

## Data Documentation

### Urban flooding - Flood hazard maps for four European cities under present-day and future climatic conditions

#### Introduction

This document contains metadata for the flood hazard maps produced by the Technical University of Denmark for Nice, Strasbourg, Vienna and Odense in 2016. For a detailed description of the methodology used to produce these maps, kindly refer to the description in Kaspersen et al. (2017; Hydrol. Earth Syst. Sci.; for the full reference please see below).

The data set was delivered to the Oasis Hub in May 2017. The data set comprises 208 independent flood hazard maps, i.e. 52 maps for each of the four cities. The data shows the impacts of urban flooding (inundation depth) as a result of high-intensity precipitation corresponding to 10, 20, 50 and 100-year return periods under present-day climatic conditions and for two climate projections, i.e. the Representative Concentration Pathways (RCP) 4.5 and RCP 8.5. To address the uncertainty related to the climate change projections of high-intensity precipitation, Change Factors (CFs) (Table 1) for high-intensity precipitation are calculated based on, respectively, the 10<sup>th</sup> (low), 50<sup>th</sup> (median) and 90% (high) percentiles of a climate model ensemble comprised by 10 regional climate model projections from the CORDEX repository.

		France		Austria		Denmark		France	
		Strasbourg		Vienna		Odense		Nice	
Parameter	Return period	RCP45	RCP85	RCP45	RCP85	RCP45	RCP85	RCP45	RCP85
90 <sup>th</sup> percentile (high)	RP10	1.22	1.33	1.25	1.37	1.18	1.28	1.30	1.37
	RP20	1.24	1.38	1.29	1.39	1.20	1.32	1.39	1.42
	RP50	1.32	1.46	1.40	1.43	1.26	1.39	1.53	1.51
	RP100	1.39	1.54	1.51	1.46	1.34	1.45	1.63	1.59
Medium	RP10	1.13	1.26	1.12	1.25	1.07	1.17	1.18	1.19
	RP20	1.15	1.28	1.13	1.27	1.08	1.17	1.22	1.21
	RP50	1.17	1.32	1.15	1.30	1.10	1.18	1.27	1.25
	RP100	1.20	1.35	1.18	1.33	1.12	1.20	1.32	1.29

10 <sup>th</sup> percentile (low)	RP10	1.06	1.14	1.01	1.17	1.01	1.09	1.06	1.02
	RP20	1.04	1.12	1.00	1.14	0.98	1.08	1.03	1.00
	RP50	1.02	1.09	0.98	1.12	0.97	1.04	1.05	1.00
	RP100	1.00	1.08	0.96	1.13	0.96	1.00	1.07	1.01

**Table 1. Climate change factors (CFs) for hourly precipitation for the period 2081-2100 (control period: 1986-2005) for RCP 4.5 and RCP 8.5 for Strasbourg, Vienna, Odense and Nice. Results are based on regional climate projections using the RCA4 regional climate model, downscaling ten different GCMs: CANESM2, CSIRO, CERFACS, ICHEC, IPSL, MIROC, MOHC, MPI, NCC and NOAA.**

### Data description

A detailed description of the data set and the methodology used to create the flood hazard maps may be found in the following publication:

Skougaard Kaspersen, P., Høegh Ravn, N., Arnbjerg-Nielsen, K., Madsen, H., Drews, M., 2017. Comparison of the impacts of urban development and climate change in exposing European cities to pluvial flooding. *Hydrol. Earth Syst. Sci. Discuss.* 1–26. doi:10.5194/hess-2017-242

Link to publication: <http://www.hydrol-earth-syst-sci-discuss.net/hess-2017-242/>

### File naming

Vienna	PD/RCP45/RCP85	RP10	ACF/LCF/HCF	D
City name	PD: Present-day climate RCPs: Climate scenarios	10 year return period (RP) of precipitation	ACF: average climate factor (50%) LCF: low climate factor (10%) HCF: high climate factor (90%)	Drainage system updated according to changes in precipitation intensities caused by climate change.  Drainage system is not updated if D is not included at the end of the file name.

The urban land surface used for the hydro-dynamical modelling in each of cities is characterized from urban remote sensing estimates of the impervious respectively non-impervious surface fractions. The presence of an urban drainage system is simulated by assuming that 5% of the precipitation is drained from impervious urban surfaces based on present day rainfall conditions (see Kaspersen et al. 2017).

File name example: Vienna\_ RCP45\_ RP10\_ ACF\_ D:

This data shows the maximum inundation depth in **Vienna** under the **RCP4.5 scenario** in the period 2081-2100 during a **10-year precipitation event**. An **average climate factor** (average of 10 different climate model projections) is used to simulate the impact of climate change on high-intensity precipitation, and it is assumed the **drainage system of Vienna is updated** according to the expected changes in precipitation intensities caused by climate change.

### File format

The data set is provided as GeoTIFF and ArcGIS Layer Package files. The latter includes default layout

### Spatial reference

WGS 1984 UTM Zone 32/33N

### Units

cm (inundation depth)

### Example of flood hazard map for Nice

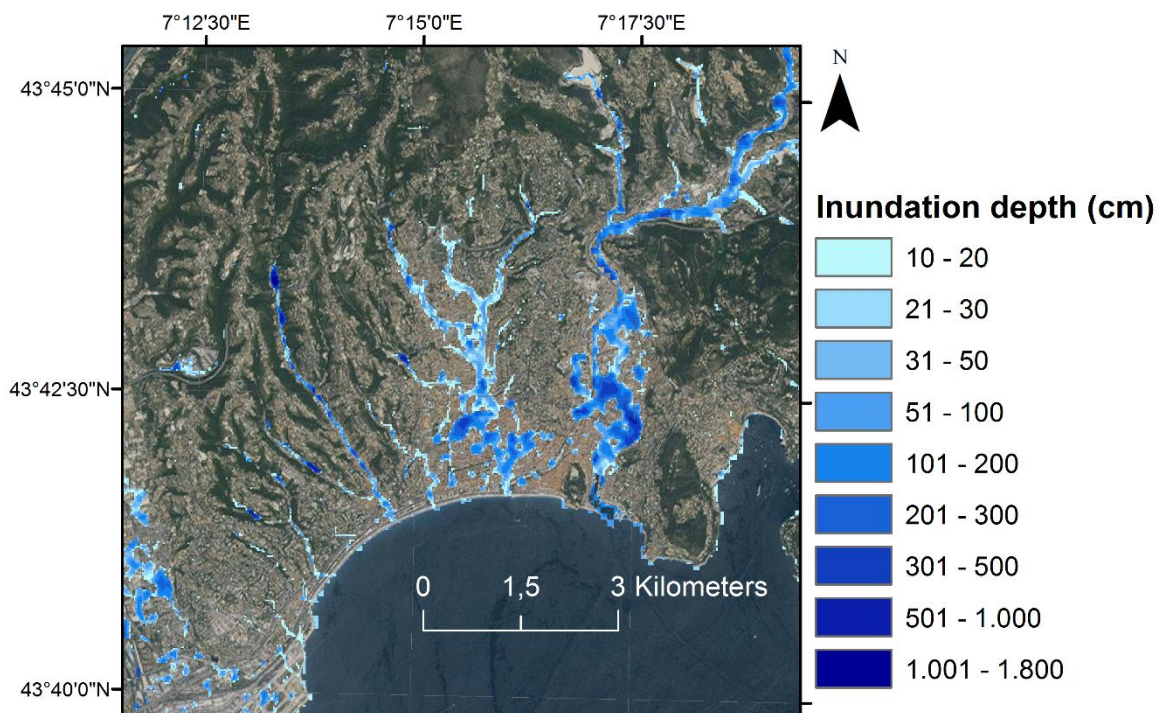


Figure 1. Flood hazard map for Nice, file name: Nice\_RCP45\_RP10\_ACF.

### Acknowledgements

When using this data set, the following reference should be cited:

Skougaard Kaspersen, P., Høegh Ravn, N., Arnbjerg-Nielsen, K., Madsen, H., Drews, M., 2017. Comparison of the impacts of urban development and climate change in exposing European cities to pluvial flooding. *Hydrol. Earth Syst. Sci. Discuss.* 1–26. doi:10.5194/hess-2017-242

## Contact

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