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GEOGRAPHIC INFORMATION SYSTEMS AND ACCESSIBILITY FOR PERSONS WITH DISABILITIES

Abstract: Disability is a natural part of the human experience across the world and an integral part of the human condition. However, people with disabilities are often seen as different from "the norm" of human being and as a result their needs are marginalized in their societies. The access to many aspects of social life is limited for them. Initially, disability was recognized in the medical and social context as a dysfunction requiring medical treatment, "special" schools, workplaces or social benefits due to incapacity for work. Over time, the influence of the environment on the functioning of a person with a disability became the subject of interest. The importance of shaping space for people with disabilities is developed in disciplines dealing with urban planning, spatial planning and architecture. Even the concept of "geography of disability" lately came into existence. Geographic information systems offer analytical methods and tools to explore various spatial concepts and their impact on the functioning of people with disabilities. Their application is growing and strengthening GIS in disability research can contribute to greater autonomy of people with disabilities and promote their integration into society. One of the impulses for the development of GIS in this area are undoubtedly regulations guaranteeing people with disabilities access to the physical environment, transport and other facilities, information and communication as well as services intended for use by the general public, and obliging not only public entities, but more and more often private entities to ensure accessibility. The aim of the article is to indicate what new challenges were created by the legal systems and what expectations can be addressed to GIS.

Keywords: geography of disability, accessible space, GIS applications in disability studies, GIS tools, the right to access

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Introduction

Human activity has a strong spatial context. It is natural for humans to live in space and influence it at the same time. Therefore, the surrounding space needs to be shaped to meet human needs. However, for many centuries the environment surrounding even the most developed societies has been shaped from the perspective of able-bodied people and intended for able-bodied people. It was overlooked that disability is not only a constant, but also a natural experience that has been present across all human societies. Historically, the perception of human corporeality was an important starting point for shaping the natural surroundings and creating social spaces (Gleeson, 1998). Persons with disabilities were treated as different from the human “norm.” The participation of persons with disabilities in social life was thus marginalised, and, under the guise of providing assistance, it was subjected to strong social control and monopolised by medicine over time. Social assistance and medicalisation were the key tools of exercising social control over persons with disabilities (Barnes & Mercer, 2008). Disability was viewed as a dysfunction that requires medical treatment and secure income, the provision of “special” education, and assistance in finding “special” employment. Even the removal of barriers initially involved the provision of “special” solutions intended only for persons with disabilities.

Spaces adapted for the needs of society thus reflect a specific social structure and cultural patterns. As a result, they represent social artefacts, shaped through the mutual interaction of structures, institutions and people in successive historical periods. From this perspective, disability represents a socio-spatial experience emerging from essential social relations (Gleeson, 1998). At the same time, the resulting environment also influences society and individuals, their ideas about social needs as well as their attitudes. It does not help to see how unfriendly, inaccessible and excluding it can be for persons with disabilities. In turn, the specific features of the surroundings determine access to places, essential public goods and services, it may foster a person’s self-actualisation or constrain their educational, professional, economic opportunities or even natural social interactions and, as a result, the quality of life. In other words, poorly designed space can exclude people and can be analysed in terms of lack of equal access to public places, goods and services.

Disability not only manifests itself but also reproduces itself in socio-spatial ways. The existing disabling socio-spatial patterns and relations are maintained by dominant power relations. Only when they begin to trigger resistance will they result, over time, in the renegotiation and change of those patterns and relations (Gleeson, 1998).

The disability rights movement was inspired by the struggle for equal racial rights. The problem of inaccessibility in many areas of life, the isolating approach that adds to the existing impairments was strongly highlighted in the *1976 Fundamental Principles of Disability of The Union of the Physically Impaired against Segregation and the Disability Alliance*. A concept emerged to reject disability as a characteristic of the person and it was proposed instead to see it as a social construct defined through discrimination and exclusion by the surroundings. A strong emphasis was placed on environmental

barriers. The creator of the theoretical concept of the social model of disability was M. Oliver, who recognised the growing sense of discrimination and social oppression among persons with disabilities and the emergence of a new paradigm of disability, which placed disability in society rather than within individuals, and called for a shift from a focus on the physical limitations of individuals towards the way in which physical and social environments impose constraints on specific groups and categories of people (Oliver, 1983). In this way, the impact of the environment on the functioning of persons with disabilities evolved into a topic of systemic interest.

The concept of accessible space

The conceptualisation of disability has expanded significantly since the 1980s. The idea of barrier-free design was born, followed by universal design, also called inclusive design or design-for-all (Ostroff, 2001). The role of assessing collective needs, co-deciding about their choice for implementation fell not only on the shoulders of urban planners, but also environmentalists, people representing health care and social policy, as well as local activists (Parnell, 2016). Ensuring accessibility (especially physical) of public spaces and facilities, incorporating the idea of universal design, also makes them more accessible for people who may not be disabled (e.g. families with baby prams, people with large luggage).

The influence of environmental and social factors on the participation of persons with disabilities in society became a researched topic. Accessibility, especially when measuring physical access, can be assessed in various ways. Measurement in absolute terms helps to assess whether or not a person with a specific disability has access or not. In order to measure accessibility more accurately, it is necessary to use other measures of access (such as accessibility to the nearest facility, “gross” accessibility as the sum of all measures and types of accessibility, accessibility with probabilistic choice, also called choice-based accessibility). For example, a ramp at the back of a building may provide absolute access, but may force its users to take a detour and take more time to get down and return to the main route (Church & Marston, 2016). Accessibility was also separately ensured in places specifically designated for persons with disabilities. Over time, it began to focus not only on access to specific places, transport and physical access, but also on broader access to urban features, public goods such as spaces open for the general public, and to public services (Waters, 2016).

Architectural accessibility was the first area where the need to provide equal access for persons with disabilities was noticed. This type of accessibility is indicated as a fundamental feature of the built environment. It enables people to participate in all the activities for which the built environment is designed. For most people, the modern environment is built accessibly. They can use it independently and naturally without being aware of accessibility as an essential feature of the environment. However, if accessibility criteria are benchmarked against the characteristics of the “average” person, this does not mean that the facilities built are automatically equally accessible to all (Wijk, 1996).

Finally, providing spaces without architectural barriers did not mean that public spaces, transport, other public services and goods were accessible to the entire community of persons with disabilities. Environmental disability may depend on the specific type of disability (Keysor, 2006). Less commonly realised but equally important was the availability of information, the accessibility of communication for deaf persons, blind persons, persons with intellectual disabilities, and persons who communicate using AAC. Technological progress, in turn, forced the need to ensure accessibility of information technology.

A separate issue is the question about the environmental factors that should be taken into account and ways of measuring their impact on the provision of accessibility. It is therefore important to recognise the real role of environmental factors in the disability process, and researchers need to develop an underlying theory to help explain when barriers actually mean that participation does not occur, without neglecting the fact that participation is also strongly related to quality of life (Whiteneck, 2006).

Finally, the interaction between the person with disability and the environment is not limited to the physical environment but also incorporates the social, cultural and economic environment (Enders & Brandt, 2007).

Development of GIS applications in disability studies

The meaning of space and place for persons with disabilities is a research area in geography, urban planning, spatial planning and architecture. Even a term such as “geography of disability” has been coined and it was first used by R. Golledge (1993, see also Zajadacz, 2011). Geography of disability is considered to be a subdiscipline of geography, focused on studying the experience of persons with disabilities in the context of the relationship between space (geographical environment) and human beings. Geographers propose to see disability as a result of the relationship between the person with disability and the geographical environment. Studies focus on this relationship, taking into account natural, political, cultural and social factors, but also degrees and types of disability. This refers to the experience of persons with disabilities in different spatial areas: from urban to rural, from the micro scale (mobility in the place of residence) to accessibility of transport (as a network connecting cities and countries) (Jacobson, 2012).

Geographic information systems (GIS) are a key tool to support geography of disability in public space planning. They connect geography, space and technology and are used for digital acquisition, mapping, collection, analysis, processing, including visualisation, of spatial data (Burrough & McDonnell, 1998). Those systems enable data comparisons over time (data on a map referring to different periods). The data may refer to physical, natural, political, social, ethnic and cultural elements and may derive from various sources. GIS enable spatial coordination of resources from distinct systems (Enders & Brandt, 2007). GIS are faster and more accurate to use than paper maps and data can be shared online. If different data are overlaid, this reveals not only the problem, but also its source and cause.

GIS offer methods and analytical tools to analyse different spatial concepts and their impact on the everyday life of persons with disabilities. However, it is still only a set of analytical tools and methods that produce results as accurate as the data processed, and are only as intelligent as their users.

GIS tools quickly made it to health services, enabling the tracking of the incidence and spread of diseases and medical conditions. It is worth mentioning that historically mapping had already been used during the cholera epidemic in 19th-century London, when a local doctor, John Snow, used his map to determine that the problem originated from a specific water pump that delivered contaminated water from the Thames. Transport has become another important area of application of GIS for persons with disabilities. GIS have been widely used to obtain information on the accessibility of public transport, the possibility of using personal transport, the conditions of individual mobility and spatial orientation, currently also inside built-up facilities (Zimmermann-Janschitz, 2018).

As geospatial technologies grew more widespread, social needs analysis has become even more attainable. New applications of GIS have expanded to include the study of how interactions between geographic phenomena and social structures affect individuals and society (Kocaman & Ozdemir, 2020), and how the environment can condition the impact on specific social groups and individuals. GIS can serve as a tool for assessing community needs and resources, setting or influencing policy, planning an initiative or intervention, as well as evaluating and redirecting work. The example of environment and population mapping in disasters has shown how the perception of persons with disabilities can change from those with “special needs” to those who contribute to progress in the community. GIS technologies are also an opportunity to be seen as part of the solution, not just part of the problem (Enders & Brandt, 2007).

Geospatial tools and methods can detect structural injustices that each person with disability experiences differently. Depending on the kind of disability, factors might hinder access to the environment but they can also support the development of solutions (Kocoman & Ozdemir, 2020). The digitalisation that is taking place in social life enables the implementation of new concepts, creative approaches to the services offered in a new institutional setting, institutional reconstruction, stimulation of processes that could meet citizens ever new needs (Grewiński & Karwacki, 2015; as regards social innovation in various European countries: Grewiński, 2018).

Among the limitations and barriers of GIS, authors point out, however, to the idea of targeting solutions to specific disabilities. Different groups identify barriers individually (Zimmermann-Janschitz, 2018). A systematic approach to the use of geospatial technologies in order to improve the rights and lives of persons with disabilities must include the structuring of the problem by identifying the basic requirements, designing the system in a proactive and evolving way so that it can be updated with new technologies and user input data (Kocoman & Ozdemir, 2020).

Accessibility in the legal system

The development of accessibility was not only associated with the spread of universal design, reasonable adjustments or social pressure to remove existing barriers. Environmental barriers were accompanied by social policy restrictions as well as formal and structural barriers. The impact of disability rights movements translated into the emergence of accessibility standards. In the USA, accessibility became mandatory for all federal facilities as early as 1978. Further, in 1990, the U.S. Congress passed *The Americans with Disabilities Act (ADA)*, a comprehensive law that covers most accessibility issues for persons with disabilities in the United States. ADA applies to all state and municipal government offices and facilities, as well as all public facilities: buildings and other spaces accessible to the general public. ADA guarantees both physical accessibility and non-discrimination in employment and in the provision of goods, services, programmes and education. Similar legislation has been introduced by the United Kingdom (*The Disability Discrimination Act 1995*, called the DDA) and Japan (*The Heartful Building Law*, in 1994).

In contrast to the “complaints-based” human rights system, regulations establishing accessibility standards were seen as a complementary tool to help reduce discrimination on the basis of disability and promote a society that is more open to persons with disabilities (Jacobs, 2016). The UN Standard Rules on the Equalization of Opportunities for Persons with Disabilities (1993) included a principle devoted to accessibility (Principle 5: Accessibility). The Rules referred to accessibility in all spheres of life, not only within the physical environment but also in terms of information and communication. They pointed out that the process by which every aspect of the organisation of society is accessible is a fundamental goal of socio-economic progress and development (Preamble). In recognition of the important role of the environment in human functioning, environmental factors were included by WHO in the International Classification of Functioning, Disability and Health (ICF). These factors range from physical (such as climate, terrain or building design) to social (such as attitudes, institutions and regulations).

A breakthrough came with the adoption of the Convention on the Rights of Persons with Disabilities (CRPD). The concept of accessibility has become part of the human rights canon. Accessibility is one of the pillars underlying the Convention. CRPD defines accessibility as one of the general principles. It views persons with disabilities as rights holders rather than targets of charity or clients of welfare services. States are now obliged to take adequate measures to enable persons with disabilities to participate fully in all aspects of life and live independently. Under the obligation to provide access, CRPD mentions the physical environment, means of transport, information and communication (information and communication technologies and systems) and all other facilities and services generally available or provided to the public, in both urban and rural areas (Article 9(1)). States Parties should promote access for persons with disabilities to new information and communication technologies and systems (Article 9(2)(g)), provide persons with disabilities with accessible information on mobility aids,

devices and assistive technologies, including new technologies, as well as other forms of assistance, support services and facilities (Article 4(1)(h)).

Year 2019 saw the adoption of Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services (OJ L 151, 7.6.2019), which aims to approximate the legislations of Member States with regard to accessibility requirements for certain products and services, in particular by eliminating and preventing the emergence of barriers to the free movement of certain accessible products and services that result from divergent accessibility requirements in different Member States. The obligations set out in that Directive should apply equally to economic operators from the public and private sectors (Recital 57). However, this is not the first piece of EU legislation on accessibility. Their list can be found in the appendix to Annex II of the Council Decision of 26 November 2009 concerning the conclusion, by the European Community, of the United Nations Convention on the Rights of Persons with Disabilities (2010/48/EC).

In Poland, new challenges arose from the Act of 19 July 2019 on ensuring accessibility to persons with special needs. Its enactment was preceded/heralded by the 2018–2025 Accessibility Plus government programme (Resolution No. 102/2018) adopted a year earlier. Among other things, the Act imposes an obligation to continuously monitor the provision of accessibility by public entities. As in EU law, certain obligations of public and sometimes non-public entities regarding accessibility also arise from many other previous regulations in the field of construction, telecommunications, postal services, information technologies, media, etc.

Conclusions

Geoinformation technologies can serve to improve and enhance the effectiveness of the rights of persons with disabilities. Inadequate spatial planning means that the rights of persons with disabilities are not exercised despite being declared in the law. This leads to structural injustice (Kocoman, Ozdemir, 2020). However, GIS can provide inputs for planning and implementation decisions and to justify them to funders and policy makers, and then evaluate the implementation. In this way, GIS enable the implementation of evidence-based public policies (Kocoman & Ozdemir, 2020).

The use of GIS is growing ever more widespread, and their strengthened role in disability studies can enhance the autonomy of persons with disabilities and foster their integration into society. One of the impulses for the development of GIS in this area undoubtedly comes from the regulations that guarantee access to the physical environment, transport, other facilities, information and communication and public services. Regulations also oblige not only public entities but increasingly also private ones to ensure accessibility.

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