Adaptation measures and strategies

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Description work package

1.1 Problem definition, aim and central research questions

Climate change demands measures at the urban scale, simultaneously dealing with increasing precipitation, drought and extreme heat. Moreover, a more conscientious approach to (waste) energy consumption in urban areas would reduce urban heat islands and CO_2 emissions.

Hence, measures are needed for the adaptation to heatwaves and mitigation of the urban heat island effect and drought on the one hand, and watersheds due to storm water excess or river flooding on the other. These measures are to be found by different means, on different scales (cities, neighbourhoods and buildings), often integrated and serving multiple purposes. Therefore, measures resulting from this Knowledge for Climate (KfC) programme would partly imply climate adaptation, climate mitigation and an approach we could call climate pro-activation, i.e. utilising climate characteristics optimally in the urban and building design.

The themes chosen for this workpackage aim to cover the entire range of measures for climate robustness: green interventions, dealing with precipitation at the buildings and city level, the combined approach to water and energy, and spatial and technical design measures at various scales.

Main research question for this workpackage is:

- Which measures can be taken for climate robustness of cities, neighbourhoods and buildings, and what is their efficacy?

General subquestions are dealt with in the themes mentioned:

- In which sense can green interventions provide solutions against increased temperatures and better retention of rainwater?
- How can rainwater be captured, stored and used in buildings and their direct surroundings, in order to avoid water excess and serve other purposes?
- How can water excesses be tackled on the urban scale, while serving multifunctional purposes?
- How can the combined approach to the water and energy system provide solutions for both climate adaptation and mitigation?

- Which design and technical measures can be taken at the building level to avoid undesired upheating of buildings and to play a role in the urban decrease of temperatures?
- Which spatial and technical design measures for climate robustness can be taken on the neighbourhood to city level?
- Which climate robust planning measures are possible on the city to region scale?

1.2 Interdisciplinarity and coherence between the projects

The seven main themes in this workpackage were formulated intentionally as such to provide measures at all urban scales and to optimally interlink the projects. Core focus of WP3 is urban design, at the scale of the building, the neighbourhood and the city, each of which requires a different approach but also need cooperation. Closely related to the design themes of projects 3.5, 3.6 and 3.7 are the green interventions of project 3.1 and the measures for precipitation of projects 3.2 and 3.3. The energy and water system project of 3.4 relies strongly on senior experience with water and energy systems. It is obvious that this infrastructural theme is also linked to the design and precipitation projects.
In addition, there is coherence with the other workpackages 1, 2, 4 and 5, in order to integrate topics of urban climate, impacts, measures, governance and the integration of all results. Personal involvement and project links will secure collaboration and cooperation between the workpackages. For example, project 3.1 will colaborate with Workpackage 1 for measurements on the effects of green in cities.
The projects within this workpackage will be executed in practical case studies (details of which are discussed in the project descriptions). In the case studies researchers will actively collaborate with municipalities. Multiple projects will contribute to the research in a case study:

- In the case study Urban Water Management the focus of the cooperation will be between project 3.2 (water system of buildings and streets), 3.3 (water system of district until region) and project 4.1 (policy integration and planning tools). Project 3.4 (water and energy systems) might provide valuable inputs.
- The Building and Street case study will entail collaboration between the projects1.3 (development of a model toolbox), 2.1 (impacts of climate change), 2.2 (human health impacts), 3.1 (green infrastructures), 3.2, (rainfall interception), 3.5 adaptation measures), 4.2 (self-organization) and 4.3 (implementation in residential buildings).
- For the Urban residential areas case, collaboration will be established between project 3.1 (green infrastructures), 3.5 (building to neighbourhood), 3.6 (neighbourhood to city) and 3.7 (city to region).
- In the case study Business parks there will be collaboration with project 3.3 (water system of district until region), 3.4 (water and energy systems), and 3.6 (neighbourhood to city). Project 4.5 elaborates the governance connection.
- The case study regional approach/climate buffers is largely executed by project 3.7 (city to region), with inputs from projects 1.1 (measuring) and 1.2 (meso-modelling), and coordinated with 3.6 (neighbourhood to city).

The University of Manchester will assist in collating the findings from Wp1 and Wp2 in order to build appropriate adaptation plans at a variety of scales. This component of the work has a large lement of knowledge transfer from relevant UK projects and programmes.

1.3 Stakeholders

As this workpackage adresses the various climate adaptation measures in cities, stakeholders include the whole range of those involved in urban planning and management: municipalities, provinces, water boards, energy companies, drinking water companies, urban planners, architects, landscape architects, building engineers, climate designers, housing corporations, property investors, project developers, end-users, proprietors, etc.
Specific stakeholders are the hotspots and other cooperating cities in this programme (Haaglanden, Rotterdam, Amsterdam, Stadsregio Arnhem/Nijmegen, Brabantstad/Tilburg)

The following hotspot-specific topics are addressed in this workpackage:

- The development and application of generic principles of the effects of green on the city climate
- Water storage in existing and new urban areas
- Flat roofs/water storage/rainfall peaks
- Dealing with peak rainfall and use of water for cooling in urban areas
- Storage in buildings or gutters
- The effects, nuisance, risks and damage of a high end extreme precipitation event: Rotterdam and others
- Storage and utilisation of water and sequestration of excessive, whilst accomplishing a sustainable, closed total energy system
- Measures to reduce impact of outdoor climate on indoor environment in buildings in existing and restructured neighbourhoods
- Impact of user behaviour
- Green roofs en facades
- Heat stress agenda
- Sustainable buildings and streets
- Diminishment, neutralisation or avoidance of upheating by urban measures
- Climate synergy between greenhouse horticulture clusters and residential and industrial areas
- Synergy Work/Living Areas <> New nature