Environmental Development 15 (2015) 103–119

Contents lists available at ScienceDirect

Environmental Development

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

A comparison of trends and magnitudes of household carbon emissions between China, Canada and UK

Tek Narayan Maraseni [a,b,*], Jiansheng Qu [a,c], Jingjing Zeng [a,c]

[a] Information Center for Global Change Studies, Lanzhou Library, Chinese Academy of Sciences, Lanzhou, China
[b] Institute for Agriculture and the Environment, University of Southern Queensland, Toowoomba 4350, QLD, Australia
[c] MOE Key Laboratory of Western China's Environmental Systems, Research School of Arid Environment & Climate Change, Lanzhou University, Lanzhou, China

ARTICLE INFO

Article history:
Received 8 December 2014
Received in revised form
31 March 2015
Accepted 1 April 2015

Keywords:
Household carbon emissions
China
Canada
UK

ABSTRACT

Household carbon emissions (HCEs) contribute a large proportion of global carbon emissions. For several reasons there are large differences in HCEs between countries. Using governments' annual data, this study aims to compare the trends and magnitudes of HCEs between China, Canada and the UK and pinpoint where these countries are heading and what lessons they can learn from others. In the years when HCEs were first reported (1995 in China, 1990 in Canada and 1997 in UK), per person HCEs in China, Canada and the UK were 0.54 tCO_2, 13.54 tCO_2 and 9.63 tCO_2, respectively. These values had changed to 1.77 tCO_2, 13.14 tCO_2, 8.20 tCO_2 by the end of reporting (2011 in China and UK and 2007 in Canada), representing an increase of 7.7%/yr in China and a decrease of 0.18%/yr in Canada and 1.14%/yr in the UK. Although the rate of increase in China was high, in absolute terms China's per person HCE remained many times lower than that of Canada and the UK. The reasons why China may not follow Canada and UK's emissions pathways are discussed. In comparison with several other studies, China's average HCEs were found to be much lower than that of developed countries. Among the developed world, Sweden and Norway had much lower HCEs, probably due to the production of electricity by hydro and nuclear power generation and the use of

* Corresponding author at: Information Center for Global Change Studies, Lanzhou Library, Chinese Academy of Sciences, Lanzhou, China. Tel.: +61746312995; fax: +61746315581.
E-mail address: Maraseni@usq.edu.au (T.N. Maraseni).

http://dx.doi.org/10.1016/j.envdev.2015.04.001

centralised heating systems in Sweden, and production of electricity by hydropower in Norway. Where possible, countries all around the world can learn lessons from these two countries.

1. Introduction

Despite a growing number of national, bilateral, multilateral and global greenhouse gas (GHG) emissions reduction policies and programs, anthropogenic GHG emissions from 2000 to 2010 grew more quickly (2.2%/yr) than in the previous three decades (1.3%/yr) (IPCC (Intergovernmental Panel on Climate Change), 2014). In 2010, about 50.1 $GtCO_2e$ GHGs were emitted into the atmosphere from anthropogenic sources, which is already about 14% higher than the median estimated emission level (44 $GtCO_2e$/yr) required to meet the 2 °C climate stabilising target by 2020 (UNEP (United Nations Environment Program), 2013). If the current trend continues, the earth will be 3.7 to 4.8 °C warmer compared to preindustrial levels by 2100, potentially resulting in a range of catastrophic effects on social, economic and environmental sectors (UNEP (United Nations Environment Program), 2013). Realising these threats, 99 countries covering over 80% of global emissions have set 2020 emissions reduction goals through a range of policies such as renewable energy, energy efficiency, demand side management, emissions trading schemes and emissions taxes (Australian Government Climate Change Authority, 2014). However, the current annual decarbonisation rate of 0.7% is not enough to revoke the climate change threat; it is estimated that an aggressive rate of 6% is necessary (PWC (PricewaterhouseCoopers International Limited), 2013).

Being a public good and therefore subject to the 'free rider' problem, the issue of 'who should bear the burden of emission reduction' has been one of contention between the developed and developing world in every climate change negotiation. When climate change policy was being negotiated in 1990, developed and developing countries shared 60% and 40% of the total global emissions, respectively; now the proportions are the opposite and both developed and developing countries are responsible for equal shares of cumulative emissions for the period from 1850 to 2010 (UNEP (United Nations Environment Program), 2013). While asking developing countries to share the emissions reduction burden would violate principles of fairness and equality, the overarching target of global emissions reduction cannot be achieved without involving them (Maraseni et al., 2009).

Setting aside this issue, this study focusses on HCEs which is a major contributor of global emissions. For example, the proportion of household emissions to the national emissions is 20% in Australia (EPA Victoria, 2013), 74% in the UK (Baiocchi et al., 2010) and over 80% in the USA (Bin and Dowlatabadi, 2005; Jones and Kammen, 2011). At the global scale, the building sector alone contributes about 19% of total emissions and the proportion rises to 25% if emissions from Agriculture, Forestry and Other Land Use sectors are excluded (IPCC (Intergovernmental Panel on Climate Change), 2014). In fact, from 1970 to 2010, total emissions increased by only 61% whereas building sector emissions increased by over 200% (IPCC (Intergovernmental Panel on Climate Change), 2014). These rapid increments were largely due to increasing population and household incomes (Liu et al., 2011; Liao and Cao, 2013; Qu et al., 2013; Wang and Yang, 2014). Therefore, the global climate stabilisation mission cannot be accomplished without combating household emissions.

HCEs have been estimated for countries such as Australia (EPA Victoria, 2013), the USA (Bin and Dowlatabadi, 2005; Jones and Kammen, 2011, 2014; Weber, 2008; Weber and Matthews, 2008), the Netherland (Kerkhof et al., 2009), the UK (Druckman and Jackson, 2009; Kerkhof et al., 2009; Büchs and Schnepf, 2013), Sweden (Kerkhof et al., 2009; Statistics Sweden, 2006), Norway (Kerkhof et al., 2009; Peters and Hertwich, 2006), Canada (Statistics Canada, 2011), China (Liu et al., 2011) and the Philippines (Seriño, 2010). Large differences in average HCEs amounts between countries are apparent. However, only three governments/countries in the world (China, Canada and UK) have published nationwide annual HCE data. Therefore, we decided to compare the trends and magnitudes