

# CRISES AND SUSTAINABLE URBAN TRANSPORTATION: SYSTEMATIC LITERATURE REVIEW

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## 1. Introduction

The recent COVID-19 pandemic, and the economic crisis of 2008 are some of the more recent examples of major disruption on a global scale. Mobility practices are often rooted in habits or routines rather than a rational decision-making process and are usually resistant to change [1]. External events such as strikes and protests or natural hazards may disrupt them and represent a window of opportunity for change. The purpose of this paper is to review the literature published on the possible long-term impacts of crises on mobility. It examines 47 peer-reviewed journal articles, 3 non-refereed reports, and other grey literature sources that were published between the years 2009 and 2024 covering two major crises, namely the economic crisis of 2008 onward and the COVID-19 pandemic and touches on the ongoing war in Ukraine. The short-term effects of a crisis are reviewed, and more importantly, the long-term effects after the presumed end of the crisis are addressed. In the final analysis, the main reasons for a long-term change in mobility patterns or the lack thereof will be discussed.

## 2. Literature and background

Crisis, as an interdisciplinary concept, can be encapsulated by “temporality, spatiality, and scale” [2]. Therefore, it is bound to a specific time and space. Thus the 2008 economic crisis and the COVID-19 pandemic are counted as crises. Both events had an impact on mobility on a global scale, forcing individuals and communities to adapt. Both crises emphasized existing inequalities and while being different across most parameters mark the vastest global crisis of the current century with the exclusion of the ongoing climate crisis. The beginning of the pandemic and its end are marked by decisions of the World Health Organization [3] for the purpose of this study. The 2008 economic crash was marked by a series of economic events and its boundaries are defined by data from the European Parliament [4].

Sustainable modes such as cycling have been shown to increase the resilience of urban populations in various crises. This is demonstrated in the case of plummeting petroleum prices [5]. During the 2020-21 pandemic, bike sharing contributed to the resilience of local mobility in cities such as Lisbon [6], Brussels [7], New York [8], and enhanced the resistance of transport systems in the case of the shutdown of major public transport systems [9]. Thus, promoting active mobility in times of relative calm may prove beneficial during harsher times.

The long-term effects of crises on mobility behavior have been researched several times in the past [10, 11]. The economic crisis of 2008 is a well-studied case though not from a mobility

perspective. Before the end of the 2020 pandemic, such attempts had not been made systematically and covered only the pandemic itself [7]. Comparisons of the effects of various crises on mobility are also nowhere to be found in the literature. This work is an attempt to systematize such phenomena and draw conclusions leading toward better crisis adaptation and goal-oriented reconstruction efforts in crisis-stricken areas.

### 2.1. Research question

The systematic review is set to aggregate the main findings in the literature on the long-term impact of economic crises on sustainable urban transportation systems.

- Which modes of urban transportation are most affected by each crisis?
- What insights can be inferred from the literature regarding the lessons learned and best practices of crises and their impact on sustainable urban transportation?
- How have crises influenced sustainable transportation initiatives in urban areas?
- What are the key differences and similarities in the individual and collective response to each type of crisis (economic crisis and pandemic)?
- What are the gaps in the literature on crises and sustainable urban transportation?
- **Did any mobility changes that accrued during crises persist after it was over and why?**

## 3. Materials and methods

An initial and a complimentary search were conducted in 2023 and 2024 respectively. The initial search yielded 847 papers and was reduced to 508 unique entries after the removal of duplicates. Next, the titles were screened to exclude papers unrelated to mobility or crisis, resulting in 53 relevant items. This process was repeated in 2024. Screening by title resulted in 97 papers from this search, and 84 articles after the results of both searches were merged.

During the screening process, some of these 84 were excluded based on their abstracts, while others required full-text screening. Ultimately, 50 relevant articles were identified, with 47 from database searches and 3 from other sources. Figure 1 details the PRISMA protocol [12] followed for the selection of peer-reviewed articles and the exclusion criteria.

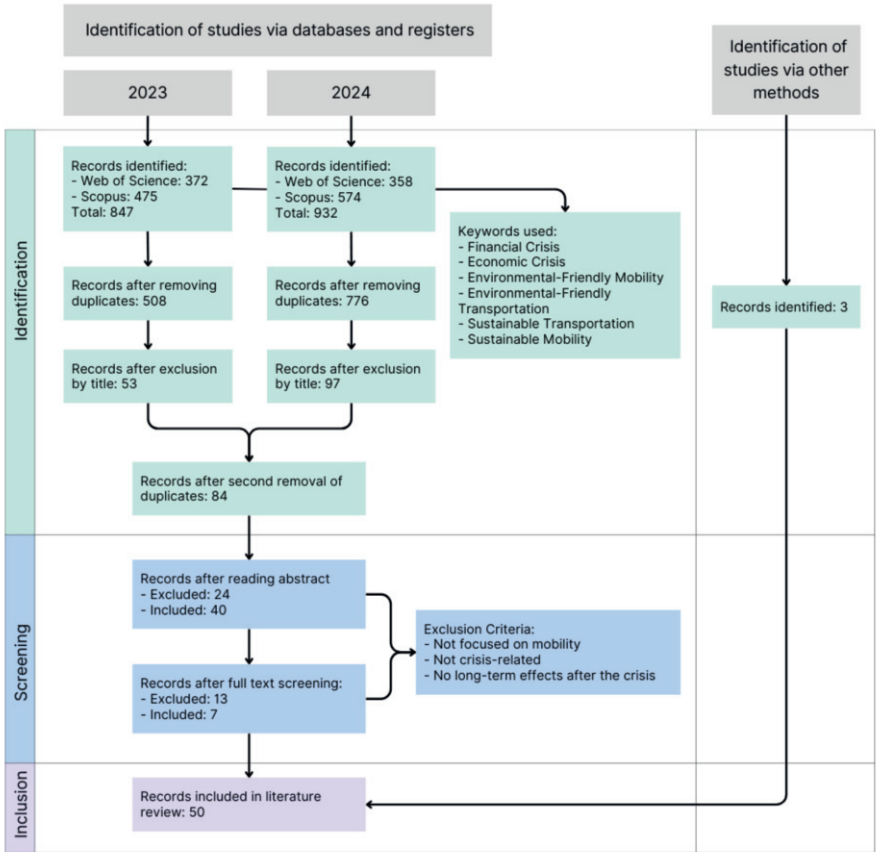


Figure 1. PRISMA diagram on the protocol of the systematic literature review

### 4. Preliminary Results

This literature review shows mobility changes occurring after and during the economic crisis of 2008 and the COVID-19 pandemic. Both crises lasted around two years and had a great variation of impact between countries and regions. The articles examined in the review were published between 2009 and 2024. Changes in all modes are examined in each crisis separately, however, special attention is given to changes in sustainable modes. The studies cover a worldwide sample. Europe and North America are the most frequently studied locations in the selected literature. Papers also include studies from Australia and Latin America.

Around 50% of the reviewed studies deal with the consequences of the economic crisis and 40% discuss the pandemic. Another 10% of the articles feature both crises. The methodologies employed exhibit a wide range of approaches including Empirical Case Studies, Quantitative Modeling,

Systematic Literature Reviews and Documentary Analysis, Forecasting and Demand Analysis, Policy Review and Analysis and Survey-Based Analysis.

Around 60% of the studies directly measure or predict mobility changes as the goal of their research and the rest mention long-term mobility changes as part of general findings or as the new status quo. Only 25% of the studies present direct results of measurements for permanent mobility changes while the others provide predictions and projections of long-term mobility changes based on surveys conducted during or after the crisis or on synthesis of their findings.

As the COVID-19 pandemic had more vivid long-term effects on everyday life these are also reflected in mobility changes during and after the crisis. The pandemic was also better scrutinized by studies of mobility and by systematic reviews. Thus a comparison of post-crisis changes between the economic crisis of 2008 and the recent pandemic is fascinating despite being asymmetric as during the pandemic more explicit mobility policies were introduced, having the potential to support a long-term change.

An overall increase in cycling in many cities [7], and a clear increase in remote work (5 percentage points in the EU [13, 14]) was found. The COVID-19 crisis also provided communities with an opportunity to expand cycling infrastructure as streets were devoid of cars. This includes major cities in Australia [15], major metropolitan areas in the Philippines [16], and a wide selection of European and North American cities [7, 17, 18]. Such infrastructure improvements included the opening of new bike lanes and the widening and enhancement of the safety of existing ones. Rail transportation has been severely hit during the pandemic however it experienced a steady recovery of 16.6% in 2021 compared to 2020, and 2022. Much of the recovery was attributed to active policies by France [19] and Germany [20].

#### 4.1. Key findings and themes identified

The effects of crises on mobility, as examined in the literature, reveal significant shifts in travel behavior, modal choices, urban planning strategies, as well as budget constraints and resource allocation. The economic crisis resulted in reduced trips and a modal shift to cycling and public transport in some regions [10]. However, the mobility shift only lasted as long as the crisis [10]. In both types of crises, public transportation suffered for different reasons. Remote work and changes in urban form are especially prominent after the pandemic. Some studies note that the changes in mobility behavior during crises might dissipate as the economy recovers, while others suggest these shifts may indicate longer-term trends toward more sustainable transportation. The long-term effects that have outlasted the crises have yet to be fully reviewed. More conclusive results of this review will be ready to present at the upcoming conference in November. The next steps in the research include full-text reading and the extraction of relevant post-crisis effects and the circumstances leading to them.

## 5. Preliminary Conclusions

Mobility changes during the crisis have a nature of emergency responses and reflect the type of crisis at hand. After the crisis has subsided a return to normality is often the most expected outcome. However, under certain circumstances, new habits and behaviors formed as crisis behavior are consolidated and carried on to the new normality. Such changes are unlikely to consolidate on their own. They rather appear with the help of new policies and developments. Pop-up bike lanes during the pandemic [21] and street interventions [22] are the best examples of such helping measures. Understanding the factors leading to long-lasting changes in favor of sustainable mobility will serve policy management for the mitigation and recovery from future crises.

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