Rural and Forest Roads – Logistics Platform for Rural Transport Services

Ruralne i šumske ceste – logistička platforma za ruralne prijevozne usluge

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Summary

This paper focuses on the historical development of rural and forest roads as part of the process of making rural areas serviceable. On the basis of a selected location of interest, the development of the rural transport, supply and service system (logistics service system – LSS) is illustrated within the context of the relevant production, economic and social potential of the area.

KEY WORDS
rural areas, roads, transport, logistics service system

Sažetak

Ovaj članak se usredotočuje na povijesni razvoj ruralnih I šumskih puteva kao dijela procesa prilagodbe ruralnih područla iskoristivima. Na temelju odabrane lokacije interesa, razvoj ruralnog prijevoza, opskrba I sustav usluge (sustav usluge logistike) oslikava se unutar konteksta relevantne proizvodne, ekonomskog I socijalnog potencijala regije.

KLJUČNE RIJEČI
ruralni prostori, ceste, prijevoz, sustav logističke usluge

1. INTRODUCTION

Rural areas in Europe represent more than 70% of Europe´s territory. This reflects the long-term development of natural and socioeconomic factors affecting rural settlements, be it either positively or negatively. As human society evolved, there was a growing need to secure enough food, products, services and other supplies for the population. As a result, efforts grew to interconnect road networks and settlements. With the changing attitudes to the landscape and settlements, the LSS gradually chžanged and transformed as well. Due to non-conceptual, short-sighted and often politically influenced decisions in the mid-20th century, the development of small scale manufacturing and of the rural and forest road network were often suspended, cancelled or abandoned. A key turning point came at the end of the 20th century when the importance of the rural LSS was rediscovered. This trend has continued into the 21st century.

2. LITERATURE REVIEW

a) Roads as the main line of communication in the past

Roads have, second only to the natural surroundings to which they are closely connected, always been the main prerequisite for organising human habitats i.e. settlements and the landscape. The existence of roads influences people´s historical awareness and their relationship with the landscape [1]. Semotanová [2] states that the construction of roads dates back to the moment when people started to explore the places where they lived and ventured further out into unknown territory and environments. Gallo [3] and Němčenko [4] state that the first records of road construction can be found in ancient Rome, where considerable attention was given to the construction of agricultural roads because the network of agricultural roads was the framework for further technical work to be carried out within the landscape.

The existence of the road network in the Czech Republic dates back to 1725. During the reign of Charles IV, a Road Reparation Commission was established to manage and organize road works. The State assumed all the tasks and responsibilities relating to the construction and maintenance of roads and laid the foundations for their organization [5]. In 1781, the Road Directorate was established in Prague. By the end of 1848, 4172 km of main public roads had been constructed, which connected Prague with the capital cities of neighbouring countries [6]. In the second half of the 19th century, the road network was extended with the construction of district roads. From the mid-1960s onwards, the construction of main public roads was followed by the construction of local roads. Local roads were built with a lower budget than the main public roads due to the limited availability of financial resources. Lots of municipal and agricultural roads were just converted into local roads [2].

b) Rural and forest roads after 2000; their importance for transport

Rural and forest roads that have been realigned or constructed in the 21st century perform many various functions. They provide access to and connections between settlements, manufactures, forest and agricultural production systems and plots of lands. They also increase the attractiveness of a location as a tourist destinations and lead to improvements in ecological stability. All of these functions combined form the logistics communications network. Despite the multifunctional character of road networks, the subsystem in its entirety, as well as the individual roads, must be viewed as a technical element within a landscape. It must therefore sensitively promote the main function, which is a purpose-built road. Rural roads are publicly accessible and therefore have a municipal character [7]. Dumbrovský [8] states that a road network must ensure the connection between neighbouring municipalities, provide access to fields, enable the connection between neighbouring farms and facilitate transport between farms and outlets.

Váchal, Mazín, Dumbrovský [9] classify the transport functions of private and local roads as follows:

- Local – high number of users, multifunctional local function;
- Forestry – provides access to a forest complex;
- Recreation – provides access to cottage complexes, cycle paths, etc.;
- Agriculture – provides access to agricultural land;
- others.

c) Defining the logistics service system (LSS)

Today, we speak of roads in the same way, Motejl et al. [10] describe them, that is to say all transport roads designed for vehicle and pedestrian use. They arise from provable, long-term use.

Roads are classified into the following categories (According to Act No.13/1997 Coll.):

a) motorways;
b) main roads;
c) local roads;
d) private roads.

3. MATERIAL AND METHODS

The location of interest is the Municipality of Borkovice. Borkovice is 5 km northwest of Veselí nad Lužnicí, and about 25 km from the centre of South Bohemia, České Budějovice (Czech Republic). It is a relatively flat, gently undulating, area with a minimal change in altitude (approx. 420 m above sea level). The characteristics of the area naturally influences the road networks and increases the technical complexity of the construction of individual roads. Industry typical for the area includes intensive farming, production of building materials, plant nurseries, extraction of peat and tourism. Due to the intersection of first and second class roads in the direction of Austria and Germany, there are also small businesses (fruit, vegetable, crafts).

d) LSS assessment procedure

To assess the LSS, a retrospective analysis was carried out. On the basis of the examination of all the available materials, the evolution of the logistics service system during the individual historical periods was assessed on the following criteria:

- area of FL (ha);
- area of FL not accessible from public access roads including the share of AL and PGL(ha);
- number of plots of land + average size within the municipality;
- total length of roads – classified into main roads, local roads, MAR, SAR, AAR, and forest roads;
- number of roads in the area.

The years for which the road networks were displayed was also determined on the basis of the materials used. The years were (in chronological order) 1829 – 1892 (or 1886 and 1905) – 1952 – 1975 – 2012.

The assessment was the basis for:

- comparing the LSS spatial arrangement in hierarchical order for the individual periods with regards to the suggested criteria;
- identifying the period with the largest changes to the LSS structure;
- determining the operators´ requirements for the individual periods;
- analysing the consequences of the changes over a time horizon.

All the operations carried out on the relevant map data were assessed in ArcGIS system.

The LSS was completed with the addition of unclassified local roads and second and third class roads which connect to first class roads (connection to the motorway currently being built between České Budějovice and Prague).

4. RESULTS AND DISCUSSION

4.1. LSS until 1829

This period does not mark the creation of all the road links, but rather the continuing development of both agricultural roads and unclassified local roads. These roads exist to this day but in a slightly altered form. Figure 1 shows the road network and inaccessible plots of land as the situation was in 1829.

The three basic classes of roads formed significant links to surrounding municipalities. They ensured transport from the adjacent secondary agricultural roads, however their formation was rather haphazard, more often than not arising as a consequence of farming industry development.

The total length of the agricultural roads and unclassified local roads giving access to plots of land was 24,109 m. This is equivalent to 29.71 m/ha. However, when looking at the share of inaccessible plots of land, this rises to 40 m/ha. Despite the fact that the area is rather flat, the road network of this period is a more radial system, which is rare, and which is more suited to hilly areas. This fact contributed to the limited accessibility to plots of land.

4.2. The development of agricultural roads until 1892

As Figure 2 shows, in the past 60 years there were only minimal changes to the formation of the LSS. In terms of the local roads, the route north-east of the village was straightened during this period and the length shortened by 200 m. The main agricultural roads were preserved with only a directional change in the north-east part, which enabled access to the adjacent plots of land. The length of secondary agricultural roads grew by 1600 m. The poor condition of the individual roads definitely contributed to the lack of accessibility to plots of land.

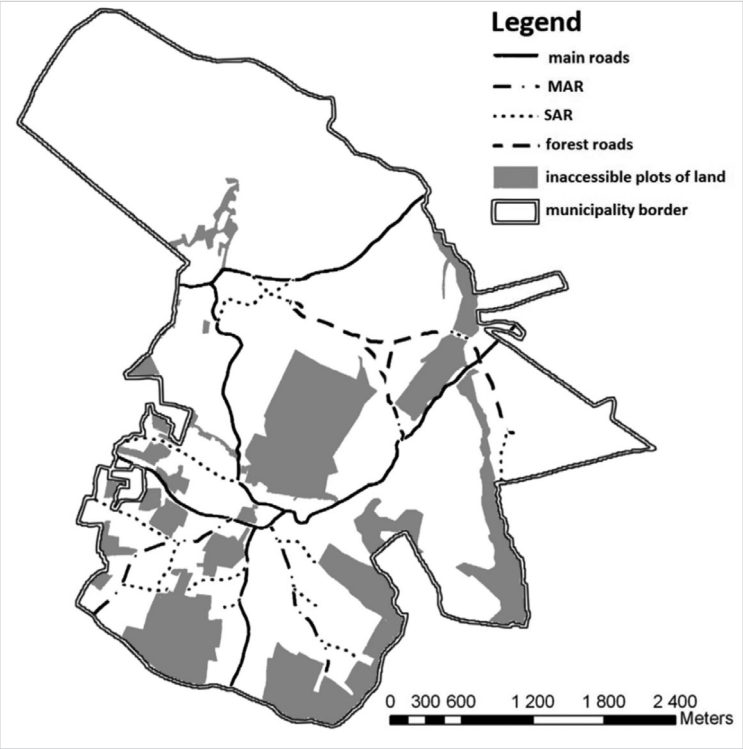


Figure 1 Road network and accessibility to plots of land in 1829

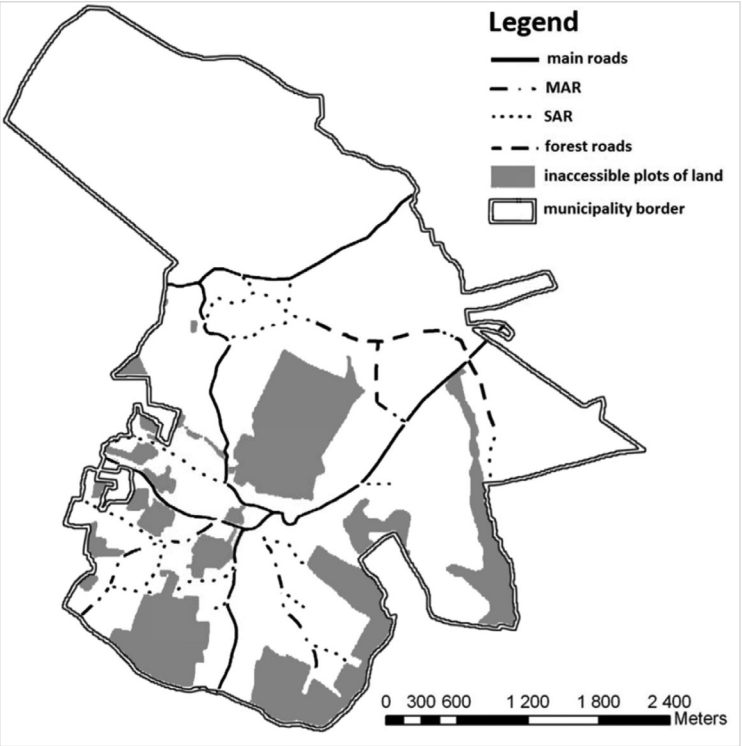


Figure 2 Road network and accessibility to plots of land in 1892

4.3. The development of agricultural roads until 1952

During this period there were serious shortcomings in the structure of land tenure. The consequences of the unsatisfactory/unsuitable structure were mostly felt in farming. However, during World War II no measures governing property rights or the structure of the agricultural road network were taken. The post-war situation called for the recovery of all the processes relating to the restoration of the Czech state, including the process of agricultural production. By 1952 the amount of land dedicated to farming in the northern part of the territory had declined and had made way for the expansion of forestry. In spite of this, the total area of the road network increased by more than 30% in comparison to the previous 60 years. This significant increase was due to the construction of a road network intended for small-scale production (see Figure 3, SAR) in the southern part of the location of interest, which made all the plots of land in this municipality accessible. These roads created a

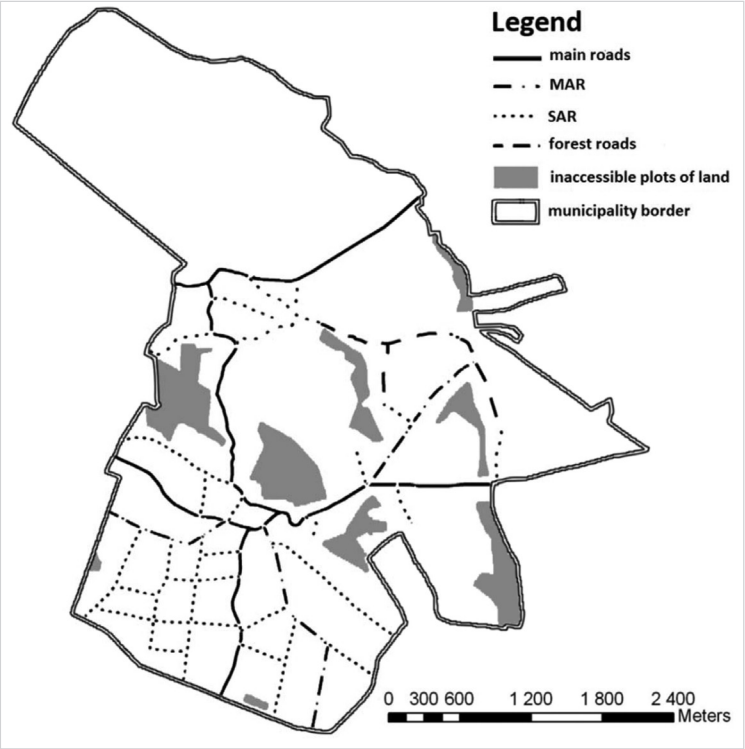


Figure 3 Road network and accessibility to plots of land in 1952

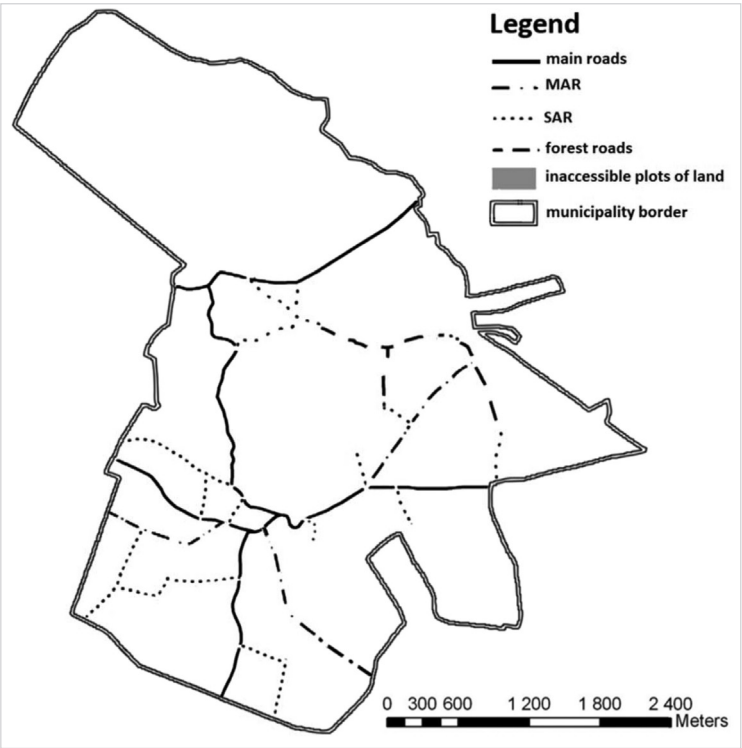


Figure 4 Road network and accessibility to plots of land in 1975

radial road network, which enabled the creation of accessible plots of land with regular geometric shapes.

It follows from the above, that by 1952 the amount of inaccessible land had significantly decreased to only 17%. The development of the road network in this period is aptly marked by the indicator of the share of roads in the landscape (44.77 m/ha).

4.4. Development of agricultural roads until 1975

The political developments in the preceding 20 years determined developments in broader society. This was also reflected in agricultural production which was supposed to become more concentrated and specialized on a national scale. There was a demand for large farms which were supposed to ensure food independence as well as provide agricultural commodities for export. Small-scale farming gradually lost its prominent position due to the confiscation of farmland and

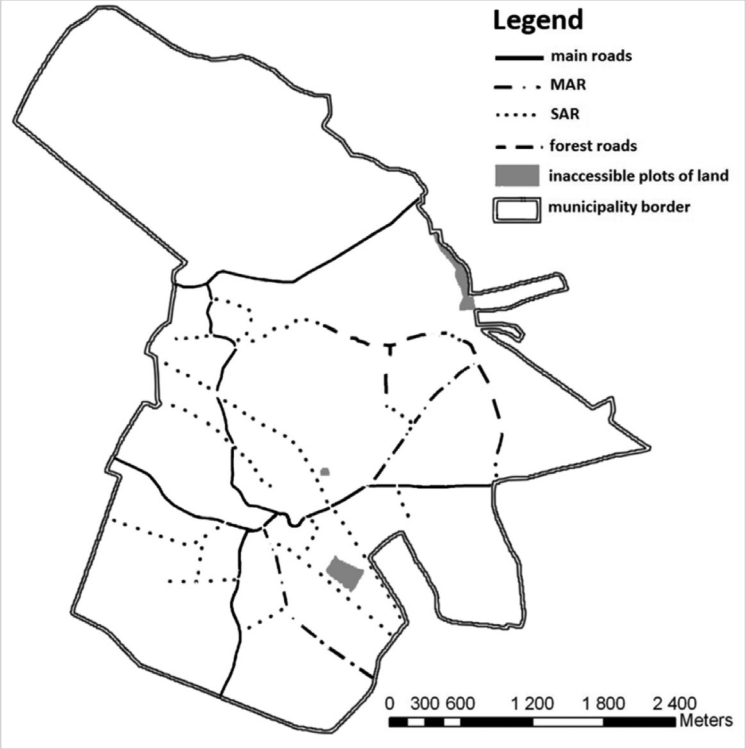


Figure 5 Road network and accessibility to plots of land in 2010

property. The road network in this period can be seen in Figure 4.

In the south-eastern part of the area, the length of MAR was reduced because a part of it had been ploughed, and the total length of SAR was reduced by half.

4.5. Development of agricultural roads up to the present day

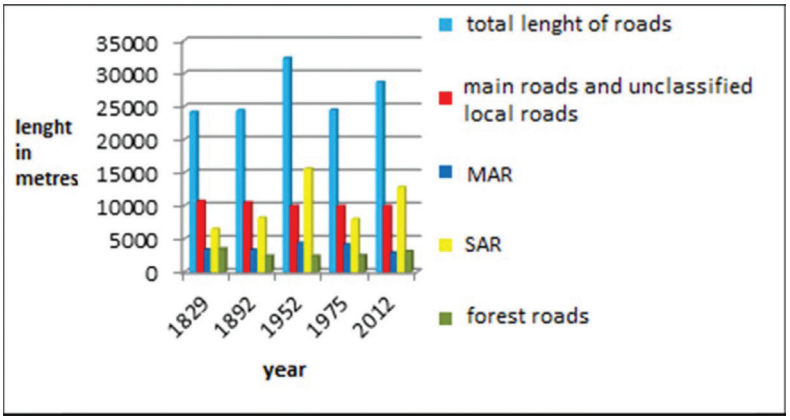
The LSS structure in the previous period did not fit the broader changes in society. The road network was also unsatisfactory from the operational technical point of view. The current road network can be seen in Figure 5.

In terms of MAR, the westernmost road lost its importance for cartage (SAR which provided access to plots of land in the south-west part of the area were cancelled – those plots became part of the land beyond the built-up area that belonged to the municipality. The road was therefore reclassified as SAR. The SAR to the north of the village grew significantly, thereby providing access to the municipal land beyond the built-up area. The length of forest roads remained almost constant with only a minor increase in length.

To give an idea of the evolution of the location of interest over time, Graph 1 was used to show the turning points in the development of the LSS. The graph shows that the length of the agricultural roads gradually grew until 1952. The growth was mainly due to the massive growth in the crafts and agricultural industries, which provided food for almost all the inhabitants of the rural areas.

5. CONCLUSION

From the results of the historical analysis of the evolution of the logistic service system in the selected location in a rural area, it can be concluded that its development is closely linked to the socio-historical developments within the country. At the same time, its development also reflects both the regional and local features of the surrounding countryside. This process is enhanced by the current state of development of settlements,



Graph 1 Length of access roads - Municipality of Borkovice

demographic developments, as well as production, economic and social factors in the particular area. A significant role is also played by the history of the area and its location, in this case its close proximity to the border area with Austria and Germany.

The LSS is likely to develop further in the near future. It can be presumed that the motorway link between České Budějovice and Prague will be finished by 2020-2030. Consequently, the first and second class road system will be strengthened and third class roads will be repaired. As a result, we can assume that this will lead to the development of other settlements, the foundation of small and medium-sized industrial establishments and the expansion of the commercial network and services for inhabitants. This will inevitably enhance the demand for the completion of the LSS in adjacent municipalities and catchment areas. There is for example a growing demand for the construction of bypasses around small villages in order to reduce pollution levels. Like with any other changes, it will be necessary to take into account the requirements of the municipalities and their citizens, whilst respecting the principles that govern the formation and preservation of the countryside.

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Explanation of abbreviations

AAR – additional agricultural road
MAR - main agricultural road
AL – arable land
PGL – permanent grassland
SAR - secondary agricultural road
FL – farmland