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## **Summary of the thesis "opportunities for efficient integration of rural areas in public transport"**

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The aim of this thesis is to explore the possibilities for traffic-related development of rural areas in the public transport systematically. The results will be tested in a case study.

For this purpose the author begins with showing the particular challenge of traffic passed in rural areas. He explains what is meant in general under the rural area and illustrates the task of public transport within the public services. So the rural area forms a regional planning function, but does not have a uniform definition. Rural areas are important, because here are living 67.5% of all Germans. They are characterized by a higher proportion of passenger car and an older age structure than in big cities. The public services will also allow these people a connection to public transport. The planning needs to be sustainable and efficient. The three pillars of sustainability form from the economic, ecological and social development. All three pillars are considered in more detail. The economic pillar is considered first with the operational and economic efficiency. The balance between supply and demand is just as important as the achievement of an optimum system. In addition to the internal costs the external costs are not negligible. The external costs often form a part of the environmental pillar. The external costs are including for example land use. This changes dramatically when people move to cities. Reasons for a change in traffic volume are primarily demographic change, urbanization and suburbanization. In rural areas these effects lead to a reduction in traffic. In these effects the planning authorities must react are particularly now, because of the up-to-dateness.

What the opportunities for the integration of rural areas in local public transport are is described in the second section. Here, the presented integration possibilities are ordered to a better structure by technology, function and organization. This thesis is based on the thesis of Josef Becker from 1999. The then presented opportunities are taken and added to the present-day level of development. It has become apparent that the number of the flexible operating forms is increasing. Also the form of a request stop is bulging. One reason for that are the reforms in the market for public rail transport in Germany. The request stops in south Germany are for the first time presented in a map. Hence there is a good overview and everyone can see if this form is useable in rural areas. Furthermore now in the thesis are opportunities also presented that were technically not possible in 1999. The development and establishment of smart phones with the applications (Apps) have made a significant contribution to the digitization of the transport sector. Without them there would be no flexible public transport and resource-efficient, spontaneous journeys. The presented options are clearly

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displayed in a table. Each column corresponds to a function in the local connection. These functions have been ordered. So far left are all public operation forms with the line operation and the flexible operating forms. In the middle of the table are two hybrids. And on the right are every individual types of operation with the resource-saving, individual and autonomous operation form. Because of the illustrating in a table, it was possible to find out some common factors in planning. So there is an increase of the three factors

- Size of transport vessel
- Company size
- Professionalism

when simultaneously a decrease of three factors

- Personal responsibility
- Individuality
- develop density

takes place. If all these factors are weighted with equal proportions, the system in the middle is the means of choice, which is known under "Mobilfalt" and "Garantiert Mobil". These two pilot projects are being tested just in North Hessa and the Odenwald and enjoy a lot of attention in the industry.

In order to finance public transport, there are different concepts. At state funding, the user financing and third-user financing there is always a demand for the most economic means of transport. Therefore, the need-for-transport-traffic is compared with the conventional liner services. There are 13 concepts for state funding of public transport company. The majority of state funding comes from the subsidies for the transport of pupils. Pupils will be created in the public services a special place, because they cannot move him individually over long distances. For user financing, there are currently more projects than for third user financing. So expensive fares are being tested and simultaneously equalized transportation comfort. Since not all transport in rural areas are profitable, there are also other approaches to avoid the traffic. With the slogan "service mobility" the services comes to the buyers who otherwise will generate the traffic. Vehicles must be used where they are profitable. However, this requires some passengers to change. For this reason, the inter- and multi-modality of transport is being researched. It examines the connectivity of the previously presented operating forms to all other types of operation. In this study 5 variants for the case study will be developed with a good connect ability to the next transport. The case study is treated in the third section. Prior to the second section is completed with a graph that compares all operational supplier curves with three groups for demand.

For the case study the district "Niederwetter" of Wetter (Hessia) at Marburg was chosen. For this purpose, the transport planning process of FGSV is applied. In the pre-orientation it is determined for example that there already runs a railroad without stopping by the place. Beyond the author takes a look on the existing planning maps. Within the problem analysis the state is analyzed using a

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written household survey. The results run in defects and opportunities that will be considered in the development of the target system arise. There are, for example, high proportions in the car availability and there is a feel of about 80% bound to poor public transport. The target system consists of the top priorities "general criteria", "user-oriented criteria" and "operator-oriented criteria", from which the overall goals and objectives are developed.

As mentioned above the Variants will now be developed which exhibit good modality of two transports. Variant 1 provides a request stop of the regional train. The service as a feeder comes from the buses and call-taxis. Variant 2 takes up the recent developments of digitization and provides the lift in combination with a station linked car sharing system contributing to the individualization of transport. The variant 3 will maintain the regional train stopping in the core district of Wetter and used from there a flexible operating form in the surface operation. In variant 4 an express bus with the individual movement is combined with bicycles. Version 5 is changeless. For the evaluation of the formalized methods of cost-benefit analysis is selected. With the result of the cost-benefit analysis and a further consideration, the Version 1 has been found to be the best variant. The author tested, if the stop in Niederwetter can be added into the existing schedule. The assessment in the thesis by Josef Becker has also spoken for a request stop. The Variant 1 is very good at the points "comfortable driving characteristics" and "clear passenger information" in the assessment of this thesis. These points are particularly important, because tourists see an opportunity for vacation in rural areas.

In summary, it can be stated that there is a lot to do for the integration of rural areas in the public transport. Even though there are more and more experimental projects. The research is neither at the end. Using the example of the mobile Internet it can be determined the following: An infrastructure can be just as good off or degraded as long all the other infrastructures are going with. Every call-bus needs a good internet connection to navigate. In the future the planning needs to go with the humans and decide that it all has to be in the right regional policy concept. The worked out target system can be used in other rural areas for the planning.