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Environmentally-Friendly Planning for Urban Shrinkage

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Abstract. Urban shrinkage has become a widespread phenomenon in contemporary urbanisation. Shrinking cities present multiple shrinkage-connected problems, where the most acute ones are demographic and social decline caused by bad economic performance. These problems are usually mirrored in urban space and thereby matters for urban planning, which, predictably, proposes mainly economic- and demographic-based models and solutions for shrinking cities. The other factors, such as environmental issues, are not well-established both in relevant theory and practice. Generally, environmental issues play a minor role for shrinking cities. However, they can be the factors to cause or to display the consequences of urban shrinkage, but they can also contribute to overcome related challenges. Therefore, environmental issues are unavoidable in any future agenda or policy in urban planning towards shrinking cities.

The first step in the process of linking these two scientific fields – the concept of shrinking cities and environmental science – is certainly to check which environmental issues are relevant for the phenomenon of urban shrinkage. This is the main purpose of this research. It aims to collect and systematise the current knowledge about these links. The findings of this investigation bring new interrelations for the multi-face character of the concept of shrinking cities. Therefore, this research presents a new input how to strengthen currently weak links between the concept and shrinking cities and environmental studies, to facilitate a more adaptive planning for urban shrinkage.

1. Introduction – Shrinking cities and environmental issues

Cities with decline patterns are not a novelty in the history of urbanisation. However, several last decades have been marked with the sharp increase of such cities, where constant population loss has become a new normality in their development [1]. The loss of urban population is not the only determinant for the phenomenon of urban shrinkage; the other ones can be also easily connected with the shrinking patterns, such as the decline of local economy, especially industry, deurbanisation through suburbanisation, the rise of unemployment, higher mobility of population, spatial deterioration [2]. In the other words, these factors influence all elements of contemporary urbanisation. Among them, demographic and economic factors are especially important, but with totally different positions within the topic of urban shrinkage. The problems in local economy are often regarded as the main causes of urban shrinkage, while demographic downturn is mainly observed as the main consequence of this process [3] [4].

The widespread of urban shrinkage across the World has attracted the general attention of urban scholars. The concept of shrinking cities has been formed on their interests and research since the early 2000s [5]. In line with the previous reflections about shrinkage factors, the improvements in



local economy are usually seen as the best way to overcome shrinkage patterns, where the main indicator is the stabilisation or even regrowth of local urban population. Nevertheless, this relatively new research has embraced the other factors that extend of the essence of urban shrinkage as a global phenomenon and related scientific framework. Political, administrative, social, fiscal or ecological factors are just some of them [6]. These factors and related approaches to deal with urban shrinkage are still under-present comparing to demographic and economic factors in the concept of shrinking cities. Moreover, all named factors and their solutions, regardless their significance, are often interconnected and mirrored in urban space (Fig. 1).



Figure 1. Interconnected factors in urban shrinkage mirrored in space, on the example of Gorizia (Italy) – the administrative peripherality of a border city caused economic decline and, eventually, the loss of population (Source: authors)

Environmental issues belong to the mentioned minor factors in the process of urban shrinkage, but its importance has surged last years, with the rise of the topics of environment and ecology globally [7]. This process has further fuelled by cementing the position of environmental studies as critical for the future of cities and urbanisation. The environmental aspect of urban shrinkage is basically linked with the essence of the model of ecologically sustainable city. This city model refers to the complex system that simultaneously deals with two objectives that are crucial for humanity today. The first objective is how to overcome pollution as the hazards of urbanisation; the second one is how to enable the constant increase of life quality for urban dwellers [8]. The ongoing international research finds necessity for a “unique social-ecological system with new challenges to sustainability science, ecology, and their application to urban planning for shrinking cities” [9]. Therefore, environmental issues emerge an unavoidable part in any future agenda or policy in the field of urban planning regarding shrinking cities.

The first step in the process of linking these two scientific fields – the concept of shrinking cities and environmental science – is certainly to check which environmental issues are (the most) relevant for the phenomenon of urban shrinkage. This is the main purpose of this research; it aims to collect and systematise the current knowledge about these links. The findings of this investigation bring new interrelations for the multi-face character of the concept of shrinking cities. Therefore, this research presents a new input how to strengthen currently weak links between the concept and shrinking cities and environmental studies, to enable a better mutual work in two emerging scientific topics and, at the end, more adaptive planning for the more and more prominent process of urban shrinkage.

2. Methodology

The paper is formed a theoretical review. The theoretical fundamentals about the environmental aspect of urban shrinking are elaborated and interconnected in a new way. Accordingly, this paper brings the systematisation of the current knowledge, but also offers an overview in the possible ways how to deepen this links in the future in the research findings. The final insights thereby carry solutions how to bridge the gap between two emerging fields: the concept of shrinking cities and environmental studies.

3. The environmental aspect in the concept of shrinking cities

During last decades, environmental science has widened its scope of interests with the global awareness about the over-pollution of human environment, climate changes, the shrinkage of reversible energy resources, etc. These fields indirectly affect all aspects of human life regardless their basic topics. Therefore, environmental aspect in urban shrinkage can be considered twofold:

1. The narrow interpretation of environmental aspect refers to the all kinds of pollution (air, soil, water, building material, etc.), ecological accidents, environmental disasters, and the impact of climate changes, as well as their environmental hazards. This aspect is relatively rare in research corpus [10]. Nevertheless, it can be very important in some specific situations, such as when urban shrinkage is the direct consequence of great pollution [11].
2. In contrast with the previous statement, the wide interpretation of environmental aspect is very often, because it also includes the question of empty/semi-empty and unused/insufficiently used buildings, infrastructure, and land in shrinking cities. These topics, which belong urban planning, are generally in the spotlight of many scientific investigations, but they are mainly concerned by socio-economic matters.

3.1. *Narrow interpretation*

The narrow interpretation of environmental aspect in urban shrinkage appears in several directions.

Urban shrinkage can sometimes be the consequence of the tightening up of the regulation regarding the protection of environment and ecology. For example, cities in the interior of Finland, which economy was traditionally based on the mass-exploitation of wood, have witnessed shrinkage with more and more rigid environmental laws regarding forestry [12]. Conversely, urban shrinkage can happen in the conditions of the absence of law or its weak implementation. Several Mexican cities are a showcase for this – they entered shrinkage state due to the intensive illegal exploitation of wood, which eventually destroyed this sector as the main one in local economy [13]. These two opposite examples clearly show the complexity between urban shrinkage and environmental issues.

Pollution generally has made a more and more visible impact on urban development in the last few decades. However, there are noticeable regional differentiations. The shrinkage of (inner) American cities has triggered suburban sprawl at the same time, causing further the significant use of automobiles as the most often transport mode and more urban pollution thereof. This has been by far less evident in more compact cities in welfare-based Western Europe or (post-)socialist cities in Eastern Europe [14]. Then, the shrinking cities that historically relied on heavy industry are more hit by pollution [15]. Finally, the impact of pollution can be visible at micro-level. Shrinking urban quarters and neighbourhoods close to old industrial plants and zones are more exposed to pollution, too [16].

Natural accidents and catastrophes, such as floods or earthquakes, played historically a significant activator and contributor to urban shrinkage. They can take this role even today, such as in the case of an earthquake for the City of L'Aquila in Italy of Hurricane Katrina for New Orleans, USA. Unlike them, ecological accidents and catastrophes are more often in contemporary industrial and post-industrial cities [17]. They are caused by human activities, representing a great danger for people, flora and fauna [18]. Big ecological catastrophes usually lead to sudden, fast and significant urban shrinkage. For instance, Fukushima Daiichi nuclear disaster from 2011 caused the entire resettlement of the nearest cities and the sharp shrinkage of many others in surrounding.

Climate changes bring different repercussions for shrinking cities; they have a global albeit slow impact on them [19]. As the process of urban shrinkage, climate changes also require the long-term adaptations of cities [20]. The impact of climate changes has been recently linked with the topic of shrinking cities, but mutual relations have been already established. Despite these new findings, some contradictions have emerged. In the one side, some scientists point out the negative side of climate changes for shrinking cities. For instance, many towns and cities in Australian interior have shrunk due to more often, longer and severe droughts [21]. The other ones highlight the positive side of urban shrinkage in this theme, such as the abundance of free and insufficiently used urban spaces in shrinking cities, which can be perfectly utilised to cope with climate changes [17] [22].

These complex relations between environmental events and urban shrinkage enable different approaches and solutions. Many of them can be similarly applied in growing cities, too. However, they had to be oppositely planned than in growing cities [23]. Unlike them, where demographic and spatial pressure is increasing, shrinking cities have a lot of underused urban space, land and infrastructure [17] [24]. It can be seen as a huge unused resource by environmental aspect [25]. This ‘underuse’ in shrinking cities is, however, also related to the other aspects (social, economic, etc.) and it thereby presents a big challenge for the (re)development of these cities.

3.2. *Wide interpretation*

The wide interpretation of environmental aspect in urban shrinkage is announced in the previous paragraph. It is more related to the solutions formed on the interaction between environmental issues and urban shrinkage. In line with their multi-face character, this segment is more thematically embedded in urban planning as a ‘proactive discipline’.

The main challenge for urban planning in shrinking cities is the appearance and increase of ‘empty places’ [17], where environmental issues are a significant burden for the planning. The essence of this problem is that population density is declining in shrinking cities [26]. By theory, the urban areas with higher population density have a better productivity and lower energy consumption per capita. Distances between dwelling and working place are shorter in higher-density cities, which cuts production expenses as a consequence [27]. Similarly, higher population densities in urban areas generally enable energy savings [20]. Hence, the logic of urban planning is totally divergent in shrinking cities that in ‘normal’ growing cities; the point is on the densification of urban areas [28] – ‘urban implosion’ instead of urban sprawl.

These empty places can be divided into:

- Underused and deteriorated built stock (buildings);
- Underused urban land (communally equipped);
- Underused public (transportation, communal, social) infrastructure; and
- The other minor problems that come out from the aforementioned segments (centres, cultural heritage, etc.).

Empty and severely underused buildings with supplementary urban land are considered as the most serious problem for the (re)development of shrinking cities [29] [30]. Apart from the problem related to environment and ecology, their state also implies different problems related to urban economy, local community, the sense of marginalisation, low accessibility, etc. There are several well-accepted approaches and solutions how to deal with this comprehensive and widespread problem in shrinking cities. The removal of unnecessary abandoned buildings is the most convenient solution in western developed countries, such as the USA [31] or Germany [32]. However, this approach rarely has an environmental meaning. The aim of the removal is more related to real estate – the decrease of the oversupply of free space calms property market [30]. Moreover, many countries, such those in post-socialist Europe, cannot afford themselves the high costs of the removal of unused built stock. The other obstacles also emerge. For example, the empty spaces waiting at property market on the site of the former buildings trigger the atmosphere of marginalisation; crime usually arise in such spaces [33] and neighbouring buildings and areas are negatively affected by the removal and ‘emptiness’ [30].

An environmentally far more acceptable approach is to transform this free space for new urban green areas, with the general goal to “bridge the gap between people and nature in built environment” [34]. Apart from environmental benefits, new green spaces are also benefit for local community, as new places for socialisation [35]. Thus, this approach is often discussed and appreciated in research circles [29]. The main disadvantage of greening as an approach is that it requires huge investments with small economic revenues. Its implementation is restricted to the most developed counties thereof. For instance, greening is used often in many shrinking cities across the space of the former Eastern Germany (Fig. 2). This is questionable for many shrinking cities where there is a huge constraint regarding local finances [34]. More sustainable solutions than simple greening are to develop economically viable zones of new and advanced production. Urban gardens are one of solutions which can easily replace ordinary green areas. This process can be a solution for some very complex problems, such as soil lead problem on the former sites of heavy industry [36].



Figure 2. The spatial imprint of urban shrinkage in Frankfurt/Oder in Eastern Germany – a new green space on the site of the former multi-family residential buildings (Source: authors)

More interesting solutions are related to energy and resource efficiency. Newly-acquired empty space in shrinking cities can be transformed into the territories to collect renewable energy; it can be used for biomass conversion, solar collectors, mini-wind turbines, etc [30]. The different solution is to transform this space in blue infrastructure – drainage pools for collecting water during rainy periods, which can be also used to preserve technical water for dry periods [37].

Another great topic in the wide interpretation of environmental aspect in urban shrinkage is transport, communal and public infrastructure. Similarly in the case of buildings and urban land, the cost of infrastructure maintenance per capita rise with population loss in some area [38]. Therefore, communal taxes usually become higher in shrinking cities [39]. This can be notices in opposite way, too. Old and dilapidated infrastructure can initiate shrinkage in some urban areas [38]. However, renewed infrastructure can also be a key element to trigger the reurbanisation of shrinking and neglected urban areas [39]. At the end, the state of infrastructure is deeply linked with the overall state of shrinking area. Therefore, treating infrastructure without including related buildings and land and vice versa can produce just partial solutions for the future [41].

4. Conclusions

The presented directions that link two great and up-to-date global topics – shrinking cities and environmental issues – show how this link is complex and how it opens many new sub-topics. The link thereby possesses a great potential for profound elaborations, yet the systematisation of the

included sub-topics is far from being established. This research proposes several recommendations to enable the better systematisation:

First, the position of environmental issues in the process of urban shrinkage is still questionable. It was aforementioned that economic factors usually caused of urban shrinkage, while demographic factors tended to be consequences of the phenomenon. This is not so distinct in the case of environmental issues. They can trigger urban shrinkage, like the explained ecological accidents in nuclear plants. In the other side, the problems in urban environment, like pollution, can be a clear indicator of the overall urban shrinkage. The latter one is usually evident in the former heavily industrialised areas with shrinking patterns.

Second, identified relations between urban shrinkage and environmental issues can be both affirmative and dissenting. This is clear in the first explained case of environmental regulation. Both its implementation and absence can generate urban shrinkage. Similar examples can be found among the solutions for urban shrinkage. Interventions in urban fabric and infrastructure in shrinking cities can produce both reurbanisation and the further decline.

Third, the environmental impact on urban shrinkage can be long-term and short-term, causing usually the different types of shrinking cities. For instance, the long-term influence of climate changes causes continual and slower urban shrinkage, while the short-term influence of environmental accidents and catastrophes causes sudden and fast urban shrinkage.

Then, regional differences also matter. The underlined different between the USA with liberal capitalist economy and more welfare Western European countries implies different urban models regarding spatial concentration and sprawl, leading further to the regional variations of environmental issues. This means that regionally sensitive approaches and solutions in this topic are desirable.

Last, the given solutions and approaches in urban planning how to deal simultaneously with urban shrinkage and environmental and ecological problems are usually costly, but with long-term and multifaceted benefits. This is explained through the examples new urban green areas of drainage pools that are huge investments, but long-term sustainable in several ways.

This last finding the most appropriately emphasises that the comprehensive solutions and approaches that tackle all segments of built environment. In accordance with this, the most feasible planning actions required unified, strategic and integrated approaches. Only in such way all mentioned environmental issues can be properly scrutinised and systematise as one entity. Apart of this, the integrative and strategic approaches can contribute more; they can (1) determine the scope and scale of mutual environmental-shrinking relations and challenges; (2) point out the position and impact of environmental issues on urban shrinkage; and (3) recognise possible actions, solutions, and models in urban planning and nearby disciplines (urban design, transportation, landscape design, etc.) with (4) the adequate evaluation of the current needs and obstacles, as well as prospective benefits and treats.

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