

# Smart-Bike as One of the Ways to Ensure Sustainable Mobility in Smart Cities

Irina Makarova<sup>1</sup>, Ksenia Shubenkova<sup>1(✉)</sup>, Anton Pashkevich<sup>2</sup>, and Aleksey Boyko<sup>1</sup>

<sup>1</sup> “Service of Transport Systems” Department, Kazan Federal University,  
Syuyumbike prosp., 10a, 423812 Naberezhnye Chelny, Russian Federation  
kamIVM@mail.ru, ksenia.shubenkova@gmail.com,  
boykoaleksey94@gmail.com

<sup>2</sup> Chair of Logistics and Transport, Tallinn University of Technology,  
Ehitajate tee, 5, Tallinn, Estonia  
anton.pashkevich@gmail.com

**Abstract.** Ensuring sustainable urban mobility is based on the rational management of transportation system. This involves the infrastructure development and design of vehicles equipped with intelligent modules, which provide the control ability. The widespread use of environmentally friendly bicycles is constrained by a number of reasons. One of them is the absence of models designed for physically untrained people. This paper proposes the concept of the smart-bike control system, which was developed to help cyclist in the situations, when the values of his/her physical condition as well as parameters of environment are critical. Prototypes of the proposed system were tested in the laboratory environment.

**Keywords:** Sustainable mobility · Control system · Smart-bike · Sensors · Controllers

## 1 Introduction

The global trend of urbanization and population growth, which puts ever increasing pressure on the world’s urban area, requires from the cities to develop a sustainable way of living. This sustainability is developed through environmental sustainable solutions combined with a full use of the possibilities, which are given by the digitalization of the society. This means enabling the technology to gather data, which can be used by the technology itself in order to adapt to the most sustainable and smart behaviour. Enabling the technology to communicate, to share the gathered data with people or other technologies, to borrow relevant data from elsewhere and to make the technology multi-functional - all of this provides solutions not only to one, but to multiple problems [1].

The Smart City concept can be defined as a model of the city development, which creates a surplus of resources through the use of information and communication technologies combined with sustainable and environmentally friendly multiple solutions. It emphasizes the need to improve the level of mobility and connectedness through collaboration and open source knowledge on all levels of the society [2].