

Self-report

Achieving scientific results after receiving a doctoral degree, representing a significant contribution to the development of the scientific discipline's civil engineering

Scientific achievement, which is referred to in Article 16, paragraph 2, point 1 of the Act of 14 March 2003 on Academic Degrees and Title and Degrees and Title in Art (Journal of Laws No. 65, item. 595, as . amended.) is a monograph: Kruszyna M. "Evaluation method of road infrastructure with the needs and specificities of the different groups of users," Scientific Papers of the Institute of Civil Engineering number 56, series of Monographs, number 24 Wrocław University of Technology Publishing House in 2013.

The main contribution of the monograph in the development of a scientific discipline construction is to construct a universal method of description elements of road infrastructure. In addition to the recognition of traditional values characterizing the geometry of the road and the movement of the users I included the role requirements of particular user groups. Analysis of the various user groups, including traveling in vehicles, public transport, pedestrians and cyclists, required a unified set the size and the related entities.

I constructed a unique method of assessing element of road infrastructure based on the copyright model description of the item including infrastructure and different groups of users. The method of assessment used the original set of features and conditions tailored to the nature of the tasks to be solved. The method is suitable for the correction of ways to calculate

the bandwidth and the traffic assessment of the development of all groups of users. A comprehensive description of all the parts of an item of infrastructure also allows for an assessment of options for implementation, or management.

An important contribution to the development of monographs discipline construction is also the use of fuzzy clustering methods to calibrate the parameters of the evaluation function, and genetic algorithms, as a modern and effective tools for solving the evaluation of infrastructure elements. For example showed the usefulness of the constructed model and the effectiveness of the author's method of assessment, also against the background of previously used methods, and including with built computer tools. In addition, I showed that by modifying specific elements methods, such as weight, the parameters of the evaluation function and its form, take into account the different degrees of priority to certain groups of users according to their preferences formulated by policy makers and expectations.

In the monograph, the term road infrastructure reflected on the works done after the transport of people and goods in the field of road transport industry. Introduced and defined the key concepts for their work, such as road infrastructure element, its types (node and interstitial segment), and part of, a group of users, route, means of transport, description and evaluation of traffic conditions. I made a statement of the state of knowledge of the issues discussed in the breakdown: a review of issues of description of an item of infrastructure, the importance of road signs in the assessment of traffic conditions and trends in the use of heuristic methods in the evaluation of road infrastructures. On the basis of this summary have described an original contribution to the field of design and evaluation of road infrastructure.

An important objective of the monograph was to create a model for the assessment of road infrastructure element allows the description of any object (node, interstitial section) regardless of location, in a unified and integrated, that is identical for users of any group. Determined to specific levels of description of an item of infrastructure and brought out a new volume based on previously used. New fishing capture the specificity of human perception in a way not done yet. I have shown that it is possible integrated description of a road infrastructure in the form of a node or interstitial segment users into consideration the specificity of the different groups.

Designing infrastructure requires an evaluation of different variants of solutions, and the search for solutions with the highest evaluation. It is essential at this point infrastructure element evaluation method, which recognizes determinants of users from different groups, the impact of their numbers, the possibility of introducing preferences by decision-makers managing the transportation system. On the basis of the constructed model of integrated infrastructure element and used in the volume brought out the method of assessment which takes into account the above considerations.

For the modeling of individual and group preferences in the evaluation of an item of infrastructure is useful heuristic parameter calibration copyright size evaluation. Similarly, modern methods are used to increase the efficiency of the search for solutions with the highest evaluation. To this end, I introduced the fuzzy clustering method to calibrate the parameters of the evaluation function infrastructure element and genetic algorithms to review the evaluations of the various solutions and to effectively find a solution with the highest evaluation. Another objective of the monograph has become the use of previously used heuristics and construct tools tailored to the specific issues of this monograph. I proved that it is possible to design effective heuristic tools: fuzzy clustering and genetic algorithms for the evaluation of road infrastructure elements by unique, I have formulated methods, and in particular the calibration parameters of the evaluation function, and in search of an embodiment of the infrastructure of the highest evaluation.

Monograph are divided into eight chapters. The first chapter is an introduction to the subject actuated and includes a discussion of the use by the author of the specific concepts and terms sometimes different from those previously encountered. In the second chapter I made a statement of the state of knowledge of the issues discussed in the breakdown: a review of issues of description of an item of infrastructure, the importance of road signs in the assessment of traffic conditions and trends in the use of heuristic methods in the evaluation of road infrastructures. On the basis of this summary have described an original contribution to the issues of design and evaluation of road infrastructure.

The third chapter contains a description of the model evaluation infrastructure element. I have described a multi-level structure of the model with the division of the characteristic recognition on: time and space. I discussed singled out a group of users adopting a man moving different means of transport as the basic unit of measurement. Subsequently,

proposed an original method for constructing aggregates. On the basis of selected parameters associated with time and bandwidth constructed the aggregated assessment infrastructure element (positive and negative). These figures named equivalents quality. I offered to write equivalents allows the use of different rating scales: percentage (preferred in further analyzes) or numerical. I pointed to the reasonableness of the use of fuzzy inference methods to describe and analyze the size of the psychological. I defined copyright, fuzzy evaluation functions infrastructure element. I constructed a specific function: the satisfaction of quality (F_S) and acceptance occurring element inconvenience (F_A).

Chapter 4 deals with the identification of variables to satisfaction and acceptance. Generally characterized the possible identification methods. These methods are different depending on the size existing in specific functions F_S and F_A . Then approached the size used in the method HCM, similar to the considerations of work. In the next steps I brought sets of quantities describing the elements of road infrastructure characteristic of typical problems (tasks) project. These tasks are classified according to the relationship of division: the time available in fixed time signalizations, space infrastructure and of space and time (complex) in signalizations adjust to changes in traffic.

Chapter 5 deals with the calibration parameters of the function of satisfaction and acceptance. I wrote and gave an example of classical calibration methods on the size described by two variables (quality assessment) and FCM fuzzy clustering method. Then characterized the author's method of calibration. This method applies the size described by one variable (only feature), but as I have shown to effectively calibrate the size used in the present method. Next, I made the calibration parameters used on the size broken down by: related to traffic, loss of time and speed. I introduced standard sets of parameter values for the selected parameters as a result of a summary of studies of the whole chapter. I handed ways of determining the parameters for the size has not grouped in a fuzzy way.

In Chapter 6, I formulated a method for evaluating the element of road infrastructure based on the model described in Chapter 3 and sizes identified in Chapter 4 and the parameters calibrated in Chapter 5 I described the construction method broken down into three components taking into account: the sensitivity of users and local preferences by choosing parameters of the partial evaluation function, the preferences of the manager of the transport system through the selection of weights and the impact of group size by the choice of the form

of the evaluation function. I built three forms of the evaluation function based on previously derived satisfaction and approval functions F_S and F_A for all user groups with weights. I discussed ways to find a solution infrastructure element with the highest evaluation. Presented an analytical and heuristic. I found that in an analytical way can be solved only simple tasks with uncomplicated form of the evaluation function and a small number of variables. As a heuristic method proposed genetic algorithms - specific methods of searching the solution space using analogies to the principles of natural selection or the social behavior of living organisms.

In Chapter 7, I showed an example of application infrastructure element evaluation method for testing the impact of the choice of method components variant solution. I researched the possibility of taking into account the priorities for users with different groups, the efficiency of broadcast interference priorities and ways of decision-maker in the design and evaluation of infrastructure element. At the same time I showed versatility and versatility author's method, also to solutions obtained existing methods.

Analysis of the subject node in the form of the four armed intersection. For such an infrastructure element formulated specific problems (tasks) and made the assessment of their solutions. By crossing the tram lines are carried out on a dedicated guideway and bus lanes on shared with the general movement. Provided for pedestrian crossings at all inlets and rides for cyclists. There are the following groups of users: the means of transport - pedestrians, bicycles traveling, traveling on trams, traveling by bus, traveling by private car and travel routes - all permitted relationships. Depending on the specific problem under consideration is distinguished by different numbers of users. A description of each track system is effected using a two-dimensional space coordinates (x, y) .

The assessment of the infrastructure element and its parts done on the basis of a set size chosen according to the specific problem. Selected problems are:

- the selection and distribution of the length of the green signals between different groups of users,
- purpose lanes at the intersection inlets, including the selection of the width of lanes,
- the selection of phase sequence and parameters of the signal cycle changes in signalizations adapting to changes in user traffic.

In order to deepen the analysis tested the impact of the three components of the method on the obtained solution. Showed that the principles taking into account the impact of:

- the importance of the number of user groups through the choice of the form of the evaluation function,
- external priorities for different groups, defined for example by managing the transportation system by introducing weights
- user preferences of different groups, or local conditions, expressed parameter values of the evaluation function.

Rating element is to calculate the value of the evaluation function taking into account any partial function values expressed satisfaction and acceptance and weights. As the variables of partial evaluation function uses identified earlier volume, selected according to the specifics of the particular problem.

Methods for assessing traffic conditions used so far in Poland allow for consideration node (in the form of the four armed intersection) to determine the PSR on the basis of loss of time for users moving vehicle (for vehicles general traffic). Presented example showed that depending on the allocated length of the green signal and traffic vehicles are completely different PSR. This allows you to evaluate your current or projected traffic conditions, as well as appropriately chosen values characterizing element of the infrastructure (eg, lane width). The test example shows that at high traffic volumes, PSR will be disadvantageous regardless of the length of the signal allocated to green, and appropriate lane width. In order to improve the PSR would be necessary to increase the number of lanes or measures to reduce the intensity.

Methods applicable in Poland do not allow for the appointment of the pedestrian traffic. These conditions are determined by using the American method of HCM (Highway Capacity Manual). As a result of the method of assessment was obtained HCM infrastructure element (crossing the road at the intersection), expressed by level of service (LOS). Depending on the length of the allocated green signal and the number of pedestrians obtained a better or worse rating. It is important that, depending upon the traffic conditions of the formula are classified in different levels of evaluation.

Pedestrians and traveling in vehicles are previously lumped in separate methods, the results of which can not be easily compared because of the different number of classes assessments.

Rating by these methods is to define the average loss of time (on the basis of qualifications shall be made to the PSR or LOS). The assessment does not take into account so: the number of user groups, their individual (local) preferences, including the impact of infrastructure on the evaluation and characteristic of human perception blur and uncertainty assessments. There is also, in the evaluation process, the possibility of including preferences (priorities) for selected groups of users, and more broadly reflect the impact of the transport system management, the process of evaluation of an item of infrastructure.

Author used the method and its tools allow you to assess the infrastructure element and choose the best option taking into account user rating for the following issues: the allocation length of the signals corresponding to the demand, the distribution of the signal between the opposition groups of users, modification of signaling plans involving the lengthening or shortening phases and the replacement of their order, the selection of the road cross section components according to requirements of various groups of users, the assignment of traffic lanes according to demand. The resulting solutions form the infrastructure element according to the preferences of different groups of users, and according to the weight imposed by the operator of the transport system. Take into account the allocation of priorities for selected groups of users, such as pedestrians or vehicles traveling on public transport. Showed that the preference for specific user groups is possible in several ways. I tested the impact of a number of components on a method of solving the result: a function evaluation (to put in the number of users in the group), the preferences expressed by weight of user requirements expressed partial evaluation function parameters (satisfaction, $F_{,S}$ and acceptance, $F_{,A}$).

I have shown that the solution of tasks depends not only on the size of describing the geometry of the road and traffic control rules. Significant are the user requirements, which are determined based on the parameters of partial evaluation function (local conditions) and the specific form of the function evaluation takes into account the impact of different groups with greater numbers. In one of the problems of the concept of dominant groups were equated with the inlet, which users formulate high requirements to the satisfaction of the item of infrastructure and low for the acceptance of waste of time. Similar importance is the identification of the dominant group with the specific road users. In previous methods (especially used in Poland), it was not possible to deal with all the above-mentioned aspects.

By modifying the values of the partial evaluation function has the effect of the use of any degree of priority for each user (for example, by converting the phase sequence, if the actual loss of time approaching the limits designated with the solution of the problem). Parameters of partial evaluation function reflects the degree of priority to specific relationships or group of users. Another way to give priority to the use of weights on partial evaluation functions - F_S and F_A . Rating infrastructure element expressed by the members of the different groups of parameter values of the function F_S and F_A is independent of the priorities assigned to them. As shown on the sample data sets even with identical preferences of users in each group, it is possible to obtain different solutions adopted, depending on the weight, and thus the degree of priority. This is reflected in this case, the impact of external factors - managing the transportation system (or, more broadly, a city) by setting transport policy, specific actions on some within the transport, other local conditions (eg traffic calming). In this manner, a desirable solution to the decision maker, regardless of the local user preferences. Slightly smaller is the significance of the number of groups, in particular to the method used to take into account individual users (including traveling in vehicles) and not vehicles. Preferred are thus collective transport carrying more people in a single vehicle and pedestrian and bicycle traffic as consuming less space in the carriage of a single user.

I showed the use of specific variables, which are the equivalents aggregating appropriate size describing the motion: speed, capacity and loss of time. Determination of the value of these aggregated size requires the adoption of certain minimum or maximum values. Thus, the value of a specific size depends not only on the parameters of the task (for example, the parameters of the partial evaluation function), but also from the accepted levels for a given size. The method constructed and used in the monograph implicitly takes into account the impact of political and maps their impact on the evaluation process infrastructure element. Use of equivalents, rather than the traditional size of describing motion, allows the recognition of the complexity of the perception of traffic conditions by users who do not follow the strict values of the specific volume, and only a subjective experience, often erroneously interpreting the observed situation.

Based on the obtained result set is modified element of the infrastructure (including traffic control), so as to achieve an assessment of users similar to the solutions of the highest evaluation. The application of the proposed method for the evaluation of infrastructure elements is not limited to the design stage such solutions. Based on the presented algorithm I

described the principle of operation of the controller signaling that actualize work according to the user preferences for different inlets (or relationship). Preferences are assessed on an ongoing basis according to the data from the detectors and the adopted method of converting these data to the parameters of the partial evaluation function. The simplicity of the algorithm used work permits to conduct such activities in real time(*on-line*).

Furthermore, if it is a variant management infrastructure element (for example, the purpose of each lane), after the definition of the variables for the groups in specific variants, hassle-free option is to choose the next most variant. This shows the application of the method as a tool to select options or how to search for solutions to the most effective.

In Chapter 8, I made a summary for presenting the results of the method and collecting requests from the general summary of the monograph. Wished to stress the achievements and contribution to the development of self-discipline construction. I described the possible use of your work, and I described further directions of research.

Other (not included in the above described achievements) published scientific papers and indicators of scientific achievements

The remaining scientific activity discuss later in self-report with honors five of its areas:

- I. Development of road infrastructure taking into consideration different users and using modern analytical methods.
- II. Studies on the movement of pedestrians and cyclists, including in the context of specific infrastructure.
- III. Modeling travel and forecasting traffic road network with particular emphasis on the role of traffic control by traffic light signals.
- IV. Issues relating to the infrastructure of public transport, including rail, taking into account the optimization and integration.
- V. Determinants of construction and infrastructure policies, transport and mobility plans taking into account traffic patterns and relationships of spatial planning.

These areas are presented in order of the issues strictly construction place themselves in the discipline of road construction, by means of modeling traffic engineering, multi-disciplinary research with the introduction of new elements in the construction discipline. Some publications may be classified in several of these areas.

The characteristics of the output generated after obtaining the degree of doctor of technical sciences close a short description to the earlier period. Achievements research and exceptional teaching and popularizing present in the system in accordance with Regulation of the Minister of Science and Higher Education of 1 September 2011 on criteria for assessing the achievements of the person applying for the PhD degree (Journal of Laws No. 196, item. 1165) - Appendix no. 4. At the end I put self-report parametric summary of scientific achievements.

Development of road infrastructure taking into consideration different users and using modern analytical methods - I. research area

Modern (heuristic) analytical methods are published [L24] (Kruszyna M. "The use of genetic algorithms in selected problems of traffic engineering", LII. Scientific conference "Problems of scientific - research building" Gdańsk - Krynica 11 - 16.09.06; Scientific Papers 603 Gdańsk University of Technology, Civil Engineering No. 60), and [E25] (Kruszyna M. "Methods heuristic traffic engineering issues", Drogownictwo 10/2005).

In the paper [L24] pointed out the possibility of using genetic algorithms to optimize traffic engineering issues. I have discussed the classical algorithm and original modifications aimed at recognition of the specific nature of the tasks that occur in traffic engineering. I concentrated on discussing the specific sizes that become decision variables in the optimization task. I offered an original encoding method used in traditional volume traffic engineering as equivalents endearing quality road facility. Such equivalents are used in a simple manner to construct a partial objective function. I showed an example related to the analysis of modal split.

The purpose of the article [E25] was the presentation of the possible uses heuristic research issues of traffic. From the stated review of the world literature revealed that such applications may be many, but in Poland they are not yet widely used. Presented selected studies from the past five years showing the methods used and their application. The rest of this article presented the results of their own work using fuzzy inference, and using genetic algorithm to optimize the operation of traffic lights.

Publication referring to the idea of examining the elements of road infrastructure from the point of view of a specific group of users [E47] (Kruszyna M. "Evaluation of distance between pedestrian crossings by students in one of the Polish cities" Archives of Civil Engineering, vol 59, no 4.) is an element common to the mainstream of research described here and the current second for pedestrians and cyclists (research on these groups are still rarely carried out both at the Polish, as well as international publications). The article pointed out that the distance between adjacent crossing the road is an important factor in determining decisions regarding pedestrian crossing the roadway. I analyzed the distance in one of Polish cities for selected locations (twenty-one seats). Based on questionnaires (surveys) constructed a database consisting of two-dimensional variables: the distance between the crossing and the distance evaluation by students (respondents). Highway Capacity Manual introduces the concept of PSR ("degrees of freedom of movement") for pedestrians. It is possible to apply this methodology to assess the facilities used by pedestrians, also in the context of crossing the road. In principle, the boundaries between the PSR are defined by specific values. Some researchers propose the use of fuzzy clustering to modify the boundaries between PAS. The database constructed for the purpose of research, was analyzed by fuzzy approach in order to create specific clusters. Several different number of clusters, in particular three, in order to compare with the methodology PSR. Each variable has been updated with the third dimension representing the value of the membership function. The values obtained in the evaluation of the distances between transitions are similar to those known from the literature. Unfortunately, high ratings distances are not frequently used in practice. This suggests the need for the additional pass through the roadways, especially in central areas of cities where pedestrians should make a big difference.

My contribution to the discipline of civil engineering in this area of research is a comprehensive consideration of all users of the road infrastructure with an indication of the specific, yet not studied conditions. As one of the first scientists have used modern analytical

methods, including genetic algorithms and fuzzy clustering to evaluate and road infrastructures.

Studies on the movement of pedestrians and cyclists, including in the context of specific infrastructure - II. research area

As part of the research on pedestrians and cyclists can point to the publication: [A2] (Kruszyna M., Rychlewski J. "Influence of approaching tram on behavior of pedestrians in crosswalks signalised in Poland" Accident Analysis and Prevention. 2013, vol 55, June , pp. 185-191) [E17] (Kruszyna M. "The green light split time at pedestrian crossing with consideration of different road users" Archives of Transport 3/03) [E27] (Kruszyna M "Bikes as part of the system combined transport Bike and Ride ", a chapter in the book:" The city friendly to pedestrians and cyclists ", Warsaw, TransEko 2007) [E32] (Kruszyna M." Additional crossing roads as a solution to improve conditions for pedestrians at the intersection of" Transport Miejski i Regionalny . 2010, No. 11, pp. 17-21), [E19] (Gasz K., Kruszyna M. "Analysis of process applications pedestrians to cross the road," Drogi i Mosty 2/2004).

Research [A2] was carried out in two Polish cities (Wroclaw and Poznan), and they relate to the impact of the upcoming tram stop on the behavior of pedestrians wanting to cross the road. Measurements consisted of counting pedestrians waiting for a green signal, passing the red light without risk (safe) or in a dangerous situation distinguishing between the situation of an oncoming tram or without. It was assumed that the behavior of pedestrians may be different depending on the fact of arrival or no public transport vehicle and taking into account that in Wroclaw, fixed time signaling function, in Poznan - adapting to changes in traffic. After analyzing the collected data demonstrated the effect of the upcoming tram to increase the number of people crossing the road at a red signal (including in a dangerous manner). This leads to the conclusion that the signaling associated with the stop should have run the algorithms take into account the green signal before entering the tram stop, so as not to provoke dangerous pedestrian behavior. Another achievement of research is the identification of an additional factor affecting the behavior of pedestrians.

Distribution of the green wavelength considered in [E17] is an important issue in the control of traffic. So far this problem has been analyzed only for groups or conflict of law rules of conflict relations vehicles. Taking into account the needs of other road users than vehicles is important at pedestrian crossings especially in the city center. In the article [E17] accepted the loss of time as a parameter used to divide the movement length green light for pedestrians and traveling in vehicles. In the first part of the publication presented the basic mathematical relationships to divide the length of the green light. Then I analyzed the different types of loss of time: real and subjective, and the importance of these losses. Impact of loss of time and the number of users on the distribution of the length of the green light was shown on the example of numerical.

In [E27] discussed some aspects of combined transport system based on cooperation bike with public transport. I have described examples of solutions of the system (Munich, Amsterdam, Seattle). I gave interchange station design principles and examples of bicycle storage solutions. I presented the proposals to introduce a system of "Bike and Ride" to Wroclaw.

Article [E32] summarized the characteristic examples and situations related to the traffic control by traffic at intersections along with a discussion of the advantages and disadvantages of solutions for pedestrians. I described the solution of introducing additional pass through the roads showing the existing and proposed locations.

Article [E19] describes the process analysis applications pedestrians to cross the road. The basis of the study were the measurements and observations made at pedestrian crossings dozen in. These transitions are equipped with traffic lights and are characterized by a large number of pedestrians and vehicles. Characterized notifying the change in the number of pedestrians to different measurement intervals (including the length of the cycle), and the distribution intervals of applications. Performed spectral analysis of time series analysis process applications and auto-regression. In conclusion, the article discusses the potential of using the results of their analysis. Last, the above-mentioned items knotted to another area of research concerning traffic patterns.

Studies on the movement of pedestrians and cyclists are relatively sparse literature. Deepening the understanding of the movement of these users of road infrastructure, including behavior towards traffic light is an important contribution to the field of civil engineering.

Identified problems, processes and solutions presented will enable better and more effectively shape the road infrastructure.

Modeling and forecasting of traffic traveling in the road network with particular emphasis on the role of traffic control by traffic light signals - III. research area

First, the work cited here, [A1] (Kruszyna M., Mackiewicz, P., Szydło A "Influence of pedestrians on pedestrian entry process delays at signal-controlled crosswalks." Journal of Transportation Engineering. 2006, vol 132, no 11, pp. 855-861) derives from current research on pedestrian traffic, but it points to aspects of modeling in the case of application traffic light signals. The authors hypothesized that loss of time pedestrians cross the street equipped with signaling influences the process of coming to pass. Previous models were based on typical situations and usually do not take into account the parameters describing the process of getting. Using these models, leading to an incorrect estimation of loss of time, especially when the process is not handle the regular character. A series of measurements by recording the loss of time. Then the measured values are compared with those obtained previous models. Indicated in situations where existing models are not estimates in a satisfactory manner loss of time. Proposed new models for calculating losses. Indicated the usefulness of the new models. This position is most frequently cited publication in my output (8 citations), which proves the usefulness of the discussed topics.

As part of the research related to modeling can point to further work related to the subject of signaling [E33] (Kruszyna M. "Quantitative evaluation of the functionality of traffic management systems on the examples from English cities", a chapter in the book: "Contemporary transportation systems: selected Theoretical and practical problems: the development of transportation systems "Publisher Silesian University of Technology, Gliwice 2010) and [E22] (Kruszyna M., Szydło A." Optimizing the distribution of green signal for pedestrian crossing based on the average loss of time ", Drogi i Mosty 3/2004).

The actual effects of the control strategy adopted in [E33] will depend on local conditions. Some of them can affect the designer: the length of the cycle and the individual phases, established maximum elongation and shortening phases. There will, however, contingent

upon an independent designer, such as the length of between green time, if the relations between the control parameters. The solution involved separate intersections. Coordination in the artery or network connections imposes further reduce the possibility of interference in the system cycle. It is then programmed "stiff" (not accommodated) program of preference for public transport (e.g. setting the coordination type green wave into the specificity of tram traffic, and no other vehicles). An alternative might be acyclic traffic-dependent control (e.g. control groups) with a strong preference for group transport.

Article [E22] shows green signal to optimize the distribution between different road users (pedestrians and vehicles) to cross the street. Proposed two functions for engaging the sum and difference of the average loss of time users. Determined the decision variables and constraints. It has been shown in the numerical example, the optimization of these functions give different results, and that the optimization based on the difference in loss of time is more favorable for pedestrians. The use of specific functions to varying degrees may prefer to pedestrians or vehicles.

Other, related models were constructed with elements of the road network: [E2] (Kruszyna M., Szydło A. "A simulation research on vehicles flow in public transport network" Archives of Transport, 4/00), [L6] (Kruszyna M., Szydło A. "Comparison of models: deterministic and stochastic modeling of public transport vehicles" in the XLVII scientific conference "Problems of scientific - research building" Opole - Krynica 16 - 21 09.01) [E23] (Kruszyna M. "Proposed traffic forecasts for motorways and expressways in Poland" Drogownictwo 1/2005), [L8] (Kruszyna M." Size of parking as an additional factor influencing the formation of the road "in XLVIII scientific conference" Problems of scientific - research building "Opole - Krynica 15 - 20.09 .02).

Publication [E2] that: assumptions, methodology and results of the flow of public transport vehicles in specific transport networks (road). We analyzed network element consisting of two intersections and segment between them, which was located dedicated lanes for public transport vehicles (buses and trams). Does not include stops. The influence of deterministic and probabilistic parameters for the loss of time vehicles. The study was conducted on the original simulation model. In the article [L6] was made to develop the above subject by comparing the effects of stochastic model work with deterministic. Indicated in situations in which random factors are irrelevant, so then it is possible to use simple deterministic models.

In the article [E23] analyzed the specifics of traffic on motorways and dual carriageways (referred to in short as a network AS). I stated that existing and traffic forecasting methods may be inadequate to the specific AS. For international road transport network should provide more than the increase in traffic on the roads in the national network. Traffic on these roads also has a different structure of the generic, with a higher proportion of heavy vehicles. AS road networks are characterized by a higher rate of growth of road traffic from the lower classes. Based on observations in Western Europe and the development of the AS traffic on them can point to some common features such growth. Firstly, it is closely associated with an increase in the length of the calls and their incorporation to the international road network. Secondly, traffic growth rates are clearly higher than for other routes. I derived a method allowed for the differentiation of SDR for individual road segments, taking into account the specificities of traffic near and far. The proposed method can be applied to forecast the projected future episodes of AS in Poland. Differentiation of traffic in each section will result from the differences in recorded today close to traffic.

Additional factors affecting the modeling of traffic to retail facilities proposed in [L8]. As an example of such an agent examined the effect of the size of the parking lot on the amount of traffic generated by a commercial facility by comparing the values obtained with traditional models with measurement results for a few specific objects (differing among other things, the size of the sales area, the size of the parking lot, location). Under the identified additional effect constructed a mathematical model takes into account the additional factor.

Position [L33] (Kruszyna M. "Modeling travel for selected rail routes near Wroclaw" Notebooks Scientific and Technical Association of Engineers and Technicians of the Republic of Polish in Krakow. Serie Materials Conference. 2010, No. 94, pp. 146-158) indicates the combining aspects of the modeling of transport problems. At the beginning of the paper described Railroads near Wroclaw. Subsequently, I discussed the elements of the model travel beyond the previously used approach. As an example of the operation of the model showed the route Sobotka - Wroclaw. Then I discussed the proposals for new routes in the area of Wroclaw. In conclusion, the paper formulated demands for efficient modeling of travel for train paths.

My contribution to the field of civil engineering in the third area of research involves the construction of the original models taking into account the movement not yet used items, such as specific roads fast motion, the impact of commercial buildings, modeling of rail travel in the situation of a limited set of input data. Research relating to the linkage of processes of formation and decomposition of traffic with advanced algorithms working traffic lights brought important elements in the form of original and effective control strategies. Some of the solutions have been implemented in practice.

Issues relating to the infrastructure of public transport, including rail, taking into account the optimization and integration - IV. research area

Issues relating to transport beyond the modeling issues were analyzed by me in aspects: design and optimization of infrastructure, the availability of spatial, functional assessment, optimization. These elements can be illustrated by the following publications: [E18] (Kruszyna M. "Method of increasing the bandwidth of traffic routes Tram", a chapter in the monograph "Recording and processing of data in the telematics transport systems", published by Silesian University of Technology, Gliwice 2003) [E11] (Kruszyna M. Makuch, J. "The concept of improving rail connections from Wrocław - Jelenia Góra", Technika Transportu Szynowego 6/03) [E28] (Kruszyna M. "Studies on the integration of the main railway station of the tram network in Wrocław." Transport Miejski i Regionalny. 2008, no 9, pp 2-5) [E37] (Kruszyna M. "Integrated interchanges rail-road at a small railway stations and stops" Transport Miejski i Regionalny. 2012, No. 2, pp. 2-4) [E34] (Wild P., Kruszyna M. "The proposed development from Wrocław Railway Junction", Przegląd Komunikacyjny. 2010, R. 65, No. 4-6, pp. 18-22), [E41] (Kruszyna M. "Train Station as a node mobility" Przegląd Komunikacyjny. 2012, R. 67, No. 10, pp. 34-37) [E45] (Kruszyna M. "Model integration passenger in Lower Silesia" Przegląd Komunikacyjny in 2013, R. 68, No. 11, pp. 18-22).

In the article [E18] introduced the concept of supporting the trams run through the intersection by lengthening or shortening phases. I described a relatively simple situation where the trams pass in only one relationship straight, as main relationship loader. The need to implement two phases of conflict to tram traffic can cause significant movement disorder but trams and big waste of time. Determined the control strategy and gave way to determine

loss of time. The problem presented as an optimization task. Much attention focused on writing a formal algorithm accommodation.

In the article [E11] authors proposed measures to improve regional rail links in the area of Lower Silesia (between Wrocław and Jelenia Góra). These activities include not only the modernization of the existing sections, but new construction taking into account the attractiveness of rail routes in the region and the possibility of reviving local traffic. The aim of the publication was to show the possibility of the development of regional rail connections and thus the possibility of increasing the share of rail in passenger, as well as interest in the idea of community and local authorities, not only of the analyzed area, but others of a similar nature.

In the article [E28] studied aspects of integration in public transport with particular emphasis on rail and nodal stations. Major railway stations, as burdened with significant passenger traffic, have extensive system of tracks and platforms. They occupy a lot of land and is accompanied by a large station building. Such station is also a major generator of urban traffic - rail passengers, mostly coming to the station by means of public transport. Ensuring good to communicate these two means of transport is not an easy task if only because of the dimensions of the station. In the vicinity of the train often runs many lines of urban public transport operated numerous routes, which further complicates the formation of functional integration hubs. Meanwhile, the smooth combination of urban non-urban communication may constitute the choice of means of transport (individual and collective) and has an impact on modal split. I pointed out that the main railway stations in addition to long-distance trains may also operate the suburban railways, or even transport. Integrating suburban railway network of public transport can therefore contribute to a reduction in car traffic intensities reaching the city center and thus contribute to the discharge of congestion. Similarly, in the article [E37] discussed the role of interchanges in public transport. Characterized the nodes at small railway stations and bus stops. and the layout of parking spaces for buses using the edge of the saw.

The authors [E34] found that under the development project for the reconstruction of Wrocław Railway Junction should immediately predict the issue of the construction of the railway system of urban and metropolitan. Presented the ideas of both authors show many

convergent elements. Elements of divergent concepts indicate the need for a discussion on the final shape of Wrocław Railway Junction.

Article [E41] presents the idea of node mobility as an extension of the concept of interchange in an integrated transport system. Node mobility focus on the transport demand. So is there a new and expanded definition of mobility as an element of human activity that can be formed. The article postulated to create a system for urban mobility nodes based on the main railway stations. General considerations based on the example of Canada, complemented by the concept of the location of the node mobility in Wrocław agglomeration. I pointed to the potential benefits of such solutions. Presented issues may be relevant to the situation in Poland is currently developing transport plans.

In the article [E45] formulated the principles and conditions for the implementation of integrated passenger transport system in the whole province. The area of interest is the Lower Silesia, but the presented model can be generalized to any other area. As a base for grid connections indicated internal railway axes. I showed the problems of integration of these axes in the corridors and external lines of a local nature (agglomeration). This article is the starting point for more detailed consideration, among other things, for each agglomeration of Lower Silesia. The last two items from the above description, you can already include the V. mainstream research on issues of broader and multidisciplinary.

In this area are possible while still two items: [A3] (Kruszyna M. "Problems of efficient connection some suburban areas with the city"), and [A4] (Kruszyna M. "A novel approach to plan the high speed rail network with consideration of timetable conditions "), currently under review, but important to the presentation of scientific achievements. The main aim of the research conducted in [A3] is to evaluate the potential options of public transport system in terms of their suitability for service suburban areas. In addition, there I brought a new evaluation method, which is based on the concept of accessibility. I analyzed three system options: the existing system of bus lines, modifications to this system with the inclusion of the suburban railway lines, futuristic system bus on request (Dial-a-Ride) for three time horizons: 2002, 2012 and 2022 (forecast). I constructed two measures of availability: spatial and temporal whose appointment requires the assembly of a relatively simple set of data (number of buildings, transit times, frequency of use). In conclusion, the article analyzes [A3] to say that only an advanced system of Dial-a-Ride can offer good accessibility to public transport in

suburban areas, especially the face of competition from the private car. A case study conducted for the selected village located in the vicinity of Wrocław. The results can, however, be adapted for other cities and countries of the similarity of processes (de)urbanization and operation of transport systems. Article [A4] deals with the problem of coordination of planning new railway line with the assumed standard of service (timetable). Illustrating the problem of examples of completed high-speed rail in Spain, Japan and South Korea and plans from the U.S., presenting considerations for the planned line Y in Poland. Problems identified for this plan are universal aspect. I point to a new approach to investment planning and a variety of factors shaping land transport infrastructure.

The effects of my research in the area associated with the transport infrastructure contributed to the development of the discipline of civil engineering material transport models for integration of different types of nodal points in the network, such as train interchanges, new concepts shaping the network, the location of stations and nodes, taking into account the optimization of timetables. Introduced and tested a new measure of the availability and quality assessment.

Determinants of construction and infrastructure policies, transport and mobility plans taking into account traffic patterns and relationships of spatial planning - V. research area

This area is the study of spatial planning, management, and organization of transport. The author's intention is to enrich the discipline of road construction on the methodology, tools and procedures used in other branches of science. On the other hand, the results formulated in these sectors could have an impact on design solutions, standards and methods used in construction. The summary of the work carried out in this trend are publications: [E31] (Kruszyna M. "Communications Infrastructure and Transport Wrocław", a chapter in the book "Social Problems in the area of Wrocław" Warsaw. Scholar, 2010. Pp. 61-82), [E3] (Kruszyna M. "Assumptions for the modernization of the public transport in Wrocław", a chapter in the book: *"Urban collective communication - opportunities and threats. Proceedings of the years 1998 to 2000"* Wrocław: Polish Ecological Club - Province of Lower Silesia, in 2000. pp. 157-166), [L37] (Kruszyna M. "Towards a 'politics of mobility' -

the key aspects of converting the existing transport policies "IX. Scientific and Technical Conference" Problems of communication in urban traffic congestion conditions "Poznań 19-21.06.2013 Rosnówko) [E36] (Kruszyna M. "Some aspects of the new law on public transport" *Przegląd Komunikacyjny*. 2,011 R. 66, No. 1/2, pp. 58-60), [L35] (Kruszyna M. "Traffic Engineering and the formation of mobility "" Modern public transport in urban areas: VIII scientific and technical conference of the cycle: communication problems in congested cities automobile ", Poznan, Rosnówko, 15-17 June 2011), [L4] (Rudnicki, A., Dudek M. , Kruszyna M. "Problems of development of the network of streets of Krakow, Poznan, Warsaw and Wroclaw - a comparative study" in XLVI scientific conference "Problems of scientific - research building" Volume IV "Infrastructure Engineering towns" Wroclaw - Krynica 17 - 22 09.00).

In [E31] claimed that Wroclaw Transport Policy as a Resolution of the City Council is a document which fits in the current European trends shaping the city's transport system. Described the objectives and proposed actions appear to be correct in the light of the experience of other centers and model considerations. Implementation of the provisions of Transport Policy, however, is problematic in the absence of institutional arrangements to support the implementation of the provisions of the Resolution. For general sense communication in Wroclaw the different units scattered among the various departments and subject to the various Vice-Presidents. In the absence of co-ordination is difficult to assess the individual plans and investments for compliance with the rules of Transport Policy. It seems that some projects stand even against the actual structure, and certainly do not contribute to achieving the stated objectives. I found that it is necessary to integrate the management of transport in Wrocław in a very broad sense of the term. In the state of transport in the city and its surroundings are affected not only the investment activities (construction of roads, tram routes), not only the action planning and organizational (trends, the charging system), but also elements of impact on society, such as the promotion of behavioral communication , to stimulate interest in new ways of traveling, etc. As part of these activities increasingly important role leading modern methods of exchange of information (so-called telematics). Small or even no interest in the City in the development of these areas of transport management can have in the near future serious consequences in terms of choice of travel by residents of Wroclaw and the surrounding area.

The publication [E3] I considered the possibility of systematizing the processes of modernization of transport systems. In particular, discussed the modernization is to cover two of the components of the system: the network and tariffs. Organizational transformations will not replace technical activities: construction of new routes, or secretion of the existing general traffic, placing priority at intersections with traffic lights, reconstruction nodes, but in light of the requirements posed today, means of transport in cities, it should be considered as a basis for any action to improve . I noticed that none of the technical measures will not bring satisfactory results in an inefficient system and its consequences: lack of competitiveness with other modes of transport, decreasing the number of passengers or less influence. This observation can refer to the program of modernization of tram no 7 in Wroclaw. Today's network organization discourages changing trains (long waiting time for a vehicle other line associated with low frequency, disrupted connections and lack of nodal points). In this case, as appropriate to the formation of nodes on the route 7 does not solve the problem. Similarly, without a well-organized public transport system in the city, it makes no sense to take the city for the integration of the region, the organization of trade transport by rail and cooperation with private carriers. An important aspect of the system changes is the lack of investment. This means low cost of implementation compared to the cost of building new routes. Perhaps that is why this issue is sometimes ignored, and so far paid little attention to him. Improve the system may, however, bring a serious effect measured eg increase in the number of passengers. It seems to be an essential foundation for all other activities.

Article [L37] concerned the proposed evolution of documents called "Transport policy". In the process of assessing and updating the Transport Policies formulated the need for a change in approach from the supply side to the demand side of the transport, which is reflected in the shift of activities from infrastructure to moderating communication behavior of users. Communication behavior can be equated with mobility, a wider, international its importance. Hence, there are also modifications in the naming of the documents referred to now as the Mobility Policy. The change in terminology should go to reformulate the content of the documents relevant to the new center of gravity. I suggested a new, original names, and gave examples of the detailed provisions of the Mobility Policy. The presented methodology can be applied in any medium.

Article [E36] concerned aspect of the implementation of the new Law "On public transport" passed 16 December 2010, the Act lays down rules on the organization and operation of

passenger transport by road, rail and others. Also established rules for the financing of regular transport of passengers. This is an adaptation of Polish law to EU regulations covering, among others, the organization of public transport on the principles of regulated competition. The Act introduces significant changes in the organization of public transport. Some of them enter into force from 1 March 2011, the other in the following years, until 2017. The article presented the most important changes that may be relevant to the organization of public transport at the level of municipalities, their associations and districts.

The development of the idea of mobility, I presented in the article [L35]. The terms "traffic engineering" and "the formation of mobility" are currently being expanded, with respect to which hitherto in use, meanings. Selected recent publications outline the broader national importance and demonstrate the need to redefine them. In developing the idea of "modification of meaning" emphasized the interaction between the broader traffic engineering and mobility shaped by diverse impact on the so-called communication behavior of users of the transport system. In the context of the above, in this paper are characterized by elements such as: expanding and modernizing the definition of "mobility", linking shaping the mobility of legislative activity, with particular emphasis on local laws, tools shaping mobility with regard to planning and telematics solutions, the importance of individual means of transport and groups users of the transport system towards the formation of mobility, the role of managing the city (agglomeration, region) in the formation of mobility.

Jobs [L4] concerned the comparison of several centers (Cracow, Warsaw and Wroclaw) in terms of: transport policy, the analysis of the network and any changes in the rules and forms of network development, the formulation of the main dilemmas of network development and evaluation of the next investment decision. Responsible for part of Wroclaw article stated that the basic dilemma is the lack of decisions on the target road network (with one hand, apply a general plan of 1988, the other sets trends study of 1997 non-law) and the role of the car in the city's communication system, the lack of clear rules phasing of development and the lack of records ratio Transport Policy for activity planning and execution. The concept of road network expansion while neglecting the development of public transport can be a source of potential local conflicts (eg the construction of a new route), and the global scale of the city (intensification of traffic, increase congestion areas, the increase in emissions). The investment plan for the coming years should be assessed as real and avoiding unnecessary elements, but it is not, however, free of conflict. A prime example is the western section of the

Srodmiejska Ring Road or route Wrocław Motorway Bypass. Although one thinks about protecting the environment these routes (eg proposing construction of noise barriers), it is chosen to implement the options do not always give the impression optimal due to interference in the environment.

Contribution to the development of the field of civil engineering in this area of research lies in the combination of ingredients of many disciplines (planning, transport optimization, construction of infrastructure), indicating common conditions and the need for modification of terms, definitions and approaches to problem solving. It is important to identify the role of infrastructure in the formulation and strategic planning documents such as transport policy.

Other research achievements

The above 30 publications (monograph, 6 chapters in books, including one in English, 5 articles in English, 12 articles in Polish and 6 papers of international conferences) is a selection of the most important scientific works. All works can be found in appendix no. 4 Below I made the most important of expertise and research documentation.

Part of expertise is the work done in the teams. In some cases, my contribution can be specified as part of the report, in others it is difficult to separate part of the whole. Some of the cited studies, the work of the individual.

As an expert on selected elements of road infrastructure mention the following items in appendix no. 4: [B5], [F2], [F4], [F5], [F26], [F27] and [F37]. They concern mainly the concept of reconstruction of copyright or evaluation of previous studies related to streets or intersections. Two items, treat, more broadly, the system bus. The results of these studies were used in the implementation of specific objects (e.g., Multimodal square in Wrocław). Cited studies implemented as a matter of design work. Principal of these studies were local government units (Swidnica, Wrocław) and private design firms.

A large part of analytical and design studies related to the implementation of models of motion (travel) and forecasts in networks with different scopes: the province (Greater [F87]),

large cities (Wrocław [J13], Szczecin [J11]), motorways and express roads (Motorway Bypass Wrocław [J7], S3 [J1], [J12], S11 [J9]), roads other categories ([F51], [F92]), streets and street circuits ([F50], [F66], [F104]) . Separate groups are an analysis related to the impact of commercial buildings on the surrounding network of streets (eg [F14]), or with the parking situation ([F48], [F67]). The acquis in the field of traffic engineering projects pointing also implemented plans for road traffic lights (Wałbrzych [B6], Wrocław [B8]). Acquired experience design expertise has enabled the implementation of a range of network and associated traffic control systems (Olsztyn [J10], Łódź [III.M.4], [III.M.6], Wrocław [III.M.5]). This utility works were the basis of the investment already made (AOW bridge in Lower Bank), as well as the base for the development of fruitful scientific publications (e.g. [L8], [E23]).

In studies on transport mention expertise on trams ([F47], [F102]), light rail (LCR [F30]) and suburban railway ([F84]). Are important studies concerning the integration of passenger transport in terms of the coordination of inter-([F22], [III.M.1]) and the formation of interchanges ([F89]). Among these concepts, those relating to the trams and the integration of inter-, have been implemented. Interchange Lubin [F89] is at the stage of development. In contrast, concepts of light rail and agglomeration yet were never implemented. There are, however, a basis for further studies and regional plans.

The development of numerous projects and expertise, in conjunction with research, led me to take part in the most extensive documents concerning plans and transport policies. Due to the volume of such documents, out of necessity, I was only a member of the team of authors, but substantial contributor to the development of the final, in the field of land transport (including transport infrastructure). In this group of studies mention: the opinion of the Feasibility Study for Integrated Traffic Management System in Warsaw [J2], the assumptions of the development of transport and communication infrastructure for the Lower Silesia Province 2005-2015 [J6], the analysis of Wrocław transport policy [F103] whether or not the plans sustainable development of public transport at different levels (Lower Silesia [F108], district of Wrocław [F109], whether the relationship counties [F107]).

Exceptional teaching and popularizing

I am a member of the Panel of Experts on Strategy for the Lower Silesia Province renovation by the Speaker of the Lower Silesia Province; member of the Association of Engineers and Technicians of Poland and Plenipotentiary of the Management Department of Wrocław SITK-RP Communication Review Committee.

I am a reviewer of scientific journals (Journal of Transportation Engineering, Archive of the Institute of Civil Engineering, City and Regional Transport, Review of Communication). I helped out as a member of the Scientific Committees of the Conference, the President of session at conferences (last: Communication problems in congested cities in the automotive, 2011, Transport Systems: Theory and Practice, 2009).

I organized and co-organized conferences and seminars in the field of transport and infrastructure, lately: Present and future of public transport in Wrocław (2009), Improving connections Jelenia Góra and Wałbrzych of Wrocław (2010), Traffic Engineering and the formation of mobility (2011), New Railways 2012 New Railways in 2013.

Since 2010, I am the Deputy Editor in Chief of the journal of scientific and technical review of Communication (4 p MNiSW).

Many times I performed at the festivals of science, for example in Lower Silesian Science Festival (DFN). In recent editions of presentations on the topic: "How to uncork Wrocław" (DFN 2009), "station as an interchange" (DFN 2010), "Innovative thinking about the system of traveling in cities: Megametro" (DFN 2013). These lectures present and popularize the knowledge acquired in the course of work performance and the results of my research. A similar character is popularizing activity on the forum include PTTK PKE whether an instance of the Congress of the "Smart Metropolis", which took place in Gdansk on 21-22 November 2013: "Metropolitan Travel System, Megametro - the answer to the challenges of mobility of the XXI century". The content of is to be published in the paper tight.

For this stream can include a number of popular science publications as, for example, Kruszyna M. "Scientist proposes: let's build megametro, let us open station" - published in Gazeta Wyborcza in April 2013. This publication has been widely discussed and cited in many web portals (market-kolejowy.pl, transport-publiczny.pl), which met the requirement popularize my thoughts and proposals.

I run lectures and design for WBLiW WUT (including "Traffic Engineering"), also lectures in English, "Road, Streets and Airports" for specialty CEB, seminars diploma. I was a supervisor of over 100 theses (Master's) and supervisor in the course "Individual work" (term papers for foreign students in English).

I am the author of numerous publications on teaching - materials made available to students of the Faculty of Civil Engineering University of Technology at all levels of education. Some of these include: script (in pdf) to the object "Roads, Streets and Airports" for specialty CEB (ii. degree in English), co-authors: K. Gash, L. Skotnicki and materials to lecture on the subject of Traffic Engineering, BDL for specialty, II. degree (available through the website the Department of Roads and Airports).

Since 2000, I am guardian wheel SKIK, whose members organize lectures, educational tours and participate in conferences of students and similar events.

I was granted the following markings:

- Gold Badge University of Technology No. 5060 of 15 November 2011,
- Silver Badge of Honour SITK-RP No. 9377 of February 6, 2012,
- marking State, bronze medal "for long-term service" No. 339-2013-106 from 27 August 2013.

Synthetic summary of the period to obtain the degree of Doctor of Technical Sciences

The first stage of scientific development ended in December 1999, the defense of doctoral thesis entitled: "The capacity of public transport network elements." Issues addressed in this work emerged the main lines of my interest in the discipline construction, which I developed

in subsequent years. These interests are focused on land transport infrastructure, traffic engineering and building relationships between objects, vehicles as components of the traffic on these objects and people as users of the infrastructure.

In particular, one can point to initiate the following research:

- the study of public transport, taking into account the requirements of this mode of transport in the development of road infrastructure, introduction of modern solutions,
- modeling travel and traffic distribution analysis of bandwidth and traffic conditions,
- the effect of deterministic and random factors in the description of the motion;
- the use of models and other theoretical analyzes to practical design solutions in the field of road construction.

The above-described stage of scientific development (between graduation in 1996, and a doctoral degree in technical sciences in 1999) closed the number 30 publications and analytical and design (including 20 scientific publications based on the scientific achievements of workers Wroclaw University of Technology, DONA, http://apin2.bg.pwr.wroc.pl/Aleph/wysz_aut.htm).

Parametric summary of scientific achievements

In the list (Annex 4) summarizes the 222 items that illustrate other (not included in the achievements mentioned in paragraph I) published scientific papers (Section II), and 49 items on the achievements of teaching and popularizing and information on international cooperation (Section III) of years: 2000 to 2013. Among them is 76 scientific publications, including 8 of an international character. Of the 76 publications, 43 are in the list of journals scoring the Ministry, with a total of 260 evaluation points. To this must be added the points for the monograph and 7 chapters in books (including one in English) according to the principles of evaluation research units ($20 + 6 * 4 + 5 = 49$ points) for a total scoring of **309 p** (An average of 22.1 points per year for 14 years).

Of the 30 major publications, 21 is only mine, and the remaining 9 made in a group of two (7 items) or three (2 items) contributors.

Base DONA(http://apin2.bg.pwr.wroc.pl/Aleph/wysz_aut.htm, scientific achievements of workers Wroclaw University of Technology), associated with the Web of Sciences database record 124 entries, including 96 scientific publications, including 6 of international (achievements recorded since 1996). Pointed to two articles of the IF (for a total of 2,374) and 3 citations of these items. Google Scholar database records more than 40 items and 12 citations. In both bases Hirsch index is 2

Summary of achievements in the table

	After doctorate	Before doctorate	total
Artworks total	100	24	124
Scientific publications	76	20	96
International works	6	-	6
Monographs habilitation	1	-	1
Articles	37	16	53
Chapters	7	-	7
Conference papers	33	4	37
Including international conferences	19	1	20
Publications popular science	7	-	7
Non-publications	17	4	21
Works with IF	2	-	2
IF number	2,374	-	2,374
Works submitted in journals with IF	2	-	2
Work with a score of Higher Education	43	11	54
Total points	309	44	353
Number of citations (WoS)	3	-	3
Number of citations (Scholar)	12	-	12
Index H	2	-	2

Maciej