1.1.4 Sustainability (S)

Unit: 1-5 Weighted average of scores from Sustainability KPIs (Benchmarking Methodology).
Format: Polygons.

1.1.5 Energy Management (EM)

Unit: 1-5 Weighted average of scores from the Energy Management section.
Format: Polygons.

1.1.6 Smart Grid (SG)

Unit: 1-5 Weighted average of scores from the Smart Grid section.
Format: Polygons.

1.1.7 Adaptation to Climate Change (ACC)

Unit: 1-5 Weighted average of scores from the Adaptation to Climate Change section.
Format: Polygons.

1.1.8 Self Evaluation (SE)

Unit: 1-5 Weighted average of scores from the Self Evaluation section.
Format: Polygons.

1.1.9 Future Outlook (FO)

Unit: 1-5 Weighted average of scores from the Future Outlook section.
Format: Polygons.

1.2 Open Ski Map

Data on pistes, aerialways and ski resorts are taken out of the OpenSnowMap. (http://www.opensnowmap.org/iframes/data.html#osm) On this page you can find ski extracts from the openstreetmap database in various formats.

1.2.1 Pistes

Data Source: OpenSnowMap, OpenStreetMap
Format: Line Vectors, osm (planet_pistes.osm.gz).
Download link: http://www.opensnowmap.org/iframes/data.html#osm
Download date: 09.08.2019
Rights to publish: Data are available under the term of the ODBL License, attribution must be granted to (c)www.openstreetmap.org & contributors wherever the data is used. You are welcome to provide this data 'Courtesy of www.opensnowmap.org'.

1.2.2 Aerialways

Data Source: OpenSnowMap, OpenStreetMap
Format: Line Vectors, osm (planet_pistes.osm.gz).
Download link: http://www.opensnowmap.org/iframes/data.html#osm
Download date: 09.08.2019
Rights to publish: Data are available under the term of the ODBL License, attribution must be granted to (c)www.openstreetmap.org & contributors wherever the data is used. You are welcome to provide this data 'Courtesy of www.opensnowmap.org'.

1.2.3 Ski Resorts

Data Source: OpenSnowMap, OpenStreetMap
Format: Polygons, osm (planet_pistes.osm.gz).
Download link: http://www.opensnowmap.org/iframes/data.html#osm

Download date: 09.08.2019
Rights to publish: Data are available under the term of the ODBL License, attribution must be granted to (c)www.openstreetmap.org & contributors wherever the data is used. You are welcome to provide this data 'Courtesy of www.opensnowmap.org'.

1.2.4 Pistes length per LAU

Calculated based on the OSM datasets by GIS (ArcGIS) analyses.
Unit: kilometres per municipality (LAU).
Format: Polygons.

1.2.5 Pistes length per resort

Calculated based on the OSM datasets by GIS (ArcGIS) analyses.
Unit: kilometres per ski resorts.
Format: Polygons.

1.3 Smart Altitude Study Sites

This project specific datasets are curated by IGF– generated by the help of EBM data.

1.3.1 Alpine Space Area

The dataset consists of one polygon containing all municipalities, which are located within the alpine space area.
Further information: http://www.wikialps.eu/doku.php?id=wiki:alps
Format: Polygon.

1.3.2 Alpine Convention Area

The Alpine Convention is an international treaty between the Alpine Countries (Austria, France, Germany, Italy, Liechtenstein, Monaco, Slovenia and Switzerland) as well as the EU, for the sustainable development and protection of the Alps. The Convention is a framework that sets out the basic principles of all the activities of the Alpine Convention and contains general measures for the sustainable development in the Alpine region. It entered into force on March 1995. (http://www.wikialps.eu/doku.php?id=wiki:alpine_convention)

The dataset consists of one polygon containing all municipalities, which are located within the alpine convention area.
Format: Polygon.

1.3.3 Smart Altitude – Case Study Areas (Ski Resort LAU Communities)

Municipality which is a part of the Smart altitude project as Living Lab.
Format: Polygons.

2 Renewable Energy Potential

2.1 Solar -> Global Solar Atlas (GSA Version 2.0)

Global solar resource data can be obtained from the Global Solar Atlas (GSA version 2.0 of October 2019). This is a free, web-based application that is developed and operated by the company "Solargis" s.r.o. on behalf of the "World Bank Group" (https://globalsolaratlas.info/support/terms-of-use, access: 11.11.2019). Their work is funded by the Energy Sector Management Assistance Program (ESMAP) and part of a global ESMAP initiative on Renewable Energy Resource Mapping that includes biomass, small hydro, solar and wind (https://globalsolaratlas.info/support/about, access: 11.11.2019). It is licensed under the Creative Commons Attribution 4.0 International License.
All data layers are provided as GeoTiff format. The spatial resolution is approximatively 1km.
Temporal coverage is 1994 to 2018 (https://globalsolaratlas.info/support/release-notes; access: 03.12.2019 & https://globalsolaratlas.info, access: 11.09.2019).

Further information: https://globalsolaratlas.info/support/methodology
Data accuracy: https://globalsolaratlas.info/support/accuracy

On the website there is a clear statement on the limitation of Global Solar Atlas:
"The objective of the Global Solar Atlas is to provide reliable introductory-level data to help policymakers, researchers, and commercial solar companies take better decisions. For project-specific analysis of large power plants, the data available via the Global Solar Atlas is suitable only for preliminary analysis. The PV yield estimates do not account for many important factors that can impact potential yield of a photovoltaic power plant. For large power plants, it is recommended to work with more detailed yield estimation tools in order to obtain a precise estimate of energy yield (https://globalsolaratlas.info/support/getting-started; access: 11.11.2019)".
This Atlas provides long-term yearly averaged solar resource and PV power potential values, described with under as yearly summaries, except of the air temperature, that is represented as a long-term yearly average.

2.1.1 Photovoltaic Electricity Output (PVOUT)

The Global Solar Atlas offers the long-term yearly/monthly average of daily totals of several datasets for solar resource and the photovoltaic power potential (PV) [kWh/kWp]. PVOUT (Photovoltaic Electricity Output) is the amount of energy, converted by a PV system into electricity [kWh/kWp] that is expected to be generated according to the geographical conditions of a site and a configuration of the PV system. Three configurations of a PV system are considered: (i) Small residential; (ii) Medium-size commercial; and (iii) Ground-mounted large scale.
Data Source: https://globalsolaratlas.info
Unit: kWh/kWp
Format: GeoTiff format.
Spatial resolution: 1 km
Temporal coverage: 1994-2018 (includes long-term yearly average of daily sum (LTAy_DailySum))
Temporal aggregation: 12x24 (month x hour) profiles

2.1.2 Global Horizontal Irradiation (GHI)

GHI (Global Horizontal Irradiation) is the sum of direct and diffuse components of solar radiation [kWh/m2]. It is considered as a climate reference as it enables comparing individual sites or regions.
Data Source: https://globalsolaratlas.info
Unit: kWh/m²
Format: GeoTiff format.
Spatial resolution: 1 km
Temporal coverage: 1994-2018 (includes long-term yearly average of daily sum (LTAy_DailySum))
Temporal aggregation: annual average

2.1.3 Diffuse Horizontal Irradiation (DIF)

DIF (Diffuse Horizontal Irradiation) is the solar radiation component that is scattered by the atmosphere [kWh/m2].
Data Source: https://globalsolaratlas.info
Unit: kWh/m²
Format: GeoTiff format.
Spatial resolution: 1 km
Temporal coverage: 1994-2018 (includes long-term yearly average of daily sum (LTAy_DailySum))
Temporal aggregation: annual average

2.1.4 Global Irradiation for Optimally Tilted Surface (GTI)

GTI (Global Tilted Irradiation) is the sum of direct and diffuse solar radiation falling on a tilted surface of fixed-mounted PV modules [kWh/m2]. Compared to the horizontal surface, the tilted surface also receives a small amount of ground-reflected solar radiation.
Data Source: https://globalsolaratlas.info
Unit: kWh/m²
Format: GeoTiff format.
Spatial resolution: 1 km
Temporal coverage: 1994-2018 (includes long-term yearly average of daily sum (LTAy_DailySum))

2.1.5 Optimum Tilt to Maximize Yearly Yield (OPTA)

OPTA (Optimum angle) is the optimum inclination [º] of an inclined and fixed PV modules for a specific azimuth (orientation), for which the PV modules receive the highest amount of solar radiation per year. As default azimuth values towards the Equator are considered, i.e. South (180º) for Northern hemisphere and North (0º) for the Southern hemisphere.
Data Source: https://globalsolaratlas.info
Unit: °
Format: GeoTiff format.
Spatial resolution: 1 km
Temporal coverage: 1994-2018 (includes long-term yearly average of daily sum (LTAy_DailySum))
Temporal aggregation: annual average

2.1.6 Direct Normal Irradiation (DNI)

DNI (Direct Normal Irradiation) is the solar radiation component that directly reaches the surface [kWh/m2]. It is relevant for concentrating solar thermal power plants (CSP) and photovoltaic concentrating technologies (CPV).
Data Source: https://globalsolaratlas.info
Unit: kWh/m²
Format: GeoTiff format.
Spatial resolution: 1 km
Temporal coverage: 1994-2018 (includes long-term yearly average of daily sum (LTAy_DailySum))
Temporal aggregation: 12x24 (month x hour) profiles

2.1.7 Air Temperature at 2m AGL (TEMP)

TEMP (Air Temperature at 2 meters above ground) is the air temperature [ºC or ºF] that determines the temperature of PV cells and modules and has a direct impact on PV energy conversion efficiency and resulting energy losses. Air temperature and also some other meteorological parameters are an important part of each solar energy project assessment as they determine the operating conditions and operation efficiency of the solar power plant.
Data Source: https://globalsolaratlas.info; ERA5, post-processed by Solargis.
Unit: °C
Format: GeoTiff format.
Spatial resolution: 1 km
Temporal aggregation: annual average

2.1.8 Terrain Elevation ASL (ELE)

ELE (Elevation) represents terrain elevation (altitude) relative to the sea level [m or ft]. Only data for the land area is shown. Areas of more complex orographic conditions (terrain) are generally less populated and most often not suitable for large-scale solar energy development.
Data Source: https://globalsolaratlas.info; SRTM-3 and other multiple sources, post-processed by Solargis.
Unit: m
Format: GeoTiff format.
Spatial resolution: 90x90 m

2.2 Solar -> Global Solar Atlas (GSA Version 2.0) -> Median per LAU

Median datasets have been calculated on a municipality level, showing median values for each municipality out of the Global Solar Atlas. Calculations have been performed by IGF through GIS analysis. For more information see 2.2.

2.3 Solar -> Hotmaps Project

In the EU project hotmaps (https://www.hotmaps-project.eu/), they collected and re-elaborated data on energy potential of renewable sources at national level, in order to build datasets for all EU28 countries at NUTS3 level. They considered the following renewable sources: biomass, waste and wastewater, shallow geothermal, wind, and solar energy. These data are used in the toolbox to map the sources of renewable thermal energy across the EU28 and support energy planning and policy. Four data sources are provided on GitLab – they are used for the Smart Altitude WebGIS. Please consider, that all hotmaps-data must be interpreted as indicators, rather than absolute figures representing the actual energy potential of renewable sources in a territory.

2.3.1 Solar Energy Potential

„Data on annual global radiation on globally inclined surfaces in kWh/m2 were retrieved from the PVGIS as a 1km x 1km raster layer and clipped by considering the building footprint with a resolution of 100m x 100m from Copernicus Services." The data were used as indicator to define patterns in Chiara Scaramuzzino, Giulia Garegnani, Pietro Zambelli, Integrated approach for the identification of spatial patterns related to renewable energy potential in European territories, Renewable and Sustainable Energy Reviews, Volume 101, 2019, Pages 1-13, ISSN 1364-0321, https://doi.org/10.1016/j.rser.2018.10.024.
Unit: kWh/m²
Format: Raster, GeoTiff
Spatial resolution: 100x100m, EU28
Temporal resolution: yearly
Download link: https://gitlab.com/hotmaps/potential/potential_solar
Last upload: June 2019
Download date: 10.08.2019
Relevant article:
Chiara Scaramuzzino, Giulia Garegnani, Pietro Zambelli (2019): Integrated approach for the identification of spatial patterns related to renewable energy potential in European territories. - In: Renewable and Sustainable Energy Reviews, Volume 101, Pages 1-13, ISSN 1364-0321, https://doi.org/10.1016/j.rser.2018.10.024.

2.4 Wind -> Global Wind Atlas (GWA Version 3.0) ->Wind Energy Layers

On the same platform as the GSA the **Global Wind Atlas** (GWA version 3.0 of October 2019) is made available. "The Global Wind Atlas is a free, web-based application developed to help policymakers, planners, and investors identify high-wind areas for wind power generation virtually anywhere in the world, and then perform preliminary calculations (https://globalwindatlas.info/about/introduction; access: 27.11.2019). It is the product of the Department of Wind Energy at the Technical University of Denmark and the World Bank Group, funded by ESMAP (https://globalwindatlas.info/about/introduction; access: 25.11.2019). It is licensed under the Creative Commons Attribution 4.0 International License.
GeoTiffs are available separately for each country in the Alpine Space. We used and downloaded the datasets of 12 countries (8 Alpine Space Countries (no single Monaco dataset) and 4 surrounding ones) to avoid border effects resulting from a different country border precision (download link: https://globalwindatlas.info/downloads/gis-files; access: 11.11.2019). These are the three Wind Energy Layers Capacity Factor IEC Class |, Capacity Factor IEC Class || and Capacity Factor IEC Class ||| as well as the mean wind power density, mean wind speed and mean air density layers each for the three selected heights.
The spatial resolution is 1km (https://globalwindatlas.info/about/method, access: 09.10.2019). The simulation period is 2008-2017 (Source: mail with Solargis Team GWA: Niels). The unit of the wind power density is W/m² (https://globalwindatlas.info/, access: 09.10.2019). These values can mainly be used for comparative analysis. A high value indicates a high potential for renewable energy from wind (https://globalwindatlas.info/, information button on the left upper side, access: 09.10.2019).
For further information see https://globalwindatlas.info

2.4.1 Capacity Factor IEC Class 1 (High wind)

Data Source: Global Wind Atlas
Format: Polygon
Simulation period: 2008-2017
Download link: https://globalwindatlas.info/downloads/gis-files
Download date: 11.11.2019
For more information on wind classes see: https://en.wikipedia.org/wiki/IEC_61400

2.4.2 Capacity Factor IEC Class 2 (Medium wind)

Data Source: Global Wind Atlas
Format: Polygon
Simulation period: 2008-2017
Download link: https://globalwindatlas.info/downloads/gis-files
Download date: 11.11.2019
For more information on wind classes see: https://en.wikipedia.org/wiki/IEC_61400

2.4.3 Capacity Factor IEC Class 3 (Low wind)

Data Source: Global Wind Atlas
Format: Polygon

Simulation period: 2008-2017
Download link: https://globalwindatlas.info/downloads/gis-files
Download date: 11.11.2019
For more information on wind classes see: https://en.wikipedia.org/wiki/IEC_61400

2.5 Wind -> Global Wind Atlas (GWA Version 3.0) ->Wind Energy Layers -> Median per LAU

Median datasets have been calculated on a municipality level, showing median values for each municipality out of the Global Wind Atlas. Calculations have been performed by IGF through GIS analysis. For more information see 2.4, 2.4.1, 2.4.2 and 2.4.3.

2.5.1 LAU median: Capacity Factor IEC Class 1
2.5.2 LAU median: Capacity Factor IEC Class 2
2.5.3 LAU median: Capacity Factor IEC Class 3

2.6 Wind -> Global Wind Atlas (GWA Version 3.0) -> Wind-Speed at a height of

The info button on the start page of the Global Wind Atlas states the following: "*Mean Wind Speed* is a measure of the wind resource. Higher values normally indicate better wind resources, but mean wind power density gives a more accurate indication of the available wind resource."
Data Source: Global Wind Atlas
Unit: m/s
Format: Polygon
Simulation period: 2008-2017
Download link: https://globalwindatlas.info/downloads/gis-files
Download date: 11.11.2019
Datasets have been selected at heights of 10m, 50m and 100m because these are the most important heights in regard to the height of energy producing machines like wind turbines. Datasets are also available for 150m and 200m height (https://globalwindatlas.info/about/method, access: 09.10.2019).

2.6.1 10m
2.6.2 50m
2.6.3 100m

2.7 Wind -> Global Wind Atlas (GWA Version 3.0) -> Wind-Speed at a height of -> Median per LAU

Median datasets have been calculated on a municipality level, showing median values for each municipality out of the Global Wind Atlas. Calculations have been performed by IGF through GIS analysis. For more information see 2.4 and 2.6.

2.8 Wind -> Global Wind Atlas (GWA Version 3.0) -> Power-Density at a height of

The info button on the start page of the Global Wind Atlas states the following: "*Mean Wind Power Density* is a measure of the wind resource. Higher values indicate better wind resources."
Data Source: Global Wind Atlas
Unit: W/m²
Format: Raster
Spatial resolution: 1000x1000m
Simulation period: 2008-2017
Download link: https://globalwindatlas.info/downloads/gis-files
Download date: 11.11.2019
Datasets have been selected at heights of 10m, 50m and 100m because these are the most important heights in regard to the height of energy producing machines like wind turbines. Datasets are also available for 150m and 200m height (https://globalwindatlas.info/about/method, access: 09.10.2019).

2.9 Wind -> Global Wind Atlas (GWA Version 3.0) -> Power-Density at a height of -> Median per LAU

Median datasets have been calculated on a municipality level, showing median values for each municipality out of the Global Wind Atlas. Calculations have been performed by IGF through GIS analysis. For more information see 2.4 and 2.8.

2.10 Wind -> Global Wind Atlas (GWA Version 3.0) -> Air-Density at a height of

Data Source: Global Wind Atlas
Unit: kg/m³
Format: Raster
Spatial resolution: 1000x1000m
Simulation period: 2008-2017
Download link: https://globalwindatlas.info/downloads/gis-files
Download date: 11.11.2019

Datasets have been selected at heights of 10m, 50m and 100m because these are the most important heights in regard to the height of energy producing machines like wind turbines. Datasets are also available for 150m and 200m height (https://globalwindatlas.info/about/method, access: 09.10.2019).

2.10.1 10m
2.10.2 50m
2.10.3 100m

2.11 Wind -> Global Wind Atlas (GWA Version 3.0) -> Air-Density at a height of -> Median per LAU

Median datasets have been calculated on a municipality level, showing median values for each municipality out of the Global Wind Atlas. Calculations have been performed by IGF through GIS analysis. For more information see 2.4 and 2.10.

2.11.1 LAU median: 10m
2.11.2 LAU median: 50m
2.11.3 LAU median: 100m

2.12 Wind -> Hotmaps Project

In the EU project hotmaps (https://www.hotmaps-project.eu/), they collected and re-elaborated data on energy potential of renewable sources at national level, in order to build datasets for all EU28 countries at NUTS3 level. They considered the following renewable sources: biomass, waste and wastewater, shallow geothermal, wind, and solar energy. These data are used in the toolbox to map the sources of renewable thermal energy across the EU28 and support energy planning and policy. Four data sources are provided on GitLab – they are used for the Smart Altitude WebGIS. Please consider, that all hotmaps-data must be interpreted as indicators, rather than absolute figures representing the actual energy potential of renewable sources in a territory.

2.12.1 Power Density Potential at 50m height

„Data show the total energy potential of wind in the EU28 at NUTS3 level. The original dataset is the Wind Global Atlas from IRENA and developed by the DTU (Delft, the Netherlands). Raster data with the power density of wind at 50, 100 and 200 m have been aggregated at NUTS3 level in Grass GIS, through the Corine Land Cover and by excluding urban areas, bird connectivity corridors, mountain peaks over 2500m and protected areas from the Natura 2000 framework.
Data on the wind-energy potential in W/m² have been drawn by the Global Wind Atlas (DTU Department of Wind Energy) for 50, 100, 200 m hub heights.“
Unit: W/m²
Format: Raster, GeoTiff
Spatial resolution: 300x300m, EU28
Temporal resolution: yearly
Download link: https://gitlab.com/hotmaps/potential/potential_wind
Last upload: July 2019

Download date: 10.08.2019
Further information: https://gitlab.com/hotmaps/potential/potential_wind
Relevant article:
Simon Pezzutto, Stefano Zambotti, Silvia Croce, Pietro Zambelli, Giulia Garegnani, Chiara Scaramuzzino, Ramón Pascual Pascuas, Alyona Zubaryeva, Franziska Haas, Dagmar Exner (EURAC), Andreas Müller (e-think), Michael Hartner (TUW), Tobias Fleiter, Anna-Lena Klingler, Matthias Kühnbach, Pia Manz, Simon Marwitz, Matthias Rehfeldt, Jan Steinbach, Eftim Popovski (Fraunhofer ISI) Reviewed by Lukas Kranzl, Sara Fritz (TUW) (2018): Hotmaps Project, D2.3 WP2 Report – Open Data Set for the EU28; www.hotmaps-project.eu.

2.13 Geothermal -> Thermomap Project / Hotmaps Project

In the EU project hotmaps (https://www.hotmaps-project.eu/), they collected and re-elaborated data on energy potential of renewable sources at national level, in order to build datasets for all EU28 countries at NUTS3 level. They considered the following renewable sources: biomass, waste and wastewater, shallow geothermal, wind, and solar energy. These data are used in the toolbox to map the sources of renewable thermal energy across the EU28 and support energy planning and policy. Four data sources are provided on GitLab – they are used for the Smart Altitude WebGIS. Please consider, that all hotmaps-data must be interpreted as indicators, rather than absolute figures representing the actual energy potential of renewable sources in a territory.

2.13.1 Thermomap

Data on very shallow **geothermal energy potential** in W/m K were retrieved from the EC co-funded project ThermoMap as a vector layer and presented in the hotmaps project without further elaboration.
Data Source: Thermomap project http://www.eurogeosurveys.org/projects/thermomap/
Unit: W/m K
Format: Polygon
Download link: https://gitlab.com/hotmaps/potential/potential_shallowgeothermal
Download date: 10.08.2019

2.13.2 Average Geothermal Potential per LAU

Average dataset has been calculated on municipality level by rasterization of thermomap (vector/polygon, see 2.13.1) based on a pixel size of 100 meters and followed by raster statistics of mean on municipality level. The average dataset shows mean values for each municipality out of the Thermomap Atlas. Calculations have been performed by IGF through GIS analysis. For more information see 2.13 and 2.13.1.

2.14 Geothermal -> GEOELEC Project

The main homepage (http://www.geoelec.eu/) for getting information on these datasets began as the website for the GEOELEC project, 2011-2013. It is now a hub for information about Geothermal Electricity in Europe and continues to be updated by the European Geothermal Energy Council. It is

now home to the European Technology and Innovation Platform on Deep Geothermal. (http://www.geoelec.eu/concep/)

The GEOELEC project (2011-2013) was co-funded by the IEE programme (EACI). GEOELEC produced an action plan towards more geothermal electricity generation in Europe, with the objective of doubling the installed geothermal power capacity in Europe by 2020. The project also looked at concrete actions to reach these objectives, for example conditions for financial feasibility, regulatory frameworks, and public acceptance. (http://www.geoelec.eu/concep/). More information regarding publications and stakeholders can be found here http://www.geoelec.eu/.

Based on currently available information, the GEOELEC Geographical Information System presents for the first time ever a geothermal resource assessment from 1km to 5km depth. The web service shows the estimated potential for geothermal electricity production in 2020 and 2050 in each of the EU-28 Member States, plus Norway, Iceland, Switzerland, and Turkey. Guidelines regarding the methodical approaches can be found here http://www.geoelec.eu/test-geoelec-online-viewer/ and here https://www.researchgate.net/publication/320622611_Limberger_et_al_2014_Data-supplement. Only some datasets have been chosen to be presented in the Smart Altitude WebGIS.

2.14.1 Basal Heat Flow

Within the GEOELEC project several existing datasets and publications regarding geothermal issues have been combined. Geothermal specific models have been performed, showing temperature information on different depths. The here presented layer shows the basal heat flow for whole Europe.
Data Source: GEOELEC project, http://www.geoelec.eu/
Unit: mW/m²
Format: GeoTiff format
Spatial resolution: 10.000 m; Europe
Download link: https://www.researchgate.net/publication/320622611_Limberger_et_al_2014_Data-supplement
Download date: 15.10.2020
Further information: http://www.geoelec.eu/test-geoelec-online-viewer/;
http://www.geoelec.eu/wp-content/uploads/2013/05/EGC2013_HS1-35.pdf;

2.14.2 Surface Heat Flow

Within the GEOELEC project several existing datasets and publications regarding geothermal issues have been combined. Geothermal specific models have been performed, showing temperature information on different depths. The here presented layer shows the surface heat flow for whole Europe.
Data Source: GEOELEC project, http://www.geoelec.eu/
Unit: mW/m²
Format: GeoTiff format
Spatial resolution: 5.000 m; Europe
Download link: https://www.researchgate.net/publication/320622611_Limberger_et_al_2014_Data-supplement

Download date: 15.10.2020
Further information: http://www.geoelec.eu/test-geoelec-online-viewer/;
http://www.geoelec.eu/wp-content/uploads/2013/05/EGC2013_HS1-35.pdf;

2.14.3 Theoretical Potential 2030

Several maps have been calculated for three scenarios representing techno-economical evaluations on geothermal electricity potential in Europe for 2020, 2030 and 2050. Only selected layers are presented through the Smart Altitude WebGIS. The here presented layer shows the theoretical potential for 2030. This is the maximum possible (theoretical) technical potential (R=1.00). (http://www.geoelec.eu/test-geoelec-online-viewer/)
Data Source: GEOELEC project, http://www.geoelec.eu/
Unit: Potential Power if UR=1 (MW), MW/km²
Format: GeoTiff format
Spatial resolution: 10.000 m; Europe
Download link: https://www.researchgate.net/publication/320622611_Limberger_et_al_2014_Data-supplement
Download date: 15.10.2020
Further information: http://www.geoelec.eu/test-geoelec-online-viewer/;
http://www.geoelec.eu/wp-content/uploads/2013/05/EGC2013_HS1-35.pdf;

2.14.4 Economic Potential 2030

Several maps have been calculated for three scenarios representing techno-economical evaluations on geothermal electricity potential in Europe for 2020, 2030 and 2050. Only selected layers are presented through the Smart Altitude WebGIS. The here presented layer shows the economic potential for 2030. The economic potential (TPlcoe_c) is calculated from the realistic underground technical potential (TPreal), accepting only those subvolumes where the levelized cost of energy (LCOE) is less than a given threshold c. The LCOE depend on the application (*power, power and co-heat*). (http://www.geoelec.eu/test-geoelec-online-viewer/)
Data Source: GEOELEC project, http://www.geoelec.eu/
Unit: Potential Power if UR=0.125 and for LCOE<300 (MW), MW/km²
Format: GeoTiff format
Spatial resolution: 10.000 m; Europe
Download link: https://www.researchgate.net/publication/320622611_Limberger_et_al_2014_Data-supplement
Download date: 15.10.2020
Further information: http://www.geoelec.eu/test-geoelec-online-viewer/;
http://www.geoelec.eu/wp-content/uploads/2013/05/EGC2013_HS1-35.pdf;

2.14.5 Theoretical Potential 2050

Several maps have been calculated for three scenarios representing techno-economical evaluations on geothermal electricity potential in Europe for 2020, 2030 and 2050. Only selected layers are presented through the Smart Altitude WebGIS. The here presented layer shows the theoretical

potential for 2050. This is the maximum possible (theoretical) technical potential (R=1.00). (http://www.geoelec.eu/test-geoelec-online-viewer/)
Data Source: GEOELEC project, http://www.geoelec.eu/
Unit: Potential Power if UR=1 (MW), MW/km²
Format: GeoTiff format
Spatial resolution: 10.000 m; Europe
Download link: https://www.researchgate.net/publication/320622611_Limberger_et_al_2014_Data-supplement
Download date: 15.10.2020
Further information: http://www.geoelec.eu/test-geoelec-online-viewer/; http://www.geoelec.eu/wp-content/uploads/2013/05/EGC2013_HS1-35.pdf;

2.14.6 Economic Potential 2050

Several maps have been calculated for three scenarios representing techno-economical evaluations on geothermal electricity potential in Europe for 2020, 2030 and 2050. Only selected layers are presented through the Smart Altitude WebGIS. The here presented layer shows the economic potential for 2050. The economic potential (TPlcoe_c) is calculated from the realistic underground technical potential (TPreal), accepting only those subvolumes where the levelized cost of energy (LCOE) is less than a given threshold c. The LCOE depend on the application (*power, power and co-heat*). (http://www.geoelec.eu/test-geoelec-online-viewer/)
Data Source: GEOELEC project, http://www.geoelec.eu/
Unit: Potential Power if UR=0.125 and for LCOE<300 (MW), MW/km²
Format: GeoTiff format
Spatial resolution: 10.000 m; Europe
Download link: https://www.researchgate.net/publication/320622611_Limberger_et_al_2014_Data-supplement
Download date: 15.10.2020
Further information: http://www.geoelec.eu/test-geoelec-online-viewer/; http://www.geoelec.eu/wp-content/uploads/2013/05/EGC2013_HS1-35.pdf;

2.15 Biomass -> Hotmaps Project

In the EU project hotmaps (https://www.hotmaps-project.eu/), they collected and re-elaborated data on energy potential of renewable sources at national level, in order to build datasets for all EU28 countries at NUTS3 level. They considered the following renewable sources: biomass, waste and wastewater, shallow geothermal, wind, and solar energy. These data are used in the toolbox to map the sources of renewable thermal energy across the EU28 and support energy planning and policy. Four data sources are provided on GitLab – they are used for the Smart Altitude WebGIS. Please consider, that all hotmaps-data must be interpreted as indicators, rather than absolute figures representing the actual energy potential of renewable sources in a territory.

Data Source: Data developed within the EU project „hotmaps“. Three datasets-tables with NUTS3 ID column are available.
Unit: PJ
Format: csv tables, Polygons

Spatial resolution: NUTS3 Level
Download link: https://gitlab.com/hotmaps/potential/potential_biomass
Last upload: 2018
Further information: https://gitlab.com/hotmaps/potential/potential_biomass
References
[1] Outlook of Spatial Biomass Value Chains in EU28, Deliverable 2.3 of the Biomass Policies project, Intelligent Energy Europe, September 204
[2] Land Use and Cover Area frame Survey, Eurostat, 2015
Relevant article:
Simon Pezzutto, Stefano Zambotti, Silvia Croce, Pietro Zambelli, Giulia Garegnani, Chiara Scaramuzzino, Ramón Pascual Pascuas, Alyona Zubaryeva, Franziska Haas, Dagmar Exner (EURAC), Andreas Müller (e-think), Michael Hartner (TUW), Tobias Fleiter, Anna-Lena Klingler, Matthias Kühnbach, Pia Manz, Simon Marwitz, Matthias Rehfeldt, Jan Steinbach, Eftim Popovski (Fraunhofer ISI) Reviewed by Lukas Kranzl, Sara Fritz (TUW) (2018): Hotmaps Project, D2.3 WP2 Report – Open Data Set for the EU28; www.hotmaps-project.eu.

2.15.1 Energy Potential from Agricultural Residues

„Original data from the Intelligent Energy Europe for energy potentials in PJ of straws, prunings and residues from agro-industrial processes (olive pits) have been spatialized on the base of Lucas dataset."
Considered agricultural residues are crop, cereals, maize, oilseed rape and sunflower, sugar beet, rice, olives, citrus and grape.

2.15.2 Energy Potential from Forest Residues

„Original data from the Intelligent Energy Europe for energy potentials in PJ have been spatialized by using the Corine Land Cover. "
Forest biomass includes two categories of residues originated from forest management, and in particular from wood harvest and processing residues (from industrial production and non): Fuelwood and roundwood; Fuelwood and roundwood residues.

2.15.3 Energy Potential from Livestock Effluents

„Original data from the Intelligent Energy Europe on production of solid and liquid residues have been spatialized from breeding of the following livestock: pig, cattle and poultry.
The whole energy potential in PJ has been spatialized on the base of the EURASTAT dataset Holdings with manure storage facilities. "

2.16 Biomass -> Global Forest Watch Project

Data sets concerning biomass potential is represented by the **Aboveground live woody biomass density** in mega gram biomass per hectare [Mg ha-1] from the open data portal **Global Forest Watch**, owned and operated by the World Resources Institute. These "carbon density values can be estimated as 50 percent of biomass density values" (http://data.globalforestwatch.org/datasets/aboveground-

live-woody-biomass-density). The spatial resolution of the GeoTiffs is 30m, representing the year 2000 (http://data.globalforestwatch.org/datasets/aboveground-live-woody-biomass-density).

Further information: http://data.globalforestwatch.org/datasets/aboveground-live-woody-biomass-density; http://data.globalforestwatch.org/datasets/

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2.16.1 Aboveground Biomass

Data Source: Global Forest Watch
Unit: Mg ha-1
Format: Raster, GeoTiff
Spatial resolution: 30x30 m
Temporal coverage: 2000
Download link: http://data.globalforestwatch.org/datasets/aboveground-live-woody-biomass-density

2.16.2 Aboveground Biomass per LAU

Median datasets have been calculated on a municipality level, showing median values for each municipality out of the Global Forest Watch. Calculations have been performed by IGF through GIS analysis. For more information see 2.16.

2.17 Biomass -> AlpES Project

Same geo- and metadata like in the AlpES project, see http://www.wikialps.eu/doku.php?id=wiki:grassland_biomass and http://www.wikialps.eu/lib/exe/fetch.php?media=de:wiki:de_biomass_production_from_grassland-supply.pdf.

2.17.1 Grassland Biomass Ecosystem Service

Fodder production of Alpine grassland, from colline to Alpine level (DM t/ha municipal area) In the Alps, there are different types of grassland (extensive meadows, frequently cut pastures, natural grassland in high altitude zones, ...) Hence, the growth depends on the grassland type and location parameters like number of vegetation days (days with a minimum temperature of 5 degrees), precipitation and energy budget of the grassland plot. The Supply of biomass production is calculated according to the “Almbewertungsmodell” as proposed by Egger et al. (2004). Here, each grassland type is connected to a growth function, which represents the yield in DM per Ha and year.

Data Source: Eurac Research, Institute for Alpine Environment, Italy
Unit: t DM ha-1 y-1
Format: Polygon
Spatial resolution: LAU
Temporal coverage: 2012

Download link: http://www.alpes-webgis.eu/?X=850359.92&Y=5947762.56&zoom=6&lang=en&focus=focus_alpes&bgLayer=alpes.osm.stamentoner.60002&layers=alpes.alpinespace.40001.wms,alpes.essi.10002&catalogNodes=101000000,101000001&layers_opacity=1,0.7

2.18 Hydro

The dataset contains all potential hydropower plant locations for micro to large hydropower plants based on the GMTED2010 breakline dataset (elevation) and runoff data from the Global Runoff Data Centre. (https://data.4tu.nl/articles/Global_potential_hydropower_locations/12708413)

2.18.1 Hydropower Potential Locations

Further information: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0171844
Data Source: Hoes O.A.C.; TU Delft, Faculty of Civil Engineering and Geosciences, Department of Water Management
Unit: MWh/year
Format: Point features; shapefile; adf raster data
Spatial resolution: The World
Temporal coverage: 2010
Download link: https://data.4tu.nl/articles/Global_potential_hydropower_locations/12708413

2.18.2 Total Hydropower Potential per LAU

Total dataset has been calculated on a municipality level, showing sum values of all hydropower potential locations (see 2.18.1). Due to uncertainty reasons of the hydropower potential locations and boarder issues on municipality level, locations/points have been transformed to polygons using a 500-meter buffer. Points located on a boarder of two municipalities are therefore attributed to both municipalities. Calculations have been performed by IGF through GIS analysis. For more information see 2.18 and 2.18.1.

3 Energy Infrastructure

3.1 Power Plants – Global Power Plant Database

The **Global Power Plant Database** (Version 1.2.0 of June 2019; Source 1) covers approximately 30000 power plants around the world. Beside the thermal plants it includes also renewables. This dataset is geolocated and the entries in the csv table contain additional information on plant capacity (Info and Download link: http://datasets.wri.org/dataset/globalpowerplantdatabase, access: 09.10.2019).
Sources to mention: Global Energy Observatory, Google, KTH Royal Institute of Technology in Stockholm, Enipedia, World Resources Institute. 2018. Global Power Plant Database. Published on Resource Watch and Google Earth Engine; (http://resourcewatch.org/; https://earthengine.google.com/). It is licensed under the Creative Commons Attribution 4.0 International License.

3.1.1 Power Plants, incl. Renewables

Data Source: Global Power Plant Database
Format: Point Vector
Download link: http://datasets.wri.org/dataset/globalpowerplantdatabase

3.2 Charging Points

Open Charge Map is a non-commercial, non-profit, electric vehicle data service hosted and supported by a community of businesses, charities, developers and interested parties around the world. The aim is to work with the community to develop and provide a high quality, public, free, open database of charging equipment locations globally. Open Charge Map is developed and operated by volunteers.

Data Source: The data made available through the Open Charge Map system and related services is sourced from many locations and is often provided directly ("crowd sourced") by users and those of apps using the services.
Format: Point Features
Spatial resolution: Globally
Download link: https://github.com/openchargemap

4 Land Use and Land Cover

"CORINE Land Cover (CLC) was specified to standardize data collection on land in Europe to support environmental policy development." (https://land.copernicus.eu/pan-european/corine-land-cover/clc-2012?tab=metadata)

4.1 CORINE Landcover (CLC)

Data Source: CLC products are based on (visual or semi-automated) interpretation of high-resolution multispectral satellite imagery like IRS, SPOT and RapidEye satellite images, dual coverage, orthophotos, topographic maps
Version: 20
Format: Raster, GeoTiff
Spatial resolution: 100 m
Geographic accuracy: 25 ha minimum mapping unit, 100m minimum mapping width, 100m positional accuracy, >85% thematic accuracy
Temporal coverage: 2018, all EEA39 countries
Download link: https://www.eea.europa.eu/data-and-maps/data/corine-land-cover-accounting-layers
Download date: 08.08.2019
Data custodians and owners: European Environment Agency (EEA)
Right to publish in AlpES WebGIS: https://creativecommons.org/licenses/by/3.0/at/deed.de
"I am aware that I am downloading non-validated data and I accept to not distribute the information contained in these files or the files themselves any further. EEA standard re-use policy: unless otherwise indicated, re-use of content on the EEA website for commercial or non-commercial

purposes is permitted free of charge, provided that the source is acknowledged (http://www.eea.europa.eu/legal/copyright). Copyright holder: European Environment Agency (EEA)." (https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/5a5f43ca-1447-4ed0-b0a6-4bd2e17e4f4d)

4.2 European Forest Areas

„This dataset shows the European forest area in 2012 and in 2015 at 100m spatial resolution, covering EEA39 countries. They are based on Copernicus HRL forest products at 20m spatial resolution and comply with the FAO forest definition (i.e. minimum mapping unit of 0.5 ha, minimum coverage of 10% and excluding land that is predominantly under agricultural or urban land use). After the selection of those pixels identified as forest by the HRL forest products and also compliant with FAO criteria, the forest area dataset at 100m was computed as a Boolean product (i.e. forest / non-forest). The value 1 (forest area) correspond to the pixels where forest is the major coverage; otherwise the pixel value is 0 (non-forest area)." (https://www.eea.europa.eu/data-and-maps/data/european-forest-areas-based-on)

Data Source: European Forest Areas based on Copernicus data
Unit: 1 (=forest) and 0 (=non-forest)
Format: Raster, GeoTiff
Spatial resolution: 100m, EEA39
Temporal coverage: 2015
Download link: https://www.eea.europa.eu/data-and-maps/data/european-forest-areas-based-on
Download date: 11.08.2019

5 Political-Geographical Boundaries

5.1 Administrative Units

EuroBoundaryMap provides a European geographic database for administrative and statistical regions that will be maintained at the source level by the National Mapping and Cadastral Agencies (NMCAs), and by providing harmonized access conditions for this geographic information within the framework of EuroGeographics. EBM offers the combined strength of detailed European administrative units and linkages to the corresponding LAU and NUTS codes. The dataset is compiled from data supplied by European National Mapping and Cadastral Agencies within in framework of EuroGeographics. It is harmonised by means of a uniform specification developed and continuously improved according to user needs by Bundesamt für Kartographie und Geodäsie (BKG).
The present EuroBoundaryMap product contains the administrative units of all national administrative levels, their names and unique codes of 43 European states according to the administrative situation as it was on 1 January 2018. The database is including relations between the European-wide unique identifiers of administrative units on the lowest level and their corresponding statistical codes (LAU) as defined by the National Statistical Institutes and also to the corresponding codes of the territorial units for statistics (NUTS) maintained and published by Eurostat. (https://eurogeographics.org/products-and-services/)

Further Information: https://eurogeographics.org/products-and-services/

Data Source: EuroBoundaryMap (EBM) 2019 - The EBM 2019 is the European reference database of administrative units and boundaries for an application scale of 1:100000.
Format: Polygos, ESRI FileGDB
Spatial resolution: Full Europe, EU28, all EFTA and some of current candidate countries as well as placeholders for all missing countries
Data: Data/DVD provided from German „Bundesamt für Kartographie und Geodäsie – EuroGeographics“, DVD with data, documents and metadata available from EuroGeographics Head Office
DVD delivery: Mai 2019
Restrictions on the access and use of a resource or metadata: https://eurogeographics.org/products-and-services/licensing/
Right to publish in AlpES WebGIS: Academic, Education and Research Licence Agreement between EuroGeographics AISBL and ÖAW/IGF valid until 07/2022.

5.1.1 Admin Unit/Boundary Level 1

National borders/ states

5.1.2 Admin Unit/Boundary Level 2

Federal states

5.1.3 Admin Unit/Boundary Level 3

5.1.4 Admin Unit/Boundary Level 4

5.1.5 LAU – Local Administrative Units

Municipality level

5.1.6 LAU – Labels

Municipality level

5.2 Statistical Units

The database includes relations between the European-wide unique identifiers of administrative units and their corresponding statistical codes and units (NUTS) maintained and published by Eurostat. For more information see 5.1.

5.2.1 NUTS 1 – Major socio-economic regions

5.2.2 NUTS 2 – Basic regions for the application of regional policies

5.2.3 NUTS 3 – Small regions for specific diagnoses

5.3 Alpine Space Area

See 1.3.1

5.4 Alpine Convention Area

See 1.3.2

5.5 Projected Areas -> World Database on Protected Areas (WDPA)

„Protected Planet is the most up to date and complete source of information on protected areas, updated monthly with submissions from governments, non-governmental organizations, landowners and communities. It is managed by the United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC) with support from IUCN and its World Commission on Protected Areas (WCPA).“ (https://www.protectedplanet.net/c/about)

Citation:

UNEP-WCMC and IUCN (year), Protected Planet: [insert name of component database; The World Database on Protected Areas (WDPA)/The Global Database on Protected Areas Management Effectiveness (GD-PAME)] [On-line], [insert month/year of the version downloaded], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.

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Areas Programme, UNEP-WCMC, 219 Huntingdon Road, Cambridge CB3 0DL, UK. Electronic copies should be sent to protectedareas@unep-wcmc.org.

Further information: https://www.protectedplanet.net/

5.5.1 WDPA Areas

Data Source: Protected Planet - United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC)
Format: Polygons
Download link: https://www.protectedplanet.net/
Last upload: August 2019
Download date: 12.08.2019

5.5.2 WDPA Points (Addition only for Slovenia)

Data Source: Protected Planet - United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC)
Format: Point Features only for Slovenia
Download link: https://www.protectedplanet.net/
Last upload: August 2019
Download date: 12.08.2019

5.5.3 Natura 2000

"Natura 2000 is the key instrument to protect biodiversity in the European Union. It is an ecological network of protected areas, set up to ensure the survival of Europe's most valuable species and habitats. Natura 2000 is based on the 1979 Birds Directive and the 1992 Habitats Directive. This version covers the reporting in 2018." https://www.eea.europa.eu/data-and-maps/data/natura-10#tab-additional-information
Metadata: https://www.eea.europa.eu/data-and-maps/data/natura-10#tab-metadata
Further information: http://ec.europa.eu/environment/nature/natura2000/sites/index_en.htm#SDF

Data Source: Unit Nature & Biodiversity, DG Environment, European Commission, Member States of the European Union
Format: Polygons
Scale of the dataset: 1:100000
Temporal coverage: 2018
Download link: https://www.eea.europa.eu/data-and-maps/data/natura-10#tab-gis-data
Download date: 08.08.2019
Data provider: European Environment Agency (EEA)
Data owners: Directorate-General for Environment (DG ENV)
Data processors: European Environment Agency (EEA)
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provided that the source is acknowledged (http://www.eea.europa.eu/legal/copyright). Copyright holder: Directorate-General for Environment (DG ENV)"

5.5.4 Nationally Designated Areas (CDDA)

"The dataset contains data on individual nationally Designated Areas and corresponding Protected Site spatial features in EEA member and collaborating countries. The European inventory of nationally designated areas holds information about protected areas and the national legislative instruments, which directly or indirectly create protected areas. The Common Database on Designated Areas (CDDA) is more commonly known as Nationally designated areas. It is the official source of protected area information from the 39 European countries to the World Database of Protected Areas (WDPA)." (https://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-14#tab-metadata)
Metadata: https://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-14#tab-metadata
Further information: https://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-14#tab-additional-information

Data Source: Data deliveries from the Eionet, the partnership network of the EEA and its 39 member and cooperating European countries.
Version: 2017
Format: Polygons, ArcGIS geodatabase file
Temporal coverage: it covers data reported until March 2019
Download link: https://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-
Download date: 08.08.2019
Data owners and providers: European Environment Agency (EEA)
Right to publish in AlpES WebGIS: EEA standard re-use policy: unless otherwise indicated, re-use of content on the EEA website for commercial or non-commercial purposes is permitted free of charge, provided that the source is acknowledged (http://www.eea.europa.eu/legal/copyright). Copyright holder: European Environment Agency (EEA); Estonian Environmental Register 01.01.2019; ©Finnish Environment Institute, 2018; Land Burgenland, Land Kärnten, Land Niederösterreich, Land Oberösterreich, Land Salzburg, Land Steiermark, Land Tirol, Land Vorarlberg, Stadt Wien aggregated by Austrian Environment Agency.

5.6 Protected Areas – IGF curated

Protected Area is a "clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (IUCN)
Further information: http://www.wikialps.eu/doku.php?id=wiki:protected_area

5.6.1 Biosphere Reserves

Data Source: Curated by IGF
Format: Polygons
Spatial resolution: Alpine Space

Download link:
http://webgis.smartaltitude.eu/?X=1161000.00&Y=5795500.00&zoom=7&lang=de&focus=focus_alpes&bgLayer=alpes.osm.stamentoner.60002&layers=smalt.alpinespace.40001.wms,smalt.biosphereserve.20303&catalogNodes=104000000,104030000,103001000&layers_opacity=1,0.6

5.6.2 National Parks

Data Source: Curated by IGF
Format: Polygons
Spatial resolution: Alpine Space Area
Download link:
http://webgis.smartaltitude.eu/?X=1161000.00&Y=5795500.00&zoom=7&lang=de&focus=focus_alpes&bgLayer=alpes.osm.stamentoner.60002&layers=smalt.alpinespace.40001.wms,smalt.nationalparks.20301&catalogNodes=104000000,104030000,103001000&layers_opacity=1,0.6

5.6.3 Natural Parks

Data Source: Curated by IGF
Format: Polygons
Spatial resolution: Alpine Space Area
Download link:
http://webgis.smartaltitude.eu/?X=1161000.00&Y=5795500.00&zoom=7&lang=de&focus=focus_alpes&bgLayer=alpes.osm.stamentoner.60002&layers=smalt.alpinespace.40001.wms,smalt.naturalparks.20302&catalogNodes=104000000,104030000,103001000&layers_opacity=1,0.6

5.6.4 World Heritage Sites

Data Source: Curated by IGF
Format: Polygons
Spatial resolution: Alpine Space Area
Download link:
http://webgis.smartaltitude.eu/?X=1161000.00&Y=5795500.00&zoom=7&lang=de&focus=focus_alpes&bgLayer=alpes.osm.stamentoner.60002&layers=smalt.alpinespace.40001.wms,smalt.worldheritagesites.20304&catalogNodes=104000000,104030000,103001000&layers_opacity=1,0.6

6 Digital Elevation Model & Hillshade

The Digital Elevation Model over Europe from the GMES RDA project (EU-DEM) is a Digital Surface Model (DSM) representing the first surface as illuminated by the sensors. The EU-DEM dataset is a realisation of the Copernicus programme, managed by the European Commission, DG Enterprise and Industry. […] The EU-DEM is a 3D raster dataset with elevations captured at 1 arc second postings (2.78E-4 degrees) or about every 30 metre. EuroDEM describes the distribution of terrain or 'bare earth' heights, not including 'first surface' elevations such as vegetation and man-made structures. It is ideal for environmental change research, hydrologic modelling, resource monitoring, monitoring mapping and visualisation. (http://www.eea.europa.eu/data-and-maps/data/eu-dem#tab-metadata; https://eurogeographics.org/products-and-services/)

Data Source: The EU-DEM is a hybrid product based on SRTM and ASTER GDEM data fused by a weighted averaging approach
Unit: m
Format: GeoTiff
Spatial resolution: 25m; EuroDEM is a 1:100 000 scale digital elevation model providing height data for 40 European countries and territories.
Spatial accuracy: 8-10m vertical accuracy, 2 arc seconds grid width
Temporal coverage: 2000
Download link: http://www.eea.europa.eu/data-and-maps/data/eu-dem
Last upload: 8.10.2013
Download date: 04.08.2016
Data provider and processor: European Environment Agency (EEA) 2013,
Data owners: European Commission and Directorate-General Enterprise and Industry (DG-ENTR)
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6.1 Digital Elevation Model (DEM)

See 6.

6.2 Hillshade

See 6.

6.3 Combined DEM & Hillshade

See 6.