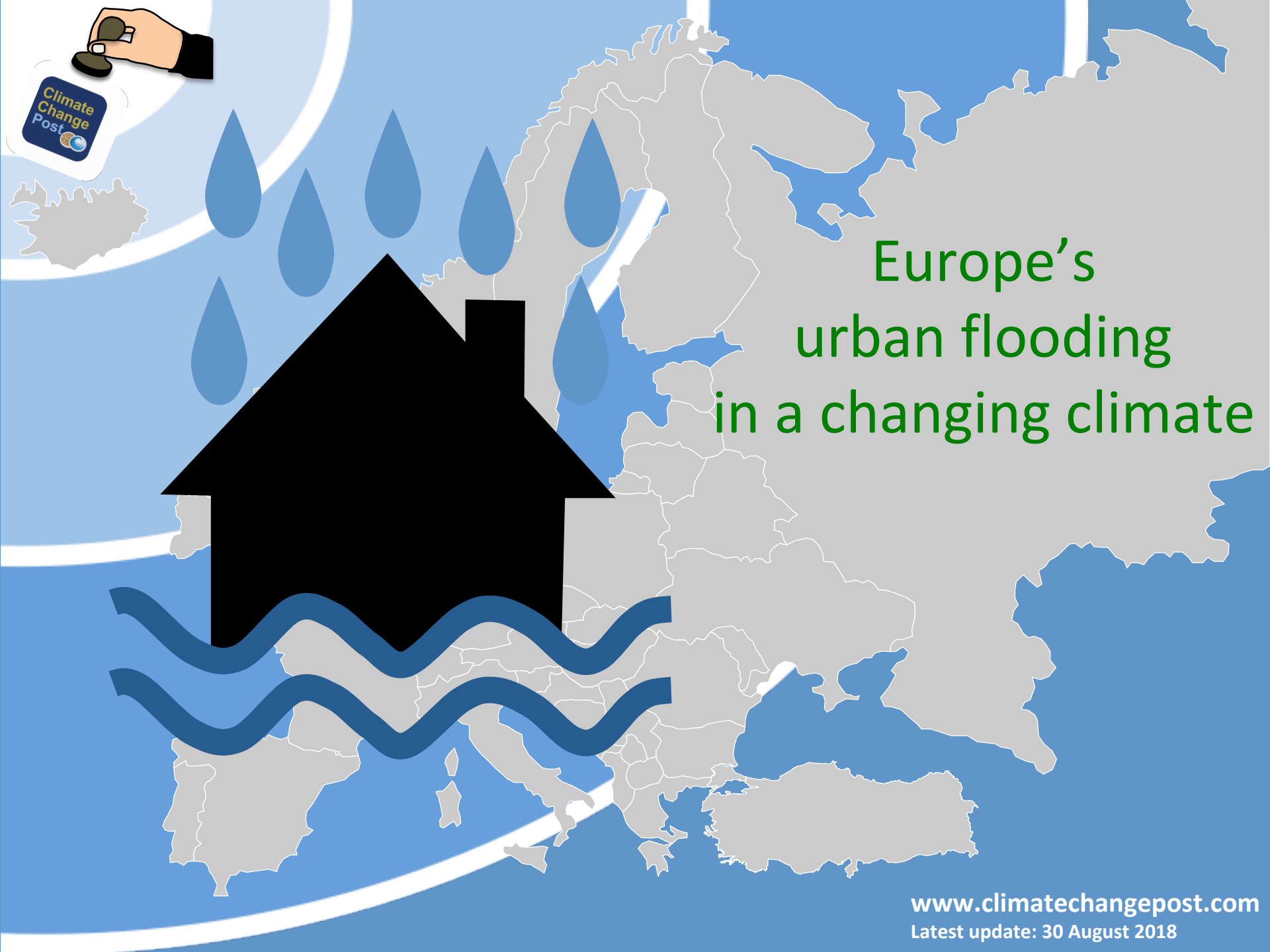

Europe's urban flooding in a changing climate

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Urban flooding

Definition

What is Urban Flooding?

Urban flooding may be triggered by heavy precipitation without being related to watercourses, when precipitation is too intense for urban drainage and overland flow results. This kind of flooding is also called surface water flooding. In general, surface water floods include all rainfall-related (pluvial) floods: both pluvial flooding and flooding from sewer systems, small open channels, culverted watercourses or flooding from groundwater springs.

Urban flooding

Past

Recent examples

2007

The floods in England in 2007 demonstrated that insufficient capacity of drainage systems can play a crucial part in surface water flooding. Much of the urban flooding in the UK in the past was flash flooding caused by unusually heavy rainfall combined with inadequate and/or ill-maintained drainage systems.

2011

On 2 July 2011, precipitation intensities higher than 2000 year return periods were recorded at the most critical locations in Copenhagen. The damage to the city was substantial; insurance companies reported that > 30 % of building owners in the municipality of Copenhagen filed insurance claims after the event, and the total claims exceeded 800 million euros.

In Switzerland urban flooding was responsible for at least 45% of all (pluvial and river) flood damage to buildings and 23% of the associated direct tangible losses between 1999 and 2013.

2009

Additional factors such as land use changes, urbanization, poor drainage, and construction and settling in the flood-prone areas worsened the consequences of Turkey's flash floods of 7-10 September 2009, especially in major urban areas of the region. Istanbul suffered most from the flash floods. Istanbul historically has been vulnerable to natural disasters. Since 1967, the city suffered 13 major floods. The current infrastructure of the city cannot accommodate runoff from heavy rainfall.

2002

On 7th August 2002, an inch of rain fell in central London in 30 minutes during the evening "rush hour", resulting in considerable disruption. London's drainage infrastructure is too old and overloaded to cope with such events. More than 50% of drainage and sewage overflow problems in England take place in London.

Urban flooding

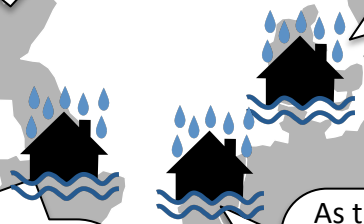
Present

Current situation

In some ways, sewage overflow could be seen as the biggest flood problem in Scotland, simply because river floods have been relatively rare in recent years. Since 1997, all the major flooding events in Scotland have been predominantly drainage related.

In Denmark, the need for rapid reaction has been exacerbated by a large increase in the number of extreme precipitation events that have resulted in pluvial flooding in most major cities in Denmark during the last 10 years.

‘Urban creep’, the cumulative paving over front and rear gardens, can have a significant impact on the natural drainage of surface water, as water that previously soaked into the ground has nowhere to go and can increase the risk of surface water flooding.



Drainage networks, particularly in older cities and towns, may date from Victorian times, designed and constructed to meet less demanding rainfall patterns than those expected in the future; already, some recent rain storms have overwhelmed local drainage systems.

As the sewage systems in the Netherlands were designed to cope with less violent downpours, heavier summer storms also will mean more flooding in urban areas.

Urban flooding

2100

Future projection

Sewage systems were designed to cope with less violent downpours. Heavier summer storms, therefore, will mean more flooding in urban areas.

The combined impact of climate change and increased urbanisation in some parts of the North Sea region could result in as much as a four-fold increase in sewer overflow volumes. For Roskilde (Denmark), for instance, a 40% increase in design rainfall intensities was found to increase the current level of damage costs related to sewer flooding by a factor of 10.

For the UK, the changes in future rainfall patterns point to an increased likelihood of floods arising from intense rainfall events overwhelming urban drainage systems by the 2080s. For instance, this number could increase as much as 20% in Edinburgh by 2080.

In Copenhagen, the risk of urban flooding (in terms of expected annual damage) is likely to increase by almost 4-8 times between now and 2100 when no adaptation measures are taken. The projected increase is more than 2 orders of magnitude for sea surge and almost 4-8 times for pluvial flooding. However, Copenhagen has developed an adaptation plan to pluvial flooding that makes the urban areas more robust and reduces the risk of flooding in 2100 to 0.2-0.3 times (and under a high-end scenario of climate change to 0.6-2.1 times) the current flood risk (in terms of expected annual damage). Severe storms in Copenhagen like the one on 2 July 2011 could occur every 40 years in 2100 under a high-end scenario of climate change.

In Belgium, sewer surcharge or flooding might occur up to about twice to four times more frequently by 2100 than in the present climate without adaptation to more intense future rainfall.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