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# MODERN METHODS OF PROVIDING WATER-SEWAGE SERVICES IN THE FACE OF MEASURES TO INCREASE THE QUALITY OF LIFE OF THE LOCAL COMMUNITY ON THE EXAMPLE OF THE WATER-SEWAGE SECTOR IN THE CITY OF RYBNIK

A b s t r a c t: The aim of the paper is to present modern solutions in the field of water-sewage services in the city of Rybnik and to indicate the degree of their use by the local community in the city of Rybnik. In order to answer the question a quantitative research has been chosen as the method so that a statistical analysis is possible to perform, and a survey questionnaire has been designed as the research tool. The survey questions referred to the respondents' opinions and feeling concerning the access to the water-sewage services provided in the city of Rybnik by the Sewage and Water Supply Ltd. Rybnik (PWiK Rybnik Sp. z o.o.). The research provided for reaching conclusions and suggestions for improvements of water-sewage services provided in the city of Rybnik and the implementation of the socially-oriented innovative strategy by PWiK Rybnik.

K e y w o r d s: innovation, social needs, the quality of life, water-sewage sector.

JEL C o d e s**:** A13, O35, L14.

## INTRODUCTION

A city, as Manuel Castells once wrote, is a system consisting of a number of subsystems that constitute various material, social and spatial elements. The most significant elements of the city is the production and consumption subsystem, linking it with the exchange subsystem and the system of administration [Castells, 1982, p. 34]. The production subsystem consists of municipal entities,

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such as PWiK Rybnik, which take part in the production of goods and services, constituting the economic base of the city. The role of the consumption system is, in turn, the reproduction of city users' human capital. Both subsystems are functionally related, none of them can exist without the other, as the production possibilities are dependent upon the consumption capacities of the groups of residents. Therefore, the development of any of those elements requires suitable transformations in all the components of the urban whole. A classical interpretation of the issue, referring to Neo-Marxism, focuses on the conflictuality of the system. It points out that the development of the production subsystem comes at the expense of the consumption of the social city subsystem [Harvey, 2012, p. 24]. Later rhetoric alleviates the vision of a society full of contradictions and treats the city as an area for both conflicts and cooperation, where interaction and communication among the subsystems takes place, too [Sagan, 2000, p. 46].

A contemporary look on the theory of the city system treats the transformations in the urban space through the prism of social development, the improvement of the quality of life or social cohesion [Błaszczyk, 2013, p. 8], which means that there exists an intermediary factor between the producers focusing on their own profits, and the residents – passive recipients of goods and services. The factor is constituted, according to M. Castells, by a symbolic subsystem which has the strongest influence on the way the residents feel the "urbanity."

The strategy of intelligent development of a city in not a set of rules concerning shaping the urban space, but rather a method of planning which aims at indicating the admissible limits for urban interference and giving effect to particular rules. Intelligent development does not constitute a formalized action, it is, however, a set of guidelines for achieving common goals. One of the most significant principles, which turned out to be the main characteristic of the whole orientation, is the maximal use of all the modern inventions and facilities that can enhance the functioning of cities. The concept of intelligent city assumes that the authorities, municipal services and institutions benefit fully from the modern ICT techniques. The so called intelligent tools and technologies are implemented, which is also accompanied by suitable creative, content-related, organizational and even formal-legal actions [Majer, 2014, p. 180]. The concept of intelligent city development does not only refer to computerization and automation, nevertheless. In order to talk about the intelligent development of cities and their more and more frequently emphasized need of revitalization, a complex, or, in other words, a sustainable development must be considered, paying attention to the social, economic, spatial and environmental spheres, as well (the last one including rational use of natural resources, such as water).

Apparently, a significant objective of intelligent development of a city is also taking care of improving and increasing the quality of life of its inhabitants. According to A. Campbell, one of the pioneers of life quality analysis,

the notion should be defined taking into consideration the level of satisfaction in such spheres as family and professional life, neighborly relations, social life, health, leisure pursuits, education, job or general standards influencing the quality of life within a given local community. Therefore, it can be assumed that the factors distinguished by A. Campbell, which determine either low or high quality of life, might be referred to in the category of needs [Campbell, 2011, p. 25-31].

Nearly all the concepts concerning the quality of life refer to the influence of objective and subjective factors, which are closely interrelated. The former, forming the so called set of human living conditions, also include the objective natural attributes, such as the access to natural resources and the need to take care of their high quality. In the information society era, it is more and more possible to have an influence on people's social stand, as they are driven by their own best interest, which manifests itself in pursuing high quality of life, yet they understand that it is impossible to achieve without taking care of the external environment. The register of modern technological solutions, facilitating city management and enhancing the life comfort of the inhabitants, includes smart grid technology, which enables the end-users to decrease their energy consumption and makes it possible for public utilities to troubleshoot problems concerning energy and water losses [Majer, 2014, p. 181].

## 1. MATERIALS AND METHODS

### 1.1. Aim of the research

The aim of the research was to become familiar with the respondents' opinions and feelings relating to the level of fulfillment of their needs concerning the access to the water-sewage services in the city of Rybnik provided by the Sewage and Water Supply Ltd. Rybnik. Another objective was to learn about the inconveniences which the respondents come across on a regular basis, as well as to obtain suggestions of new innovative measures to be taken by PWiK Rybnik so that the quality of life of the local community can be increased and the services provided by the company can be improved.

### 1.2. The research method, technique and tool

A quantitative study has been chosen as the research method, which makes it possible to conduct a survey, and the variables are selected in such a way that a statistical analysis is possible to perform. A questionnaire has been used as the research technique as it allows the high level of standardization of the questions. The survey questionnaire, as the research tool, took two forms of distribution: 1) the tool was placed on the PWiK Rybnik website and the respondents had the possibility to fill it in on their own online, 2) some questionnaires were printed out and mailed to those respondents who do not use the electronic way of

contacting PWiK Rybnik. The research tool consisted mostly of closed and half-open questions, where a respondent could choose "other" as an answer and give their own response if the answer choices were not satisfactory enough. There were open questions in the survey, too, so that respondents could share their feelings and suggestions. The questionnaire included conditional questions, as well, which enabled the respondents to skip those questions they were unable to answer because of their previous responses.

**1.3. Study population and the choice of research sample**

The research population consisted of the community living in the city of Rybnik, and the sampling frame was composed of the users of the Sewage and Water Supply Ltd. Rybnik services. The city of Rybnik is inhabited by 140,000 people, who live in 27 districts on a total area of 148 km² [www.rybnik.eu, 2017].

The research sample has been selected in a random-purposeful way so that both kinds of sampling could be taken advantage of, which radically decreased the level of complexity of analytical procedures as the problem of selecting the most representative unit has been eliminated and the necessity to have a fully systematized register of units belonging to the population has been limited.

800 completed survey questionnaires have been returned and such number of research material has been put into analysis. Among the respondents, 46% were women, 54% were men. The biggest group of respondents was composed of persons aged 35-44, who constituted nearly 30% of the respondents. Groups of people aged 25-34, 45-54 and over 55 constituted roughly 23% of all the pollees each. The percentage of the surveyed aged below 25 was very small, the reason for which might be the fact that people at such age rarely run a household on their own. Such distribution of the sampling frame in terms of gender and age made it possible to familiarize with the opinions and feelings of both men and women, as well as the representatives of most age groups equally. The majority of the respondents were individuals with tertiary education, who constituted over 55% of the pollees. The second most numerous group were those with secondary education, who constituted 11% of the respondents, whereas primary education was declared by less than 1.5% of the surveyed. The households run by the respondents mostly consist of three of four people. Such households constitute 24% of the study population. The smallest group is represented by those running a single person household and those whose households consist of more than six people. They constituted 5.5% and 2%, respectively.

The residents of the following districts answered most willingly the questions raised in the survey: Niedobczyce (10.5%), Rybnik Północ (8%) and Śródmieście (7,5%). A statistical analysis of the sample data revealed that nearly 94% of the respondents live in owner-occupied houses or flats. The remaining 6% of the respondents live in tenant or cooperative flats (3%) or they rent apartments

(almost 3%). Those who rent flats constitute 0.25% of the respondents. Over 86% of the pollees concede that they possess a backyard or an allotment garden.

## 2. RESULTS AND DISCUSSION

### 2.1 The residents' needs concerning the use of water in the city

In order to provide innovative water-sewage services, the Sewage and Water Supply Ltd. Rybnik carried out a campaign entitled "Reach the refreshment," which basically consisted in installing water-machines in the city – devices to prepare and serve tap water drinks made of water coming from the city's first established water intake in Tęczowa-Street. The first question to the residents concerned the frequency of their using the facility, especially during hot weather. Very few citizens (only 12.6%) decided to use the possibility of satisfying their thirst thanks to the devices installed in public places in the city. The reasons for such a state of affairs might be twofold: a lack of confidence in the use of such public devices and the lack of habits related to the need of drinking water.

Statistical distribution shows the use of the water-machines by respective age groups and indicates that the biggest interest in the device was among the youngest, i.e. below 24 (37.5% of all users), whereas the interest was the smallest in case of the oldest groups of those over 55, whereas 91.2% of people have never used a water-machine, even in hot weather.

In spite of low frequency of using the water-machines, a great majority of residents supports their usability, claiming that they are either very useful or at least sometimes useful, especially on hot days. What might constitute the reason why they were not used frequently enough is the fact that they have not functioned for a long time yet. The residents' firm statements concerning the usefulness of the machines, however, bode well for the future and a more extensive use of the devices.

Another question referred to using tap water to drink. Nearly 30% of the respondents answered affirmatively to the question, which indicates a relatively high level of the citizens' confidence as far as the quality of water provided by PWiK Rybnik is concerned. The biggest group of citizens, however, admits to use bottled water to drink. It can be presumed that the main reason for such state of affairs is determined the taste of the water.

Further, the respondents were asked about their opinion on the usability of water curtains in the city during hot weather. The response was very positive as almost 80% of the pollees answered that they are very useful or just useful on hot days.

While answering another question, the residents referred to the actions they take in order to reduce the water consumption, as a significant group of the

respondents (over 75%) declared that they do undertake measures related to saving water.

Table 1. The residents' statement concerning saving water, according to age

| | | Age | | | | | |
|---|---|---|---|---|---|---|---|
| | | below 24 | 25-34 | 35-44 | 45-54 | 55 and more | Total |
| **Yes** | % out of Do you save water? | 1.0% | 20.7% | 29.1% | 21.7% | 27.4% | 100.0% |
| | % out of Age | 75.0% | 69.7% | 73.4% | 71.4% | **85.4%** | **75.0%** |
| **No** | % out of Do you save water? | 1.0% | 27.1% | 31.7% | 26.1% | 14.1% | 100.0% |
| | % out of Age | 25.0% | **30.3%** | 26.6% | 28.6% | 14.6% | **25.0%** |

Source: Own study based on the research.

Taking into account the age groups, it can be noticed that it is the elderly over 55 who tend to save water to the greatest extent.

The measures to save water mentioned by the respondents the most frequently are: consuming water reasonably, choosing ECO mode while washing, using a pressure compensating aerator/a water sprinkler, taking a shower instead of a bath, turning off water while brushing one's teeth, collecting rainwater, watering plants with rainwater, eliminating leakiness, filling a swimming-pool partially. The aforementioned actions indicate the city residents' relatively high awareness, not only ecological, but also economical, related to reducing high costs of water supply.

A comparatively large percentage of surveyed citizens (37.3%) uses water to fill swimming-pools, which may cause a considerable overload of the water-sewage system during the summer season. Watering gardens with the use of tap water has a similar influence, as it is usually done at some particular times, mostly in the evenings, which is shown in the distribution of answers to another question concerning the time of irrigating gardens.

Among over a half of the respondents (54%), who declare to have a garden, a considerable group of 46.3% acknowledge that they water the garden either early or late in the evening. Some pollees claim that they use mainly rainwater in the garden, water it at night or only in hot weather, the proportion of such people is very small, however, as it amounts to only 1.63%. In such case it could appear efficacious to encourage the residents to change some habits, including the typical times of using large amounts of water, mainly to avoid breakdowns and pressure drops in the water-sewage system.

**2.2. Gauging the inconveniences caused by the sewage treatment plant and the pumping station**

A sewage treatment plant functioning in the city usually involves experiencing different types of inconveniences which the residents tend to complain about. The objective of one of the survey questions was to gather opinions concerning such inconveniences experienced by the respondents. Over 12% of them admitted that indeed such annoyances caused by the sewage treatment plant do exist, whereas only 3% described them as very burdensome.

Among those who declared experiencing the inconveniences, a great majority (72%) indicated an unpleasant odor, more than 10% complained about noise, and nearly 8% referred to increased traffic during sediment transportation. Other inconveniences enumerated by the respondents were: the lack of water-sewage system in some districts of the city and an awful smell during blackouts.

Among the residents of particular districts who reported experiencing significant inconveniences related to the functioning of the sewage treatment plant, the largest percentage constituted the inhabitants of Zebrzydowice (12%) and such districts as: Chwałęcice, Kamień, Kłokocin, Meksyk, Orzepowice, Rybnik Północ and Zamysłów (8% each). The residents of Orzepowice and Zamysłów most frequently referred to the functioning of the plant as slightly inconvenient (18.9% and 13.5%, respectively).

The objective of another question in the survey was to gauge the inconveniences resulting from the functioning of the pumping station. While responding to it, a similar percentage of people (10.9%) indicated experiencing some inconveniences because of the station. The residents of the following districts complain about the annoyances caused by the pumping station the most frequently: Zamysłów (19%), Chwałęcice, Radzejów, Rybnik Północ and Zebrzydowice (9.5% each). The inhabitants of Zamysłów, Orzepowice and Kamień find the inconveniences slightly burdensome (26.2%, 10.8% and 7.7%, respectively).

## CONCLUSIONS

Despite a relatively low frequency of using the water-machines, a considerable majority of the residents support their usefulness in the streets of the city. Slightly over 80% finds them very useful or sometimes useful, especially during hot weather. Therefore, it can be assumed that the low rate of their utilization results from low awareness and scarce knowledge concerning such devices functioning in the city, as well as the lack of confidence when it comes to using public facilities. Both reasons might equally result from the lack of information concerning the role of water-machines and their locations in the city. What could appear useful here is an information campaign encouraging the residents to use such innovative and practical devices in the city, and, simultaneously, propagating a healthy lifestyle related to drinking large water volumes, not only to satisfy one's thirst or because of hot weather.

In spite of the fact that a relatively big group of residents (nearly 30%) admits to use tap water directly to drink (which, at the same time, indicates a comparatively high level of the citizens' confidence in the quality of water provided by PWiK Rybnik), the remaining significant proportion of the residents decides not to use the water directly, i.e. without boiling it, or they just prefer to buy the bottled counterpart. As far as those who choose to buy bottled water, the reason for such choice appears to be mainly the taste; on the other hand, peoples' lack of confidence in drinking tap water is, to an appreciable extent, caused by a long term propaganda campaign warning against drinking directly from the tap, which presumably resulted in today's deeply rooted conviction that it is detrimental to our health. What might appear the most effective tool for fighting such stereotypes is taking up measures to promote and disseminate the high quality and harmlessness of the currently available tap water. Such actions could be carried out with the involvement of e.g. local social authorities (in the form of posters, short information and advertising spots encouraging people to use the tap water directly).

The residents' response so as to the usability of the water curtains functioning in the city during hot weather turned out to be very positive. Nearly 80% of the respondents found them very useful or just useful on hot days. Such positive feedback encourages to continue to use this type of measures mitigating the impact of heat on an even larger scale.

Another very positive phenomenon that that could be observed among the surveyed residents turned out to be their extensive knowledge of the forms and methods of saving water, and therefore more than three quarters of the respondents declared taking different measures towards achieving the goal. People over 55 prove to be the most active in taking water saving actions. In this case it might

also appear useful to introduce some educational campaigns informing on how to save water most effectively.

A relatively big proportion of the respondents (as much as 37.3%) uses water to fill swimming-pools, which might have significant effects on the water-sewage system overload during summertime, as using running water to irrigate gardens does, especially in the evenings, which is the most popular time for doing so according to the respondents. The implementation of intelligent systems of communication with the city residents, along with encouraging them to use such solutions, might seem the best possibility of PWiK's warning measures preventing from large fluctuations of water consumption, as well as a way of forecasting such situations. On the other hand, a bilateral exchange of information might appear useful for the water consumers, who, thanks to monitoring the situation related to the water-sewage system overload, could be informed on how and when to use large amounts of water so that it is the most convenient for them.

While assessing the inconveniences resulting from the sewage treatment plant functioning in the city, more than 12% of the surveyed indicated that such inconveniences are felt indeed, whereas only 3% of the respondents referred to them as very burdensome. Among those who declared experiencing the inconveniences, a vast majority of 72% pointed the unpleasant odor, over 10% complained about the noise, and nearly 8% indicated the higher traffic volume during the time of sediment transportation. The opinions on the inconveniences caused by the sewage treatment plant and the pumping station were highly diversified among the residents of particular districts of the city.

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# NOWOCZESNE METODY ŚWIADCZENIA USŁUG WODNO-KANALIZACYJNYCH WOBEC DZIAŁAŃ WYZNACZONYCH IDEĄ PODNIESIENIA JAKOŚCI ŻYCIA SPOŁECZNOŚCI LOKALNEJ NA PRZYKŁADZIE BRANŻY WODNO-KANALIZACYJNEJ W MIEŚCIE RYBNIK

Z a r y s t r e ś c i: Celem artykułu jest przedstawienie nowoczesnych rozwiązań w zakresie usług wodno-kanalizacyjnych w mieście Rybnik oraz wskazanie stopnia ich wykorzystania przez społeczność lokalną w mieście Rybnik. Jako metodę przyjęto badania ilościowe, aby możliwa była do przeprowadzenia analiza statystyczna, natomiast narzędzie badawcze stanowił zaprojektowany kwestionariusz ankiety. Pytania w ankietach dotyczyły opinii i odczuć respondentów związanych z dostępem do usług wodno-kanalizacyjnych realizowanych w mieście Rybnik przez Przedsiębiorstwo Wodociągów i Kanalizacji Sp. z o.o. w Rybniku. Przeprowadzone badania pozwoliły sformułować wnioski oraz propozycje usprawnień świadczonych usług wodno-kanalizacyjnych w mieście Rybnik oraz realizacji prospołecznej strategii innowacyjności firmy PWiK Rybnik Sp. z o.o.

S ł o w a k l u c z o w e: innowacje, potrzeby społeczne, jakość życia, branża wodnokanalizacyjna

K l a s y f i k a c j a JEL: A13, O35, L14.