



Climate Mitigation Pathways for Cities – enabling a just transition through quantified actions?

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As Climate Change challenges threaten future quality of life, urgent action to mitigate CO₂ emissions as well as to adapt to current and future risks is mandatory. Cities are crucial for both areas: mitigation, because 2/3 of the world wide population live in urban areas and thus cause XX emissions; adaptation: because the settlements structure, mainly sealed areas, enhances the negative effects of climate change. Within the Horizon Europe Research and Innovation Action KNOWING [1] climate mitigation pathways, which represent timelines of specific interventions, are compiled for different regions.

Urban areas are a core region type within KNOWING as they are particularly vulnerable towards climate change. Over the past years cities have responded by defining strategies regarding mitigation and adaptation that identify measures for specific sectors. Although there is vast knowledge with respect to future impacts and possible mitigation and adaptation measures within different sectors (e.g. transport, energy, etc.), implementation remains inadequate Existing strategies often tackle the different sectors separately, thus ignoring possible spill-over and rebound effects of one measure taken to other areas

KNOWING develops a framework for defining Climate Mitigation Pathways based on understanding and integrated assessment of climate impacts, adaptation strategies and societal transformation. The modelling framework will be used to assess the interrelations between potential risks of climate responses, i.e., public and private adaptation and mitigation strategies. For instance, the installation of air conditioning can improve living conditions inside, but it also has a two-fold negatively impact due to its heat and CO₂ emissions.

To quantify the interrelations, the chosen comprehensive approach builds upon a system dynamics (SD) model for quantifying cross-sectoral influences of measures taken in different sectors (e.g., energy, mobility, land use, construction, agriculture) affecting the overall emission budget. Therefore, specific so-called domain models for mitigation (e.g. energy demand model MAED-City, energy supply IES-opt) and adaptation (e.g. urban climate PALM4U, flooding model SFINCS, ICM-Infowork) are applied, fed with high resolution (5x5km) WRF input data. Based on this systems perspective, mitigation pathways along optimised combinations of interventions in the different sectors are developed. The framework also includes a coping behaviour model that provides guidance on how measures can be implemented in an equitable way to enable a just and broadly supported transition.