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A City for People in the Light of Studies on Urban Stress: Case Study of a Medium-sized City in Poland – Zduńska Wola

Miasto dla człowieka w świetle badań stresu miejskiego. Przykład średniego miasta z Polski – Zduńska Wola

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Abstract: Alarming data revealing the poor quality of the urban environment as well as international documents calling for urban policies to be re-orientated towards more sustainable growth (e.g., IPCC Sixth Assessment Report: Climate Change 2022) force greater integration and deepening of the existing urban studies, as well as promote the initiation of new research. This paper focuses on the perception of urban stress in contemporary cities and towns and on identifying factors that produce it. The case study features a deliberately selected town of Zduńska Wola, from the Łódź Voivodeship in Poland. The thesis proposed in this paper reads: Contemporary towns and cities, including Zduńska Wola, generate urban stress that is experienced by its residents. Significant aspects of this work deal with the specification of differences in the interpretation of urban stress factors. Based on the study of the literature on the issue of stress, it appears that among the most often listed stressors are the ones connected with the condition and quality of the environment, which was confirmed by opinions expressed by inhabitants of Zduńska Wola (more than 70% of respondents mentioned pollution as a stress factor). Interestingly, our questionnaire-based studies revealed that commuters to the city reported higher levels of perceived stress caused by neglected urban space, than permanent residents.

Keywords: town, city, externalities, environment quality, urban stress

Streszczenie: Alarmujące dane na temat niskiej jakości środowiska w miastach oraz dokumenty międzynarodowe wzywające do reorientacji polityki miejskiej w kierunku zrównoważonego rozwoju miast (m.in. Szósty raport IPCC nt. zmian klimatu) wymuszają integrację i pogłębianie dotychczasowych badań miejskich oraz inicjują rozwój nowych. Artykuł koncentruje się na identyfikacji zjawiska stresu miejskiego we współczesnych miastach oraz zdefiniowaniu czynników go wywołujących. Studium przypadku stanowi dobrane celowo miasto województwa łódzkiego – Zduńska Wola. Przyjęta w artykule teza brzmi: We współczesnych miastach, w tym w Zduńskiej Woli generowany jest stres miejski, który identyfikowany jest przez mieszkańców. Istotnym elementem pracy jest określenie różnicowań interpretacji czynników stresu miejskiego. W świetle przeprowadzonych badań literaturowych najczęściej wskazywanymi stresorami, są te wynikające ze stanu i jakości środowiska, tak też wskazują mieszkańcy Zduńskiej Woli (ponad 70% respondentów wskazało zanieczyszczenie jako czynnik stresogenny). Interesującym wynikiem badań ankietowych jest, że osoby mieszkające poza Zduńską Wolą, które przebywają w mieście z uwagi na pracę, naukę czy w czasie wolnym zgłaszały większy poziom odczuwanego stresu z powodu zaniedbanej przestrzeni w mieście niż jego mieszkańcy.

Słowa kluczowe: miasto, efekty zewnętrzne, jakość środowiska, stres miejski

Introduction

Cities cover just three percent of the world's land surface and are the natural habitat of nearly 60 percent of the whole population (UN 2015b). They consume more than two-thirds of the world's energy and account for more than 70% of global CO₂ emissions (C40.org). The carbon footprint, and more broadly, the ecological footprint of cities, both Polish and European, continues to grow. It is much higher than the capacity of the environment and its resilience to increasing pressures (IURD 2022). In addition, population concentration creates a "congestion" effect in cities, which promotes competition for space and access to various public goods (Bańka 2002, 223; Nowak and Martyniuk-Pęczak 2017). Constant reduction of biologically active areas, the ubiquitous "concretosis", the burning of fossil fuels and individual car transport leads to the formation of urban heat islands (UHI), a phenomenon that adversely affects the health and well-being of city dwellers. In the latest WHO air quality guidelines, it was indicated that around 77% of people living in EU cities were exposed to PM 2.5 concentrations considered harmful to human health (Air Quality in Europe 2019). Furthermore, cities are a significant source of noise and light pollution (Lightpollutionmap.info 2022).

Alarming data on poor environmental quality in cities (Report on the Condition of Polish Cities. Environment and Adaptation to Climate Change 2021) and international documents calling for a reorientation of urban policy toward sustainable urban development (e.g., Leipzig Charter for Sustainable European Cities 2007)¹ highlight the integration and deepening of the existing urban research and promote the development of new areas such as research on urban stress. Research conducted by biologists, psychologists, or sociologists (Bell, Greene, Fisher and Baum 2004; Adli 2011) indicates that cities and towns, irrespective

of their size (area, population, etc.), generate a variety of physical and social stimuli that the modern city dweller has to deal with, stimuli that trigger a physiological response of the body, referred to as urban stress. The daily well-being and psycho-physical condition of city dwellers are influenced by factors that are characteristic of the advancement of civilisation.

From the perspective of the economic sciences, all unplanned but perceived disadvantages and inconveniences arising from economic and social activity and experienced by other actors (e.g., other residents) are referred to as negative externalities. For the purpose of this paper, externalities are perceived as stressors. These include noise, congestion, pollution, urban planning chaos, etc. (Jewtuchowicz and Markowski 1990). Due to the significant impact of these phenomena on the well-being and the functioning of residents and users of urban space, they are important determinants of the quality of life. Urban environment is often seen as harmful to health, yet, "despite that, our thinking about cities usually focuses on its positive aspects" (Czepakiewicz and Jankowski 2015). As argued by Freeman and Stanfeld (1998), life in a big city is psychologically very attractive but at the same time very costly for human organism. The cost includes psycho-vegetative reactions such as anxiety caused by reduced social distance or waiting in queues. In addition, urban stress has a significant impact on the economic condition of a city and its inhabitants, especially in terms of human capital, i.e., the health of its inhabitants, their ability and willingness to work (Bell, Greene, Fisher and Baum 2004).

This article, therefore, focuses on identifying the phenomenon of urban stress in contemporary cities and towns and on defining the factors that cause it. The case study is the town of Zduńska Wola in the Łódź Voivodeship, purposively selected for the following reasons:

1. it has been listed among the top 50 most polluted cities and towns in Europe,

¹ E.g. (Ec.ueropa.eu 2007; ECoSC&T 1994; ECoTP 2003).

2. it is actively involved in the reduction of low emissions, moreover it won the Innovative Local Government 2022 competition in the category of urban municipalities, organised by the Polish Press Agency
3. it is a post-industrial town
4. it is characterised by increased levels of civic engagement

The example of Zduńska Wola mirrors the situation of many cities in Poland, illustrating the real problems they have to face. The conducted study fills a gap in research on urban stress in cities other than large cities. The example of a medium-sized city is an interesting area of research, and the results and conclusions of the study have the potential to be implemented and to make a real difference in managing and shaping a good quality of life. The thesis adopted in the article reads: Contemporary cities and towns, including Zduńska Wola, generate urban stress that is perceived by the inhabitants. An important element of the paper is to determine the variations in the interpretation of urban stress factors. In order to accomplish what we have planned and to validate the formulated thesis, literature research and field studies were carried out. They also became the basis for preparing and carrying out pilot, original surveys among residents and users of urban space in Zduńska Wola. The survey title is "Stress in Zduńska Wola" and random sampling was used to select a representative sample of respondents. By using the Computer-Assisted Web Interview (CAWI) technique, we allowed respondents to provide answers individually and anonymously in settings selected by them. The survey was conducted in late April and early May 2022. A total of 276 people took part in the survey, including 206 people who live in the city (0.5%), representing 75% of respondents, and 70 people who do not live in Zduńska Wola but work, study or spend their leisure time in the city.

1. Urban stress resulting from externalities of cities and their residents

In his book *Cities for People*, Jan Gehl writes: "First we shape cities, then they shape us" (2017, 9). The fact that people settle down and strive to organise the space they live in by deploying state-of-the-art knowledge, as well as capabilities and technical skills available in the community together with available resources (water, building materials), has led to the emergence of diverse forms of urban settlement (Rzeńca and Rzeńca 2016, 22). The specificity of settlement organisation resulting from natural conditions and economic and social factors, such as the progressive division of labour or the exchange of goods and services, triggered dynamic urbanisation processes. Political conditions related to the hierarchy of settlement units and their administrative functions also played their role.

Above all, the city is "the effect of people's experience and action", "it is created and formed thanks to the community living in it" (Zaniecki and Ziolkowski 1984, 34 after: Podgórska-Rykała, Kandzia, and Mikrut-Majeranek 2015, 105). It is "a product of nature, especially human nature." (Park 1915 after: Jalowicki and Szczepanski 2006, 18). In the same vein, Parysek (2015, 28) sees the city as "a highly complex product of human activity acting as a living environment." A human being is where the change in the city begins, he initiates it and at the same time benefits from it. Individuals and processes operating in the environment are "a source of resources and a recipient of effects." Benefits generated by cities and towns, i.e., economic growth, innovation, an attractive labour market, an increase in the wealth of inhabitants, top-class building structures (including housing resources), attractive spaces or modern infrastructure, are paid for with a number of consequences that trigger problems faced by cities and towns as well as their inhabitants. It suffices to mention social inequalities, environmental poverty or overproduction of pollution described in the literature and in national and

international reports (Report on the Condition of Polish Cities. Environment and Adaptation to Climate Change 2021; National Programme for Counteracting Poverty and Social Exclusion 2020; Report on the Quality of Life in European cities 2020). By-products of the functioning of the city and of entities operating within it (both public and private) or by-products generated by the inhabitants (individually or collectively) revealed in the process are treated as costs of their functioning while, when transferred to other entities and users (third parties), they are referred to as externalities (Stiglitz 2004; Samuelson and Nordhaus 1995). Characteristically, environmental externalities are not market-based, i.e., they are not reflected in the price and are not traded on the market. As a result, they are directly viewed by their recipients as disadvantages and losses. Moreover, they undermine the usefulness of the goods offered in the city, both natural (water availability and quality, natural greenery, air quality) and man-made (paved public space, spatial chaos, inefficient infrastructure). Most externalities are public goods by nature, making the extent of their impact universal. They are, therefore, an important determinant shaping the urban environment, living and business conditions in the city (Czaja et al. 2002).

Remarkably, the concept of urban stress was introduced in 1972 (Glass and Singer) when the discussion was launched at the international level on the shape and quality of the environment in the context of decent living conditions (U Thant Report 1968; UNEP 1972²) as well as environmental limits and the consequences thereof (energy crisis in 1972). Indeed, urban stress is, “a category of environmental stress used conventionally to denote the large and varied number of physical and social stimuli faced by an inhabitant of a modern large city” (Banka 2002, 222).

2 Principle 1 of the Stockholm Declaration “Man has the fundamental right to freedom, equality and adequate conditions of life in an environment of a quality that permits a life of dignity and well-being” (UNEP 1972, 1).

According to the European Environment Agency, it denotes “a state of bodily or mental tension developed through city living or the physical, chemical or emotional factors that give rise to that tension” (EEA 2022). Urban stress is, therefore, a phenomenon caused by unfavourable factors, conditions, processes, representing a real or perceived threat, which disturbs the organism’s equilibrium and is related to human existence in urban space. It is a response of the body to negative externalities generated in the city, associated with overload, anxiety, irritation, or a sense of threat.

There are many categories according to which factors causing urban stress are grouped. The occurrence and perception of stress are affected not only by the quality of public services and the degree to which residents’ needs are met, but also, among other things, by land-use patterns and space management in the neighbourhood. The city can be perceived as a stressful environment due to objective factors such as crime, inaccessible or poor-quality public transport or individual differences, as well as situational, cultural, and social factors (Bell, Greene, Fisher and Baum 2004, 421). Among the stressors cited in the literature, we can distinguish three groups, i.e.: factors related to the quality of the urban environment, social conditions, and the physiognomy and morphology of the city (Tab. 1.). The classification is based on the scope of the subject matter addressed, but the dividing line is very thin. This is because the stressors are correlated with each other and can be perceived in a multidimensional way, e.g., access to green areas is closely linked to the spatial arrangement of a given unit, in effect it concerns both accessibility for the community (social conditions) and at the same time the quality of the natural environment.

Factors related to the natural environment and its condition include pollution, e.g., flue gas, emissions from households or factory chimneys, exposure to light, i.e., both a shortage of natural light and excessive

Table 1. Factors producing urban stress. Own compilation based on (Bańka 2002; Bell, Greene, Fisher, and Baum 2004; Gehl 2013; Montgomery 2021)

Groups of factors	Factors producing urban stress
Quality of the urban environment	noise, exposure to light, pollution, too high/low temperatures, climate change, natural disasters, catastrophes
Social conditions	population density, overcrowding, crime, fast-paced city life, social inequalities, inadequate conditions to work, study, and rest
Urban physiognomy and morphology	lack of spatial order, no human scale in the city, no access to green areas, SBS, condition of infrastructure, no access to services

artificial lighting and noise. Too low or too high temperatures can also be a source of stress. According to environmental psychologists, climate change and related natural disasters and catastrophes are also undoubtedly stressors.

Progressing urbanisation means there are increasingly more people in cities and social disadvantages begin to arise. Population density is associated with congestion, which is defined as “a psychological state characterised by stress (...)” (Bell, Greene et al. 2004, 399). Further stressors include crime, social tensions and inequalities, and the fast pace of city life associated with pressure and the pursuit of success. In addition, the learning and work environment is often affected by the problems described above such as noise, insufficient access to natural light or overcrowding while well-being and perception of stress are also influenced by conditions in places designed for leisure.

The last group of factors are stressors related to the physiognomy and morphology of the city, such as spatial chaos or the lack of human scale in space design and planning (social field of view, central angle and the four stories limit). A stressor closely related to the physical characteristics of the city, the manner and quality of development is the sick building syndrome, “in which symptoms and discomfort appear but no specific disease can be identified” (Olivier and Shackelton 1998; Thron 1998; Woods 1988 after: Bell, Greene et al. 2004, 297). Urban stress can also be experienced due to inefficient infrastructure, lack of access to public services or to green spaces.

The city is, therefore, a place of multiple stressors, which interact and jointly affect users of urban spaces. Symptoms associated with chronic stress include, i.e., reduced resistance to frustration, aggression or alienation, anxiety, cardiovascular disease, depression, and other conditions with proven psychological causes. Contact with multiple stressors can also lead to overload, concentration problems or burnout. It is worth noting, however, that the perception of stressors depends on a number of conditions and that the presence of a particular stressor does not indicate that those exposed to it are aware of its presence and adverse effects. Furthermore, it should be clearly emphasised that in times of climate change, the digitation of individual and social life, new influencing factors are emerging (Hernandez et al. 2020).

2. Specificity and living conditions in Zduńska Wola

Zduńska Wola is located in the central part of the Łódź Voivodeship in the administrative district of Zduńska Wola. The town is extremely conveniently located in the centre of Poland, about 180 km from Warsaw, about 50 km from Łódź and about 160 km from Wrocław. It belongs to the medium-sized category, covering the area of 24.57 km² (0.13 % of the region), with a population of just under 40,000. The population density in Zduńska Wola is 1, 608 people/ km² compared to the average for the Łódź Voivodeship 133 people/km², and for Poland 122 people/km². The town suffers from systematic depopulation, with an annual decrease of about 730 inhabitants (Report on the

Condition of the Municipality of Zduńska Wola in 2021, LDB).

The axis of the town is Łaska Street – the main shopping and service street, while the town ring road – Łódzka Street (voivodeship road No. 482) divides Zduńska Wola into two parts. In the currently binding Study of Conditions and Directions of Spatial Development (2012), the designated urbanisation zone covered an area of approximately 1,356.8ha, including: development areas of 511.8ha and built-up areas of 845 ha (as of 2012). Over a period of almost 10 years, the urbanisation zone has increased by almost 18 ha and currently covers an area of approx. 1,374.5 ha, of which the built-up area has increased by approx. 44.1 ha, while the development area has decreased by approx. 26.4 ha. An unfavourable phenomenon is the growing area of residential development in the industrial district (Study of Conditions and Directions of Spatial Development of the City of Zduńska Wola of June 2019). Beneficial for the town is the significant share of green areas, 19.4% of the total area, of a diversified nature, i.e., the city park, the Paprocki Forest and the areas around the Kępina retention reservoir on the Pichna River.

Environmental conditions are determined by poor air quality stemming in particular from low emissions and the presence of industrial plants situated in the vicinity of residential areas. In 2016, Zduńska Wola was listed in the top-50 cities with the most polluted air in the European Union. The number of days with 24-hour average PM₁₀ concentrations greater than 50 µg/m³ gradually decreased between 2018 and 2020 but increased in 2021³ (UMZDW 2020a). In 2021, there were four notifications regarding the risk of exceeding the amount

3 Number of days with average 24-hour concentration of PM₁₀ >50 µg/m³ amounted to: 84 in 2018, 61 in 2019, and 40 in 2020. Unfortunately, in 2021 it increased to 54 days. (Report on the Condition of the Municipality of Zduńska Wola in 2020 (UMZDW 2020a), Report on the Condition of the Municipality of Zduńska Wola in 2021).

of PM₁₀ particulate matter in the air issued by the Provincial Crisis Management Centre of the Łódź Regional Office. On top of that, the town struggles with a lack of resilience to environmental hazards such as extreme weather events or noise (Drzazga and Żak-Skwierczyńska 2021).

The Zduńska Wola City Office is taking a number of measures to reduce air pollution. The Stop Smog application, developed during the Hackathon for Cities, allows residents to calculate the cost of replacing coal burning stoves and using more environmentally friendly solutions, provides information on subsidies, and allows them to fill in and file application to a local subsidy scheme. In addition, the app won the Innovative Local Government 2022 competition, organised by the Polish Environmental Agency. Representatives of Zduńska Wola shared examples of innovative solutions implemented in the city also during this year's World Urban Forum (WUF11) held in Katowice. Moreover, the local government joined the PolAir 2.0. programme, thanks to which seven air quality monitoring sensors have been placed in Zduńska Wola.⁴

Local manufacturers of construction materials together with post-industrial heritage and establishments related to the city's history – the Zduńska Wola Brewery, the Open Air Railway Rolling Stock Museum in Karsznice or the St. Maximilian Kolbe Birthplace – are unquestionable economic assets of the town. Unfortunately, the city is struggling with an underdeveloped, unattractive local labour market, a growing debt and an the ever-decreasing operating surplus observed in 2018-2020, which is indicative of a decreasing growth potential. This is confirmed by the next budget of Zduńska Wola, where in 2021 subsidies from the central government budget accounted for 28% of all income.⁵ This means a rolling and

4 Readings in the form of a table can be found at https://www.airqlab.pl/polair_ZW.php.

5 Over recent years, in all towns and cities (according to data of the Association of Polish Cities), an average share of general subsidy in the income dropped

Table 2. Results of studies Source: Annex to the diagnosis worked out under the Development Strategy for Zduńska Wola in the years 2021-2028 (UMZDW 2020b, UMZDW 2020c)

Zduńska Wola is...			
Answer	Yes	No	Don't know
a safe town	770 (64.8%)	238 (20.0%)	180 (15.2%)
well-managed	277 (23.3%)	576 (48.5%)	335 (28.2%)
full of green areas	557 (46.9%)	574 (48.3%)	57 (4.8%)
environment-friendly, taking care of nature	286 (24.1%)	655 (55.1%)	247 (20.8%)
aesthetically pleasing	503 (42.3%)	556 (46.8%)	129 (10.9%)
Clean	583 (49.1%)	487 (41.0%)	118 (9.9%)

consolidating year-on-year reduction in the financial independence of local government units. The current financial situation of local governments, including Zduńska Wola, is marked by a significant deterioration in the financing of basic day-to-day operations, which in the long term may mean worsening of the conditions. Despite the difficult financial situation in 2021, the city spent more than PLN 34 million on investment projects, 3 million more than in 2020. The main directions of investment are road infrastructure, municipal economy, and environmental protection. The unemployment rate for the Zduńska Wola county was 6.2% in 2021 (as of 31 December 2021). At the end of 2021, there were 1,082 unemployed people in Zduńska Wola, while in the whole county there were 1,581 unemployed. A total of 919 people at risk of poverty benefited from social welfare assistance in 2021 in cash and non-cash form. It should be stressed that the city takes care of its residents and promotes living in Zduńska Wola, as it offers the City Family Card and the Zduńska Wola Senior Card. In addition, there is a new Zduńska Wola Resident's Card Programme addressed to the inhabitants which came into force in 2021. The city is witnessing an increasing involvement of its residents in the life of the city, which manifests itself, among other things, in the activities of formal and informal groups. Their engagement is facilitated

by the opening of Social Initiatives Incubator in 2020. In 2021, the participatory budgeting process was conducted in Zduńska Wola for the eighth time. In addition, in 2022 a public consultation process was launched for the identification of tasks for the Green Budget of the City of Zduńska Wola 2023 (UMZDW 2022a; UMZDW 2022b). The ecological awareness of the inhabitants is also growing together with interest in the activities of the authorities concerning the way green areas are managed (e.g., the Paprocki Forest), as well as participation and organisation of events related to environmental protection.

An important issue in the assessment of living conditions in Zduńska Wola is the image of the town in the eyes of its inhabitants. According to a survey conducted by the City Office in 2020, Zduńska Wola is not an attractive tourist destination (81.8%), neither it is attractive to young people (81.2%), young married couples (76.1%) or start-ups (66.6% of respondents). On the other hand, 44.6% of respondents see it as an attractive town for senior citizens. More than half of the respondents believe that Zduńska Wola offers very few prospects for development and does not provide good living conditions (76.5% and 60.9% respectively). The answers to some questions confirm deep social polarisation. Respondents are divided on whether the city is full of greenery, aesthetically pleasing, and clean. At the same time, however, 79.5% of respondents feel that it is easy to get around, and to 87% of respondents "it is close to everywhere." (UMZDW 2020 b, UMZDW 2020c).

clearly from more than 34% to slightly above 22% while the share of subsidy increased from less than 15% to more than 29%.

3. Urban stress perceived by the residents of Zduńska Wola: Results of studies

The survey conducted among the residents and users of the urban space of Zduńska Wola covered three areas of stress factors, i.e., the quality of the environment, social conditions and the physiognomy and morphology of the town (Tab.1.). Respondents answered the question "To what extent do you think the following factors influence the occurrence of urban stress in Zduńska Wola?" and were asked to assess on a 5-grade scale whether a given stressor: occurs and is very stressful, occurs and is rather stressful, occurs but is not stressful, does not occur and is not stressful, or "hard to say". The most frequently indicated stressors, occurring and very stressful or occurring and rather stressful in Zduńska Wola are:

- in the group of stressors associated with the quality of the environment: pollution e.g., smog (according to 77.6% of respondents),
- in the area of social stressors: work and role overload (63% of respondents),
- the condition of road infrastructure in the town, e.g., the condition of pavements, roads (62%) and neglected, degraded space in the town (51.8%) in the area of physiognomy and morphology of the city (Fig. 1, 2, 3).

Despite the many measures being taken to improve air quality, among other things, residents still point to pollution as the most significant urban stress factor (78%). According to respondents, climate change (41%) and noise (40%) are also stressful. The studies have demonstrated that more than a third of respondents perceive problems such as too high temperature/heat in the town and too much sunshine, although they do not indicate these as stressful. However, this shows that residents recognise what phenomena shape living conditions in the town (Fig. 1).

When analysing the social area, a clear stressor is work and role overload (63%) and social inequality and discrimination (44%). The second factor, especially in the case of small (up to 20,000) and medium-sized (up

to 100,000) towns, may act as a stigmatising factor leading to social exclusion and, as a result, reinforcing stress. Interestingly, the inhabitants of Zduńska Wola (about 50% of respondents) point to the congestion and fast pace of life in the town, but these factors are stressful and rather stressful to only ¼ of all respondents, while ⅓ of respondents fail to perceive them. In addition, 40% of the respondents say that Zduńska Wola can be a good place to live and more than 30% claim that the town offers adequate conditions for work and study. For more than half of the respondents, the town does not offer adequate conditions for leisure in places designated for this purpose and a significant part of this group feels stress associated with this (Fig. 2).

The condition of road infrastructure is perceived as a stressor (over 60% of responses). On the one hand, such answers are justified on the grounds of safety in the context of very high traffic intensity. On the other hand, however, the question arises about limiting individual transport and traffic organization in the town. With regard to poor air quality, it is important to re-organise transport in the town with a view to ensuring the safety and comfort of journeys for residents and city users and reducing low emissions.

Respondents remain divided over the quality of accompanying infrastructure, such as outdoor benches or bicycle racks. About 1/3 of respondents feel stressed by the lack or poor quality of street furniture. Another 1/3 notice the problem but do not find it stressful, and for 24% of respondents the stressor is non-existent. What is stressful is the neglected, degraded space in the town (52% of respondents) and spatial chaos (37% of respondents), the reason for which may be the lack of binding landscape regulations. In Zduńska Wola there are no high-rise buildings, which is why the stressor relating to them does not occur and is not perceived by residents (63% of respondents), only 14% of respondents viewed living on the 4th floor or higher as stressful (Fig. 3).

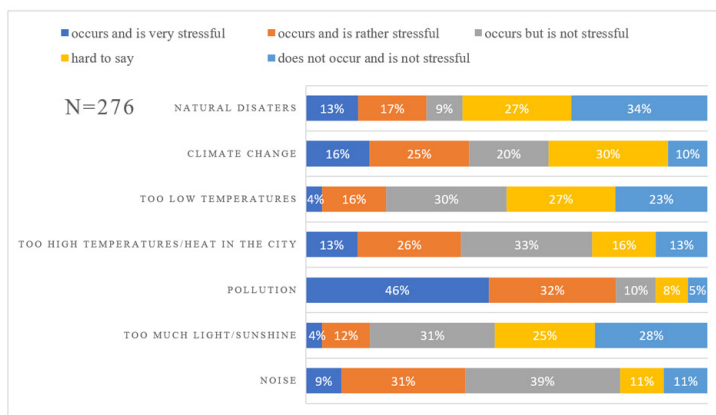


Figure 1. Perception of stressors associated with the quality of the environment in Zduńska Wola. Own compilation based on the original pilot survey designed by the authors

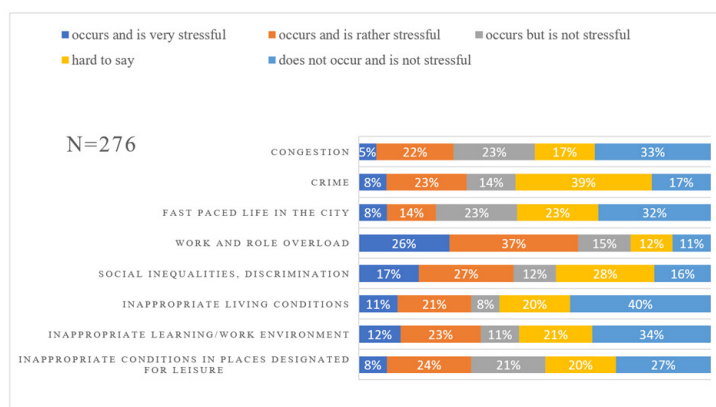


Figure 2. Perception of stressors: social conditions in Zduńska Wola. Own compilation based on original pilot survey designed by the authors

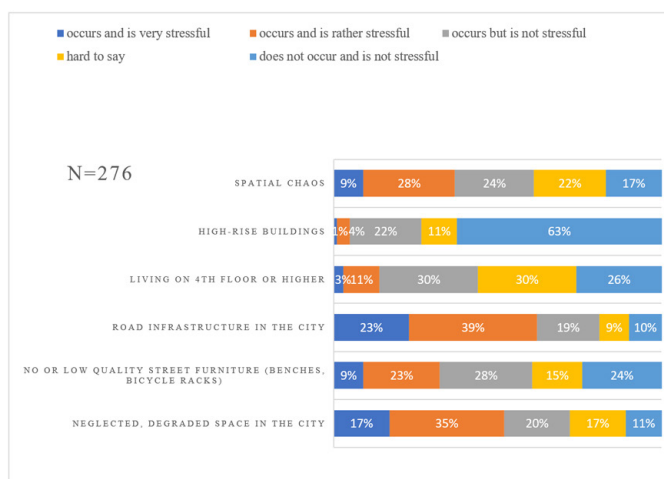


Figure 3. Perception of stressors associated with physiognomy and morphology of Zduńska Wola. Own compilation based on the original pilot survey designed by the authors

According to the available literature, determinants of how urban stress is experienced include primarily: age, gender, and health status. People with an innate sensitivity to stimuli are also particularly vulnerable to stress. Furthermore, the response to various stimuli in the environment is determined by psychological factors, such as:

- cognitive appraisal of the physical environment
- individual emotional state with respect to a particular the situation
- personality traits that guide cognitive and emotional processes
- previous experiences, which are understood as critical events experienced by the individual (Bańka 2002, 196).

Statistical analysis was performed to test the relationship between demographic characteristics (gender, age, education), subjective assessment of health status, net income per person in the respondents' household and place of residence, and perceived stressors. The following hypotheses were formulated:

- Ho – there is no relationship between demographic characteristics and perceived stressors.
- H1 – there is a relationship between demographic characteristics and perceived stressors.

For values $P > 0.05$, the Ho hypothesis was confirmed; for values $P = < 0.05$, the Ho hypothesis was rejected. The results of the statistical tests – chi-square tests – are presented collectively in table 3.

The subject-matter literature suggests that women are more vulnerable to stress and that stressors affect them more strongly. This phenomenon is also observed in Zduńska Wola, where gender determines the perception of stress for a number of factors examined in the pilot study. Age, education, income or health status can also determine the perception of stress. The statistical study proved that there is a correlation between the place of residence of the respondents and the perception of stress triggered by inadequate conditions in the place of residence

or a neglected and degraded space. Interestingly, people living outside Zduńska Wola who commute to the town to work, study or in their leisure time reported higher levels of perceived stress caused by neglected space in the town than its inhabitants (Tab.3.).

The survey also included identification of landmarks on the territory of Zduńska Wola which, according to respondents, exert a powerful impact on reducing or increasing urban stress levels. Green areas (City Park – Stefan Żłotnicki Park and the area by the Kępina retention reservoir) are indicated as places that definitely reduce stress and promote relax and chill-out. On the other hand, places that increase urban stress by causing tension and anxiety are associated with road infrastructure in the centre of the town (Łaska Street) and regional road 482 – Łódzka Street (due to traffic volume and noise). Surprisingly, respondents indicated the centre or more precisely its most prominent part, i.e., Wolności Square, as a stressful space. The place has undergone a major renovation, which included the construction of the Town Hall about 10 years ago. This square, although recently upgraded, remains an unfriendly, concrete-paved place and thus it does not host much public life. However, it is worth noting that the City Office has plans for another redevelopment of Wolności Square to be carried out within the next 5 years.

Conclusion

Recent years have seen an abundance of concepts that put stress on a social and ecological perspective in urban development, i.e., the idea of a civic, healthy, green, liveable and work-friendly city. These are intended to counterbalance environmental problems of modern cities. The 2030 Agenda for Sustainable Development (UN 2015a), in particular Sustainable Development Goal 11, is dedicated to cities and towns and calls for “making cities socially inclusive, safe, stable and sustainable”. In addition, the EU Green Deal strategy (EC 2019) and the New Leipzig Charter on the Transformative Power of

Table 3. Perception of stressors associated with the natural environment and its condition, social factors, and urban physiognomy and morphology. Own compilation based on an original pilot study designed by the authors

Factors/ Stressors	Gender	Age	Education	Income	Subjective perception of health condition	Domicile
noise	0.400	<0.001	0.002	0.276	0.359	0.312
too much light/sunshine	0.884	0.662	0.949	0.891	0.169	0.355
Pollution	0.033	0.003	<0.001	0.576	0.648	0.325
too high temperatures/heat in town	0.805	0.376	0.090	0.988	0.858	0.637
too low temperature	0.857	0.711	0.066	0.323	0.251	0.975
climate change	0.230	0.464	0.448	0.727	0.758	0.846
natural disasters	0.051	0.541	0.237	0.878	0.710	0.667
Congestion	0.093	0.362	0.363	0.179	0.015	0.867
Crime	0.051	0.123	0.028	0.281	0.044	0.245
fast paced city life	0.355	0.003	0.094	0.007	0.097	0.147
work and role overload	0.093	0.001	0.191	0.734	0.269	0.738
social inequalities, discrimination	0.002	0.135	0.586	0.630	0.225	0.401
inadequate living conditions	0.059	0.871	0.350	0.545	0.069	0.003
inadequate conditions at work/ place of study	0.012	0.010	0.012	0.160	0.003	0.810
inadequate conditions in leisure areas	0.020	0.551	0.815	0.711	0.002	0.382
spatial chaos	0.522	0.770	0.295	0.873	0.306	0.135
high-rise buildings	0.425	0.179	0.261	<0.001	<0.001	0.486
living at 4th floor or higher	0.970	0.032	0.200	0.174	0.128	0.140
condition of road infrastructure in the town	0.910	0.726	0.568	0.654	0.014	0.151
poor quality accompanying infrastructure (outdoor benches, bicycle racks)	0.171	0.025	0.902	0.420	0.870	0.576
neglected, degraded space in town	0.327	0.090	0.545	0.256	0.797	0.008

Cities for the Common Good (2021) clearly emphasise the relevance of collective action to improve urban living conditions and a more powerful shift towards achieving sustainable growth of green cities that operate in a fair and efficient manner (Ec.europa.eu 2020). Meanwhile, as both literature and empirical research indicate, cities are invariably a stage for the clash of different goals and priorities and the implementation of diverse activities. They generate benefits, but also costs, which are reflected in urban stress. Identification and interpretation of urban stress, as shown by the survey, varies widely, which should be an argument for local authorities to monitor urban living conditions on a continuous basis. At the same time, the findings of studies on stress can be used as a participatory identification of the

phenomenon and the perception of urban quality of life, as well as the role of urban stress in the assessment of the quality of life.

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