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Functional Structuring of Road Networks

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Abstract

Transport network planning determines the form of transport networks and the characteristics of the network elements. A common concept in road network planning is the structuring of roads depending on the function of the road. In network planning transport planners therefore determine the form of a network not only by adding new network elements but mainly by assigning a function to a road which then influences the road design. The paper presents an approach for a functional structuring of road networks as it is described in the German Guideline for Integrated Network Planning. It describes the general methodology of the approach and shows some examples applying the methodology.

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Keywords: Road network planning; road categories; service quality in networks

1. Introduction

Transport networks connect places and serve built-up areas. Transport network planning determines the form of transport networks and the characteristics of the network elements. Examples of such characteristics are alignment, speed, number of lanes and the control type at intersections. Transport networks are rarely developed from scratch. Typically transport planners extend an existing network or modify the characteristics of an existing network element or an entire network section.

A common concept in road network planning is the structuring of roads depending on the function of the road. Roads with a high share of through traffic connecting distant or important places have a different function than urban main roads or urban access roads. This leads to function-specific network densities and design characteristics. In network planning transport planners therefore determine the form of a network not only by adding new network elements but mainly by assigning a function to a road which then influences the road design. Fig. 1 shows two examples of a network design problem, where the building or upgrading of a network section may depend on the location of places C and the spatial dimension x of the network. An additional or upgraded direct diagonal high level

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road link in the left example network may not be appropriate for a network where x is small, but it can be reasonable for a network with a large x. The road characteristics of the dotted links in the right example network should likewise depend on the distance x from the high level roads and the location of the places C1 and C2. Only if C1 and C2 are located far-off the high level roads (as it is the case with C1´´ and C2´´) the dotted road should be considered for an upgrade.

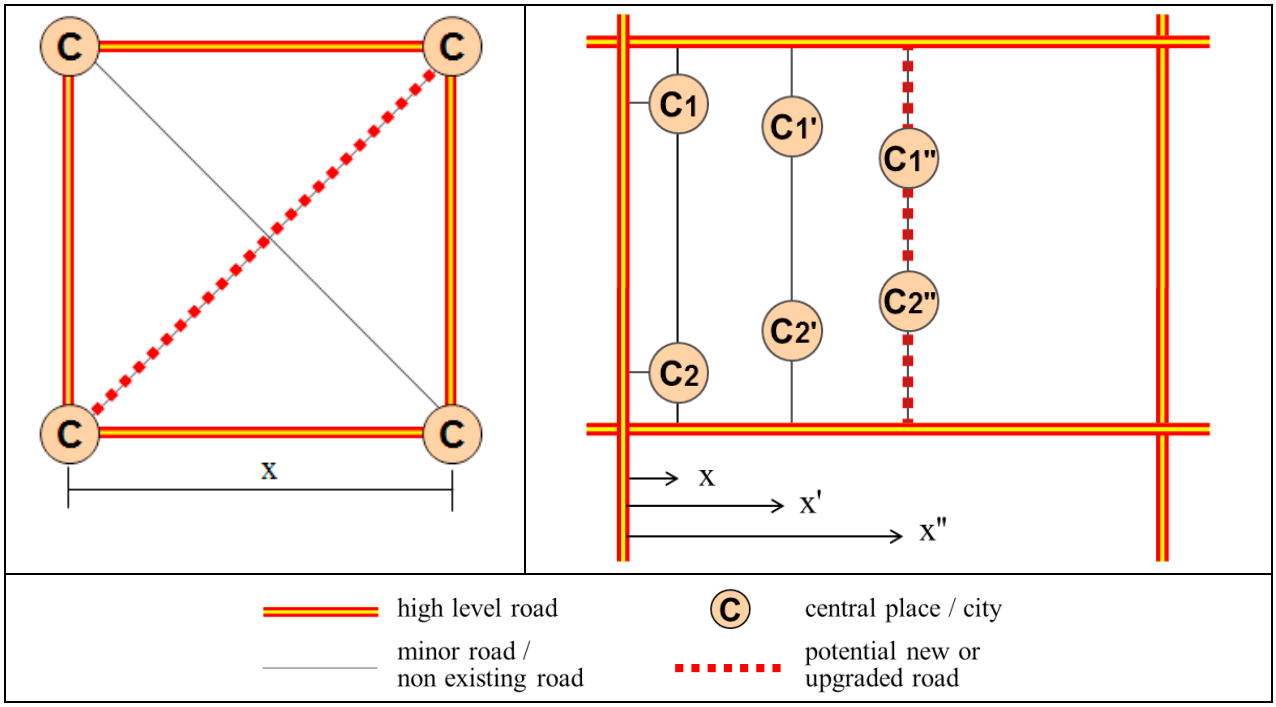

Fig. 1. A network design problem: When is it appropriate to build a new road section or upgrade an existing road section?

The intention of this paper is to present an approach for a functional structuring of road networks, as it is described in the German Guideline for Integrated Network Planning RIN (RIN, 2008). The approach is common practice in Germany and constitutes an integral part of the network planning process for motorways, rural and urban roads (Fig. 2). The RIN determine road categories by structuring a road network. Road categories then define specific requirements for the road design which serve as input for subsequent guidelines for the design of motorways RAA (2008), rural roads RAL (2012) and urban roads RASt (2006). After determining the network form and the road characteristics the Highway Capacity Manual HBS (2015) evaluates the level of service (LOS) of the road elements. Since the RIN is not (yet) published in English the first part of the paper describes the general methodology of the RIN approach. The second part of the paper shows a simple example employing the methodology and names some areas of application. The RIN addresses not only networks for motorized road transport but also includes public transport and non-motorized modes. The paper, however, will focus on road networks for motorized vehicles.