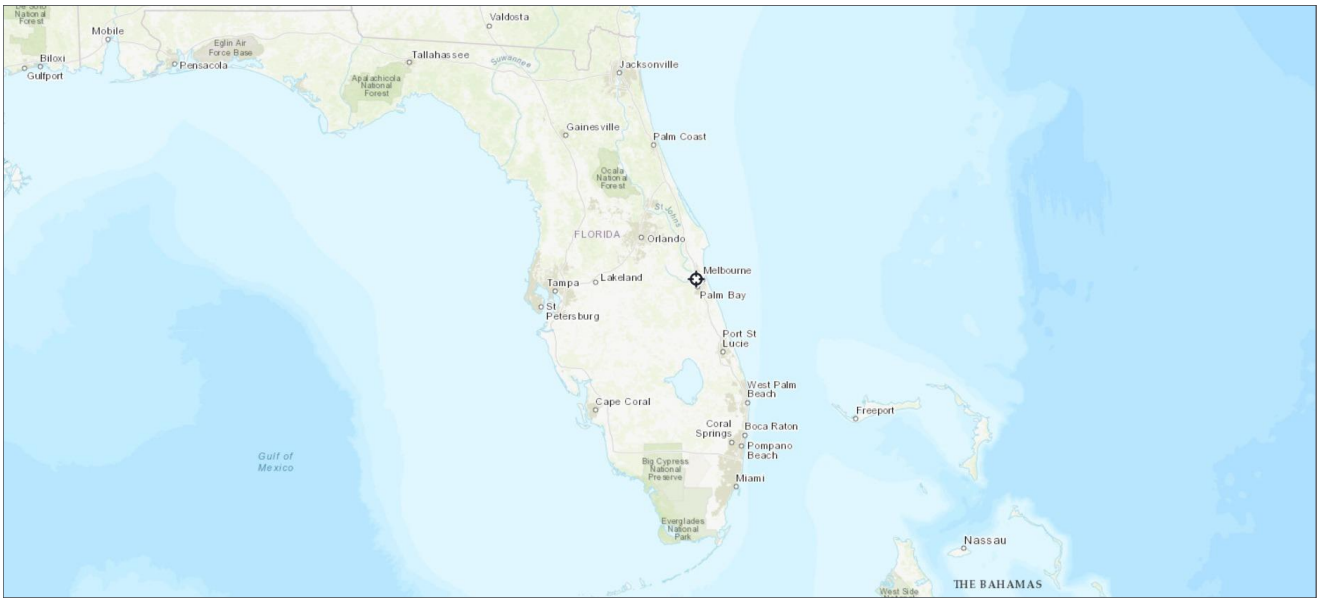


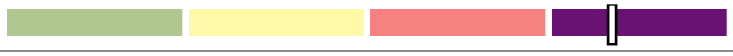

# Location Risk Intelligence
# Single Risk Assessment Report

03/21/2023

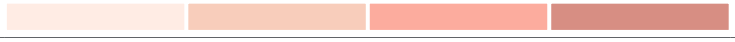
## Single Risk Assessment Report

| | |
|---|---|
| **Risk Location** | Circle Dr, 32904 Melbourne, USA |
| **Longitude/Latitude** | -80.6936, 28.0774 |
| **Munich Re Risk Location Quality** | Coordinates (100) |
| **Elevation** | 9m |
| **Distance to Coast** | 8314m |
| **Distance to Fault** | > 50 km |

## NATHAN: Risk Scores

| | | |
|---|---|---|
| Overall Risk Score |  | Extreme (112) |
| Earthquake Risk Score |  | Low (1) |
| Storm Risk Score |  | Extreme (107) |
| Flood Risk Score |  | Low (4) |

## NATHAN: Hazard Scores

| | low — high | hazard rating |
|---|---|---|
| Earthquake |  | Zone 0: MM V and below |
| Volcanoes |  | No hazard |
| Tsunami |  | No hazard |
| Tropical Cyclone |  | Zone 3: 213 - 251 km/h |
| Extratropical Storm |  | Zone 1: 81 - 120 km/h |
| Hail |  | Zone 3 |
| Tornado |  | Zone 4: high |
| Lightning |  | Zone 5: 20 - 40 |
| River Flood |  | Zone 0 minimal flood risk |
| Flash Flood |  | Zone 4 |
| Storm Surge |  | No hazard |
| Wildfire |  | Zone 1: low |

## NATHAN: Additional Information

| | low — high | hazard rating |
|---|---|---|
| Soil and Shaking |  | Class 4: stiff soil |

## Climate: Tropical Cyclone

| | low | high | hazard rating |
|---|---|---|---|
| Current | | | Zone 3: 213 - 251 km/h |
| RCP 4.5, 2030 | | | Zone 3: 213 - 251 km/h |
| RCP 4.5, 2050 | | | Zone 3: 213 - 251 km/h |
| RCP 4.5, 2100 | | | Zone 3: 213 - 251 km/h |
| RCP 8.5, 2030 | | | Zone 3: 213 - 251 km/h |
| RCP 8.5, 2050 | | | Zone 3: 213 - 251 km/h |
| RCP 8.5, 2100 | | | Zone 3: 213 - 251 km/h |

## Climate: River Flood Undefended

| | low | high | hazard rating |
|---|---|---|---|
| Current | | | Zone 0 minimal flood risk |
| RCP 4.5, 2030 | | | Zone 0 minimal flood risk |
| RCP 4.5, 2050 | | | Zone 0 minimal flood risk |
| RCP 4.5, 2100 | | | Zone 0 minimal flood risk |
| RCP 8.5, 2030 | | | Zone 0 minimal flood risk |
| RCP 8.5, 2050 | | | Zone 0 minimal flood risk |
| RCP 8.5, 2100 | | | Zone 0 minimal flood risk |

## Climate: River Flood Defended

| | low | high | hazard rating |
|---|---|---|---|
| Current | | | Zone 0 minimal flood risk |
| RCP 4.5, 2030 | | | Zone 0 minimal flood risk |
| RCP 4.5, 2050 | | | Zone 0 minimal flood risk |
| RCP 4.5, 2100 | | | Zone 0 minimal flood risk |

| | | |
|---|---|---|
| RCP 8.5, 2030 |  | Zone 0 minimal flood risk |
| RCP 8.5, 2050 |  | Zone 0 minimal flood risk |
| RCP 8.5, 2100 |  | Zone 0 minimal flood risk |

## Climate: Sea Level Rise

| | low | high | hazard rating |
|---|---|---|---|
| RCP 2.6, 2100 |  | | No hazard |
| RCP 4.5, 2100 |  | | No hazard |
| RCP 8.5, 2100 |  | | No hazard |

## Climate: Fire Weather Stress Index

| | |
|---|---|
| **Current** | 3 |
| **RCP 2.6, 2030** | 3 |
| **RCP 2.6, 2050** | 3 |
| **RCP 2.6, 2100** | 3 |
| **RCP 4.5, 2030** | 3 |
| **RCP 4.5, 2050** | 3 |
| **RCP 4.5, 2100** | 3.2 |
| **RCP 8.5, 2030** | 3 |
| **RCP 8.5, 2050** | 3.2 |
| **RCP 8.5, 2100** | 3.2 |

## Climate: Drought Stress Index

| | |
|---|---|
| **RCP 2.6, 2030** | 0.5 |
| **RCP 2.6, 2050** | 1 |
| **RCP 2.6, 2100** | 4.5 |
| **RCP 4.5, 2030** | 1 |
| **RCP 4.5, 2050** | 3 |
| **RCP 4.5, 2100** | 1.5 |
| **RCP 8.5, 2030** | 4 |
| **RCP 8.5, 2050** | 3.5 |
| **RCP 8.5, 2100** | 7.5 |

## Climate: Heat Stress Index

| | |
|---|---|
| **Current** | 7.8 |
| **RCP 2.6, 2030** | 8 |
| **RCP 2.6, 2050** | 8 |
| **RCP 2.6, 2100** | 8 |
| **RCP 4.5, 2030** | 8 |
| **RCP 4.5, 2050** | 8 |
| **RCP 4.5, 2100** | 8.5 |
| **RCP 8.5, 2030** | 8 |
| **RCP 8.5, 2050** | 8 |
| **RCP 8.5, 2100** | 8.8 |

## Climate: Precipitation Stress Index

| | |
|---|---|
| **Current** | 6 |
| **RCP 2.6, 2030** | 6.3 |
| **RCP 2.6, 2050** | 6.3 |
| **RCP 2.6, 2100** | 6.3 |
| **RCP 4.5, 2030** | 7 |
| **RCP 4.5, 2050** | 6 |
| **RCP 4.5, 2100** | 6.3 |
| **RCP 8.5, 2030** | 6.3 |
| **RCP 8.5, 2050** | 6 |
| **RCP 8.5, 2100** | 6.3 |

## Climate Expert: Annual Maximum Temperature

| | |
|---|---|
| RCP 2.6, 2030 (change mean) | 0.8 |
| RCP 2.6, 2050 (change mean) | 0.9 |
| RCP 2.6, 2100 (change mean) | 0.9 |
| RCP 4.5, 2030 (change mean) | 0.8 |
| RCP 4.5, 2050 (change mean) | 1.4 |
| RCP 4.5, 2100 (change mean) | 2 |
| RCP 8.5, 2030 (change mean) | 1.1 |
| RCP 8.5, 2050 (change mean) | 2.1 |
| RCP 8.5, 2100 (change mean) | 4.6 |
| Current (absolute) | 34.3 |

## Climate Expert: Fire Season Length

| | |
|---|---|
| RCP 2.6, 2030 (change mean) | 0.4 |
| RCP 2.6, 2050 (change mean) | 1 |
| RCP 2.6, 2100 (change mean) | 0.6 |
| RCP 4.5, 2030 (change mean) | 0 |
| RCP 4.5, 2050 (change mean) | -0.3 |
| RCP 4.5, 2100 (change mean) | 1 |
| RCP 8.5, 2030 (change mean) | 0.2 |
| RCP 8.5, 2050 (change mean) | 0.5 |
| RCP 8.5, 2100 (change mean) | 2.5 |
| Current (absolute) | 1.8 |

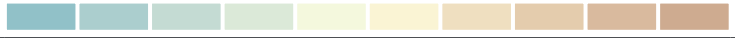
## Climate Expert: Maximum 5-Day Precipitation

| | |
|---|---|
| Current (absolute) | 109.2 |
| RCP 2.6, 2030 (rel. change mean) | 3.1% |
| RCP 2.6, 2050 (rel. change mean) | 3.5% |
| RCP 2.6, 2100 (rel. change mean) | -1.4% |
| RCP 4.5, 2030 (rel. change mean) | 11.1% |
| RCP 4.5, 2050 (rel. change mean) | 0.9% |
| RCP 4.5, 2100 (rel. change mean) | 6.8% |
| RCP 8.5, 2030 (rel. change mean) | 7.5% |
| RCP 8.5, 2050 (rel. change mean) | 2.4% |
| RCP 8.5, 2100 (rel. change mean) | 2.6% |

## GEM: GEM Global Earthquake Model

| | low | high | hazard rating |
|---|---|---|---|
| GEM PGA no soil, 12 classes |  | | Zone 1: 0.00 - 0.01 g |

## General Location Information: Location Information

| | low | high | hazard rating |
|---|---|---|---|
| Elevation |  | | No Information |
| ESA Worldcover 2020 |  | | Grassland |

## General Location Information: Population Information

| | low | high | hazard rating |
|---|---|---|---|
| Population Density |  | | Class 5: ≥ 200 |
| DLR WSF Evolution |  | | 1985 and older |

## General Location Information: Flood Defense Information

| | |
|---|---|
| **Flood Defense SoP** | 0 |

# Legend

**Overall Risk Score**

- Low
- Medium
- High
- Extreme

The overall risk score includes on all provided NATHAN hazard scores with different weights in combination of an annual loss value for standard industrial business. It has to be taken into account that the wildfire score was not taken into account for the Risk Score split. This could cause small deviations between the overall Risk Score value and the sum of the individual Earthquake, Storm and Flood Risk Score.

**Earthquake Risk Score**

- Low
- Medium
- High
- Extreme

Includes the Earthquake, Volcano and Tsunami Risk.

**Storm Risk Score**

- Low
- Medium
- High
- Extreme

Includes the Tropical cyclone, Extratropical storm, Hail, Tornado and Lightning Risk.

**Flood Risk Score**

- Low
- Medium
- High
- Extreme

Includes River Flood, Flash Flood and Storm Surge Risk.

**Earthquake**

- Zone 0: MM V and below
- Zone 1: MM VI
- Zone 2: MM VII
- Zone 3: MM VIII
- Zone 4: MM IX and above

Probable maximum intensity (MM: modified Mercalli scale) with an exceedance probability of 10% in 50 years (equivalent to a „return period“ of 475 years) for medium subsoil conditions.

**Volcanoes**

- No hazard
- Unclassified
- Zone 1: minor hazard
- Zone 2: moderate hazard
- Zone 3: high hazard

Secondary effects that can occur as a result of the large-scale distribution of volcanic particles (e.g. climate impacts, supraregional ash deposits) are not considered

**Tsunami**

- No hazard
- Zone 0 minimal flood risk
- Zone 1000 year return period
- Zone 500 year return period
- Zone 100 year return period

Zones based on 100m SRTM (Version 4.1) elevation model, taking into account height above sea level and distance from coasts.

**Tropical Cyclone**

- Zone 0: 76 - 141 km/h
- Zone 1: 142 - 184 km/h
- Zone 2: 185 - 212 km/h
- Zone 3: 213 - 251 km/h
- Zone 4: 252 - 299 km/h
- Zone 5: ≥ 300 km/h

Probable maximum intensity with an exceedance probability of 10% in 10 years (equivalent to 'return period' of 100 years).

**Extratropical Storm**

- No hazard
- Zone 0: ≤ 80 km/h
- Zone 1: 81 - 120 km/h
- Zone 2: 121 - 160 km/h
- Zone 3: 161 - 200 km/h
- Zone 4: > 200 km/h

Probable maximum intensity with an average exeedance probability of 10% in ten years (equivalent to a „return period“ of 100 years). Areas were examined in which there is a high frequency of extratropical storms (approx. 30°–70° north and south of the equator).

**Hail**

- Zone 1: low
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Zone 6: high

Frequency and intensity of hailstorms.

**Tornado**

- Zone 1: low
- Zone 2
- Zone 3
- Zone 4: high

Frequency and intensity of tornados.

**Lightning**

- Zone 1: 0,2 - 1
- Zone 2: 1 - 4
- Zone 3: 4 - 10
- Zone 4: 10 - 20
- Zone 5: 20 - 40
- Zone 6: 40 - 80

Global frequency of lightning strokes per km² and year. Lightning frequency is determined by counting the total number of lightning flashes independently of whether they strike the ground or not.

**River Flood**

- Zone 0 minimal flood risk
- Zone 500 year return period
- Zone 100 year return period

Areas threatened by extreme floods. JBA flood maps with return periods of 100 and 500 years.

**Flash Flood**

- Zone 1: low
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Zone 6: high

Frequency and intensity of flash floods.

**Storm Surge**

- No hazard
- Zone 1000 year return period
- Zone 500 year return period
- Zone 100 year return period

Detailed calculation for coasts and the shores of large lakes. Zones based on 30m ALOS Digital Elevation Model (DEM), taking into account wind speed and bathymetry (underwater depth of lake or ocean floors). Does not consider dykes.

**Wildfire**

- No hazard
- Zone 1: low
- Zone 2
- Zone 3
- Zone 4: high

The effects of wind, arson and fire-prevention measures are not considered.

**Soil and Shaking**

- Class 1: low, hard bedrock
- Class 2:  rock
- Class 3: soft rock/dense soil
- Class 4: stiff soil
- Class 5: soft soil
- Class 6: high, reclaimed land

Underground conditions influencing earthquake intensity (based on geological, soil and hydrological information).

**Tropical Cyclone, RCP 4.5, 2100**

- Zone 0: 76 - 141 km/h
- Zone 1: 142 - 184 km/h
- Zone 2: 185 - 212 km/h
- Zone 3: 213 - 251 km/h
- Zone 4: 252 - 299 km/h
- Zone 5: ≥ 300 km/h

Probable maximum intensity with an exceedance probability of 10% in ten years (equivalent to „return period“ of 100 years). Current and for respective projection year and RCP scenario.

**Tropical Cyclone, RCP 8.5, 2100**

- Zone 0: 76 - 141 km/h
- Zone 1: 142 - 184 km/h
- Zone 2: 185 - 212 km/h
- Zone 3: 213 - 251 km/h
- Zone 4: 252 - 299 km/h
- Zone 5: ≥ 300 km/h

**River Flood, Current & Future, Undefended & Defended**

- Zone 0 minimal flood risk
- Zone 500 year return period
- Zone 100 year return period

Areas threatened by extreme floods. Flood maps with return periods of 100 and 500 years (Undefended: Does not consider dykes; Defended: Includes flood protection). Current NATHAN River Flood hazard zones from JBA data, projected NATHAN River Flood hazard zones with return periods of 100 and 500 years for respective projection year and RCP scenario, using CMIP5 climate models and global land surface models to estimate changes in peak water runoff. Maps showing Undefended hazard zones.

**Sea Level Rise, Future**

- Low
- Medium
- High
- Extreme

Hazard zones derived from IPCC sea-level rise data and high-resolution elevation data for respective projection year and RCP scenario. Model is based on storm surge events with 100 years return period.

**Fire Weather Stress Index,  Current & Future**

- 0.0 - 2.0 low
- 2.1 - 4.0
- 4.1 - 6.0
- 6.1 - 8.0
- 8.1 - 10.0 high

Index from 0 (low) to 10 (high).

Fire Stress Index describes current meteorological fire conditions on the basis of fire danger modelling, namely the Fire Weather Index (FWI). The FWI combines the probability of ignition, the speed and likelihood of spread and the availability of fuel to a combined metric. Fire Stress Index includes information about e.g. length of fire season, extreme fire danger days.
Calculation for parameter Current based on ERA5 ECMWF atmospheric reanalysis data for the timeframe from 1986 - 2005.
Projected Fire Weather Stress Index for respective projection year and RCP scenario, derived from available set of CORDEX and CMIP5 climate models.

**Drought Stress Index, Future**

- 0.0 - 2.0 low
- 2.1 - 4.0
- 4.1 - 6.0
- 6.1 - 8.0
- 8.1 - 10.0 high

Index from 0 (low) to 10 (high).

Drought Stress Index for respective projection year and RCP scenario describes change in water balance (precipitation minus potential evapotranspiration) derived from modelled Standardised Precipitation-Evapotranspiration Index (SPEI). The SPEI is a multiscalar drought index based on climatic data, used to determine duration, intensity and severity of drought conditions with respect to normal conditions in reference period (1986-2005).
Drought Stress Index includes information from local (CORDEX) and global (CMIP5) climate models.

**Heat Stress Index,  Current & Future**

- 0.0 - 2.0 low
- 2.1 - 4.0
- 4.1 - 6.0
- 6.1 - 8.0
- 8.1 - 10.0 high

Index from 0 (low) to 10 (high).

Heat Stress Index describes current meteorological threat by heat stress, derived from information about e.g. heat waves, annual maximum temperature, tropical nights.
Calculation for parameter Current based on ERA5 ECMWF atmospheric reanalysis data for timeframe from 1986 - 2005.
Projected Heat Stress Index for respective projection year and RCP scenario, derived from available set of CORDEX and CMIP5 climate models.

**Precipitation Stress Index, Current & Future**

- 0.0 - 2.0 low
- 2.1 - 4.0
- 4.1 - 6.0
- 6.1 - 8.0
- 8.1 - 10.0 high

Index from 0 (low) to 10 (high).

Precipitation Stress Index describes current meteorological threat by high precipitation, derived from information about e.g. single-day high precipitation events, prolonged precipitation events.
Calculation for parameter Current based on ERA5 ECMWF atmospheric reanalysis data

**Heat Stress, Annual Maximum Temperature Change Mean, Future**

- <= 0.00
- 0.01 - 0.50
- 0.51 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 2.50
- 2.51 - 3.00
- > 3.00

Arithmetic mean of projected change (absolute or relative, depending on scale of parameter) of underlying parameter from reference period to specified projection year, derived from set of available CORDEX models (alternatively from CMIP5 climate

**Heat Stress, Annual Maximum Temperature Absolute, Current**

- <= 24.00
- 24.01 - 26.00
- 26.01 - 28.00
- 28.01 - 30.00
- 30.01 - 32.00
- 32.01 - 34.00
- 34.01 - 36.00
- 36.01 - 38.00
- 38.01 - 40.00
- 40.01 - 42.00
- > 42.00

Annual maximum temperature [°C] for reference period 1986-2005 from ERA5

for the timeframe from 1986 - 2005. Projected Precipitation Stress Index for respective projection year and RCP scenario, derived from available set of CORDEX and CMIP5 climate models.

**Fire Weather Stress, Fire Season Length Change Mean, Future**

- <= 0
- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- > 30

Arithmetic mean of projected change (absolute or relative, depending on scale of parameter) of underlying parameter from reference period to specified projection year, derived from set of available CORDEX models (alternatively from CMIP5 climate models where CORDEX data not available).

**Fire Weather Stress, Fire Season Length Absolute, Current**

- 0
- 0 - 1
- 1 - 5
- 5 - 10
- 10 - 20
- 20 - 40
- 40 - 80
- 80 - 120
- 120 -180
- 180 - 240
- 240 - 365

Annual number of days corresponding to the fire season, which is defined by the start/end according to the Fire Weather Index (FWI) above and below the threshold value 15, respectively, maintained for two consecutive weeks in the 7-day moving average annual FWI series, including information from ERA5 ECMWF atmospheric reanalysis data.

**Precipitation Stress, Maximum 5-Day Precipitation Absolute, Current**

- <= 30.0
- 30.1 - 45.0
- 45.1 - 60.0
- 60.1 - 75.0
- 75.1 - 90.0
- 90.1 - 105.0
- 105.1 - 120.0
- 120.1 - 135.0
- 135.1 - 150.0
- 150.1 - 165.0
- > 165.0

Annual maximum of 5-day consecutive precipitation [in mm] for reference period 1986-2005 from ERA5 ECMWF atmospheric reanalysis data.

**Precipitation Stress, Maximum 5-Day Precipitation Rel Change Mean, Future**

- <= -10%
- -9% - 0%
- 1% - 10%
- 11% - 20%
- 21% - 30%
- 31% - 40%
- 41% - 50%
- > 50%

Arithmetic mean of projected change (absolute or relative, depending on scale of parameter) of underlying parameter from reference period to specified projection year, derived from set of available CORDEX models (alternatively from CMIP5 climate models where CORDEX data not available).

**GEM PGA no soil, 12 classes**

- Zone 1: 0.00 - 0.01 g
- Zone 2: 0.01 - 0.02 g
- Zone 3: 0.02 - 0.03 g
- Zone 4: 0.03 - 0.05 g
- Zone 5: 0.05 - 0.08 g
- Zone 6: 0.08 - 0.13 g
- Zone 7: 0.13 - 0.20 g
- Zone 8: 0.20 - 0.35 g
- Zone 9: 0.35 - 0.55 g
- Zone 10: 0.55 - 0.90 g
- Zone 11: 0.90 - 1.50 g
- Zone 12: > 1.50 g

The Global Earthquake Model (GEM) Global Seismic Hazard Map (version update 2019) depicts the geographic distribution of the Peak Ground Acceleration (PGA) with a 10% probability of being exceeded in 50 years, computed for reference rock conditions (shear wave velocity, V , of 760-800 m/s). The map was created by collating maps computed using national and regional probabilistic seismic hazard models developed by various institutions and projects, and by GEM Foundation scientists.

M. Pagani, J. Garcia-Pelaez, R. Gee, K. Johnson, V. Poggi, R. Styron, G. Weatherill, M. Simionato, D. Viganò, L. Danciu, D. Monelli (2018). Global Earthquake Model (GEM) Seismic Hazard Map (version 2018.1 - December 2018), DOI: 10.13117/GEM-GLOBAL-SEISMIC-HAZARD-MAP-2018.1

https://www.globalquakemodel.org/gem
https://www.globalquakemodel.org/hazard-model-documentation

**ESA Worldcover 2020**

- Tree cover
- Shrubland
- Grassland
- Cropland
- Built-up
- Bare / sparse vegetation
- Snow and ice
- Permanent water bodies
- Herbaceous wetland
- Mangroves
- Moss and lichen

ESA
© ESA WorldCover project 2020 / Contains modified Copernicus Sentinel data (2020) processed by ESA WorldCover consortium' Zanaga, D., Van De Kerchove, R., De Keersmaecker, W., Souverijns, N., Brockmann, C., Quast, R., Wevers, J., Grosu, A., Paccini, A., Vergnaud, S., Cartus, O., Santoro, M., Fritz, S., Georgieva, I., Lesiv, M., Carter, S., Herold, M., Li, Linlin, Tsendbazar, N.E., Ramoino, F., Arino, O., 2021. ESA WorldCover 10 m 2020 v100. https://doi.org/10.5281/zenodo.5571936

**Population Density**

- Class 1: Unpopulated
- Class 2: 1 - 9
- Class 3: 10 - 49
- Class 4: 50 - 199
- Class 5: ≥ 200

People per km² (2016); The population density represents a 24-hour average value. This means that the figures include daily movements, such as commuter journeys, and not just the night-time population.

**DLR WSF Evolution**

- no coverage (transparent)
- 1985 and older
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014

2015

DLR

World Settlement Footprint (WSF) Evolution

The World Settlement Footprint (WSF) Evolution is a 30m resolution dataset outlining the global settlement extent on a yearly basis from 1985 to 2015. A comprehensive publication with all technical details and accuracy figures is currently being finalized. For the time being, please refer to Marconcini et al,. 2021.