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## **EQUITY IN TRANSPORTATION: NEW APPROACH IN TRANSPORT PLANNING – PRELIMINARY RESULTS OF CASE STUDY IN CRACOW**

**Summary.** The goal of the paper is to present the concept of equity as a new approach in transport and land-use planning. This concept is consistent with the objectives of sustainable development and it is becoming more common in European and world literature. Understanding the idea of equity in the context of the transport system development is very important in creating sustainable cities and regions without discriminating any social groups and creating a cohesive society not exposed to social exclusion due to lack of access to primary and secondary activities. The paper presents some results of the preliminary analysis on transport equity in Cracow. The basic equity level which has been considered here concerns senior citizens, older people living in Cracow area, in terms of their accessibility to transport infrastructure. Taking into account living conditions of elderly pedestrians, contour measures were used, in order to determine accessibility as equity indicator.

## **RÓWNOWAŻNOŚĆ W TRANSPORCIE: NOWOCZESNE PODEJŚCIE W PLANOWANIU TRANSPORTU – WYNIKI WSTĘPNYCH ANALIZ W KRAKOWIE**

**Streszczenie.** Artykuł stanowi przedstawienie koncepcji równości, jako nowego podejścia do planowania transportu. Podejście to jest zbieżne z celami zrównoważonego rozwoju oraz jest coraz częściej spotykane w europejskiej i światowej literaturze. Zrozumienie idei równości w kontekście rozwoju transportu jest bardzo istotne w tworzeniu zrównoważonych miast i regionów, które rozwijają się nie dyskryminując żadnych grup społecznych i tworząc spójne społeczeństwo nienarażone na wykluczenie społeczne z powodu braku dostępu do podstawowych i drugorzędnych aktywności. W pracy zaprezentowano również wyniki wstępnych analiz równości transportowej na przykładzie obszaru Krakowa. W analizach wzięto pod uwagę sytuację osób starszych, mieszkających w Krakowie, pod kątem ich dostępności do infrastruktury transportowej. Do określenia dostępności wykorzystano miary konturowe, uwzględniające uwarunkowania w poruszaniu się osób starszych.

## 1. INTRODUCTION

The concept of equity in social sciences is not new, but equity in transport is still underestimated by social movements the world over. However, understanding of transport policy equity and its impact becomes increasingly important, but, in spite of this fact, issues of equity are still poorly represented in analyses and evaluation of land-use planning and development plans of transport systems, as well in Poland as in another countries.

The concept of equity in transportation raised from the social sciences, economics and politics and it is sometimes presented together with the concept of justice and freedom. In political and social sciences the equity concept was introduced in the UN Universal Declaration of Human Rights (1948), where its meaning was related the natural human rights, independent of race, nationality, religion or social status. The equity idea was connected to equal rights and freedom for all individuals who have the same choice of path in life. In economics, the equity concept is used in a context of welfare and taxation rules and as general rule stating that authorities are responsible for providing all citizens with basic and equal minimum of income, goods and services [2]. Equity in this approach means such a distribution of goods among different individuals and social groups, that none is discriminated or excluded. In Poland, however, concept of equity is still associated with the approach used in socialistic and communistic regimes, which makes its understanding difficult or controversial.

## 2. EQUITY IN TRANSPORTATION

In the literature the concept of equity divides into several categories with regard to spatial and transport planning. Following Litman [9, 10] at least three dimensions of equity can be indicate:

- “Horizontal Equity (known as egalitarianism and fairness);
- Vertical Equity:
  - vertical equity in relation to mobility need and ability,
  - vertical equity in relation to incomes and social conditions”.

According to horizontal equity definition, in the process of planning and in the process of decision-making all inhabitants should be treated equally, if there is no legitimate reason for departure from the rules. Considering horizontal equity the distribution of costs and benefits is analyzed, assuming abilities and needs of individuals and social groups on the same level. The general meaning of such equity measure could be expressed in one sentence: consumer should “get what he pays for and pay for what he gets” [10]. However, in relation to spatial and transport context this horizontal equity measure could be referred to the distribution of costs and benefits which are results of external effect. Impact of land-use, design approach of cities, in terms of external costs and benefits can be represented by using its separate elements as:

- environmental sustainability and climate change (including pollution, noise, traffic accidents),
- access to sources of healthy activities – such as parks or food shops,
- access to basic and secondary services by securing access to various modes of transport such as public transport, cycling and walking,
- ability for meeting with the local community members, enabling social life,
- socio-economic aspects such as crime rate, poor housing, level of unemployment.

Vertical equity, in literature also called social justice and social inclusion, is connected with the approach that supports vulnerable individuals or social groups, who could be in a difficult situation (the disabled persons, children, older people etc.). Among all features which should characterize areas to provide equity in the vertical meaning [10], the following ones should be mentioned:

- financially affordable housing with accessible multi-modal locations,
- cost-friendly modality (walking, cycling, transit, car sharing, etc.) which gets an adequate support and is planned as an integrated system,
- poorer households pay a smaller part of their income or gain greater benefit in comparison to more rich households,

- introduction of discounts for transport services based on economic needs,
- investment in services quality and quantity favor groups with lower income and poor areas,
- transport services provide an adequate access to health-care facilities, schools, work places, and other basic activities,
- priorities favor trips of high necessity, such as trips of emergency ambulance.

### 3. INEQUITY LEADING TO SOCIAL EXCLUSION

Considering the equity in terms of transport and land-use planning, it is possible to speak about territorial equity. Lack of such equity causes territorial exclusion. "Territorially excluded individuals of groups are those from the poorest areas, which are suffering often from their peripheral location, limited accessibility, lack of basic infrastructure, socio-economic backwardness, deindustrialization tendency, low level of education development, lack of administrative support, high levels of unemployment, deteriorating housing and life conditions, difficulties with access to public services, lack of favorable conditions for technological development and the huge number of people which belong to groups with risk of social exclusion" [11].

When regarding the field of spatial and transport planning the following potential exclusion factors can be identified [7]:

1. Place of living:
  - a) neighborhood including aspects of security and crime,
  - b) local area poorly equipped,
  - c) lack of social unity,
  - d) territorial/geographical isolation (in terms of accessibility: lack of access to services, goods and transport).
2. Mobility conditions:
  - a) lack or bad supply of transport system,
  - b) lack of access (or bad access) to social network, services, goods and activity.

As spatial policy in Poland define, both economic and social conditions of vulnerable groups exposed to social exclusion should be regarded. Vulnerable groups are as follows [4, 11]:

- children and young people growing up in a deprived area or outside of the family,
- single mothers,
- victims of family life pathology,
- people with low qualifications and low education level,
- people living in very difficult housing conditions,
- disabled people and people with chronic or mental diseases,
- older single people,
- people discharged from prison,
- immigrants,
- minorities.

Certain individuals or groups are excluded from minimum level of participation in activities related to the places to which they do not have an access, even though they would like to be a part these activities. Such situation creates a multidimensional process that keeps out individuals or groups of participation in social and public life. Lack of access to goods and services generates a feeling of social exclusion.

### 4. PRELIMINARY ANALYSIS OF TRANSPORT EQUITY IN CRACOW

Equity issues in spatial and transport planning are neither easy nor understandable. The concept of transport equity in the context of transport planning can be explained through the concept of

accessibility. This concept is related to the role of spatial and transport system for society: it gives possibilities for people to participate in activities situated in different locations.

Geurs [6] defines accessibility in other words as "measure which is provided by spatial and transport system and enables for individuals (groups of units) or goods to achieve activity or location by using one mode of transport or combination of different modes of transport." By definition of accessibility concept, researchers emphasize connection of two space components: transport component and land-use component.

At least two approaches to accessibility could be recognized [3]. The first one is focused on mobility or ability to make a trip. This concept was particularly appreciated by geographers and transport engineers. These experts concentrate on aspects of traffic flow geography and distribution of these flows between origins and destinations, taking into account, for example, average speed or predictable direct cost of trip. The second approach to accessibility focused more on "ease of reaching" various goods and services situated in different destinations [3,14].

This formulation refers to ease of spatial interactions or contacts (potential) with activity or function (access to school, hospital, etc.). The public transport system in the concept of accessibility is understood as an element which allows inhabitants to realize their needs related to carrying out of activities or, with other words, all their social and economic needs [8]. The transport accessibility defined as an effect of the transport system is a basic parameter used in the spatial analysis, accessibility determines benefits of location for current area in comparison to another ones [15]. Spatial analysis of accessibility can serve as a measure of transport equity.

In Cracow studies on transport equity, an evaluation of the current state of senior citizens accessibility to public transport infrastructure was the main objective, because this group of citizens is regarded as one of the most sensitive to social exclusion.

Ageing is a common trend in all societies in Europe, and this trend is also strong in Polish cities like Cracow. Senior citizens (aged 65+) are a growing social group especially in big cities. Older people want to provide an active life and to live independently, without help of others [20], as long as possible. There are several barriers to their independent life and everyday activities. Individual mobility is regarded as one of the most important preconditions of independent life in older age. Together with health problems, outdoor mobility barriers can effect in restriction of social life, which may lead to social exclusion. Ability of senior's participation in outdoor activities is depending on their accessibility to transport infrastructure in independent way. The results of the large EU project SIZE (Life quality of senior citizens in relations to mobility conditions) revealed [17] multiple barriers of individual mobility of older people in Europe, among which poor accessibility to the public transport services was a significant restriction.

In the work presented here and conducted as a Cracow case study, simple distance measures known as contour measures (also called as isochronic measures or cumulative opportunities) were used. Contour measures has been construed as [eg. 1, 6]:

$$A_i = \sum_{j=1}^J B_j O_j \quad (1)$$

Where:

$A_i$  – accessibility measured in point  $i$  to potential opportunities in area  $j$ .

$O_j$  – opportunity in area  $j$ .

$B_j$  – binary value equal to 1 if area  $j$  is in the assumed threshold and 0 otherwise.

This analysis concerned evaluation of the senior citizens population (aged 65+) which can reach the nearest tram or bus stop within 5 minute walking distance. The applied walking speed was lower than in standard evaluations of pedestrian accessibility, due to the restricted physical mobility of older people. The walking speed adopted to the senior's conditions was assumed as 1 m/s, based on [12].

Using the tool for spatial analysis, the areas in Cracow were indicated, with the highest density of older people in the population. In the next step, the buffers with the radius of 300 m around bus and

tram stops were set, as a representation of walking time within 5 minutes. The results of the analysis are illustrated in Fig. 1 and Fig 2.

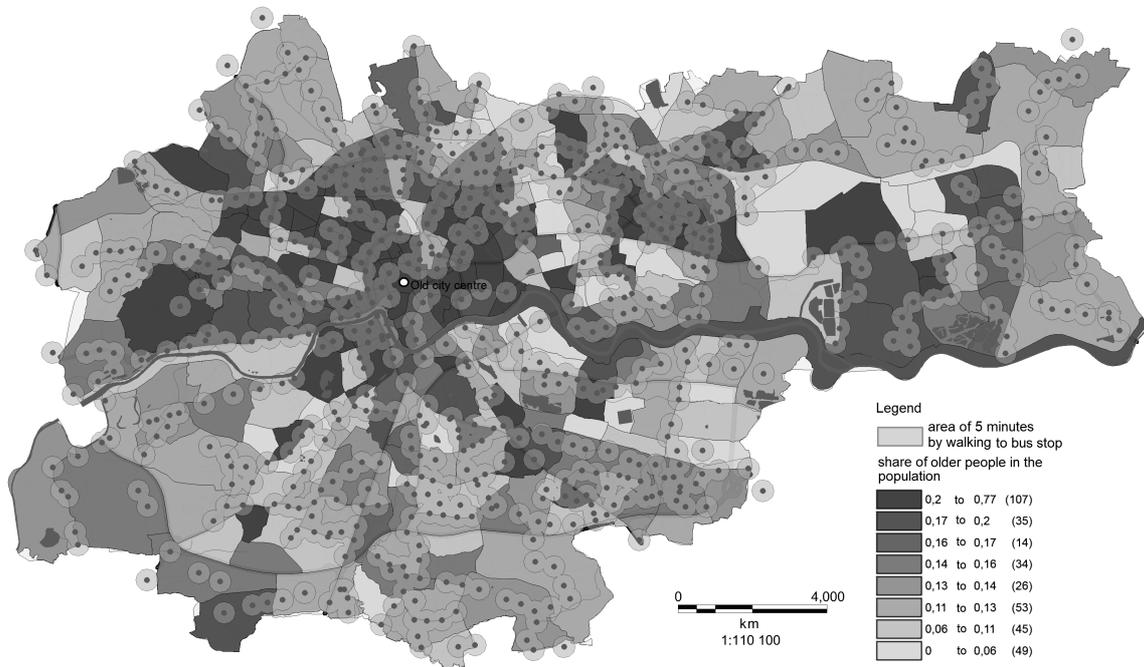


Fig. 1. Cracow' senior citizens accessibility to bus stops

Rys. 1. Dostępność do przystanków autobusowych starszych mieszkańców Krakowa

Tab. 1

The number of elderly residents of Cracow with good accessibility level to public transport infrastructure

		Men over 65	Woman over 65	People over 65 total
total in Cracow		47388	75955	123343
in the 5 minutes buffer	bus stops	35547	57453	93000
	tram stops	17780	29590	47370

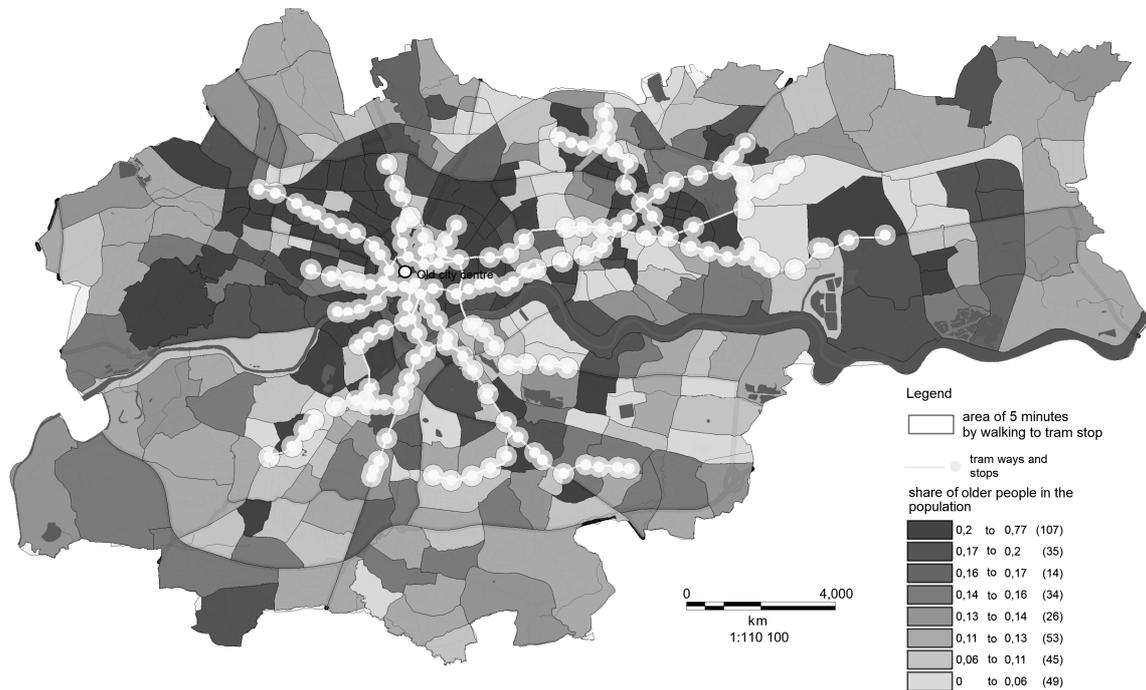


Fig. 2. Cracow' senior citizens accessibility to tram stops

Rys. 2. Dostępność do przystanków tramwajowych starszych mieszkańców Krakowa

According to the latest demographic-spatial information (GIS maps from 2010), there are 17% of Senior citizens (aged 65+) are registered in Cracow. This group of citizens can enjoy a relatively good access to the public bus stops. This study results show that 76% of old men and old woman lives within 5 min walking access to the nearest bus stop. This bus infrastructure is highly developed and spread around all Cracow districts.

Tram stops are not so easy available for all citizens. While tram city transport is the second important public transport system in Cracow, tram stop infrastructure is accessible within 5 minutes walk only to 38% of the whole senior citizens population (38% of woman, 39% of men).

This analysis, as shown in the Fig. 1 and Fig. 2, indicated the existence of zones with high density of population but poor mobility conditions. For senior citizens it is especially important, if the city public transport is easily accessible. This convenient public transport infrastructure is the most important precondition of unrestricted mobility of older people.

## 5. CONCLUSIONS

Equity considerations started many decades ago, but despite the fact that they helped to raise the discussion about social dimension of transport systems, there is still no proper understanding of this concept. Transport equity is connected to transport accessibility, but equity concept in modern societies have to be perceived much wider than transport accessibility. In democratic societies the social responsibility for vulnerable groups is becoming one of the most valid indicators of social equity. Therefore, despite the fact that general social equity is being elaborated in Poland in many studies from the early fifties of the 20 century, it is a vital concept which still needs to be researched for the successful implementation. All the existing worldwide approaches to equity in transportation presents a multidimensional scale, which let us expect to face a large scale of challenges during the following years on. The suspected scale we will face during next studies will not be limited to the one we face now. The future development of accessibility tools, which will help us to measure equity

dimensions, are vital to achieve better answers in the decision-making process on where and for whom transport plans are really made.

The presented study results are in line with the final findings from the earlier European research on mobility conditions of senior citizens, which indicated that barriers to senior's mobility may lead to social exclusion. High quality of public transport and walking infrastructure is especially important for older population. An inaccessible or poorly planned public transport and pedestrian environment will be a major barrier to outdoor mobility for many potential users, including disabled and older people.

Planning high quality transport for seniors citizens means planning for all - what is good for senior citizens will also serve well for all other groups mobility. Planning with accessibility and equity in mind means planning for all users. Equity concept in transport planning may not only help to reduce unnecessary travels, make shorter necessary journeys but also can make safer and easier for people to access places and services by public transport, walking, and cycling. Transport equity, what's more, is in line with today's philosophy of sustainable urban design.

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