

Urban resilience and urban sustainability: What we know and what do not know?



Xiaoling Zhang^{a,b,c}, Huan Li^{d,e,*}

^a State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, China

^b Department of Public Policy, City University of Hong Kong, China

^c Tongji University Sustainable Development and New-Type Urbanization Think Tank, China

^d City University of Hong Kong, Shenzhen Research Institute, Hong Kong

^e Key Laboratory of Coastal Zone Exploitation and Protection, Ministry of Land and Resources, China

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ABSTRACT

The past literatures have studied both ‘urban resilience (UR)’ and ‘urban sustainability (US)’ in terms of the dual character - vulnerability and pertinacity - of cities. However, there is a large overlap between the meaning of resilience and sustainability, which threatens to weaken both concepts. In this study, we discuss the difference between urban resilience (UR) and urban sustainability (US) from three aspects of research trends, research scale and research clusters. CiteSpace 4.0.R5 is used for co-citation analysis, visualizing co-citation networks and research clusters. UR and US studies contrast in not only their different theoretical bases, but also even more in their empirical work. A conceptual framework is proposed to define the difference between UR and US, and four kinds of urban development are examined based on the framework. We indicate that rational urban development can be achieved only when it is both resilient and sustainable, and conclude that urban planners, policymakers and researchers should pay equal attention to both UR and US before decision-making.

1. Introduction

Cities are increasingly becoming complex systems of social, economic and ecological factors (Liu et al., 2007). However, they are very vulnerable when any of their subsystems are destroyed or fail to adapt to new challenges (Coaffee, 2010). Such a situation may lead to a fatal crisis or even destruction (Rao & Summers, 2016). Uncertain factors, such as natural disasters, climate change, energy crises, political instability, financial crises, food security and terrorist attacks play an important role in threatening urban development (Spaans & Waterhout, 2017). Although these threats have already existed worldwide for a long time, few big cities have been permanently destroyed or abandoned since the 19th century (Campanella, 2006). Such famous cities in the world as Hiroshima, Tokyo, Warsaw, Dresden, Berlin and Beirut, for example, although destroyed by wars or natural disasters, continue to exist even more vibrantly than before.

Urban resilience (UR) and urban sustainability (US) are studied here in terms of the dual character - vulnerability and pertinacity - of cities. In the urban research field, UR has gradually changed from an emerging research topic direction into mainstream one. The International Local Governments for Sustainability (ICLEI), for instance, hosted its “1st Global Forum on Urban Resilience and Adaptation” in 2009. The

concept of “Planning for Resilient Cities and Regions” was developed by the Association of Collegiate Schools of Planning (ACSP, US) and Association of European Schools of Planning (AESOP) together in 2013 and has been widely recognized by urban academia in both the U.S. and the EU. In May 2014, the Resilience Alliance Resilience 2014, was hosted in Montpellier, France. Increasing numbers of government administrators, research scholars and urban planners participate in UR study and many academic organizations (e.g. Resilience Alliance, Resilience Organization, Resilient City Organization) have been founded worldwide.

However, resilience has been closely associated with sustainability for more than a decade, although without precise meaning and often as an additional label attached to pre-existing research (Timon, 2014). In current studies, some scholars hold the view that UR has already replaced US as the mainstreaming concept in the discipline of urban studies. A large overlap between the meaning of resilience and sustainability threatens to weaken both concepts. It is an urgent matter, therefore, to break this confusing status quo by clarifying their relationship. In order to meet this need, this study aims to answer the following question: what is the difference between UR and US? Firstly, a large sample of articles from the Web of Science are reviewed to identify the difference in research trends and research clusters between

* Corresponding author at: Department of Land Management, Zhejiang University, Hangzhou, China.
E-mail address: lihuan2039@163.com (H. Li).

UR and US and the differences in research priorities from the different scale of research involved. The New York Sea Gate project is then used as an example to demonstrate the contradictory nature between UR and US. Finally, a new conceptual framework is developed to capture the essential differences between UR and US and from which new and inclusive definitions are offered.

2. Research method and materials

In this study, CiteSpace 4.0.R5 is used to do co-citation analysis, and applied for visualizing co-citation networks and research clusters. CiteSpace is an open-source Java application that must be run on a computer that supports Java (Chen, Hu, Liu, & Tseng, 2012) and can download input data from the Web of Science (WoS) (Madani & Weber, 2016). Applying CiteSpace, researchers can do temporal and structural analyses of various networks derived from academic publications, including document co-citation networks, author co-citation networks and collaboration networks (Mustafee, Bessis, Taylor, & Sotiriadis, 2013). The bibliometric tool focuses on identifying the critical points in the development of a field or domain, especially intellectual turning points and pivotal points (Chen, 2004). It also provides a variety of functions to promote the simulation, understanding and interpretation of literature network patterns and historical patterns, including decomposing a network into clusters, automatically labeling clusters with terms from citing publications and geospatial patterns of collaboration (Chen, Ibekwe-Sanjuan, & Hou, 2010).

The Science Citation Index and Social Sciences Citation Index contained in Database of Web of Science™ Core Collection are used to identify the literature relating to urban/city UR and US. The search terms “urban resilience” or “city resilience” contained in title yield 272 results, while the search terms “urban sustainability” or “city sustainability” yield 679 results. These data are used for trend analysis by ranking all the literature for both UR and US by their frequency of citation. The 200 most cited articles in the SCI and SSCI are therefore imported into CiteSpace to visualize and analyze the co-citation network, aiming to reveal the research clusters. These 400 papers are then reviewed to find the primary differences in UR and US research priorities according to the different scale of research.

3. Differences between UR and US

Temporal evolution, spatial scale and the space-time carrier are recognized as the three main devices for estimating the difference between different objects of study in geography research. These three devices are also often applied in urban studies research. In this section, research trends, scale and clusters are used to represent temporal evolution, spatial scale and the space-time carrier respectively to examine the difference between UR and US studies.

3.1. Difference in research trends

Although there are far fewer papers relevant to UR than US, the momentum (increased rate of articles) of UR studies is much stronger (Fig. 1). The earliest US paper appeared in 1968 (Cain, 1968). This was

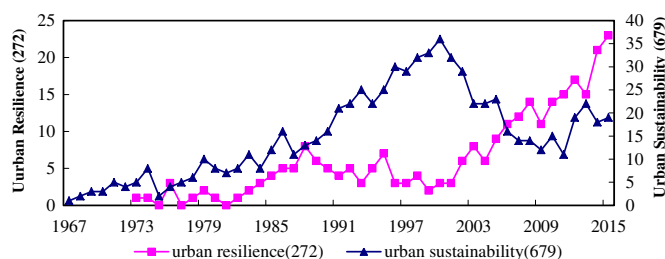


Fig. 1. Publication comparison between UR and US.

concerned with the contribution of land use & planning to urban sustainable development and first recognized the importance of ecological studies as a basis for land use & planning. The first UR article was published five years later (Holling, 1973) and is often cited as the origin of modern UR theory. This is echoed with the fact that the UR and US viewpoints can yield different approaches to the management of multiple kinds of resources from the ecological systems' behaviors. The US research focuses on socioeconomic equilibrium, the maintenance of ecological balance and the harvesting of nature's excessive production with least destabilization. In contrast, the resilience view emphasizes domains of attraction and the need for persistence (Holling, 1973).

Although the first US article was published only 5 year earlier than the first UR study, these two kinds of research are substantially different in their volume and trend of research papers published over the past 50 years. In terms of volume, there were 679 US papers over the period compared with 272 UR papers, suggesting US research to be the most dominating keyword over the period. The trends of the two are quite different, however, as Fig. 1 illustrates, with US peaking at around the year 2000 and UR becoming increasingly popular since that time. This suggests that many US researchers may have chosen to switch their allegiance to UR since the new millennium.

3.2. Difference in research scale

Relatively speaking, US is an old but evolving concept, while UR is new, but inconsistently defined. This section examines the trajectories of the difference in research priorities across global, regional, city, community and facilities levels.

As Table 1 shows, there are many studies involving UR and US from the global to facilities scale, with each having different priorities.

- 1) On the *global scale*, both UR and US studies involve collective measures for the management and protection of ecological systems. The difference is that UR studies place more emphasis on the self-protection and restoration of ecological systems to cope with crises, while US studies pay more attention to the utilization and protection of ecological resources.
- 2) On the *regional scale*, US studies place additional emphasis on the self-sufficiency of the local economy and environmental benefits of economic activities, while UR studies keep a watchful eye on the stability and diversification of urban economic structures to cope with unknown risks and pressures.
- 3) On the *city scale*, UR studies place more prominence on policy management and propose strengthening the institutional arrangement of elastic urban structure to guarantee the adoption of elastic city measures. Moreover, UR studies are more concerned with the influence of terrorism on sound urban development, while US studies always take into account administrative issues, such as urban and land use planning, needed to realize sustainable urban development.
- 4) On the *community scale*, although both UR and US studies propose providing basic material conditions for residents, such as sufficient water, healthcare and dwellings, the resilient city attaches more importance to diversification and the insurance benefits of employment.
- 5) On the *facilities scale*, UR studies stress the guarantee of traffic and communication infrastructure to ensure their immediate availability in emergencies and with much greater emphasis on the design of green buildings at the micro level and aseismic requirements of construction. In contrast, US studies always place more emphasis on infrastructure, architectural planning and layout.

3.3. Difference in research clusters

In this section, the 200 most cited UR and US articles are imported into CiteSpace to visualize and analyze the co-citation network, and

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