

# Preface

---

Man-made, biological and physical systems have never been static, but always in a state of flux, be it in the short term or in the long term. Such changes may sometimes take the form of gradual or incremental transitions, but sometimes they reflect also abrupt transformations with structural dynamics, often in a non-linear form. Depending inter alia on the specification of the system's border, such drastic changes may be caused by internal forces or by external stimuli. The questions addressed in system dynamics are not only related to the causes of such changes in systemic patterns, but also to the implications and the recovery potential of such multi-faceted dynamic systems. In recent decades, the scientific study of such dynamic evolutionary patterns has received much attention, for example, in bifurcation theory, catastrophe theory, synergetics, chaos theory, tensor analysis and complexity theory. Applications of this new strand of thinking are not only found in the natural sciences, but also in the social sciences (e.g., demography, sociology, geography, economics, neural sciences and so on). Against this background, the present volume is focussed on the relevance of systemic perturbances in cities or urban agglomerations.

Nowadays, we observe an increasing scientific interest in urban and spatial evolution, with a particular view to the analysis of causal mechanisms and recovery patterns after a disruption of a stable urban system. Such disruptions may inter alia be caused by catastrophes (e.g., earthquakes, storms, floods, fires), political turbulence (e.g., revolutions, political turmoil), economic shocks (e.g., recession or crises), and the like. Modern resilience analysis aims to trace the pathway towards recovery after an initial disaster or jump happening in an urban system. In many cases, it appears that the transition path of 'back to normal' contradicts the initial – often pessimistic – catastrophic forecasts on the future of the city concerned. In reality, the recovery rate is sometimes much faster and more efficient than anticipated during or right after the occurrence of the abrupt event. From a scientific perspective, there is thus, alongside a descriptive event history investigation, also a clear need for a more strategically oriented and quantitative analysis of urban resilience patterns, with a view to a dynamic analysis of the recovery trajectory of a city after an initial disruption.

In urban history, we find numerous illustrations of negative catastrophe events, such as a destruction of cities during a war situation, a total collapse of a city after an industrial crisis, a disastrous decay as a result of political unrest, or a sudden turndown caused by natural catastrophes. Such events prompt of course questions on the severity and financial costs of such dramatic changes in relation to the systemic structure and organization of the city, as well as questions on recovery strategies in relation to institutional support systems and financial means needed. Urban disaster impact studies have indeed gained much popularity over the past years. In general, urban disaster impact assessment forms a systematic and measurable scientific approach to assessing the order of magnitude – in terms of costs and impacts on citizens – and the restoration capability and operational recovery strategy for a city, after it has been dramatically affected by an external rather abrupt change.

This volume aims to provide an original contribution to urban disaster analysis, with a focus on the quantitative analysis of urban recovery patterns after an initial disruption or catastrophe. The various chapters provide novel contributions of an analytical nature on urban evolution and adjustment patterns based on studies from all over the world. Both causal mechanisms and policy responses to the high social costs of a disaster are addressed in the volume. The volume addresses in particular issues concerning the long-term survival pathway of cities.

A prominent question that often shows up in the general disaster management literature – and hence also in urban disaster management studies – is the degree of vulnerability of an urban system vis-à-vis external shocks. Vulnerability refers to the potential weakness of a system against drastic influences from the outer world. It describes the shock resistance of cities, which may mean that, in our case, a shock may be mitigated or aggravated depending on the system's structure and the nature or direction of motion. Urban disaster management always has a preventive component and thus building up a priori resistance measures or programmes before a disastrous event takes place is a critical component of policy. For example, early warning systems, building dikes or good medical care may provide the means to safeguard the sustainability of cities.

On the effect side, there is a need for a solid impact analysis on urban disaster management. In particular, the socio-economic (including human) impacts on urban systems or cities subjected to disasters need a careful evidence-based investigation. Methods used can comprise input-output analysis, partial or general equilibrium modelling, bifurcation analysis and so on. This type of system impact analysis reflects a rather common trend, with one exception: there is a shock effect and no gradual effect on the urban system. Thus, there is a need for 'jump' effects in urban disaster

management analysis and this is a great challenge. The present volume contains several interesting evidence-based applications in this field.

Finally, any urban disaster management problem is faced with the task to explore recovery options, in particular, in the context of abatement policy and the recovery potential in cities. Sometimes a return to the original system or position may be strived for, while in other cases a transformation of the city or its morphology may be seen as a smart urban policy. In this context, scenario building techniques regarding urban design and future may provide useful strategic information, while simulation methods on urban recovery processes may also offer meaningful decision support.

In conclusion, this volume aims to offer a broad panorama of studies on urban shocks and disasters, in which quantitative management techniques play a crucial role. The studies included in this volume are systematically organized (see Contents) and have different features: they may be analytical or policy-oriented, they may be conceptual or applied in nature. But in all cases they reflect the new trend in urban management analysis that urban contingency and disaster management belongs to the toolbox of modern urban planners and policy-makers seeking for sustainable development of cities.

Kamila Borsekova and Peter Nijkamp

