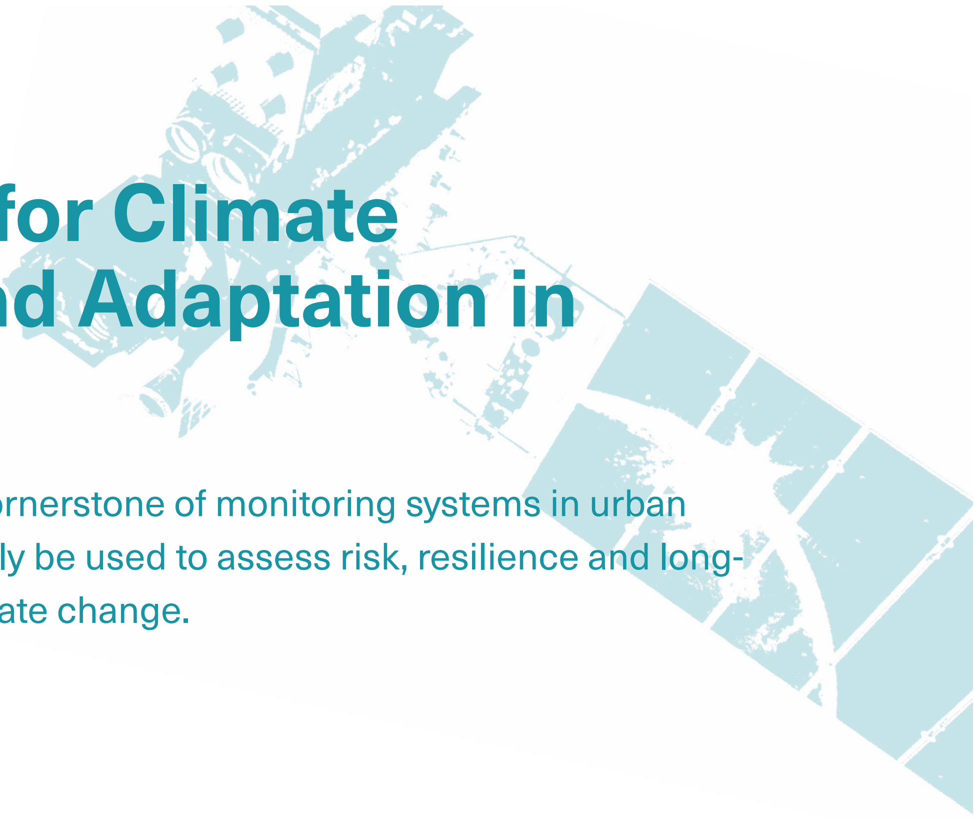

Enabling EO for Climate Mitigation and Adaptation in Urban Areas

Earth observation data is a cornerstone of monitoring systems in urban landscapes and can effectively be used to assess risk, resilience and long-term stresses caused by climate change.

Mads Christensen [A], Emil Møller Rasmussen [B]

A: DHI GRAS B: Copenhagen Municipality

The challenge

A changing climate is undeniably one of the greatest threats to our environment, ecosystems, and socio-economic structures and the struggle to combat climate change and mitigate climate impacts is never more pronounced than in urban landscapes.

With a future predicament of heavier rain, higher sea levels and warmer weather, urban landscapes are positioned on the frontline of climate impacts, and city planners and policy makers are faced with the daunting challenge of redesigning cities to enhance resilience against climate-induced impacts, while at the same time reducing greenhouse gas emissions.

However, while climate change is one of the top societal challenges, the ability to reshape cities in a changing climate inherently depends on good quality data and information.

The space-based solution

Earth Observation data is an indispensable and mature resource for monitoring and measuring key parameters relevant to climate change in cities. Satellites have the capacity to capture large quantities of timely and accurate environmental information on the physical, chemical and biological dynamics within urban landscapes.

Satellite data can be used to measure temperature differences in urban landscapes caused by urban heat islands, providing city planners with a critical tool to spatially allocate a more optimal composition of hard surfaces and green space vegetation in order to reduce overall temperature variability.

> **“The Municipality of Copenhagen has applied data from satellites to monitor so-called Urban Heat Islands in the city. This has provided planners with actionable information about which areas of the city need heat mitigation, for instance in the form of new green areas.**
>
> *Emil Møller Rasmussen, Copenhagen Municipality*

Impervious surfaces and vegetation cover can also be consistently monitored and mapped using earth observation data, providing an essential resource for modelling surface runoff and predicting urban flood exposure in order to manage flood risk and inform climate adaptation plans.

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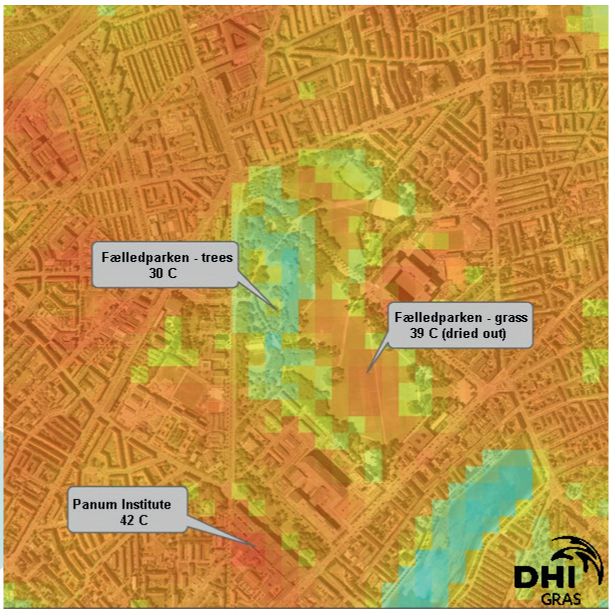

Extract from satellite-based temperature map of Copenhagen, Denmark, indicating the impact of green areas on urban surface temperature.

Monitoring surface water dynamics and frequency of flooding in southern Copenhagen.

Benefits to citizens

Earth observation data is more accurate and accessible than ever before, and the advent of the Copernicus programme providing freely available data in high spatial, spectral and temporal resolution is a game changer for operational monitoring of urban landscapes.

Satellite data is consistent and unbiased, thus providing a cost-effective way to assess the spatial and temporal evolution of urban processes at a fraction of the cost of traditional in-situ sampling and measurements.

The ability to track and monitor urban greenness, temperature and other relevant climate parameters provides an objective metrics for city planners and decision-makers to make our cities greener, more sustainable and more livable for its citizens.

As temperatures are expected to increase in the future, the ability to map urban heat islands and monitor fluctuations in vegetation cover will provide urban planners with a tool to make use of strategic planning of green infrastructure to mitigate the impacts of rising temperatures and the effects from climate change.

Outlook to the future

The ability to monitor urban landscapes in high spatial resolution, with frequent updates, is critical in order to inform city planning and climate adaptation measures in the future. Free data from the Sentinel satellites will continue to contribute to an expanded avenue of opportunities, providing a means to test and develop new tools to provide enhanced means for decision-makers to target urban spatial planning strategies in the context of a changing climate and sustainability performance requirements.

Future missions such as the Copernicus candidate Land Surface Temperature Mission (LSTM) are highly relevant as a potential future tool to monitor temperature variation and water use efficiency parameters in even higher spatial-temporal resolution.

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