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## Modern Approach of Street Space Design

Evgeniya Prelovskaya <sup>a</sup>, Alexey Levashev <sup>b\*</sup>

*Irkutsk National Research Technical University, 83 Lermontova str., Irkutsk, 664049, Russia*

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### Abstract

The article, according to the concept of urban sustainable development, proposes street classes that are absent in the Russian standards: urban boulevards, transit friendly streets and the so-called shared space. The results of the comparative analysis of road network classification systems in different countries are given, on the basis of which we have proposed a list of criteria that make a basis of road network classification; the peculiarities of the design of the proposed street classes are discovered. Using the example of the central part of Irkutsk, we conducted an audit of street space. In view of the proposed streets classes, we proposed measures to reform the road network of the study area. In the new network we estimated the traffic demand and the redistribution of traffic flows. The simulation results show a significant decrease in inter-regional transit flows of individual transport in the central part of the city.

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*Keywords:* Sustainable development, sustainable transport, balanced street and road network, multimodal streets, balance of interests of all users of street space

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### 1. Main text

The current "City Planning" Code does not fully cover the controversial issues of road network design standards in towns, when street space should at the same time meet high criteria in terms of a movement function (service transit flows and access to the site), and in terms of "place" function (comfortable public space for people). This situation is most common in the streets, rich in a variety of attractions and serving major transport and pedestrian flows of more

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\* Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000 .

E-mail address: [jessprelove@gmail.com](mailto:jessprelove@gmail.com) <sup>a</sup>, [alexey.levashev@tl-istu.com](mailto:alexey.levashev@tl-istu.com) <sup>b\*</sup>

than 1,400 vehicles/h and 1,500 pedestrians/h respectively. According to current Russian standards high design speeds (80 km/h or more) shall be provided at a given intensity of vehicular traffic, including road interchanges at different levels [Ministry of Regional Development RF (2011)]. In the context of the current level of development of Russian cities, the given design guidelines do not meet the objectives of increased comfort, safety of users and attractiveness of the urban environment [Mikhailov (2004), Marshall (2002)].

For a more detailed study of classification of the road network systems we conducted a comparative analysis of the "City Planning" Code and the leading international guidelines for planning and design of urban streets of cities in North America, the UK, Austria and Germany, the United Arab Emirates [Abu Dhabi Urban Planning Council (2011), Chicago Department of Transportation (2013), Marshall (2002), NACTO (2016), Roads Task Force (2013)]. Each of the above classification systems has a relationship with the traditional functional classification "mobility-access" supplemented with classes from the pedestrian-oriented and bicycle-oriented streets to the multi-modal street space in accordance with the concept of new urbanism. Three classes of streets that are not found in the Russian legal framework for the design of street space are of particular interest, while in the foreign practice of urban transport planning they are widely used: urban boulevards, transit friendly streets and shared space.

Modern urban boulevards are the streets serving major traffic flows, but with a low permitted speed. In contrast to urban roads, a boulevard is integrated into the urban environment, and is designed for heavy traffic of all users of street space, saturated with diverse objects of attraction of population, including business offices, trade areas, recreation and leisure activity areas. Street trees, wide sidewalks, landscaped median, and the separation of road users through spatial zoning are all integral components of the boulevard.

Transit friendly streets provide high quality pedestrian communication services in relation to the high-capacity public transport. Low noise and high activity of pedestrians are the key dominants, and cycling is also provided. Homogeneous paving unifies the street with the square and points to its highest level as a public space, where pedestrians are prioritized. The use of the gardening coverage as the zoning of street space between public transport and other users is widespread.

Shared space characterizes a new approach to the street space design, which aims to minimize the distinction between the movement of vehicles, cyclists and pedestrians using the exception of attributes inherent in road traffic: curbs, isolated walkways, markings, traffic lights, traffic signs and pedestrian crossings. The uniform paved space becomes a public place of harmonious interaction of all road users. Thus, all design elements are intended to reduce the distinction between flows of motorized and non-motorized means of transport.

Design and architectural solutions of urban boulevards, transit friendly streets and shared space should emphasize the priority of functions of the street as a place over its transport functions, which will influence the behavior of drivers and reduce speed, providing a balance of interests of all users of street space. Characteristics of the design of these street classes are summarized in Table 1.

The results of the Russian experts in the field of transport planning indicate a low level of service of street space users and the quality of urban environment [Bakhirev et al. (2015), Levashev (2013), Levashev et al. (2013)]. In this context, it is proposed to upgrade the existing classification of urban streets, adding to it such categories as urban boulevard, shared space, transit friendly streets. Introduction of these categories to the Russian classification system will take into account the following items of the modern approach to the urban transport service: street classification takes into account the function of "place" of street space in an urban environment, a hierarchy of streets is linked with sustainable ways of transportation.

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