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ROAD INFRASTRUCTURE MANAGEMENT - THE PERSPECTIVE OF THE LOCAL ROADS AUTHORITY

Summary. This paper presents the results of research conducted among 100 local government units performing the duties of road network administrators, i.e., administrators of municipal roads (AMR), county roads (ACR) and those operating within the boundaries of cities with county rights (ACCR). The aim of the research was to identify and assess management problems related to the implementation of statutory measures related to the protection and development of respective road networks. A hypothesis was formulated about the existence of statistically significant differences between the AMR, ACR and ACCR groups, which was verified by quantitative analysis of the data obtained from the online survey. They were analysed and interpreted using the SPSS package and using measures of descriptive statistics, the correlation coefficient and the Kruskal–Wallis test by ranks. The results of the study indicate that the difficulties of providing and maintaining an efficient road network pavement, as well as the challenges of developing draft financing plans for the construction, reconstruction, and rehabilitation of the road network, are currently the main points of focus for all road administrators. The lack of statistical significance of intergroup differences was observed in the vast majority of measurements. The exceptions to this were the differences that occurred in the total number of difficulties reported, which were greater among the members of AMR and ACR than ACCR, as well as

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the differences related to the implementation of measures undertaken for the maintenance of roadside greenery, which were more onerous for ACR.

Keywords: road infrastructure, road infrastructure management, local roads authority

1. INTRODUCTION

Road infrastructure is one of the key issues of interest to local government administrators and, like other assets in a region, requires efficient and effective management [12, 18]. In a broad sense, such management should not only consist of planning, implementing, and monitoring all activities related to the maintenance and development of the road network and its engineering structures, but also of creating conditions conducive to the interactivity and efficiency of the road infrastructure, while minimising the associated costs.

Among road infrastructure administrators, a special place is occupied by local government road administrators, whose role is steadily increasing in the context of co-creating a coherent and integrated road transport system across the country [10]. As of the end of 2021, the length of the national road network was 429,815.6 km, 88.79% of which were municipal and district roads managed by local government units. The total value of the road network in cities with county rights, including bridges, tunnels, and subways, amounted to more than PLN 34 billion at the end of 2020 [20]. Due to the high level of capital invested here, including expenditures on maintenance and renewal of infrastructure, the decisions of road administrators should be directed towards the rational management of the budget allocated for this purpose. It should be borne in mind that infrastructure elements, especially linear facilities, undergo rapid obsolescence when used too intensively and lose their utility value. This, in turn, has negative consequences in the form of a lower level of road safety.

In this article, attention is focused on discussing the results of research relating to selected road infrastructure management issues. In particular, management problems occurring on the part of local government units acting as administrators of the road network, i.e., the administrators of municipal roads (AMR), county roads (ACR) and the administrators of public roads functioning within the boundaries of cities with county rights (ACCR), which combine the features and tasks of the municipality and county [19], have been taken into account. A hypothesis was formulated about the existence of statistically significant differences between them with regard to the difficulties associated with the implementation of statutory activities.

2. DEFINITION OF ROAD INFRASTRUCTURE

Within the meaning of Article 3(3) of the Act, Construction Law, elements of road infrastructure are construction objects, which are not buildings or small architectural objects. Elements of such objects include: roads with exits, which are referred to as linear facilities, as well as bridges, viaducts, flyovers, tunnels, culverts and above- and below-ground pedestrian crossings [21]. In turn, in the literature, the term is most often understood to refer to points and places used by means of transport, both when moving and at a standstill [9]. According to H. Link et al., road infrastructure consists of all its elements that are necessary for motorised traffic, including elements related to traffic safety and noise protection [15]. A similar definition, although limited to the transport of goods by road, is provided by J. Nieder, who proposes that the term should be understood as all fixed, permanently located equipment and

facilities that enable the movement of goods [16]. The road infrastructure also includes the so-called associated infrastructure elements, i.e., pavements and cycling paths, gantries and signs, lighting and traffic lights and noise barriers.

3. ROAD INFRASTRUCTURE MANAGEMENT

In a narrow sense, management is understood as the sum of activities related to the disposal of owned resources by an organisation, which are undertaken in order to achieve its objectives. For R.W. Griffin, management refers to 'a set of activities directed at an organisation's resources (human, financial, physical and informational) and performed with the intention of achieving the organisation's objectives in an efficient and effective manner' [11]. Treating management in terms of the theory of organisational equilibrium, on the other hand, one can quote the definition according to which this concept is presented as a method consisting of defining and redefining the criteria of equilibrium and the conditions for its achievement in the material and social, external and internal dimensions, and influencing the environment in such a way that equilibrium is restored and sustained [14].

Considering the object of interest of this paper, it is worth quoting the definition of A. Zofka, who defines road infrastructure management as 'coordinated activities of an organisation aiming to obtain value from assets while fulfilling the organisation's objectives' [23]. In this definition, road infrastructure is understood as the tangible assets of institutions and organisations responsible for road infrastructure management.

The literature also operates with the alternate terms, i.e., 'road asset management'. In contrast, researchers M.A. Akofio-Sowah and A.A. Kennedy operate with the term 'transportation asset management' understood as 'road infrastructure asset management'. According to the authors, the term should be understood as a structured set of activities that occur in a systematic and regular manner to maintain and improve the condition of physical assets using economic and engineering analysis carried out on the basis of high-quality information. The main task, to which the authors attribute a strategic dimension, is to identify the appropriate sequence of activities to achieve and maintain the desired condition of assets throughout their life cycle, taking into account the principle of cost minimisation. These activities include: maintenance, preventive maintenance, upgrading and construction work involving changes in performance or technical parameters [2]. This definition draws attention to two types of activity, i.e., corrective actions, which are undertaken to eliminate a defect or other undesirable situation, and preventive actions, which in turn are undertaken to prevent their occurrence.

Also worth quoting is the definition contained in the publication entitled *Compendium of Best Practices in Road Asset Management*, according to which road infrastructure management is understood as the optimum allocation of expenditures for the purpose of maintenance of road network, taking into account the medium and long-term effects on its technical condition and the costs incurred by road users [3]. It is also understood as a coordinated activity which, in addition to the physical activities, consists of tasks in the area of the budgetary management method and cost-benefit analyses undertaken in order to obtain value from the resources held. This definition, it is worth noting, is in line with the ISO 55000:2014 standard [8].

3.1. Proactive road infrastructure management

The concept of proactive management of road infrastructure, which refers to damage prevention according to the idea of so-called *pavement preservation*, has been intensively promoted in the literature. This concept is understood as the sum of all measures that are taken to ensure and maintain a functioning road pavement, excluding newly commissioned road sections and infrastructure in need of major rehabilitation or reconstruction. It is important that all actions are taken at an early stage of damage/failure before they irreversibly damage the pavement and become costly to repair. The concept of proactive measures, as emphasised by A. Zofka, focuses on performing road treatments when the pavement condition index is at a high or very high level, without the occurrence of structural damage. However, this is not a one-off treatment, but a long-term maintenance process extending the life of the road infrastructure, which — importantly — should be adapted to the specific technical and operational conditions of each facility. This means that the decision for such a particular prevention is taken by the administrator separately for each facility, depending on the individual characteristics associated with its use. In practice, it should be based on a comprehensive cost-benefit analysis, covering the stochastic nature of climate-related events together with a determination of the probability of undesirable phenomena and the magnitude of their impact on the road [22]. It should be emphasised that understanding the costs and benefits of taking precautionary measures plays a key role in road infrastructure management, as it brings long-term economic benefits. *Pavement preservation* activities require a customer-oriented approach and should ensure that the level of service provided is appropriate and cost-effective [7, 22].

4. RESEARCH MATERIALS AND METHODS

The primary research was nationwide and was conducted in October 2022 using purposive sampling and an electronic survey questionnaire prepared using a docs.google form. The invitation to participate in the survey was addressed to representatives of public road administrators representing local government units, obtaining responses from 100 units.

The unified part of the questionnaire investigating the problems associated with the management of road infrastructure elements by local government units consisted of questions concerning the difficulties associated with the implementation of statutory activities and the style and manner of related decisions. The opinions were measured using two types of scales, i.e., nominal scales with 'yes', 'no', 'do not know' answers and seven-point ordinal scales with borderline ratings of 'definitely yes' – 'definitely no'. Most questions were closed, single or multiple choice.

SPSS software was used to process the results. Standard measures of descriptive statistics, the Spearman correlation coefficient and the Kruskal-Wallis test by ranks were used in the statistical description to verify the hypothesis. The result was assumed to be statistically significant at $p < 0.05$.

The majority of the research sample consisted of municipal road administrators (AMR) (62%), mainly located within the administrative borders of municipalities with up to 20,000 inhabitants (80%). The second most numerous group were the administrators of public roads within the borders of cities with county rights (ACCR) (21%), coming from cities of different sizes. On the other hand, the share of county road administrators (ACR) in the research sample amounted to 17%; most often the above-mentioned units performed their tasks on the territory

of counties with a population of up to 50,000 individuals. The characteristics of the research sample in various cross-sections are presented in Tab. 1.

Tab. 1

Structure of the research sample

No.	Description	AMR	ACCR	ACR
1.	Participation in the research sample	62%	21%	17%
2.	Number of residents within the administrative boundaries of a unit	<ul style="list-style-type: none"> - up to 20k (80%) - 21–50k (18%) - 51–100k (2%) - 101–200k (0%) - 201–300k (0%) - over 300k (0%) 	<ul style="list-style-type: none"> - up to 20k (5%) - 21–50k (14%) - 51–100k (29%) - 101–200k (9%) - 201–300k (19%) - over 300k (24%) 	<ul style="list-style-type: none"> - up to 20k (0%) - 21–50k (23%) - 51–100k (59%) - 101–200k (18%) - 201–300k (0%) - over 300k (0%)
3.	Gender of a person completing the questionnaire	<ul style="list-style-type: none"> - female (44%) - male (56%) 	<ul style="list-style-type: none"> - female (19%) - male (81%) 	<ul style="list-style-type: none"> - female (23%) - male (77%)
4.	Age of a person completing the questionnaire	<ul style="list-style-type: none"> - 18–25 yo (0%) - 26–35 yo (24%) - 36–45 yo (52%) - 46–55 yo (19%) - 56–65 yo (5%) - over 65 yo (0%) 	<ul style="list-style-type: none"> - 18–25 yo (0%) - 26–35 yo (24%) - 36–45 yo (52%) - 46–55 yo (0%) - 56–65 yo (0%) - over 65 yo (0%) 	<ul style="list-style-type: none"> - 18–25 yo (0%) - 26–35 yo (35%) - 36–45 yo (35%) - 46–55 yo (0%) - 56–65 yo (17%) - over 65 yo (0%)
5.	Education of a person completing the questionnaire	<ul style="list-style-type: none"> - primary (0%) - vocational (0%) - secondary (6%) - higher (94%) 	<ul style="list-style-type: none"> - primary (0%) - vocational (0%) - secondary (0%) - higher (100%) 	<ul style="list-style-type: none"> - primary (0%) - vocational (0%) - secondary (0%) - higher (100%)

Representatives of units taking part in the survey were senior and middle administrators, mainly men aged 36–45, with a university degree. Respondents were most often employed as directors, administrators, chief executives, inspectors and specialists.

The survey was carried out within the framework of a research project called *Optimisation of Road Investments in the Adaptation of the National Road Network to the Traffic of Heavy Goods Vehicles with an Axle Load of up to 11.5 tonnes*, financed by the Gospostrateg programme (NCBR). The aim of the project was to increase the capacity of the road management to optimally plan periodic maintenance measures over many years.

5. ANALYSIS OF RESEARCH RESULTS

5.1. Road infrastructure management from the perspective of survey participants

As the research showed, 90% of the total number of road administrators are struggling with difficulties related to the road infrastructure they manage, with an average of more than 4 indications in the sample. The results of the standard deviation indicate a low degree of polarisation of the answers given ($\sigma=2.50$), so that the respondents differed in the number and thus the type of problems reported. The research indicates that the percentage of respondents

signalling the presence of at least 5 different difficulties in their unit was 42% and was slightly higher than the percentage of those declaring a smaller number of difficulties, i.e., between 1–3 (40%). The figure below shows the percentage distribution of responses regarding the number of difficulties encountered during road infrastructure management tasks.

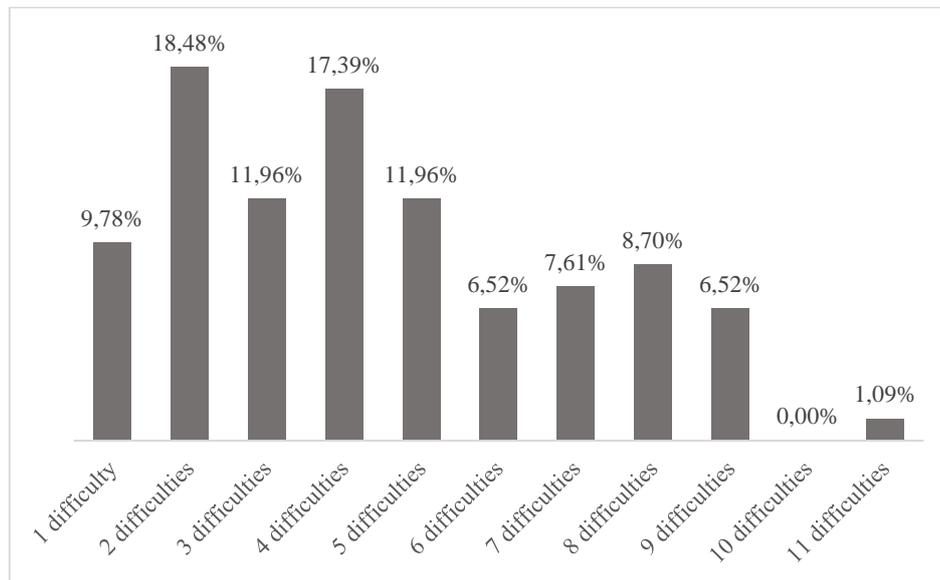


Fig. 1. Number of reported difficulties in the subject of activity

Fig. 2. shows a hierarchically ordered list of results related to the respondents' opinion on the broad catalogue of activities considered in terms of difficulties that road administrators have to overcome in their daily operations. They were classified into three groups based on the criteria of their frequency of occurrence in the research sample. The first group included four problems for which the range of mean values measured on a 7-point scale was well above the midpoint of the scale. This means that, in each case, respondents were more likely to form opinions confirming than denying the existence of obstacles to the task. The results of the standard deviation show a similar degree of polarisation in the answers given.

The results of the survey suggest that the greatest challenges for the surveyed groups of road administrators are the difficulties in providing and maintaining efficient road pavements, engineering structures and traffic safety devices, as well as the challenges occurring at the stage of drafting financing plans for the construction, reconstruction and rehabilitation of the road network. In the first case, in percentage terms, there was a clear predominance of 'rather yes', 'yes' and 'definitely yes' declarations (62.92%) over the denial answers, i.e. 'rather no', 'no' and 'definitely no' (23.60%). In the second case, the percentage distribution of affirmative answers was 50.00% and of denial answers – 20.93%. The problem of taking measures to reduce road damage by road users was also reported quite frequently. On this issue, 47% of respondents answered in the affirmative, with 12.50% indicating the 'definitely yes' category. Relatively many respondents (41.33%) also reported difficulties at the drafting stage of road network development plans.

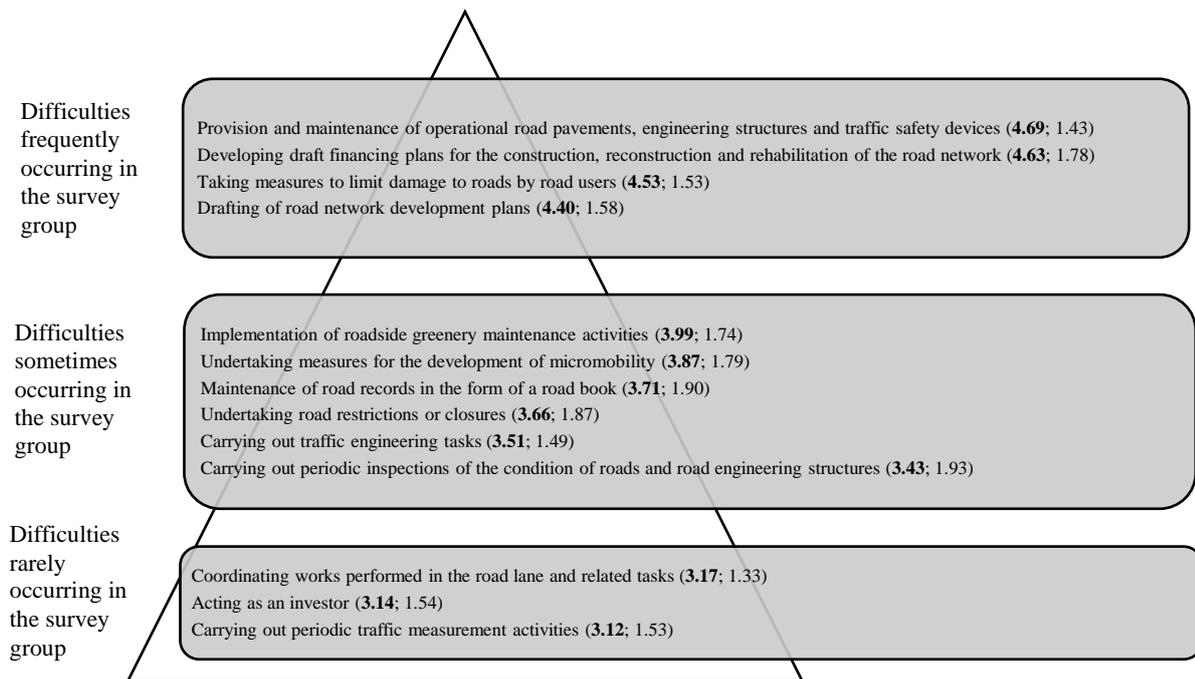


Fig. 2. Difficulties related to road infrastructure management as perceived by respondents

The second group consists of six measures relating to various issues related to road infrastructure management. The frequency with which each difficulty was reported was lower than that recorded in group one. As in the former case, the standard deviation values indicate a similar degree of polarisation of the indications given. In general, the range of mean values measured on the 7-point scale was 3.43–3.99, which is below the value of 4. This means that, in each case, respondents preferred to take a neutral position, more often in denial, rather than confirm the existence of a non-difficulty in the area. The exception here is the difficulty of maintaining roadside greenery, where the percentage of responses from both categories was at the same level (41.38%). More often than not, one in three organisations experienced difficulties in taking measures to develop infrastructure related to micromobility (36.76%) and in maintaining road records in the form of a road book (36.05%). A large group of respondents, exceeding 30%, reported difficulties in implementing road restrictions or closures, as well as in carrying out periodic inspections of both their condition and the condition of road engineering structures. From the declarations obtained, one in four units reported difficulties in undertaking traffic engineering measures.

In the third group, there were the activities that received the lowest rating, i.e., in the surveyed collective, respondents relatively rarely confirmed the existence of difficulties in relation to individual variables. This group includes, in turn, activities related to the coordination of works carried out in the road lane (3.17), duties to perform the function of investor (3.14) and activities related to periodic traffic measurement (3.12). The standard deviation values show similar variation in the results within each variable. The mean scores ranged between 3.12 and 3.17, well below the middle of the scale and only slightly above the 'rather not' rating. The distribution of responses shows that, in each case, respondents had a high tendency to give denial responses (respectively: 59.77%, 65.88%, and 64.18%). It is worth noting that respondents were three times less likely to assess the above-mentioned actions as a difficult situation than as a positive one.

The survey participants were also asked to express their opinion on the existence of difficulties in accessing information necessary for the proper implementation of road infrastructure tasks. The average rating (2.95) generally fell well below the middle of the scale (4) and was close to a declaration of 'rather not' (3). The distribution of responses shows that the vast majority of road administrators (69.57%) do not experience difficulties in obtaining information for their work. The percentage of affirmative responses in this case was 18.48%, and less than 12% had no opinion on the matter.

In the opinion of more than half of the surveyed administrators (56.7%), decisions regarding the management of road infrastructure are made in the course of teamwork, which is typical of a democratic management style. Nevertheless, 34.2% expressed the opposite opinion, indicating the dominance of the administrator with one-person decision-making, and just over 9% had no formed opinion on the subject. A similar distribution of responses was noted for the question on the scope of decision-making. According to 58% of respondents, road authorities make all decisions related to the road infrastructure management subject to their administration themselves. The percentage of opinions to the contrary in this case was 39.0%, and 3.0% of respondents declared no opinion on the subject.

5.2. Statistical analysis

Tab. 2. shows the results of the statistical analysis of the respondents' difficulties related to the managed road infrastructure. The type of road administrator was taken as the grouping variable. Analysing the data, it can be seen that respondents classified as AMR and ACR showed a greater tendency to report difficulties in the subject of the activities carried out than ACCR administrators. The multiple comparisons test showed that the differences between AMR–ACCR and ACR–ACCR were highly statistically significant. It is worth mentioning that both AMR and ACR reported a similar number of difficulties, thus there were no statistically significant differences between these groups.

Tab. 2

Statistically significant differences between the compared groups

No.	Description	AMR		ACR		ACCR		Statistical analysis	
		\bar{x}	Σ	\bar{x}	σ	\bar{x}	σ	K	p
1.	Number of declared difficulties	4,75	2,42	5,06	2,29	2,82	2,40	11,63	0,003**

Tab. 3. shows the results of the research aimed at identifying differences in the analysed range of difficulties between individual groups of administrators. It turns out that the highest number of them are on the side of ACR representatives. In half of the scales studied, the range of mean values measured on a 7-point scale was above the midpoint of the scale. ACR respondents were therefore more inclined to give answers confirming than denying the existence of difficulties in a given management area. The results indicate that respondents most frequently reported problems with the implementation of roadside greenery maintenance activities. Overall, the mean score here was 4.81, close to the 'rather yes' declaration. The distribution of responses shows that more than half of the respondents (56%) admit that they struggle with problems in terms of landscaping the greenery of the roadside lanes of managed roads as part of their activities. It was also relatively common for ACR representatives to

declare struggling with difficulties at the stage of drafting road network development plans. Again, the majority of opinions were centred around a 'rather yes' assessment. The percentage of declarations fully or partially confirming difficulties in this area amounted to 41.6% and was more than twice as high as the denial answers (16.7%).

Tab. 3

Difficulties related to road infrastructure management as perceived by different types of road administrators

No.	Description	ZDG		ZDP		ZDM		Statistical analysis	
		\bar{x}	σ	\bar{x}	σ	\bar{x}	σ	K	p
1.	Difficulties exist at the stage of drafting road network development plans	4,37	1,55	4,75	1,36	3,95	1,76	1,59	0,451
2.	Difficulties exist at the stage of drafting financing plans for the construction, reconstruction and rehabilitation of the road network	4,59	1,85	4,30	1,70	4,57	1,80	0,38	0,829
3.	Difficulties exist in providing and maintaining an efficient road pavement, engineering structures and traffic safety devices	4,50	1,56	4,69	1,40	4,68	1,43	0,57	0,752
4.	Difficulties exist in coordinating works carried out in the road lane and related tasks	2,91	1,28	3,31	1,30	3,64	1,43	4,69	0,096
5.	Difficulties exist in maintaining road records in the form of a road book	3,46	2,01	3,73	1,9	3,95	1,56	1,17	0,556
6.	Difficulties exist in carrying out periodic inspections of the condition of roads and road engineering structures	3,12	1,85	4,06	2,08	3,32	1,89	2,53	0,282
7.	Difficulties exist in performing traffic engineering tasks	3,33	1,59	4,00	1,37	3,42	1,26	3,24	0,198
8.	Difficulties exist in performing the function of investor	3,19	1,59	2,53	1,24	3,45	1,53	2,96	0,227
9.	Difficulties exist in taking measures to reduce damage to roads by road users	4,28	1,73	4,37	1,68	4,67	1,35	0,64	0,726
10.	Difficulties exist in taking measures to develop micromobility	3,73	1,86	4,35	2,24	3,43	2,09	1,60	0,448
11.	Difficulties exist in taking measures for road restrictions or closures	3,50	1,94	3,75	1,77	3,71	1,76	0,81	0,668

12.	Difficulties exist in the implementation of measures related to the maintenance of roadside greenery	3,37	1,65	4,81	1,64	4,29	1,92	9,69	0,007**
13.	Difficulties exist in carrying out activities related to periodical traffic measurement	3,00	1,48	3,69	1,75	2,75	1,39	2,47	0,291

The representatives of ACCRs most frequently reported difficulties in providing and maintaining efficient road pavements, engineering structures, and traffic safety devices, as well as in taking measures to reduce road damage by road users. The average ratings were, respectively: 4.68 and 4.67, with dominants of 5 and 4. In the former case, the percentage of affirmative declarations exceeded 68%, while in the latter case it was 38%. It is worth noting that on the issue of reducing road damage, the majority of respondents (52.4%) preferred to give neutral answers ('neither yes nor no'), the opposite of the first case, where the percentage was only 4.5%. Representatives of ACCRs relatively often declared difficulties occurring at the stage of preparing draft plans for the development of the road network, which may be due to the fact that they operate in an area with a more complex structure of the road and traffic network. The average score on the 7-degree scale oscillated between 4 and 5 with a dominant value of 6, which means that the respondents most often gave a more decisive 'yes' answer (42.9%).

According to the declarations of the AMR group, difficulties in managing road infrastructure most often occur at the stage of obtaining funds for construction, reconstruction and repairs of the road network and then ensuring its operational efficiency. The average scores here were, respectively: 4.59 and 4.50, with dominants of 3 and 4. An analysis of the frequency of responses shows that the percentage of affirmative declarations was 51.8% in the first case, and 46.4% in the second. Relatively often, respondents also reported difficulties occurring at the stage of drafting road network development plans. The proportion of summed 'yes' responses for this variable was 41.7% and neutral responses were 33.3%.

Analysing the data in Tab. 3, it was noted that there were significant differences in responses between the compared groups for one variable, i.e., the implementation of roadside greenery maintenance activities. The analysis performed using the Kruskal-Wallis test by ranks showed that this difference was highly statistically significant ($p < 0.01$). The test of intergroup comparisons showed that statistically significant differences existed between ACR and AMR authorities, with ACR being indicated far more frequently. A noticeable difference was also observed for tasks related to the coordination of works carried out in the road lane. It is apparent that ACCR respondents more often declare the occurrence of difficulties in this regard than the surveyed AMRs, although the differences in responses are not statistically significant. ACR respondents, on the other hand, are more likely than the other groups to struggle with problems during the preparation of directions for the development of the road network. In this case, the differences in declarations are also not statistically significant.

Fig. 3. shows the results of the survey on the difficulties indicated by the respondents in obtaining the information necessary for the proper implementation of tasks. The average score in the ACR group was 2.25 and in the AMR group it was 2.65, which indicates that there are no barriers to accessing information in both cases. The situation in the ACCR group is somewhat different. There, the average score was 4.00, and more than 27% of respondents admitted that they face a problem in their work in the form of insufficient information. The differences in ratings between ACCR and AMR, as well as ACCR and ACR were found to be

highly statistically significant ($p < 0.01$). Statistical analysis also indicated a significant positive correlation between the frequency of difficulties occurring on the side of access to information and those occurring in the area of implementation of periodic traffic measurement activities (Spearman's rho coefficient = 0.238*, $p < 0.05$).

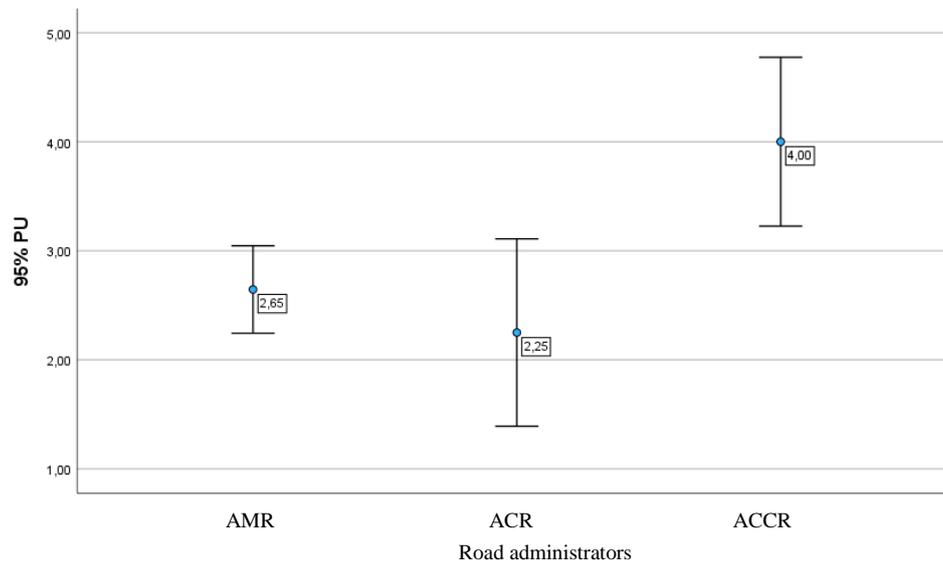


Fig. 3. Difficulties in obtaining information in the opinion of ZDG, ZDP and ZDM

Fig. 4. shows the results of the survey on the extent of decision-making powers in the area of road network management. The average score for the ACCR group was 3.18 and for the ACR group was 3.63. In both cases, therefore, the results fell below the middle of the scale (4), indicating that in both units not all decisions related to road infrastructure management are always made. AMR respondents are more convinced of self-determination in terms of decision-making. The average score here was 5.10, thus being above the 'rather yes' answer. The percentage of respondents who were of the opinion that all decisions regarding the road network are made in their unit exceeded 74%. This compares with 37.6% in the ACR group and 27.3% in the ACCR group. The differences in assessments between AMR and ACCR proved to be highly statistically significant ($p < 0.01$) and between AMR and ACR — statistically significant ($p < 0.05$).

The results of the study showed that the individual road administrators differed non-significantly in their assessment of how decisions are made regarding the road infrastructure under management. In this case, the average ratings ranged from 3.25 for ACR to 3.95 for ACCR. Thus, it can be assumed that ACCRs were slightly more likely to admit that there is a dominance of an administrator with one-person decision-making in their unit. The percentage of affirmative declarations was 42.1% in the ACCR group and was more than 8.0% higher than in the AMR, and more than 17% higher than in the ACR. However, the differences between the types proved to be statistically insignificant ($p > 0.05$).

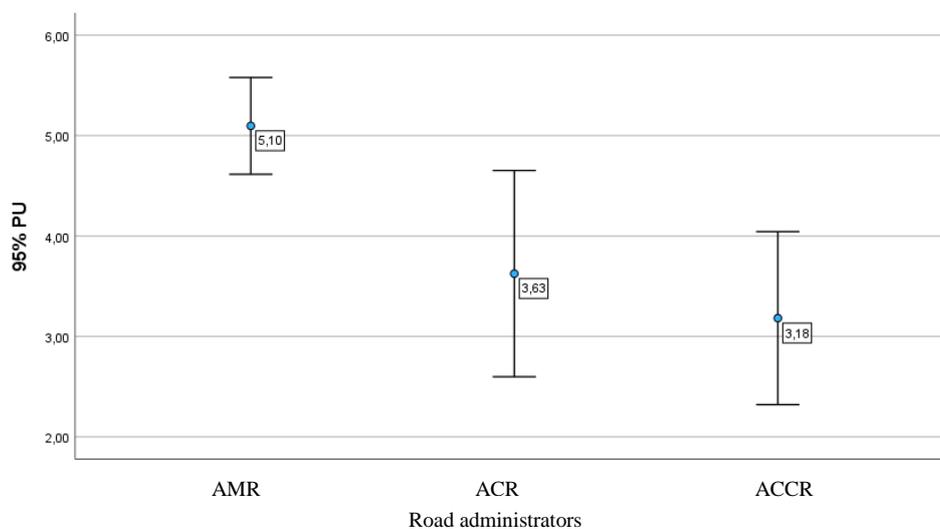


Fig. 4. Difficulties in obtaining information in the opinion of ZDG, ZDP and ZDM

6. CONCLUSIONS

Road infrastructure management is a highly complex issue, as confirmed by both literature studies and empirical research carried out. In practice, it requires a high level of management competence, skills in data acquisition, analysis and processing, a significant resource commitment and considerable capacity required to maintain the desired condition of road assets while achieving cost efficiency. To make sound decisions, as jointly noted by experts from FHWA (The Federal Highway Administration) and AASHTO (American Association of State Highway and Transportation Officials), traditional management methods are not sufficient [5]. In this context, it is worth citing the opinion of T. Adey et al., who, based on intervention theory, point out that decisions related to road infrastructure should be made taking into account the service nature of the road and the impact it has on the activities of its users [1]. Our own research seems to confirm that the right direction for local authority road administrators is the concept of proactive management.

The research shows that the vast majority of road administrations' representatives, to a greater or lesser extent, are struggling with difficulties related to the road infrastructure they manage. In the analysed population, on average, each respondent declared the existence of more than four difficulties related to the implementation of the object of activity, marking at least in several cases answers above the middle of the scale, thus, to some extent agreeing with the statements confirming the existence of inconveniences in the given management area. The above may lead to a situation in which the activity of administrators, due to the obstacles encountered, is performed in a manner far from the expected results. These conclusions are confirmed by the results of a study of the technical condition of local government roads in the Świętokrzyskie Voivodeship, which shows that a significant proportion of road administrators did not fulfil all of their obligations specified by law [20].

The results of the research indicate that difficulties in providing and maintaining an efficient road network pavement, as well as challenges related to the development of draft financing plans for the construction, reconstruction and renovation of the road network, are currently

the most common management problems among the surveyed local government units. These results are not surprising if we consider that these tasks are closely related to each other and are an important focus of the activities analysed. It should be borne in mind that the activity of administrators related to the maintenance of efficient road infrastructure, due to its high resource consumption, requires considerable financial outlays, which the surveyed units most often do not have at their disposal. The above statement is moreover confirmed by a considerable number of the survey participants, who consider the lack of financial means for statutory tasks as the main reason for their problems. It can be expected that this problem will only grow in the coming years, taking into account the current problems of the financial management of local government units, including the risk of withholding EU funds for co-financing investments in the new financial perspective.

The results of the research do not allow us to accept the hypothesis of the existence of significant differences between the surveyed administrators with regard to the difficulties related to the implementation of statutory activities. The lack of statistical significance of intergroup differences was noted in the vast majority of measurements. Clear differences only occurred in the number of difficulties reported, which was higher among AMR and ACR members than ACCR members, and in the area related to the implementation of roadside greenery maintenance activities, which was more onerous for ACR. It is difficult to explain both differences unequivocally; nevertheless, it seems that the picture emerging from the research can be partly explained by the specificity of the functioning of the AMR and ACR bodies, which are characterised by a simpler form of work organisation, as well as a lack of adequate human resources. Partial confirmation of this thesis can be found in the statement of the mayor of the municipality of Wodzisław, who pointed to frequent rotation in the positions related to road construction and maintenance in the office and the staff not having the appropriate authority as the main cause of irregularities in the management of the road network [17]. The research shows that the number of employees in AMR is much lower than the number of employees in ACCR, the degree of autonomy and decision-making powers in these units may therefore be much higher than in the other cases.

The results of the research indicate that in one in three of the surveyed units, the management of road infrastructure is carried out in an authoritarian manner, i.e., one characterised by directive team leadership and the dominance of the supervisor in the form of individual decision-making. Although the results of the present study did not show a relationship between the scales relating to team performance and the difficulty of carrying out statutory activities, many examples of the negative impact of authoritarian leadership on business performance can be found in the literature [13, 4, 6]. At the same time, the majority of respondents acknowledge that all decisions related to road infrastructure management are made in the organisational units where they are employed.

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