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INTERACTION OF IRREGULARITIES IN THE STANDARD OF SURVEYING AND CARTOGRAPHIC DOCUMENTATION WITH RAIL TRANSPORT PROBLEMS: A CASE STUDY

Summary. Surveying (geodesy) and cartographic documentation, their types, and their flow (circulation) are the basis for the uniformity of the work carried out in the pre-design, design, and execution of construction works, ultimately having a representation in the operational (exploitation) and maintenance of railway infrastructure. The type and circulation of surveying and cartographic documentation constitute an important element for the transport sector. The aim of the present scientific research work was to define the state of irregularity of the standard of uniform surveying-cartographic documentation, their type, and their circulation (Ig-1) in interaction with rail transport problems. A case study method was used corresponding to a factual description, which aimed to analyze and evaluate the existing standard. This is important from a theoretical and, above all, a practical point of view. The results show an extensive space of irregularities occurring, violating legal regulations and professional ethics. At the same time, good practice solutions have been implemented to optimize the negative impact when interacting with rail transport problems. The authors' position on the irregularities was forwarded to an infrastructure manager. The irregularities that occur significantly contribute to the limitations of surveying and cartographic documentation harmonization, and these have an impact on fully functional rail transport.

1. INTRODUCTION

Surveying (geodesy) and cartographic documentation are important parts of sustainability development in rail transport. Cartographic studies of railway areas should ensure the correct transmission of information so that its efficiency is preserved, along with the realization of the intended purpose [1]. The uniformity of requirements for the content and the form of surveying and cartographic documentation, as well as the path of its flow (circulation) during pre-design, design, and the realization of construction investments, are the basis for the rational management of the resources of railway areas. Irregularities and ambiguities in the current regulations result in arbitrary interpretations of the results of work acceptance and failure to meet the requirements assumed in construction projects [2]. Identification and analysis of irregularities in the standard of uniform surveying-cartographic documentation (Ig-1) [3] allow for the assessment and improvement of weaknesses in the requirements of railway areas. Positive aspects of studying such irregularities include:

- eliminating the lack of uniformity in surveying and cartographic documentation,
- improving the state of harmonization of legal acts,

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- increasing the state of uniformity of standards in interaction with improved safety,
- reducing organizational losses, and
- detecting signals which threaten operational (exploitation) safety.

The task of this scientific research work was to define the state of irregularities of the standard of uniform surveying-cartographic documentation, their type, and their circulation of the railway areas of a railway infrastructure manager (Ig-1) [3] in interaction with rail transport problems in accordance with current regulations and professional ethics. The idea underlying this publication was to develop a position on the state of the Ig-1 standard [3], filling a gap in the civil engineering, surveying/geodesy, and transport industry market. This publication combines scientific research knowledge with practical problems, providing a source of knowledge for an international audience, especially on the subject of the interaction of irregularities of the standard of uniform surveying and cartographic documentation with rail transport problems. The starting point for this scientific research is to identify standards for surveying and cartographic studies of railway areas. This article consists of three parts. First, a literature review is conducted on the type and extent of surveying and cartographic documentation used in railway areas and its circulation in organizational structures. The second part of the article is the methodology, which provides a harmonious transition to the results and discussion – the third part – as the essence of the scientific research work for a typical case study. By showing irregularities of the standard of uniform surveying-cartographic documentation in interaction with the discussion, the context of which is to optimize the negative impact of irregularities in response to rail transport problems and implement solutions within the framework of good practices.

This research used a case study method corresponding to a factual description, which aimed to analyze and evaluate the existing standard. The results of the scientific research works showed an extensive space of irregularities occurring, violating legal regulations and professional ethics. At the same time, good practice solutions have been implemented to optimize the negative impact in response to rail transport problems. The authors' position on irregularities has been forwarded to an infrastructure manager. The scientific research method used in the completed subject worked well and confirmed the conclusion drawn by Krusenik in [4] in the application of the research dilemma solutions considered in the relevant agenda. The subject of this publication covers original scientific research works results specifically on civil engineering, surveying/geodesy, and transport, supported by real and practical application. Essential for the work surveying and cartographic works in the pre-design, design, and execution of construction works. Ultimately, being in interaction with the operation and maintenance of railway infrastructure – being so important in the assessment of the transport sector. Transport infrastructure investments require the development of surveying and cartographic documentation, their uniformity, and their circulation, shaped by processes of analysis and evaluation. A positive result provides a premise for the implementation of further stages of work aimed at the proper functioning of transport.

2. RELATED WORK

Sustainability development and associated tasks in rail transport influence the activities of railway companies. Szaciłło et al., in [5], indicate active participants for safety. The scientific research is also largely focused on the operation of railway transport in the sphere of reliability and safety [6-9]. In some areas, a lack of standardization has been noticed in the field of technology, which is considered crucial for the development of railways. Thus, Soilán et al., in [10], found a shortage of standards for data processing. They emphasize that light detection and ranging-based technologies (e.g., for infrastructure monitoring) are still in their early phase. It was noted in [11] that the standardization of global navigation satellite systems (GNSS)-based localization performance characteristics in railways has not been done. In turn, D'Amico et al., in [12], highlight the progress of monitoring defects in railway transport infrastructures. There is a strong emphasis on damage effects and reliability costs in the aspect of the reliability allocation method [13] and the reliability of the railway transportation system by type of infrastructure [14]. In turn, Niu and Hou, in [15], in terms of the subject of infrastructure maintenance and management, addressed the issue of the rapid detection of foreign object intrusion on railway tracks.

With regard to the effectiveness and usefulness of the map as a means of conveying information, Fiedukowicz et al., in [16], paid attention to their components. They also emphasized the role of the functionality of web applications for this means of map distribution [16]. Wardziak, in [17], notes that the specificity of railway terrain – for example, its linear nature and exceptional density of utility networks – means that conducting work and locating new networks requires an appropriately high quality of surveying documentation. At the same time, [17] concluded that the data accumulated in documentation centers are reference and baseline values for infrastructure projects. Their scheduling and realization are based on the quality of this data, the speed of access to it, and the ease with which it can be updated [17]. In turn, Połośński and Kowalski, in [18], note the problematic issues in the geodetic interaction of areas – namely, regional railway surveying units (pl. Kolejowe Ośrodki Dokumentacji Geodezyjnej i Kartograficznej, KODGiK, eng. Railway Geodetic and Cartographic Reference Centers, Railway Surveying and Cartographic Reference Centers, RGeCRC) – when applying “other” demands.

The fundamental basis for the development of surveying and cartographic documentation is the Act of 17 May 1989 Geodetic and Cartographic Law (GaCL) [19], and the Regulation of the Minister of Development, Labour and Technology of 23 July 2021 on the Database of Topographic Objects and the Basic Map [20]. Preparing surveying and cartographic documentation for railway areas also requires taking into account standards, technical conditions, and instructions for organizing and carrying out surveys and preparing survey documentation based on them. These steps are important for the specificity of these areas, especially for measurements of railway infrastructure elements and other legal regulations [21, 22], in particular, the technical standard GK-1 [23], the instruction on drawing up and updating schematic plans Ig-10 (D-27) [24], and the standard Ig-1 [3]. A previous paper [25] presents the fundamental preparatory work preceding the implementation of a linear investment with reference to cartographic studies based on maps.

The literature query carried out shows a lack of extensive scientific research works on the irregularities of the standard of uniform surveying and cartographic documentation of railway areas, which is the subject of this publication.

3. METHODOLOGY

The methodology provides essential knowledge on the current case study on the subject of the interaction of irregularities in the standard of surveying and cartographic documentation with rail transport problems. Regardless of whether it relates to scientific research works or the state of quality in industry, it has a common denominator in the combination of scientific and practical knowledge, represented by the maturity of cooperation with the social and economic environment.

3.1. Methods

Due to this study’s objective of defining the state of irregularities of the standard of uniform surveying-cartographic documentation, their type, and their flow at the railway infrastructure manager [3], a case study method was used. Krusenvik in [4] and Crowe et al. in [26] express approval for applications of the case study method. At the same time, the results of scientific research works can apply to a wide range of scientific disciplines, while in terms of the subject matter pursued, it specifically relates to civil engineering, surveying/geodesy, and rail transport.

3.2. Study Area

The study area includes the standard *Types and Circulation of Surveying-Cartographic Documentation in PKP Polskie Linie Kolejowe S.A. Ig-1* [3], which is a strategic legal source for the type and circulation of an infrastructure manager’s unified surveying and cartographic documentation in the pre-design, design, and execution of construction works. As a result, it also has an effect on the continued functioning of the railway infrastructure and, above all, on the overall evaluation of the rail transport sector. In which it is important to carry out surveying and cartographic works, and then to

implement conclusions from these works. The results of scientific research works show that the researched Ig-1 standard [3] for surveying and cartography with a focus on railway areas covers the core economic sector represented by railway transport, subject to rapid development, thus having a grounding in civil engineering, surveying/geodesy, and transport.

4. RESULTS AND DISCUSSION

Vališ et al., in [27], state that there are many excellent options for assessing the technical condition of facilities. Thus, Galar et al., in [28], recognize that increasing the effectiveness of investments already made in process control systems represents a novelty in the management of technical infrastructure. At the same time, Sztubecki et al., in [29], mention the safe use of buildings and the need to inspect them. When conducting surveying and cartographic work, attention is drawn to the quality of the work performed and the harmonization of data sets. The harmonization of datasets is a legal, technical, and organizational activity that brings about mutual coherence in these datasets and their adaptation for joint use [19].

Scientific research works in the subject of this publication has showed a clear and distinct space of irregularities, which violate legal regulations and professional ethics. At the same time, the results of scientific research works ensure that the authors are able to implement them as part of good practice with their transfer to infrastructure managers. The most frequent irregularities are:

1. The title of the standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3]. In terms of the scientific research works conducted, the use of the wording “surveying-cartographic documentation” in [3] is an irregularity. Act of 17 May 1989 Geodetic and Cartographic Law [19] corresponds separately to the subject of “surveying works” and “cartographic works.”. It presents individual definitions of these works. Of course, these works are complementary to each other, but they are a separate assortment. Surveying and cartographic law, in the essence of its name, refers to “surveying and cartographic law” and not “surveying-cartographic law.” The individuated term “surveying-cartographic documentation” as used in the title of the standard [3], both in the GaCL [19] and the regulations related, does not appear. GaCL [19] remains in agreement only for the terms “surveying documentation,” “cartographic documentation,” and possibly “surveying and cartographic documentation.” The use of a divisor (-), also called a hyphen in the standard under review [3], is an intra-word character that is used in common words and proper names. It should not be used in the name of the standard [3]. If it is, there should undoubtedly be harmonious coherence in the overall developed content [3], which, unfortunately, is lacking, as evidenced by the alternating use of the term “surveying-cartographic documentation” or “surveying and cartographic documentation” in [3].
2. Missing the purpose of the standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3]. This standard should have a defined objective or objectives unambiguously emphasized in it. In the opinion of the authors, it is recommended to introduce the following provision: *The purpose of this study is to unify the requirements for the type and circulation of surveying and cartographic documentation, then the rules applicable to their execution, content and form in the pre-design, design and for construction works.* Thus, the objective in the standard under examination should specify the action to be pursued.
3. Lack of fully defined destinations and scope of the standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3]. This standard should have an addendum to define the purpose and scope of its use. It is recommended to enter the following provisions:
 - *Standard on “Type and circulation of surveying and cartographic documentation (...)” (hereinafter: Standard) applies to the type and circulation of surveying and cartographic documentation at the pre-design, design and construction works carried out, regardless of the system of carrying out these works and at maintenance works, each time preparing and carrying out tasks related to the execution of surveying and cartographic documentation.*

- *In matters in which, prior to the date of entry into force of these Standards, a contract was concluded, technical conditions were issued, or the rules previously in force were otherwise invoked, the rules previously in force shall apply unless the parties agree to apply these Standards.*
 - *Other additional requirements for the type and circulation of surveying and cartographic documentation not included in these Standards and regulations will be specified in the contract/order.*
 - *In cases where this Standard refers to the content of other regulations (e.g., internal regulations, legal acts) and these regulations have changed, the requirements of the current and applicable regulations should be applied.*
4. The appeal correspondence with existing regulations is not clearly demonstrated or emphasized in the text of the Ig-1 standard [3]. These should be supplemented, especially with:
 - Act of 17 May 1989 Geodetic and Cartographic Law [19],
 - Act of 7 July 1994 Construction Law [30], and
 - Act of 28 March 2003 on Railway Transport [21], and
 - the implementing acts indicated in the aforementioned laws as delegations for their implementation.
 5. Lack of regulations on the correct functioning of electronic documentation. According to the authors, it is recommended to introduce the following provisions:
 - *The electronic version of surveying and cartographic documentation should be consistent with the paper version, signed with a qualified electronic signature or a trusted signature.*
 - *Surveying and cartographic documentation in electronic form should be properly named according to the content of the document using the nomenclature contained in these Standards.*
 6. The current Ig-1 standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3] does not have final provisions. According to the authors, it is recommended that the following provision be introduced: *The relevant infrastructure manager – Headquarters – is responsible for updating these Standards. Supervision of the implementation of the provisions of the Standard shall be exercised by the relevant Bureau of Real Estate, Railway Surveying, Railway Land and Environmental Protection.*
 7. The present Ig-1 standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3] does not have edited block diagrams of the type and circulation of surveying and cartographic documentation of the various assortments of work implementation. Flowcharts provide significant support not only for the implementation of these works but also for the staff responsible for their implementation. According to the authors, the appendices of the modernized Ig-1 standard [3] should include flowcharts of the type and circulation of surveying and cartographic documentation of the various assortments of work execution.
 8. The existing Ig-1 standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3] in the subsection entitled “Application of the standard” prescribes its application at all stages of the investment process, regardless of the system of investment management and maintenance work, whenever preparing and carrying out tasks related to the execution of surveying-cartographic documentation:
 - development of a feasibility study,*
 - preparation of maps for design purposes,*
 - development of a functional-utility program,*
 - development of a land development project (elements of the construction project),*
 - development of real estate division projects,*
 - surveying service of the investment,*
 - surveying as-built inventory,*
 - maintenance work, in particular concerning the geometry of the track, and*
 - repairs to the infrastructure constituting the railway line.*

The content of the aforementioned provision shows the vagueness and inconsistency of ideas used in the current nomenclature of civil engineering, surveying/geodesy, and transport. Among them, the following should be specified:

- The sequence of the above tasks should be in accordance with the various stages of the work (i.e. pre-design, design, implementation of construction works),
 - Tasks concerning *maintenance work and, in particular, concerning track geometry renovation, repair of infrastructure constituting the railway line* should be corrected for redaction by adding as a prefix to the phrase: *development of documentation on*.
 - There is a conflict in the terminology used. *The surveying service of investments* already in itself includes the *making of maps for design purposes*. The surveying service of an inherently superior investment includes the assortment of work of making maps for design purposes. This inconsistency also *applies to as-built surveying inventory*.
9. Imperfect definitions are used in the existing standard Ig-1 “Types and Circulation of Surveying-Cartographic Documentation (...)” [3] in the subsection entitled “Definitions used in the standard.” Among them, the following should be specified:
- The definition of “base map.” It should be based on GaCL [19]. In line with [19], the modernized Ig-1 standard [3] should introduce a GaCL-based base map definition as follows: *Base map – large-scale cartographic study containing up-to-date information on the spatial location of points of the surveying grid, registered plots of land, buildings, land use contours, classification contours, networks of land utilities, structures, and construction equipment and other topographic objects, as well as selected descriptive information about these objects. For closed terrain, instead of a base map, separate cartographic studies are prepared, which also include in their content the network of underground utilities and components of railway infrastructure*.
 - The definition of “land and building records (real estate cadastre)” is not consistent in its entirety with the GaCL [19]. According to [19], the definition of “land and building registration (real estate cadastre)” should be based on GaCL [19] as follows: *Land and building registry (real estate cadastre) – an information system that ensures the collection, updating, and provision, in a uniform manner for the country, of information about land, buildings, and premises, their owners, and other entities that own (seized) or manage these lands, buildings, or premises*. It should be emphasized that, apart from the classified areas (having a confidentiality clause or secrecy clause), other closed terrains should be shown in accordance with the provisions on land and building registration. In the land and building registry, communication terrains, including railway terrains, are shown as a single-use contour, marked with the symbol “Tk” – according to [31] – while, in practice, there are other uses that are not shown at all.
 - The definition of “surveying grid” is not consistent with GaCL throughout [19]. According to [19], the definition of “surveying grid” based on GaCL [19] should be introduced as follows: *Surveying grid – a systematized set of uniquely identified points that have been marked in the field with surveying signs and whose location have been determined in the state spatial reference system in a manner appropriate for a given type of grid and allowing to determine the accuracy of this determination (designation)*. In addition, it is recommended that the definition be clarified with the internal regulations of the manager of the national rail network, with particular reference to the Railway Surveying Grid (pl. Kolejowa Osnowa Geodezyjna, KOG, eng. Railway Surveying Grid, RSG) and the Railway Special Grid (pl. Kolejowa Osnowa Specjalna, KOS, eng. Railway Special Grid, RSG).
 - The definition of “map for design purposes” does not correspond throughout the GaCL [19]. According to [19], the definition of “map for design purposes” based on GaCL should be introduced as follows: *Map for design purposes – a cartographic study prepared on the basis of data obtained from the Railway Surveying and Cartographic Reference Center and the National Geodetic and Cartographic Resource (pl. Państwowy Zasób Geodezyjny i Kartograficzny, PZGiK, eng. National Geodetic and Cartographic Resource, NGaCR) made*

using the results of surveying measurements containing elements constituting the content of the base map and situation and altimetric map, as well as information necessary for the preparation of project documentation, including a clause constituting an acknowledgment of acceptance of data sets or documents to the KODGiK, sets of new, modified, or verified data, which belong to the information scope of databases, documents required by separate regulations or their certified copies, regulations on the basis of which the map for design purposes was prepared, or a statement of the surveying contractor on obtaining a positive result of verification.

- The definition of “thematic map” should correspond with the following: *Thematic map – a map showing information on one or more different selected topics.*
10. There is opacity and inconsistency in the content used in the existing Ig-1 standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3] in the subsection entitled “Project documentation.” The following should be specified:
The existing wording of the provision: *Reconciliation of the geometric layout design is carried out in terms of permissible traffic speeds – according to the rules in instruction Id-1 Module A3 – Track geometric layout.* The notation, in its current form, refers to the Technical Conditions for Maintaining Track Surface on Railway Lines Id-1 (D-1) [32]. It contains the erroneous term “instructions,” and, de facto, it is “Technical Conditions.” A correction should be made to the degree of legal regulation.
11. There is a lack of excellence in the content used in the existing Ig-1 standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3] in the subsection entitled “Implementation of investments and transfer of surveying-cartographic documentation produced in the course of construction works.” The following should be specified:
The existing wording of the provision: *In the course of construction works, surveying-cartographic documentation includes:
longitudinal profiles of the railway line,
acceptance reports signs railway track axis adjustments,
partial acceptance maps made for works disappearing during construction,
as-built inventory maps,
information on the condition of the geodetic grid (including a list of destroyed and restored points),
staking sketches, and
survey sketches.*
The incorrect use of the terminology *surveying-cartographic documentation* should be replaced with *surveying and cartographic documentation*. It is then recommended to complete the surveying and cartographic documentation with the following:
*schematic plans made in accordance with the Instruction on Drawing Up and Updating Schematic Plans Ig-10 (D-27) [24],
transverse profiles, especially at such locations as PKP – Beginning of the Transition Curve (pl. Początek Krzywej Przejściowej, eng. Beginning of the Transition Curve, BTC), KKP – End of the Transition Curve (pl. Koniec Krzywej Przejściowej, eng. End of the Transition Curve, ETC), full curve – center of the curve,
continuous welded rail track (CWR track) documentation materials, and
GNSS survey reports.*
12. The existing Ig-1 standard “Types and Circulation of Surveying-Cartographic Documentation (...)” [3], in the subsection entitled “Transmission of as-built documentation,” requires information on the state of the grid with a list of coordinates of grid points. This provision requires clarification of the procedure for determining the condition of the surveying grid, along with the scale of its evaluation. The authors recommend introducing a three-level scale for assessing the operational condition of a surveying grid. The Railway Surveying Grid can be in one of three basic operating states:
- full suitability,
 - limited suitability, or
 - inoperability.

13. The existing standard Ig-1 “Types and Circulation of Surveying-Cartographic Documentation (...)” [3] refers to non-binding regulations represented by, among others, [33÷36].

The results of this scientific research work confirm that its purpose is valid and clear, justifying the need to address and implement the subject interaction of irregularities in the standard of surveying and cartographic documentation with rail transport problems through a case study of standard Ig-1. The demonstrated state of irregularity violates other legal regulations and professional ethics. It refers to facts and events that do not comply with the applicable regularities, *de facto* causing a lack of regularity. Surveying and cartographic documentation, their types, and their circulation are the basis for the uniformity of the work carried out in the pre-design, design, and execution of construction works, ultimately having a reflection in railway infrastructure management and forming an important part of the overall evaluation in the transport sector. Their irregularities at the pre-design, design, and construction execution levels have negative consequences on operation and maintenance. Chimhamiwa et al., in [37], refer to the circulation of documents, paying attention to their quality. Thus, surveying and cartographic documentation, their types, and their circulation are also corollaries of the control measurements to which construction facilities and technical and operational equipment are subjected, affecting capacity. Their release for operation is conditioned by their technical acceptance based on the realization of the dimensional and geometric conditions stipulated in their technical design. They require consistency with the Ig-1 standard. It should be emphasized that surveying and cartographic documentation as a result of surveying and cartographic work are basic elements for the zero measurement, which is a reference – a baseline measurement for subsequent periodic measurements, requiring the effectiveness of the safety of monitored construction objects and technical and operational equipment to be ensured.

The state of the problematic issues of quality and the harmonization of data resources has been addressed by the authors of many publications [38–41]. Ruiz-Alarcon-Quintero, in [38], refers to transport data sources and their harmonization according to Infrastructure for Spatial Information in Europe – INSPIRE (a European directive establishing an infrastructure for spatial information in Europe). Balawejder et al., in [39], address the problem of spatial information-Polish resources and their adaptation to the INSPIRE standards. In contrast, Procházka et al., in [40], perceive the progress of European Union countries as a result of INSPIRE. At the same time, Ogryzek et al., in [41], state that geoportals have a good quality status and should aim for a very good status.

The authors of [18, 42–43] address in-depth scientific research issues regarding geodetic support for investments related to transport problems. Połoński and Kowalski, in [18], indicate the most important hazards due to the specificity of construction works – to the performance of railway contracts – in Poland for railway sites. The in-depth scope of scientific research work relevant to civil engineering, surveying/geodesy, and transport has also been integrated with the results of the elaboration by Trembecka in [42], concerning acquisition for road development. The author proposed solutions to the modifications. As well as by Wojtas [43] in the scope to legal issues of land acquisition for roads.

Irregularities in the standard of uniform surveying and cartographic documentation contribute to the delayed development of infrastructure, making them negative features of civil engineering, surveying/geodesy, transport, and, as a result, the overall socio-economic environment. Among the negative effects of delayed infrastructure development are:

- an increase in the cost of surveying and cartographic work (in the pre-design, design, and execution of construction works), which ultimately has an effect on railway infrastructure management;
- disruption in surveying, cartography, and accompanying works, affecting the harmonization of works; and
- losses in transport capacity.

Wojnar and Irlik, in [44], explore the role of railway capacity by rationally emphasizing its essence. The correlation of surveying and cartographic works in civil engineering, surveying/geodesy, and transport means that any irregularities that affect the quality of work implementation are grounded in economic value. Kuhlmann et al. in [45] rightly recognize and perceive the importance of engineering geodesy, emphasizing its scientific role in applications and professional approach.

5. CONCLUSION

Scientific research works on the subject of the interaction of irregularities in the standard of surveying and cartographic documentation with rail transport problems based on a case study have provided a detailed examination of the state of the Ig-1 standard in a real-world context. The impact of irregularities remains high because the problems have multiple sources. Obtaining uniform surveying and cartographic documentation, their type, and their circulation requires their strong synchronization in order to optimize the negative impact in response to rail transport problems. This article demonstrates irregularities in the implementation of solutions as good practices. It should be emphasized that the position developed by scientific research works resulting in the interaction of irregularities in the standard of surveying and cartographic documentation with rail transport problems based on the case study was forwarded to an infrastructure manager.

The subject matter of this publication is part of improving the quality and efficiency of uniform surveying and cartographic documentation, their type, and their circulation. As part of good practices, it optimizes the negative impact in response to rail transport problems. It has grounding primarily among surveyors but also diagnosticians, operators, assemblers, and policymakers in the security context.

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