Renewable and Sustainable Energy Reviews 49 (2015) 232–242

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

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

Reduction of CO_2 emission and non-environmental co-benefits of bicycle infrastructure provision: the case of the University of Novi Sad, Serbia

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ARTICLE INFO

Article history:
Received 18 January 2014
Received in revised form
13 March 2015
Accepted 23 April 2015

Keywords:
Co-benefits
CO_2 emission
Bicycling
Developing cities

ABSTRACT

The co-benefits approach is a concept that aims to align the climate change issue with the local development goals. The premise of this approach is that the mainstreaming of the climate mitigation issue within the local level polices will result in various local environmental and non-environmental co-benefits in addition to a reduction of GHG emissions. The implementation of the co-benefits approach aims to strengthen the policy making process, which is identified as being especially important in context of developing cities. This paper attempts to confirm this by analyzing a planning process of and global and local benefits generated by an innovative project related to provision of bicycle parking. The paper firstly overviews recent co-benefits literature related to urban transport in general and active travel in particular, as well as evaluated benefits related to bicycle infrastructure provision. Then, taking the case of the Serbian city of Novi Sad, this paper examines local drivers behind the bicycle project implementation, the reduction of CO_2 emission generated by the increase of cycle commuters, the project impact on individual commute behavior as well as potential for income generation. The results support arguments towards relevance of implementation of the co-benefits approach within processes of cycling planning and popularization, particularly highlighting the role and possibilities for implementation of co-benefits projects related to bicycle parking facilities. This case study is relevant as it identifies and analyses a real-life action to respond to both, global and local sustainability challenges, but also, as it points to an action at the city level that has potential for diffusing desirable changes into wider society.

Contents

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http://dx.doi.org/10.1016/j.rser.2015.04.100
1364-0321/

1. Introduction

As the largest end-use consumer of energy, the transport sector is one of the main anthropogenic sources of CO_2 emissions in the atmosphere. The most problematic area of this sector is urban transport. Besides the threat of climate change, a huge consumption of fossil fuels for daily transportation in urban areas brings many negative social consequences and harms local environment. As such, decisions related to local transport development are crucial for quality of urban residents' life and local and global environment. This is especially true for cities of developing countries, which face multiple local development and sustainability challenges [1–3]. In respect to transportation, there are challenges related to the needs for new infrastructure, organization of transport system, as well as decrease of local environment quality [4–7]. On the other hand, looking through global perspective, cities in developing countries are increasing significantly the emission of greenhouse gases (GHGs) due to their rapid growth, urbanization and growing motorization [8–11]. Therefore, in order to effectively respond to climate change on the global level, it is becoming clear that not just cities of developed countries have to mitigate their impacts on climate, but the cities in developing countries as well [8].

However, the stabilization of GHG concentration in the atmosphere today is an official policy task of industrialized countries, while developing countries do not have yet international obligations to reduce their GHG emissions due to consideration of global justice and equity issues [12,13]. Also, since global sustainability goals are very often in conflict with local development goals (such as urbanization and economic growth), local policies related only to reduction of GHG emission are usually jeopardized by low level of political commitment and low level of policy effectiveness [8]. Here, the co-benefits approach has emerged as a new concept that aims to address these challenges [14]. This approach intends to align the climate change issue with the local development goals [8]. It supports growing recognition that policies established at international and national levels, specifically those concerned with GHG emission, need to be implemented at the local level in order to succeed [15–17]. The premise of the co-benefits approach is that the mainstreaming of the climate mitigation issue within the local level polices will result in various local environmental and non-environmental co-benefits in addition to reduction of GHG emissions.

In line with this, it is widely recognized that transport policies and interventions, especially those that entail increased cycling can reduce both global and local (non)environmental burdens [18]. Indeed, encouraging cycle commuting has been seen as a promising urban mobility policy that simultaneously addresses global climate change issues and different local environmental and non-environmental impacts [19–23]. Besides reduction in CO_2 emission, benefits of cycling development and popularization at the local level could be linked with some of the following issues: reduction of local traffic problems (congestions, lack of parking, road safety), health improvement (more active commuting pattern), improvement of air quality, and affordable accessibility [24–31]. However, in the context of developing cities, there is often a challenge in relation to local drivers for cycling policies and projects due to low level of acknowledgment of many benefits of bicycle commuting by decision makers and planners. Namely, in those cities, economic development and rising income imperatives are mostly followed by rapid motorization and monopolized provision of infrastructure for motor vehicles, while cycling is usually being marginalized, what is especially true for many of Chinese and Indian cities [32]. Looking at individual level, cycling is usually in opposition to representation of one's accomplishment in life or other individual perspectives, what represents very serious obstacle as well [33,34]. Therefore, for a widespread popularization of cycling and its inclusion in a local transport planning, it is necessary that policy makers acknowledge both local and global benefits of cycling, but also that they address issues related to attitudes towards cycling. Here, implementation of the co-benefits approach in the planning process can be crucial in achieving significant results, as it aligns specific local benefits with reduction of GHG emission. But to do so, it is necessary to understand how specific local policies and goals could be related to cycling developments and thus to climate polices, as well as what are the effects of particular investments related to sustainable mobility promotion and how to evaluate them.

This paper attempts to address these gaps by analyzing the planning process of an innovative local project related to the provision of bicycle parking, as well as evaluating its generated global and local benefits and the project's impact on individual commute behavior in the City of Novi Sad, Serbia. In addition, potential for income generation is shortly evaluated as well.

The paper firstly overviews recent co-benefits literature related to urban transport in general and active travel in particular, as well as evaluated benefits related to particular elements of bicycle infrastructure provision. Although the central point is cycling, the overview of the co-benefits literature also comprises walking, public transport and urban transport for two reasons. Firstly, many existing studies on co-benefits do not address cycling explicitly but rather as part of broader active travel or urban transport agendas. Secondly, this paper aims to contribute to the wider body of literature related to urban transport and climate (mitigation) policies, since systematic reviews on the recent co-benefits literature related to active (urban) transport is rather scarce.

2. Literature overview

2.1. Recent contributions to the co-benefits literature in the transport sector

Research on the co-benefits generally aims to inform the policy making process of climate mitigation related projects and actions. They mirror a rising interest in the links between climate and various local policies and goals, and examine how they could be