



DATASET DESCRIPTION

UHI-MAP - Urban Heat Island grids for Germany

Version: 7.0

Publication date: 2024

Cite data set as: UHI-MAP - Urban Heat Island grids for Germany, Version 7.0

Dataset-ID: urn:wmo:md:de-dwd-cdc:ad93a104-ae5c-4553-a14d-fb4d4e0ecfc7

Dataset-URL: https://opendata.dwd.de/climate_environment/CDC/grids_germany/monthly/Project_UHI-MAP

Dataset-URL: https://opendata.dwd.de/climate_environment/CDC/grids_germany/seasonal/Project_UHI-MAP

Dataset-URL: https://opendata.dwd.de/climate_environment/CDC/grids_germany/annual/Project_UHI-MAP

ABSTRACT

The UHI-MAP raster dataset for Germany (www.dwd.de/uhi-map) is based on the high-resolution hourly raster dataset (HOSTRADA) for Germany. This is a climatological reference dataset, which represents the basic data for further development and updating of the current test reference years and is therefore of particular importance for technical climatology. With a spatial resolution of one square kilometre and a temporal resolution of one hour, it provides a large number of meteorological parameters since 1995 for the land surfaces of the Federal Republic of Germany (https://opendata.dwd.de/climate_environment/CDC/grids_germany/hourly/hostrada/).

The HOSTRADA variables include the hourly-resolved urban heat island intensity (UHI intensity) layer, which was calculated on the basis of the CORINE land cover layer 2018 of the Copernicus Land Monitoring Services (<https://land.copernicus.eu/en>). In order to capture and evaluate land use changes and their influence on urban climatology, the urban heat island intensity was also calculated for the CORINE land cover layers 1990, 2000, 2006 and 2012. Three climate indicators were created using the hourly rasters on a monthly, seasonal and annual scale.

The three UHI-MAP climate indicators are:

- maximum UHI intensity
- mean UHI intensity (based on the daily maximum)
- delta tropical night (number of tropical nights that additionally occur due to building structures; a tropical night is a night in which the minimum air temperature is ≥ 20 °C (daily measurement period: 18 UTC to 06 UTC))

The data are available in the EPSG:3034 projection for Germany. UHI-MAP is a result of the Caroline Herschel Framework Partnership Agreement (FPCUP) 2020 Action 2020-2-25.

POINT OF CONTACT

Deutscher Wetterdienst
CDC - Vertrieb Klima und Umwelt
Frankfurter Straße 135
63067 Offenbach
Tel: + 49 (0) 69 8062-4400
Fax: + 49 (0) 69 8062-4499
E-Mail: klima.vertrieb@dwd.de

DATASET DESCRIPTION

Parameter	number of tropical nights (min ≥ 20 °C), air temperature at 2 m
Unit(s)	K, days
Statistical processing	monthly sum, annual mean, 3-months mean, 3-months sum, monthly mean, annual sum
Temporal coverage	1995-01-01 -- 2023-12-31
Temporal resolution	1 month, 1 year, 3 months

© Deutscher Wetterdienst 2024

Temporal resolution	1 month, 1 year, 3 months
Spatial coverage	Germany
Spatial resolution	1 km x 1 km
Projection	ETRS89 / LCC Europe (EPSG:3034)
Format description	<p>UHI-MAP_V7_P1M (monthly data) :</p> <p>A folder is provided for each parameter: 1. tropical-nights_diff (number of tropical nights that additionally occur due to building structures) 2. uhi_daymax-max (maximum UHI) 3. uhi_daymax-mean (mean UHI based on daily maxima) The rasters are provided as a NetCDF file.</p> <p>The name of the NetCDF file is as follows: {Project name}_{Version}_{CorineLandcoverEdition}_{Parameter}_{temporal resolution}_{YYYY-mm-dd(start date)}.nc, e.g. : uhi-map_v7_clc2012_tropical-nights_diff_p1m_2023-01-01.nc. For the temporal resolution, the specifications p1m for monthly, p3m for seasonal and p1y for annual are available.</p>
Format description	<p>UHI-MAP_V7_P3M (seasonal data) :</p> <p>A folder is provided for each parameter: 1. tropical-nights_diff (number of tropical nights that additionally occur due to building structures) 2. uhi_daymax-max (maximum UHI) 3. uhi_daymax-mean (mean UHI based on daily maxima) The rasters are provided as a NetCDF file.</p> <p>The name of the NetCDF file is as follows: {Project name}_{Version}_{CorineLandcoverEdition}_{Parameter}_{temporal resolution}_{YYYY-mm-dd(start date)}.nc, e.g. : uhi-map_v7_clc2012_tropical-nights_diff_p3m_2023-01-01.nc. For the temporal resolution, the specifications p1m for monthly, p3m for seasonal and p1y for annual are available.</p>
Format description	<p>UHI-MAP_V7_P1Y (annual data) :</p> <p>A folder is provided for each parameter:</p> <ol style="list-style-type: none"> tropical-nights_diff (number of tropical nights that additionally occur due to building structures) uhi_daymax-max (maximum UHI) uhi_daymax-mean (mean UHI based on daily maxima) <p>The rasters are provided as a NetCDF file.</p> <p>The name of the NetCDF file is as follows: {Project name}_{Version}_{CorineLandcoverEdition}_{Parameter}_{temporal resolution}_{YYYY-mm-dd(start date)}.nc, e.g. : uhi-map_v7_clc2012_tropical-nights_diff_p1y_2023-01-01.nc.</p> <p>For the temporal resolution, the specifications p1m for monthly, p3m for seasonal and p1y for annual are available.</p>

DATA ORIGIN

The grid data used to calculate the UHI intensity is based on the interpolation of hourly station data from the German Weather Service's full-time monitoring network. As the availability of station data is heavily dependent on the respective variable and these sometimes exhibit strong spatial variability, additional predictors are used. Satellite data from CM-SAF (The Satellite Application Facility on Climate Monitoring) and model data from a convection-allowing regional climate simulation (HoKliSim-De) based on the regional climate model COSMO-CLM are used for this purpose. The interpolation method used depends on the parameter under consideration.

Data sources:

urn:x-wmo:md:de.dwd.cdc::gridsgermany-hourly-hostrada

VALIDATION AND UNCERTAINTY ESTIMATE

Krähenmann S, Walter A, Imbery F, Brienen S, Matzarakis A (2018): High-resolution grids of hourly meteorological variables for Germany. TAAC. doi:10.1007/s00704-016-2003-7

UNCERTAINTIES

Uncertainties result from the interpolation method and from incorrect or missing station measurements of wind speed and cloud cover in the HOSTRADA data set, which are used to calculate the UHI intensity. If grids from different years are compared with each other, it should be noted that the underlying measurement network has changed over time. If UHI grids of different CORINE land cover grids are compared, it should also be noted that the land cover grids and their classifications have changed over time. With the introduction of the Digital Land Cover Model Germany (LBM-DE), which is used as the basis for CORINE land cover data from 2012 onwards, there is a methodological break between the data sets before 2012 and the data sets after 2012. In addition to the changes that can be observed in reality, the methodological changes can, for example, lead to areas previously labelled as "continuous urban fabric" being designated as industrial or commercial areas in a more recent version without any real change in the development structure occurring. These methodological changes can also affect the UHI intensity.

CONSIDERATIONS FOR APPLICATIONS

The data represents the spatial mean for the specified grid area. Furthermore, the data is subject to the precision of the Hostrada data used for the calculation (wind speed & cloud cover), as well as to the precision of the 100m grid of the CORINE land cover raster1990, 2000, 2006, 2012 and 2018.

LITERATURE

[Krähenmann S, Walter A, Imbery F, Brienen S, Matzarakis A \(2018\): High-resolution grids of hourly meteorological variables for Germany.](#)

TAAC. doi:10.1007/s00704-016-2003-7

© Deutscher Wetterdienst 2024

COPYRIGHT

[The Creative Commons BY 4.0 - Licence 'CC BY 4.0' apply.](#)

REVISION HISTORY

This document is maintained by Deutscher Wetterdienst, KU 14, last edited at 2024-10-10.