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Ways to Increase Population Mobility through the Transition to Sustainable Transport

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Abstract

Ways to increase sustainability of the city transport system and, particularly, measures to promote safe public transport and non-motorized means of transport are considered in the article. Analysis of the existing positive experience shows that complex decisions for a sustainable development of the urban transport system are necessary. Technical and organizational ways to increase sustainability and safety of the transport system are studied. The results of solution for separate tasks, which are aimed to meet the goal, are presented: they include definition of transport preferences for the citizens of Naberezhnye Chelny and a model of an adaptive smart-bicycle. It is shown that the reasonable combination of public transport and non-motorized transport systems for strategic and operational management will help to enhance efficiency and safety of transport system.

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Keywords: sustainable mobility, public transport, last mile, control system, smart-bike, sensors, controllers

1. Introduction

Demographers predict that by 2050 there are going to be 2.5 billion more people, which will live in urban areas. Transport plays a crucial role in the urban development, because it provides an access for people to different activities including education, markets, employment, recreation, health care and other key services. Overall demand

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for both passenger and freight transport is growing rapidly, and it is expected to double roughly between 2005 and 2050. The global vehicle fleet is set to multiply three- or four-fold in the next few decades: the most growth of this set will occur in developing countries. There is a growing consensus on the need for more sustainable patterns of transport activities [12].

The development of sustainable transport systems is one of the Global Goals for Sustainable Development and is the priority working area of the Pan-European Program on Transport, Environment and Health (the PEP), which is focused on safe, efficient, accessible, affordable, inclusive, green and healthy mobility and transport. In the Paris Declaration in addition to the four priorities of the PEP, the new primary goal was adopted. This goal is to integrate transport, health and environmental objectives into urban and spatial planning policies by developing capacities and frameworks for integrated urban and spatial planning in order to reduce the impact of transport on health, environment and land use, to increase energy efficiency and to support green and healthy mobility and transport as well as sustainable livelihoods [14]. Mobility and transport remain a real challenge for sustainable urban development. Traditional models of city development can lock us into congestion, sprawl, and inefficient resource use. However, compact, connected and efficient growth can help to ensure more competitive cities as well as to provide a better quality of life for citizens. The planning of urban and peri-urban centers according to mixed-use and smart growth design principles must be a part of sustainable transport future. Urban development along these principles will serve to lower dependence on personal vehicles and support in the increased use of public transport systems and non-motorized transport for short distances and daily commutes [13]. Meanwhile, transport flows within cities are becoming ever more challenging to predict and to manage. Some cities have already begun to integrate smart technologies into their transport infrastructure.

2. The main directions to improve the urban transport system

2.1. Strategies to increase sustainability of urban mobility

Sustainable cities cannot exist without sustainable mobility. Apart from the shift to renewable energy sources, we should not forget about the shift towards more sustainable modes of transport like public and non-motorized transport. It plays an indispensable role to make the cities livable and less polluted. Current urban mobility patterns are also having considerable negative impacts on air quality, noise pollution, safety and usage of public space. Therefore, sustainable urban mobility plans and transport strategies aim to reduce these impact, by shifting to environmentally friendly modes of transport such as walking, cycling and car sharing, by increasing the share of public transport and clean vehicles, and by using the state-of-art technology for the remaining individual motorized transport. Realization of such strategies requires long-term planning, continuous implementation and consistency in policies, regulations and communication. An integrated approach is essential, bearing in mind the effect, which traffic and transport infrastructure have on the natural environment, health, social equality and economic development. In the ideal case scenario, urban mobility should be inclusive, safe, resilient and sustainable: (1) inclusive cities enable citizens to access freely to any opportunity in the city regardless of their social characteristics or economic means; (2) dense cities can promote walkability and non-motorised means of transport like bicycle, but only under the condition that the city network include safe and high-quality streets [1]: for example, priority for pedestrian, cyclist, and emergency vehicle traffic increases safety for the most vulnerable on the streets; (3) resilience is the ability for cities to adapt and respond to changes in and stresses on social, economic, and environmental systems: for example, higher flows of people moving through the city can improve the economic viability for businesses and public transit services; (4) environmentally friendly transport, together with inclusive, safe, and resilient planning creates sustainable mobility. This entails mixed transport options, which optimize space, minimizing the energy needed to fuel mobility and reducing time and resources needed to move about the city.

Considering the fact, that the world community has set an objective to reduce the levels of greenhouse gases (first of all carbon dioxide) by 50% by 2050 [12], bicycles get an additional advantage, as they do not produce CO_2 emissions. Furthermore, cycling makes efficient use of roadway capacity, reduces congestion as well as has direct health benefits [2]. Thus, cycling is a low-polluting and a low-cost transportation alternative and can be an important means for getting to destinations, which are not serviced by transit [3]. But at the same time, it has a number of