Urban Climate 14 (2015) 116–137

Contents lists available at ScienceDirect

Urban Climate

journal homepage: www.elsevier.com/locate/uclim

A conceptual framework for an urban areas typology to integrate climate change mitigation and adaptation ☆

William Solecki [j,*], Karen C. Seto [i], Deborah Balk [a], Anthony Bigio [b], Christopher G. Boone [c], Felix Creutzig [d], Michail Fragkias [e], Shuaib Lwasa [g], Peter Marcotullio [h], Patricia Romero-Lankao [f], Timm Zwickel [k]

[a] City University of New York, Baruch College, School of Public Affairs, One Bernard Baruch Way, Box D-0901, New York, NY 10010, USA
[b] Sustainable Urban Planning, The George Washington University, USA
[c] School of Sustainability, Arizona State University, PO Box 875502, Tempe, AZ 85287-5502, USA
[d] Mercator Research Institute on Global Commons and Climate Change, Torgauer Str. 12-15, 10829 Berlin, Germany
[e] Boise State University, Micron Business and Economics Building Room 3246, 1910 University Drive, Boise, ID 83725, USA
[f] Urban Futures (RAL-ISP), National Center for Atmospheric Research, PO Box 3000, Boulder, CO 80307, USA
[g] Makerere University, Department of Geography, P.O. Box 7062, Kampala, Uganda
[h] City University of New York, Hunter College, Department of Geography, 695 Park Ave, 1003E North Building, New York, NY 10065, USA
[i] Yale University, School of Forestry & Environmental Studies, 380 Edwards Street, Room 102, New Haven, CT 06511, USA
[j] City University of New York, Hunter College, Department of Geography, 695 Park Avenue, 1215E, New York, NY 10065, USA
[k] Potsdam Institute for Climate Impact Research (PIK), PO Box 60 12 03, 14412 Potsdam, Germany

ARTICLE INFO

Article history:
Received 24 December 2014
Revised 12 July 2015
Accepted 14 July 2015

Keywords:
Urbanization
Typology
Climate change
GHG emissions
Vulnerability

ABSTRACT

Urban areas are key sources of greenhouse gas (GHG) emissions and also are vulnerable to climate change. The recent IPCC Fifth Assessment Report illustrates a clear need for more research on urban strategies for climate change adaptation and mitigation. However, missing from the current literature on climate change and urban areas is a conceptual framework that integrates mitigation and adaptation perspectives and strategies. Because cities vary with respect to development histories, economic structure, urban form, institutional and financial capacities among other factors, it is critical to develop a framework that permits cross-city comparisons beyond simple single measures like population size.

The primary purpose of this paper is to propose a conceptual framework for a multi-dimensional urbanization climate change typology that considers the underlying and proximate causes of GHG emissions and climate change vulnerabilities. The paper reviews some of the basic steps required to build such a typology and associated challenges that must be overcome via a demonstration of a pilot typology with nine case study cities. The paper shows how the proposed framework can be used to evaluate and compare the conditions of GHG emissions and climate change vulnerability across cities at different phases in the urbanization process.

© 2015 Published by Elsevier B.V.

☆ All authors were equally responsible for the development of the paper. The paper emerged as a result of group workshop discussion. Karen Seto and William Solecki took the leadership role of developing the paper in its final form.

* Corresponding author.

E-mail addresses: wsolecki@hunter.cuny.edu (W. Solecki), karen.seto@yale.edu (K.C. Seto), Deborah.Balk@baruch.cuny.edu (D. Balk), agbigio@email.gwu.edu (A. Bigio), Christopher.G.Boone@asu.edu (C.G. Boone), creutzig@mcc-berlin.net (F. Creutzig), michailfragkias@boisestate.edu (M. Fragkias), lwasa_s@arts.mak.ac.ug (S. Lwasa), Peter.Marcotullio@hunter.cuny.edu (P. Marcotullio), prlankao@ucar.edu (P. Romero-Lankao), timm.zwickel@pik-potsdam.de (T. Zwickel).

http://dx.doi.org/10.1016/j.uclim.2015.07.001
2212-0955/© 2015 Published by Elsevier B.V.

1. Introduction

The recent Fifth Assessment Report of the IPCC presents a clear indication of the how the conditions of climate adaptation and mitigation still operate largely in separate worlds – both intellectually and operationally. The objective of this paper is to actively focus on the opportunities for promoting more connection between climate change adaptation and mitigation in urban areas, and with specific focus on the definition and articulation of a typology tool designed to investigate climate vulnerability and greenhouse gas emissions (GHG) contexts of individual cities or sets of cities.

It is becoming increasingly obvious that there is a need to reconcile the vulnerability-adaptation and emissions mitigation dimensions of climate change with respect to cities.[1] The recent IPCC reports (WG 1, 2, 3 and Synthesis Report) all focus on the demand for accelerated action.[2] However, these reports pay little attention to human settlements, whether they are towns, cities or large urban agglomerations (with Chapter 8, WG 2; and Chapter 12, WG.3 notable exceptions) It is thus important to ensure that climate adaptation and mitigation *in cities* occurs at the same time, and most often in ways that are collaborative and synergistic (i.e. leading to co-benefits and not situations for example where adaptation strategies that could heighten GHG emissions).

Cities have been recognized as important sites of global climate action. Cities have become global leaders in addressing climate change through greenhouse gas mitigation and an increasing focus on the need for climate adaptation (Rosenzweig et al., 2010). The September 2014 Mayors Declaration at the UN Summit which highlight the goals of more rapid moment on climate adaptation and mitigation (http://www.un.org/climatechange/summit) is further evidence of this commitment. The IPCC AR5 report and similar assessments (e.g. US National Climate Assessment) illustrate the spectrum of conditions across the universe of cities with respect to adaptation and mitigation strategies, actions, and capacity. For instance, Chapter 12 of AR5 introduces the classification of cities as ''net producers, trade-balanced, and net consumers.'' It also identifies four key urban factors potentially leading to urban GHG reductions: ''density, land-use, connectivity, and accessibility.'' Furthermore, it looks at mitigation options and scenarios appropriate for small vs. large cities.

The wide diversity of cities speaks to the need for understanding the contexts under which these variations have emerged and the situations under which there has been more forward movement to effective adaptation and mitigation than in others, and under what circumstances has meaningful forward movement been made on both activities simultaneously. It is these examples that will be most important for other cities to study and potentially emulate. Urban areas are important sources of GHG emissions and are also vulnerable to climate change. A rapidly growing literature exists on city-specific climate change strategies with a majority of these efforts describing the actions taken by individual cities. Missing from the current understanding is a framework that connects how metrics of cities and the broader scale process of urbanization (defined here as the sum of the conditions which result in the [re]building of cities – see Solecki et al., 2012) connect with metrics of climate change.

The primary objective of this paper is to propose and describe a conceptual framework for an urbanization-climate change typology that simultaneously considers the drivers of urban GHG emissions and vulnerabilities to climate change. The elements and variables defined in the framework reference the key assertion and finding generated by the AR5 WG2 and WG3 reports generally, and the urban-focused chapters in the two reports specifically. Building off these recent efforts, the framework is structured to be useful for the identification of effective points of cross-urban comparisons and potential intervention in these urban systems across a diversity of settlements, urbanization processes and geographies.

A framework of this type also can be used to facilitate the testing of potential climate change mitigation and adaptation strategies within and across groups of cities by allowing investigators to define levels of association within and between these two categories of variables. The research literature makes it clear that cities are beginning to engage with the threat of climate change, and their condition and capacity to act varies widely. Understanding what metrics cities can use to facilitate climate change action comparisons, and what these comparisons might signify is part of the overall rationale of this work. In this regard, the typology enables the organization and comparison of the large and growing number of case studies on urban strategies of climate change mitigation and adaptation. Overall, the construction of the typology is designed to address two fundamental and interrelated questions about cities. They are: A. What conditions are consistent with having both a significant amount of adaptation and mitigation planning and practice?; and, B. What conditions are consistent with promoting both high levels of adaptation and mitigation moving into the future?

The paper is organized into the following sections. First we discuss the case for an operational and analytical connection between climate vulnerability and GHG emissions. Next we define a theoretical understanding of how these elements can be connected, and how conditions for enhanced adaptation and mitigation can be made possible. In the following section we propose a process to develop the typology that provides understanding of the connections and serves as hypotheses testing

[1] We distinguish between the terms vulnerability and resilience. While resilience theory has informed vulnerability analysis, resilience in of itself represents a different process associated with the 'ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions' (IPCC SREX, p. 563).Vulnerability can be defined as the propensity or predisposition to be adversely affected (IPCC SREX 2011) and as the ''susceptibility to damage or harm'' which results from conditions of exposure and adaptive capacity (Eakin and Luers, 2006; Adger, 2006; Field et al., 2012). Adaptive capacity of individuals or households can be defined by the conditions of available resources (e.g. insurance, wealth), networks (e.g. social capital, supportive family and friends), information access (e.g. knowledge of emergency services), physical health, and other site- and situation-specific characteristics. At an aggregate level, adaptive capacity depends on the resilience or robustness of social and ecological systems (Polsky et al., 2007).

[2] Many of the authors of this effort were contributors to the AR5 volumes, specifically WG2 Chapter 8 and WG3 Chapter 12.

Download English Version:

https://daneshyari.com/en/article/10260238

Download Persian Version:

https://daneshyari.com/article/10260238

Daneshyari.com