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Reflections on Resilience and Economics

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Summary

Resilience means different things to planning professionals, shaped by factors as diverse as their disciplinary backgrounds and the cultural and political contexts in which they operate. As the relevance of resilience and resilience planning in all areas of society is growing, it is important to understand some of the associated interpretations, demarcations and planning dimensions in order to enable a cross-contextual, integrated application. The traditional economic planning instruments are proving to be unsuitable for this purpose. Interdisciplinary methods of scenario-based planning and disaster risk management are better suited for this purpose.

Keywords: Resilience; Economics; Cost-Benefit Analysis; Risk Management; Climate Change

Introduction

Examining resilience from an economic perspective entails evaluating its effectiveness through a cost-benefit analysis, raising the question of whether conventional economic tools remain sufficient to address intricate human-nature crises like climate change and pandemics. This paper juxtaposes economic resilience planning strategies for climate change and pandemics. In Section 2, resilience is defined, considering its evolution, current challenges in human-nature relationships, and the influence of diverse stakeholder perspectives. Section 3 delves into the temporal dimension, structural and non-structural measures, and the balance between mitigation and adaptation, highlighting the need for distinct resilience strategies for different shocks. Section 4 explores economic approaches to resilience planning, asserting that traditional measures like GDP may be unsuitable, given their positive treatment of repair measures and exclusion of irreversible losses.

Complex crisis resilience planning necessitates a reevaluation of economic risk management instruments, accounting for socio-economic distributional effects and the unpredictability of shocks. Moving to Section 5, the paper discusses alternatives to traditional economic approaches in resilience planning. It contends that scenario-based methods and adaptive strategy models are better suited for addressing spatio-temporal planning, structural and non-structural measures, and the mitigation-adaptation relationship. The complexity introduced by the human dimension underscores the importance of interdisciplinary collaboration in shaping resilient societies. In summary, the paper underscores the multifaceted and complex nature of resilience planning and advocates for interdisciplinary collaboration in shaping resilient futures.

What is Resilience, for Whom?

The first question that arises in any resilience context is what exactly is meant by this term. In in its early 1970th-beginnings in engineering and biology, it stands for a "return to normality", to a preexisting equilibrium that is understood as an optimal or desired state [1]. In today's complex, changing human-nature relationships, which are far from equilibrium, however, the question arises as to whether the original state is always the preferred future state. This is especially true after events that we may call "crises" or "disasters", i.e. turning points after failures in the existing system contexts.

After two years of extreme economic and psycho-social stress caused by the COVID-19 pandemic, the question arises as to whether we want to return to the housing, working and living conditions that have proven to be dysfunctional during the phases of the "lockdowns". In many cases, resilience planning therefore calls for a "bounce forward" instead of a return to the pre-existing ("bounce back") [2]. Some even speak of the need for a "great reset" for the world as a whole [3].

The political and practical question arises as to whose definition of the "new normal" should be guiding us after a systemic crisis: that of those who are still affected by the damage to health, that of those in dire need of economic recovery or that of the authorities responsible for disaster risk management. The pandemic has taught us that in crisis situations, "stakeholders" have even more adverse resilience goals and strategies than before. During the pandemic, civil society has by no means agreed on what "resilience" means to them. This is not only shown by the many, heterogeneous protest movements in the Corona period. Age, gender, income, religion and ethnicity and many other factors lead to different resilience goals and priorities in the population in all areas, as Isenrich et al. [4] demonstrate using the example of nutrition-related health behaviors. In my view, however, a deeper reason for the persistent blurring of the concept of resilience in social discourse lies in the various roles that the political actors take on in each case. As owners or tenants, as beneficiaries or users of local public facilities, as businessmen or employees of local or international firms, or as scientists involved in the public process, citizens have conflicting interests in shaping a resilient society. If their interests as individual subjects in different walks of life – e.g. as those exposed to health risks and those as consumers - do not coincide, they will deliberately blur their resilience goals to avoid cognitive dissonance. Vagueness in the definition of objectives, diversity of interests and the reconciliation of interests are therefore at the core of resilience planning.

Climate Change and Pandemics – Different shocks, different resilience strategies?

Resilience planning for different crises and disasters leads to different resilience strategies, understood as a spatio-temporally defined catalogue of measures or combinations of measures to achieve resilience goals. The planning of resilience in relation to climate change differs significantly from resilience planning against pandemics such as COVID-19 both in terms of preparedness planning and implementation. Due to the specificity, strength and speed of the mechanisms of action, the damage to health caused by the spread of viruses is much clearer than with the diverse, often insidious mechanisms of action of climate change.

Although both are global, man-made risks of existential dimension, i.e., the key variables for resilience planning seem similar, the strategic priorities ("focal points") are different:

i. In terms of the spatio-temporal dimension and the perceived urgency of action, the focus in pandemics is more on the immediate impacts and protection needs, while climate-related action and preparedness against climate risks are more important in the medium term.

ii. In the relationship between structural and non-structural measures, the focus of climate change is on technologies or technology surrenders such as the "phase-out of coal" or the ban on combustion engines. In the fight against pandemics, on the other hand, we observe an equal importance of behavioral, non-structural measures in the "pre-pharmaceutical phase" and structural measures in the "pharmaceutical phase" [5].

iii. In the relationship between mitigation and adaptation, the focus in pandemic control is on local adaptation ("adaptation"), while climate policy is more geared towards global mitigation.

iv. Each of these differences warrants further investigation.

Timing

The time issues faced by social planners are usually associated with processes that extend over a longer or shorter period of time. Problems are often perceived as "long-term" or "short-term" and discussed as if the distinction were a matter of arbitrary definition, possibly in conjunction with the length of parliamentary terms. From an economic point of view, the short and long term differ due to the variability of key factors for economic value creation. If the supply of labour, capital or certain resources is unchangeable, which may include a given climate or the absorption capacity of pollutants in the atmosphere, optimization can only be made in the short term; if all factors are selectable, we are in the realm of long-term optimization.

The focus on short-term measures in the case of resilience planning for epidemiological risks is linked to the assumption that the adverse effects are rapid and intense and require immediate remedial action within the framework of existing resilience capacities. The demand for "flatten the curve" was justified by the avoidance of overloading health infrastructure such as hospital beds and staff. But it was also about systemic risks. Uncontrolled infection and illness of the population not only overload hospitals, but also lead to cessation of consumption, loss of sales, lower tax revenues and even a collapse in overall economic activity. Time is of the essence here, and it is imperative to act quickly, even if this may prove to be premature, wrong or expensive as development progresses.

"At the end of the pandemic, we will have to forgive each other a lot," said Federal Health Minister Spahn, aptly describing the social decision-making situation in the pandemic [6].

In the case of climate protection, the short-term pressure to act is less dramatic, because the capacity to absorb carbon dioxide and other greenhouse gases will not be exhausted for at least a few decades, so that all options for action to combat the greenhouse effect, including negative emission technologies, can be optimized in the long term. Today, the period is increasingly shortening in view of the prevalence of climate damage, but a hasty, error-ridden or particularly economic hardship approach, as legitimized by those in power during the COVID period, is not justified in climate protection today, at least from an economic perspective.

A critical parameter in long-term economic optimization is the choice of interest rate or discount rate for long-term benefits and costs. Economic effects, which only occur after more than 100 years, are already significant at moderate discount rates of three to four percent in the present value determination with less

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than 1/1000 of their future values. This is seen as unacceptable, with good reason, in the context of climate damage where we are imposing cost on future generations. There is a growing call for a renunciation of discounting, instead calling for so-called "zero-discounting" [7,8].

Linking Structural and Non-structural Measures

Pandemics require behavioural measures long before structural measures such as vaccinations or health treatments take effect. These include curfews and "lockdowns" that prohibit all non-essential outdoor activities in order to keep the increase in the infection rate within the given limits of the health infrastructure and reduce the death rate. Until a safe, widely available vaccine or effective treatment for the viral disease is found, it is recognized that the only option is to adopt nonstructural behavioural policies in a well-thought-out mix of hard and soft interventions [9]. Even after a vaccine has been developed, there is an important role in a general vaccination policy for supportive behavioral interventions such as nudges in the implementation of the policies (see Table 1 for a summary of non-structural approaches to epidemic health policy).

Table 1: Strategic Use of Nudging and Behavioural Approaches in Public Health Policy for Epidemics.

	Public Health Policy Goal	Behavioural Intervention or Its Component
Non-pharmaceutical intervention phase	1. Practicing social distancing / obeying quarantine regulations	**Social nudge:** information about % of complying people (could be combined with fines for free-riders)
	2. Increasing usage of infection-tracing app	**Default (opt-out)** for "passive" decision-makers
		Social nudge: information about % of people willing to install the app (could be combined with monetary or non-monetary benefits)
	3. Improving hand hygiene	Habit-enabling framework: **Prompts, reminders, cues** that make the performance of the behaviour easier, faster and more pleasant
	4. Avoiding touching own face Popularising sneezing & coughing etiquette	Habit-enabling framework: **Prompts, reminders, cues** that make the performance of the behaviour easier, faster and more pleasant
		Social nudge & framing: making the behaviour socially & culturally inappropriate be making commonly despised features salient
Pharmaceutical intervention phase	5. Increasing rate of vaccination	**Default (opt-out)** for "passive" decision-makers
		Social nudge: information about % of complying people (could be combined with economic incentives like health benefits or tax reliefs)
		Planning prompts (Reminder of vaccination dates)

Adapted from: Michalek & Schwarze (2020).

Many behavioral interventions are components of a broader mix of instruments in which complementary financial incentives (fines) or prohibitions and commandments, such as clear warnings of sanctions for non-compliance, play an important role. These behavioral interventions developed for the crisis situation can also serve as a strategic mix to prepare for new pandemics and improve the long-term resilience of society. In this respect, resilience planning needs a strategic program of non-structural, behavioral measures in public health protection.

In climate protection, behavioral interventions, both in their hard form and in their soft components, play only a minor role see [10]. Behavioural approaches were first discussed in the 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in WG 3 ("Mitigation of Climate Change") [11], but have not been incorporated into the report's policy recommendations. This "blind spot" in science-based climate policy has to do with the dominance of economic models that are well suited for the long-term optimization calculus in climate policy.

These models are based on a rational behavior of economic agents that is "predictable". They are referred to as "computable general equilibrium" or CGE models [12], and they still dominate climate economic planning today. The use of CGE models corresponds to the prevailing long-term optimization calculus in climate policy. However, this methodology becomes increasingly dysfunctional the closer we get to planetary boundaries and potential break downs in the existing system contexts. In the climate crisis, we need a strategic program of soft and hard behavioral measures for climate protection ("mitigation") as well as for adaptation to climate change that has become inevitable.

Relationship of Mitigation and Adaptation

A trade-off between mitigation and adaptation is unavoidable in resilience planning, if only for the reason that the resources available for one or the other response to crises and disasters are limited, so a choice must be made. In some cases, mitigation and adaptation can complement each other, but in most situations they are at odds with each other, so compromises are necessary. One

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example is the trade-offs and necessary compromises in climate-friendly urban development.

Urban development is currently facing major challenges, not least the need to transform cities to increase their resilience [13]. Conflicting goals and compromises manifest themselves in a variety of contexts at different levels. For example, there is a structural contrast between the trend towards concentration and densification on the one hand and deconcentration and unbundling on the other. From the point of view of adaptation to climate change, decentralised settlement structures are preferable. Not only do they offer greener and building spaces to counter microclimatic problems or cushion extreme events, but they also increase the ability to be self-sufficient. The "spatial distancing" of decentralised social structures also facilitates the response to epidemiological crises such as COVID 19. However, "urban sprawl" has been criticized for decades because it is associated with increased land use, long transport routes, higher costs for utility infrastructure and thus higher greenhouse gas emissions. On the other hand, denser structures have advantages in terms of more efficient material and energy flows, short distances and easy accessibility, which makes them advantageous from the point of view of climate change mitigation.

Visible trends in selected urban contexts show the contradiction between competing adaptation and mitigation goals. The new way of dealing with water in the city, in which, for example, the concept of the sponge city replaces the former ideal of draining the city, leads to enormous competition for space [14]. Adaptation measures in favor of a sponge city will lead to additional cooling effects and an increase in green spaces and biodiversity when rainwater and flood water no longer drain quickly, but are kept in the city. The drainage systems and receiving waters can also be relieved in this way. However, the space required for this and the associated redesign of the infrastructure are likely to lead to numerous socio-economic conflicts. Options for climate-proofing cities are linked to questions of the social distribution of costs: price increases for urban real estate as a result of ecological conversion can lead to the displacement of socially disadvantaged groups.

"Green gentrification" has already become a new buzzword describing ecologically oriented but socially unbalanced urban development [15]. Urban lifestyles associated with walkability, bike-friendliness, consistent waste reduction and recycling, the use of recycled water, jointly managed sustainable energy supply, and local producer-consumer communities are still limited to a minority of the population. The extent to which these "real-world laboratories" could lead to a wider spread of new urban structures is the subject of open and controversial debate and depends to a large extent on the lifestyle chosen, financial means and political priorities. At the global level, the conditions that cities face are very different for this to be conducive or hindering, and the possibilities for shaping the existing opportunities depend on the starting conditions, skills and interests [16].

The example of the climate-resilient city shows that decisions about mitigation or adaptation depend to a large extent on how the chances of success of measures are assessed at the respective level of the decision-makers. Socio-economic distributional effects and their buffering possibilities play a major role here.

Economic Approaches to Resilience Planning

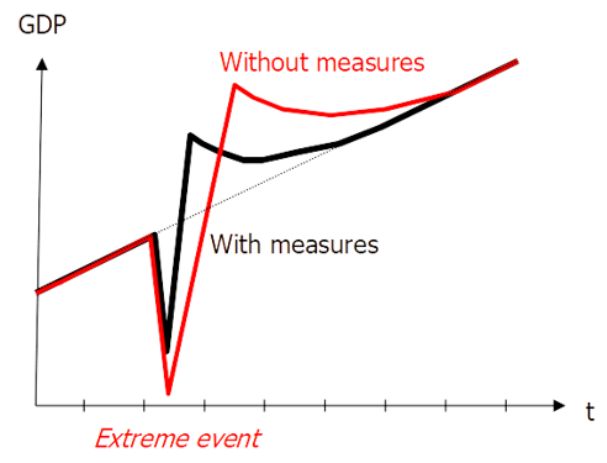

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Figure 1: Economic Efficiency of Resilience Measures.

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From an economic point of view, resilience planning serves the goal of minimizing macroeconomic disruptions from extreme events, whereby "disruptions" are interpreted as unplanned deviations from a desired growth or development path of the overall economy, as shown in Figure 1. With resilience measures, these disruptions are less than without resilience measures and the damage is repaired more quickly. According to the economic point of view, the efficiency of resilience measures can be determined by comparing the saved damage ("benefit") with the costs.

However, gross domestic product (GDP), a common measure of growth and prosperity in national accounts, is an inappropriate measure in the contexts of disasters. On the one hand, because the repair measures after an extreme event are treated as a positive contribution to GDP; on the other hand, because irreversible losses of assets are not included as negative items because they are not monetizable or difficult to monetize. They are therefore treated as "intangible effects" in traditional cost-benefit analysis.

To the extent that economic planners measure resilience in terms of a return to pre-disaster levels of economic activity – as is currently the case after the COVID pandemic – they will (a) underestimate the "cost" of the shock and (b) declare a return to normal before the "intangible" human capital losses, such as long COVID, are fully resolved.

To make matters worse, this methodology misses the core tasks of resilience planning, which we identified above as vagueness in goal setting, diversity of interests and reconciliation of interests. The economic cost-benefit analysis is determined exclusively by aggregated economic variables, i.e., without taking into account the socio-economic distributional effects and the necessary balance of interests. The reference to planned parameters for expected growth paths also contradicts the requirements of resilience planning. Minimizing deviations from the plan does not help to ward off unplanned disruptions ("shocks"). Shocks are unpredictable, or at least difficult to predict. Here, planning is about how systems are best positioned to best respond to unplanned disruptions. The results of macroeconomic cost-benefit analyses are of dubious value when it comes to evaluating alternative courses of action in the context of intangible effects and mechanisms of action that are difficult to predict. Resilience planning therefore requires a rethinking of the common instruments of economic risk management see [17].

Resilience Planning in Disaster Risk Management

Disaster risk management means "analyzing the fundamental risk factors of a society in order to then reduce existing risks and prevent the emergence of new risks" [18]. Scenario-based methods of preparedness planning and adaptive strategy models are widely used in climate policy and disaster risk management. They are better suited than traditional economic methods to provide answers to the key questions of spatio-temporal planning of measures, the connection between structural and non-structural measures, and the relationship between mitigation and adaptation to strengthen the resilience of systems. This requires interdisciplinary approaches and adaptive methods [19]. Plans that target partially unknown events can only work if they enable decision-makers to respond to crises in existing systems by continuously reviewing and updating resilience measures.

Trade-offs and negotiation processes shape climate policy and disaster risk management. This "human dimension" makes the optimization of resilience strategies multifaceted and complex. Links between "hard" and "soft" resilience measures, trade-offs between adaptation and mitigation, and socio-economic objectives are unavoidable. Economic analyses are, at best, auxiliary instruments in an interdisciplinary context with the behavioral sciences, decision theory, and ethics. Traditional economic approaches can point in the wrong direction in the choice of discount rate, in dealing with "shocks" and in quantifying life, health and other "intangible effects" in disaster risk management.

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