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# Benefits and Opportunities of Climate Adaptation in Cities: Findings of Systematic Literature Review

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**ABSTRACT**

Climate economists call on more researches to advance climate change economics and to focus on policy relevant topics in the following years: it is important to provide better understanding of consequences and climate policy (Burke et al, 2016). This has motivated us to find out consequences of climate change adaptation policy, particularly those implemented in urban or city setting. The research question we would like to tackle is: How does it pay for cities to adapt to climate change?

This paper systematically reviews literature on benefits and opportunities of climate change adaptation in cities. The review analyses which climate change options in cities show benefits and opportunities (economic, social, environmental aspects). Which sectors and which cities report more benefits and opportunities than others? How are the benefits and opportunities measured in the studies? Which stakeholders initiate climate adaptation and who implements them in cities? Which stakeholder groups are benefited at the end? By looking into the measuring of benefits and opportunities, further details are also examined to see whether the current measurements are comprehensive enough in terms of social, economic and environmental aspects. The study aims to contribute to the topic of cities research by presenting the systematic literature review to answer the questions above. More importantly, theoretical foundations supporting or explaining benefits and opportunities of climate change adaptation, or any methodological or empirical studies providing evidence for the payback of climate change adaptation in cities or urban setting are also included in this review. To achieve the research aim, a systematic literature review is carried out.

Methodologically, systematic literature reviews are already established in several fields, as well as in sustainability and climate change studies, which are also adopted in this study (Berrang-Ford, Pearce, & Ford, 2015a, 2015b; Hueske & Guenther, 2015; Muench, Thuss, & Guenther, 2014; Stechemesser & Guenther, 2012; Tranfield, Denyer, & Smart, 2003). In the phase of planning the review, the need of the review should be identified, a proposal for the review should be prepared and a review protocol should be developed. The review protocol includes screening and selection criteria, bibliographical data (title of the publication, authors, authors' affiliations, location of affiliations, year of publication, journal name, and quality of the publication). Review protocol also consists of further information such as background of the publication and content for the review. While conducting the review, it is important to define the research questions and scope of the study clearly. Afterwards, the selection of the documents according to our criteria is carried out.

First of all, a set of keyword search in title, abstracts or keywords includes: climat* AND adapt* AND (benefit* OR opportunit*) AND (cit* OR urban) in several databases (for instance, ScienceDirect, Emerald, Wiley, EBSCO, and Web of Science). The articles have to be peer-reviewed publications in English and at the end the keyword combination yields 799 research results. Each publication is screened under the following criteria (1) relevance to climate change adaptation, (2) relevance to urban or city setting, (3) contribution to benefits or opportunities (in any aspects such as environmental, economic and social). The publications meeting all three criteria are selected for the analysis. The selection process is well documented, including writing down the reasons for inclusion and exclusion. After selecting the studies, the quality of the publications is being assessed. The final selection of studies is being analysed with the aim to provide synthesis to answer the research questions. The results aim to give recommendations to research and practice.

Four out of five databases are already being screened and selected. The preliminary results from the first database analysis show that cases show benefits of local climate adaptation measures include different types of measures categorized according to categorization of sectors in IPCC: agriculture, housing, urban flooding, water, wind, sea level rise, coastal system, and energy. The methods which were used to calculate the payback or benefits of adaptation measures in cities are also quite diverse, including econometric methods, simulation, simulation with cost-benefit analysis, cost benefit analysis, cost effectiveness analysis, cost assessment, flood return period and loss estimation, integrated assessment mode with refined adaptation functions, and general equilibrium model. The analysis is still ongoing, and a discussion on which methods of calculation are used and which gaps are identified will be provided. Also, more details on how the benefits and opportunities are measured in the studies and what the pros and cons of the current measurement are will also be discussed. Furthermore, it is important and interesting to also look at which stakeholders initiate climate adaptation, implement it, and are benefited at the end. One of our finding provides details why economic viable adaptation measures are not implemented: affordability and equitability of climate adaptation measures should also be taken into account (Fletcher, Rambaldi, Lipkin, & McAllister, 2016). The further findings will also discuss not only from the economic aspect, but also social and

environmental perspectives.

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