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GENERAL CONCEPT OF RE-FRAMING URBAN RESILIENCE

ABSTRACT

Urban resilience has a significant influence on human safety and security around the world. As the vast majority of the 21st century population lives in a hazard-networked reality, urban resilience remains under pressure of multiple factors which force a need to re-frame it. The research objective is to outline a general concept for re-framing of urban resilience with respect to gaps to be found in theory and practice of urban resilience. The methodology bases on a wide-designed literature review of international base of scientific papers. Theoretical and practical descriptions of the urban resilience problem allow to identify serious gaps that need to be taken into account. They can be transformed into requirements and ideas for new frames of urban resilience. The new framework stems from the state-of-art and, additionally, allows for the identified gaps. For those reasons, it is worthwhile to consider those frames in future investigations and in research dedicated to resilience, urban resilience, disaster risk reduction, disaster management and crisis management.

KEYWORDS

resilience, urban resilience, city resilience, disaster risk reduction

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OGÓLNA KONCEPCJA NOWEGO UJĘCIA ODPORNOŚCI MIEJSKIEJ

ABSTRAKT

Odporność miejska ma znaczący wpływ na bezpieczeństwo ludzi na całym świecie. Ponieważ zdecydowana większość populacji XXI w. żyje w sieci zagrożeń, odporność miejska znajduje się pod presją wielu czynników, które wymuszają konieczność jej zmian. Celem badań jest zarysowanie ogólnej koncepcji ponownego określenia odporności miejskiej z uwzględnieniem właściwych luk w teorii i praktyce. Metodyka opiera się na szeroko zakrojonym przeglądzie literatury z międzynarodowych baz prac naukowych. Teoretyczne i praktyczne opisy problemu odporności miejskiej pozwalają na zidentyfikowanie poważnych luk, które należy wziąć pod uwagę. Można je przekształcić w wymagania i pomysły na nowe ramy odporności miejskiej. Nowe ramy wynikają z aktualnego stanu wiedzy i dodatkowo uwzględniają zidentyfikowane luki. Z tych powodów warto je rozważyć w przyszłych dochodzeniach i badaniach dotyczących odporności, odporności miast, ograniczania ryzyka katastrof, zarządzania katastrofami i zarządzania kryzysowego.

SŁOWA KLUCZOWE

odporność, odporność miejska, odporność miasta, redukcja ryzyka katastrof

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1. INTRODUCTION

Every society is affected by hazards that often form a highly complex catalogue. Because of superficial illogicality and possible lack of previous experiences, some connections between factors that can be dealt with as causes and consequences for the quality of people living are very difficult to identify. The butterfly effect is a good example of such mechanisms, emphasizing that societies and relevant authorities are often unaware of all safety determinants that are crucial for their existence [1]. What is more, hazards can affect each other, constituting long, branch and looping structures of triggers that cause emergency situations, and even crisis situations in the form of floods, wildfires,

hurricanes, earthquakes, blackouts, etc. [2, 3]. Proper conditions contribute the domino development, sometimes equated to a cascading effect [4]. As a result it becomes difficult to quickly develop sufficient awareness concerning the actual safety situation, which is simply too complex and affects too many areas of people's lives to be thoroughly analysed by practitioners [5]. This determines difficulties in efficient safety management (including policy design), as well as building social and infrastructural resilience to present-day hazards.

The abovementioned complexity is common also for urban areas where most of people actually live [6], considering globally, and where they have been increasing in number for many years [7]. As a result, the vast majority of the 21st century population lives in a hazard-networked reality. As urbanization processes proceed, cities seem to be places where citizens experience many types of negative phenomena and, hopefully, where they receive support from various numerous and professional safety institutions. This has a strong impact on the organization and policies of cities, especially when we take into account many aspects of their operations (e.g. disaster response, infrastructure-centred optimization and resilience, risk assessment and management) [8]. Additional attention should be paid to organizational flexibility and holism, which is crucial from a strategic point of view.

The networking character corresponds not only to hazards. The activity of safety entities reflects it (more or less intentionally) by creating a framework with respect to mitigation (e.g. policy creation), preparedness (including planning), response and recovery. Consequently, in city environment many public, non-public and private institutions serve the public interest. Their synergistically determined potential is clearly expressed in the case of serious emergencies and crisis situations regarding both natural [9] and technological disasters [10]. The entities are established not only by public administration, public services (the police, fire service, communal services), non-governmental organizations etc. Worthy of emphasis is the clear role of critical infrastructure. All of those entities are responsible for the continuity of city functions, and logically for the continuity of the city [11]. However, the right personnel, equipment and facilities are generally localized in the urban area, so they can be affected by "city" hazards as well. This fact strongly affects the actual urban resilience framework, emphasizing a necessity to protect not only citizens, but also networking protection entities.

A multitude of city elements (such as institutions, organizations, social groups and sub-groups, infrastructures, etc.) connected with negatively perceived determinants of their activeness and existential quality (hazards) justify searching for concepts that allow to make steps forward to ensure safety in urban areas regardless of circumstances. From the theoretical and practical perspectives, two of them are fundamental and should be dealt with as points of reference for the others, and namely risk and resilience [12, 13]. The first term pertains to an imminent threat and reflects the level of safety (even if safety is "invisible and intangible", it can be assessed for risk among others with the use of safety engineering methods). The second one stems from the conviction about the ability to understand and remedy city risks [14, 15]. From the citizens' perspective, the city should be as far as possible resilient to all kinds of hazards (risks), even if it is sustainable, smart, smarter, smart sustainable and/or green. Consequently, it can be concluded that safety aspects meet practically all current concepts of city development [16, 17, 18]. As for the complexity of urban safety, many different and surprising consequences for risk management and urban policy creation may be noticed [19]. However, generally the more complex is the universe analysed, the higher level of generality is observed. The same situation can be applied to the city safety and resilience concepts. From the point of view of public administration and public services (e.g. fire service, the police), the level of generality often boils down to a functional dimension of relations between the safety and resilience determinants (hazards, institutions, infrastructure etc.). The functional analysis is usually the only one that is practically feasible in emergency situations, when time limitation and other signs of situational stress are noticed.

Comprehensive knowledge about resilience and its determinants is absolutely crucial for safety management purposes. It creates a framework for planning, organizing, directing and controlling relevant activities. Following the previous research results, different management approaches can be deployed in safety management of the city-related problematic aspects. For instance, we can mention a descriptive and analytical approach, a historical approach, a systems approach, an environmental approach, a case study approach and an integrated approach [20]. All of these are cognitively valuable. However, allowing for thr differential character of hazards and safety entities in the city, the integrated approach seems to be the desired one, because it

allows the use of multi-network methods for a holistic approach to complex urban reality.

The main objective of the research is to outline a general concept of re-framing urban resilience – the concept which takes into consideration all above-mentioned issues. The research bases on a wide-designed literature review from an international database of scientific papers (www.sciencedirect.com). Its structure is expressed by theoretical and practical descriptions of the problem which may be perceived as reference points for identification of gaps and creation of a new framework directions for urban resilience.

2. THEORETICAL DESCRIPTION OF THE PROBLEM

Resilience is the core aspect of safety in terms of citizens' existence and development. The general definition refers to a conviction concerning the ability to understand and treat (mitigate, reduce, monitor, accept etc.) risks [14, 15]. Many authors have carried out research focusing on this dilemma, using different dimensions and deepening scientific exploration of the problem. Even if, generally speaking, "resilience, especially the concept of community resilience is becoming the *de facto* framework for enhancing community-level disaster preparedness, response, and recovery in the short term, and climate change adaptation in the longer term" [21], different scientists present also differing views on this topic.

As an example, Sherrieb, Norris and Galea [22] conducted research in 23 southernmost Mississippi counties. They confirm that resilience can be perceived as a set of capacities structured into a network entirety, following Norris, Stevens, Pfefferbaum, Wyche and Pfefferbaum [23] who had previously related this theoretical concept to the capacities approach. A metaphor of a set of capitals (e.g. economic and social) was used by Aldrich [24] who highlighted the resilience role regarding to post-disaster recovery and described it on the examples of earthquakes in Tokyo (1923) and Kobe (1995), Indian Ocean Tsunami (2004) and Hurricane Katrina (2005). The next step closer to a community capital model was made by Miles and Chang [25]. Basing on the measurable community capital aspects, they developed a simulation manner of operationalizing community resilience across multiple, hierarchical scales, expressing a complexity of the research object. A further idea was presented by Flynn [26] who emphasized the necessity of analysing

resilience from the viewpoint of infrastructure, dealing with it as a relevant attribute (resilient infrastructure). Also economy characteristics were observed. For instance, Rose [27] noticed that efficient allocation of resources and speeding recovery after the occurrence of hazards through repair and reconstruction of the capital resources are crucial for ensuring safety. What is typical of hazards is that they generate negatively perceived causes, and economic perspective grows in importance in safety managers' eyes. Tierney [28] pointed to an important role of governance, focusing on the disaster context that should allow to build high-quality resilience of the community, as an effect decreasing its vulnerability to hazards [29]. This shows that every resilient approach should be accessible for public administration bodies – the main disaster decision makers.

The abovementioned examples do not exhaust the catalogue of results concerning the ideas for resilience, which has been expanding over the last years, especially in connection with global climate change, increasing risk of terrorist attacks and narrowing dependencies occurring between critical infrastructures and societies. The examples illustrate the complexity of the research object, serving as reference points for carrying out further analyses. Additionally, their synthesis allows us to predict difficulties in holistic efforts connected with the exploration of the resilience area of knowledge.

The high-quality ability to understand and deal with risks is very important in places where most people live. Taking into account actual demographic tendencies, cities do create such a kind of environment and will continue to do so in the nearest future [30]. Resilience and city characteristics meet each other, since "resilience principles appear to fit logically within 'natural' urban development because cities have inherent societal capacities to rebuild themselves" [31, 32] and this capability has a direct influence on citizens' safety. Respecting this objective, every city wants to be resilient against all possible factors that could affect adversely its existence and development. Consequently, ensuring citizens' safety (and resilience) is a necessity regardless of circumstances.

Urban (city) resilience has received many interpretations so far. Nevertheless, its descriptive core is based on what resilience is in its essence [33, 34] according to the first resilience approach formulated by Holling [35]. To be more precise, Ribeiro and Gonçalves [36] show its direct relation to disasters threatening the survival of urban areas, setting its main aim –

reduction of "the impacts resulting from a disturbance of local (urban) society. Proceeding logically, they define the urban resilience as an ability of a city "(…) system to resist and/or adapt to a particular disturbance (any kind of the disturbance – P.G.) and recover its normal functioning or equilibrium state, which may set the initial baseline or a new situation". This definition seems to outline the urban resilience framework, highlighting its holistic (system) specification. The framework can be described in detail referring to Chelleri [37] who points out four correlated relevant themes: metabolic flows (production, supply and consumption chains), social dynamics (demographics, human capital and inequity), built environment (ecosystem services and urban landscapes) and governance networks (institutional structures and organizations). Each theme can be analysed individually, with positive impact on narrow and deep exploration of resilience issues. However, if all themes are taken into consideration, this allows a rational creation of appropriate conditions for building the total resilience concept (accordingly for all feasible circumstances). Additionally, it should be borne in mind that risks related to city operation disturbances can affect (directly or indirectly) many different objects, systems, installations and services at the same time, also those operating for safety purposes (healthcare institutions, emergency services etc.), which additionally makes the situational awareness even more complex [38]. Hence, ensuring the urban resilience should reflect a wide spectrum of stakeholders: local authorities (mainly public administration), public services (fire brigades, police, healthcare services, communal services etc.) and citizens, in particular regarding to basic, utilitarian values (human life and health).

Results of a preliminary analysis justify an assumption that a holistic study should deal with a multi-network approach, especially if one takes into account that two main collegial actors on the city resilience scene – citizen and safety entity – operate typically in complex environmental multi-network of determinants comprised of hazards, operational threats, operational needs, institutions, infrastructures, etc. This complexity is proven by other scientists who point out that it seems to stem from many areas of science and from practically determined research priorities. As an example, Ribeiro and Pena Jardim Gonçalve [36] found in literature that the urban resilience theory foundations are in agricultural and biological sciences, engineering, environmental sciences, social science, business management and accounting,

psychology and energy, thus confirming a multitude of potential research directions and determinants. In turn, Zhang and Li [39] enumerated urban resilience priorities such as ecological environment protection, resource protection and utilization, population and health, regional economic structure, regional resource flow, regional resource carrying capacity, urban governance, urban system, urban security, residents demand, neighbourhood, community management, infrastructure management, transport and building.

For these reasons, it is considered that a network approach is very useful in resilience research. Fostering a dialogue on urban resilience and adaptation policies, Therrien, Jutras and Usher [40] decided to use the Social Network Analysis (SNA) and network mapping. Goldbeck, Angeloudis and Ochieng [41] implemented network flow models into resilience assessment for interdependent urban infrastructure systems. Meerow, Newell and Stults [42], applied the approach to present a general idea for defining urban system for analysis its resilience, while Sharifi [43] used it for analysis of traffic conditions in the city.

In the search for a new framework of the city resilience concept, it is worthwhile to consider the network nature of interdependencies between citizens, safety institutions and relevant factors (hazards, operational risks etc.). In order to respect their complexity, our focus should be placed on integrated conceptual solutions that simultaneously correspond with current development trends in cities. In addition to this, being accessible for practitioners is of crucial importance in the abovementioned context [44]. The two requirements seem to contradict each other, however, they both should be taken into account, respecting concurrently both theory and practice. A holistic analysis (e.g. concerning resilience urban planning principles and criteria) [45], dealing with the city as a system [46] and focusing only on the elements that are crucial (critical) for urban resilience may be useful in rationalization of the multi-network analysis process. Moving from theory into practice, it must consider two perspectives – the citizen's perspective and that of the safety entity, outlining a theoretical dimension for re-framing the urban resilience concept into a city-oriented one.

3. PRACTICAL DESCRIPTION OF THE PROBLEM

Urban resilience deeply contributes to practical activeness aimed at safety in urban areas. The United Nations Office for Disaster Risk Reduction shows

that practical efforts are being undertaken in many countries around the world and concern i.a. building of local alliances (comprising many different stakeholders), creating a common risk awareness, moderating crisis communication, budgeting risk reduction, multi-hazard risk assessment, protecting infrastructure, vital facilities and environment, urban planning, early warning and response, effective recovery, and they give examples from Cape Town and Johannesburg (South Africa), San Francisco (USA), Philippines, Copenhagen (Denmark), Bonn (Germany), Sichuan (China), Palestine and Bhubaneswar (India) [47]. Formally, these issues often determine the content of institutional strategic plans [48], emergency response plans, resilience plans, climate action and sustainability plans as well as hazard mitigation plans [49, 50], with direct transfer onto actions carried out by safety entities (public administration, services, non-governmental organizations, non-formal groups of citizens etc.). Spreading pro-management movements and ideas concerning business continuity management [51], sustainable cities and communities [52], rational environment management [53] and even occupational health and safety issues [54] considerably facilitate the implementation of resilience issues in planning processes.

Nevertheless, not all urban resilience directives are reflected in plans and other local regulations. The first obvious reason is significant multidimensionality. There are so many issues concerning i.a. physical, natural, social, economic and institutional aspects requiring taking into consideration from the holistic point of view [55–58] that urban resilience practice does not keep up with the theory. The second reason is that "frameworks in literature still do not provide a roadmap with a detailed sequence of policies that cities can implement to operationalize the resilience-building process" [15]. The third reason is that the urban resilience concept often proves to be too abstract for practitioners, leads to misinterpretations due to a lack of sufficiently concrete and numerous examples and creates barriers to many planning objectives [59].

A similar phenomenon can be observed for plans (crisis management plans, civil protection plans, etc.), which are not ideal and fail to allow for all kinds of hazards for citizens, urban institutions and city itself (as a whole). They stem from urban politics which constitutes another area of searching for practical obstacles in the analysed context. A key aspect is close correspondence between the political orientations and real safety conditions.

Accordingly Kelman [60] argues that disaster diplomacy (and consequently policy) should reflect cascading characteristics of hazards, with direct influence on urban resilience determinants in qualitative and quantitative realms. Sfarifi [61] noticed several potential triggers for city operation disruption, enumerating natural (earthquakes, floods and tsunamis, fires and wildfires, other natural disasters), environmental (climate change consequences, extreme weather, resource scarcity) and social (social and healthcare issues) ones, completing them with economic risks, changing circumstances (technological etc.), attacks, sabotage and terrorism. That confirms that the potential magnitude of the hazard network determines the forms of the cascading effect.

The cascading effect reflects the complexity of urban safety determinants and interdependencies. Based on own experiences with relation to up-to-date emergency procedures, planning processes are oriented on "one hazard – one response" way of thinking, which highlights the next gap between theory and practice (an exception can be observed due to critical infrastructure protection, which considers interoperability of particular systems, objects and facilities).

Following a necessity of considering all possible hazards, putting of cascading effect idea into urban resilience practice is relatively challenging. The approach forces complementary, time-consuming studies that may not be made rationally, especially in emergency situations as a result of a lack of resources (mostly time, analytical staff and information). As a matter of fact, there have been many solutions for cascading analysis developed so far. Magnitude classification and diagrammatic views [62], event trees, time scales, flow chart models, layer models, snowball model, hazard compatibility/transition matrix, graph models and Bayesian networks [2] can be exemplified. Hypothetically, all of them can be used for urban resilience purposes. Nevertheless, even if some cognitive attempts connecting the cascading effect with resilience problematic aspects were made [63] and many community resilience assessment tools were developed [64], it is hard to expect from practitioners to be extensively familiar with and be able to use complicated logical functions and laborious apparatus in management and executory operations, especially in urgent conditions of emergency (crisis) response. This may be substantiated by the fact that in real emergency circumstances, there is no time for complicated resilience studies and there may be no access

to all specified data at an acceptable level of quantity and quality. What is more, not all consequences of the cascading effect materialization are of such great importance. Similarly to the theoretical description of the urban resilience re-framing problem, the core segment of cause and effect network should take into account the utilitarian values, namely human life and health.

Therefore, it is desirable to have comparatively simple ways for response planning and executing. The same simplicity is advisable in other emergency (crisis) management phases (prevention, planning, rebuilding and recovery), which have huge importance for accessibility and practical use by key decision makers (managers and commanders), their supporting staff (crisis management teams, emergency staff, crisis and emergency management centres etc.) and executors (first responders and supporting entities). Generally, users are not safety engineers or security specialists, but all of them contribute to creating urban resilience. That is the reason why the new urban resilience framework should recognize their cognitive potential and resources limitations.

4. FROM GAPS TO FRAMES FOR URBAN RESILIENCE RE-FRAMING

The analysis of theory and practice of the urban resilience dilemma allows an identification of gaps resulting from relevant disharmony. Consequently, the gaps may serve as reference points in re-framing of the urban resilience approach. Table 1 shows gaps identified on the basis of contextual conclusions set out in section 2, complementing them with general requirements for the new re-framing idea.

Table 1. Gaps and requirements for urban resilience re-framing

No.	Gaps	Requirements for the reframed approach
1	Abstractive "resilience language" makes implementation of theory into practice difficult	An alternative term for "resilience" should be established to make urban safety analysis more practical and intuitive (especially for practitioners), to serve as a bridge leading from resilience theory to practice

cont. Table 1.

No.	Gaps	Requirements for the reframed approach
2	Complexity of city safety determinants (incl. cascading effect of hazard development) confuses their holistic analysis and prioritization	Holistic approach for identification and networking analysis of relations between city safety determinants is required. Prioritization requires focus on crisis hazards only
3	Complexity of the city structure (including infrastructure) confuses its holistic analysis and prioritization	Holistic approach for identification, networking analysis and prioritization of functional relations between city safety determinants is required
4	"One hazard – one response" way of thinking excessively simplifies emergency (crisis) proceedings	Emergency (crisis) proceedings should be made more realistic. The approach needs to create frames for cascading effect analysis
5	Often the deployment of laborious mathematical apparatus is impossible for practitioners in emergency (crisis) situations, especially under time pressure and other limitations of emergency (crisis) situation	Re-framing should assure a simplified method for intuitive and relatively time-saving calculations using commonly used calculation tools
6	Access to specified data and information is practically limited at the acceptable level of quantity and quality	Lack of data and information forces to focus on functional relations between elements of the city reality
7	Total urban resilience perspective is feasible in case of multi-network analysis of the city elements and their safety determinants that contradicts the cognitive potential and real resource determinants of practitioners (e.g. access to data and information)	New frames for the city resilience concept should arise based on at least two networks – the first comprised by the most powerful hazards and the second concerning most important, safety-related elements of the city

Source: own study

Re-framing of the real urban resilience concept to make it more practical requires reconciling many contradictions on the line "complexity – holism – simplicity", which reflects the approach outlined in this paper.

Firstly, the abstraction of the term resilience and its interpretation induces us to look for an alternative. According to observations made by practitioners (public administration bodies, critical infrastructure operators and first responders) carried out by the author from 2013 to 2019 as an effect of participation in several scientific projects (e.g. BaltPrevResilience, DESTRIERO, SECTOR, EU-SENSE, SAFECARE, ImProDiReT, ABECE) during emergency actions and educational processes, both impact and vulnerability seem to fully satisfy this requirement. These terms are conceptually strongly interconnected. This is claimed by Pelling [33] regarding vulnerability of cities in the context of social resilience in natural disaster, by Polsky, Neff and Yarnal [65] who elaborated vulnerability scoping diagram for building comparable global change vulnerability assessments in the spirit of resilience, as well as by Hearn Morrow [66] considering community resilience in a social vulnerability perspective. Moreover, vulnerability applies to the resilience politics design due to crisis hazards (such as climate change consequences) [67] and is substantially determined by cascading characteristics of the hazards' development [2]. For these reasons vulnerability, which is dealt with as a degree to which a system (city and citizens) is susceptible to, or unable to cope with, adverse effects of hazards, and a function of the character, magnitude, and rate of hazards variation to which the system is exposed, its sensitivity, and its adaptive capacity [68], may play a bridging role in the urban resilience re-framing. The "impact" term presents the opposite way of thinking about city safety determinants, creating commonly more comprehensive picture of the urban resilience. It can be an alternative for "risk" as well, especially when there is limited data available for risk calculations.

Secondly, a complete and clear picture of the city's safety determinants is often very difficult to obtain, especially in emergency (crisis) situations. More difficulties can be noticed when analysing the object interdependencies. Taking into account practitioners' expectations, the very first step is to limit the number of hazards only to the most risky sources of danger. As regards emergency and crisis management issues, hazards should be characterised by a potential for generating a crisis situation and a crisis (as a culminating point of the crisis situation) in the city. From this point, the following hazards (crisis

hazards) should be listed (i.a.): flood, epidemic, chemical contamination, disruptions in the supply of key utilities (e.g. energy, fuel, gas), strong frost, intense snowfall, hurricane, fire, drought and extremely high atmospheric temperature, radiological contamination and building collapse [69]. While respecting the probability of the cascading effect, it may be useful to analyse morphologically connections that exist between particular crisis hazards [70]. This will allow us to identify typical and non-typical cause and effect relationships, ensuring holism of the research.

The same complexity is noticeable as regards the city structure (including infrastructure). In close analogy to a study of critical hazards, it can be very useful to identify those elements which are most influential, as well those which are most vulnerable. Basically, critical infrastructure (CI) is said to be a category that consists of the most important elements of a city in the urban resilience framework. Formally, CI is ascribed to safety determinants at the highest level of safety (and security), namely national (national CI) and international (e.g. European CI), ensuring "the basic function of the state from the perspectives of both governance (state and territorial) and the infrastructure providing goods and services (supply, transport, electric power, communications, etc.)" [71]. However, CI categories can also be used to analyse urban vulnerability. This will assure a ready-to-use catalogue for further morphological analyses, with particular attention focused on functional relations between particular objects, which, even if not critical for the national operation, may be critical for functioning of the city.

Fourthly, a morphological analysis seems to be useful for the cascading effect purposes, increasing realism of emergency (crisis) proceedings as opposed to the "one hazard – one response" way of thinking. After checking all possible connections between crisis hazards, the procedure can be developed in much more rational manner.

The fifth gap indicates that practitioners need quite simple tools in the decision-making processes regarding resilience (impact and vulnerability) in urban areas. As in the majority of cases a laborious mathematical apparatus may not be used due to an emergency (crisis) situation and the ensuing conditions, it is worth pointing out two directions to achieve simplification: 1. Calculations should be intuitive and relatively time-saving; 2. Calculations should be made using common calculation tools. The first requirement can be met thanks to simplified assessment techniques (e.g. checklist, peer-com-

pare technique, point technique, 3 points technique) [72]. The second one can be achieved with the use of popular office software (MsExcel®, Google® calculation sheet, OpenOffice.org Calc, Gnumeric, Kspread etc.).

Sixthly, time pressure and other emergency (crisis) situation conditions reduce real possibilities for collecting data and information of the desired quality (e.g. topicality, credibility, thoroughness, accuracy, accessibility) and quantity. That is why from the rational point of view the re-framing process should focus on relatively non-changeable, merit-related foundations. Legal acts and other normative documents seem to meet this clause, constituting functional relations between city elements.

The last identified gap refers to the total urban resilience perspective, which can be obtained in the case of multi-network analysis. In principle, the multi-network should be comprised of two network-structured modules (sub-networks) – first dedicated to crisis hazards, and second to the most important, safety-related elements of the city. The city, as a complex system, is determined by a large number of particles (objects, systems, organizations, institutions, social groups, etc.). However, the utilitarian citizen values (human life and health) are clearly defined by CI and CI-specified objects (CIS; objects non-formally named as CI but making relevant local functions), and this kind of city elements should be taken into account when the multi-network is considered [41, 73].

The seven gaps and their corresponding requirements outline a new concept of the urban resilience that remains between a bottom-up and a top-down approach. From the first point, a widely discussed citizens' initiative for creation the urban safety is given [74, 75]. From the second one, the prime role for safety still lies in public institutions. Between these two, the city-oriented approach emerges. It maintains the leading role of public institutions (practitioners) in ensuring urban resilience, but the resilience is built with correspondence to such utilitarian values as human life and health. This is the re-framing direction which can make the city resilience concepts more practical and meet real emergency (crisis) conditions, which can be used by practitioners.

5. CONCLUSION

The urban resilience concept is just as dynamic as its determinants. Gaps identified during analyses of theoretical and practical issues related to the research objective allow the presumption that the concept requires changes.

Concretizing, alternative for "resilience" term should be established to make urban safety analysis more practical and intuitive (especially for practitioners), serving as a bridge from resilience theory to practice. Holistic approach for identification and networking analysis of relations between city safety determinants is required. Prioritization needs focus on crisis hazards only. Furthermore, holistic approach for identification, networking analysis and prioritization of functional relations between city safety determinants is required. In accordance with emergency (crisis) proceedings, they should be made more realistic. Consequently, the approach needs to create frames for cascading effect analysis

Re-framing should allow working out a simplified method for intuitive and relatively time-saving calculations using common calculation tools. In addition, lack of data and information forces to focus on functional relations between elements of the city reality. Moreover, new frames for the city resilience concept should arise on at least two networks – the first comprised by the most powerful hazards and the second concerning most important, safety-related elements of the city.

The directions state commonly new frames for urban resilience. They stem from the state-of-art and, additionally, respect the identified gaps. From these reasons, the frames are worth to be considered in future investigations and research concerning resilience, urban resilience, disaster risk reduction, disaster management and crisis management.

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