

Towards greater resilience among populations: some operational concepts

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1. Introduction

This note explores how to strengthen population resilience by focusing on psychosocial dimensions of control rather than only on infrastructures and institutions. It defines population resilience as a meta-capacity based on anticipation, adaptation and learning, which depends strongly on how people perceive risks and their own ability to act. Locus of control (LOC) is presented as a key framework: internal LOC reflects the belief that one's actions shape outcomes, while external LOC attributes events to powerful others or chance. The paper contrasts Rotter's unidimensional internal–external model with Levenson's multidimensional approach, separating internal control from “powerful others” and “chance”, which is especially relevant for trust in authorities and warning systems.

A central theoretical debate concerns whether LOC is relatively stable or can be changed by interventions. Longitudinal and pandemic-related studies suggest LOC behaves as a moderately stable disposition, with only gradual changes over time rather than rapid shifts from short interventions. The authors therefore distinguish LOC (a general, inert disposition) from perceived control and self-efficacy, which are more situational and flexible, and thus more promising levers for action. Perceived control is defined as beliefs about control in a specific context, and research shows that preparedness and coping are more influenced by perceived control, self-efficacy and outcome expectations than by global LOC.

On this basis, the note analyses foresight exercises and crisis simulations as experiential tools to act on perceived control and self-efficacy. It concentrates on crisis simulations (the so-called “Waldwiller scenario”, see below) where participants role-play local authorities, make decisions under uncertainty, and debrief collectively. Two small-scale simulations performed in December 2025 and February 2026 used Levenson's LOC scale before and after the exercise, with Franco-German students and public officials from several municipalities. Descriptive results show heterogeneous individual trajectories and only exploratory trends: students tended to show decreased internal LOC and higher reliance on “powerful others”, while officials started with higher internal LOC and lower external scores.

No statistically significant pre–post differences were found, and the authors stress that LOC did not shift in the expected “more internal” direction. They suggest that the relative stability of LOC, the small samples, lack of explicit feedback about success, and fatigue may explain the absence of clear effects. The simulations may nonetheless foster a situated sense of agency by letting participants experiment with action, observe consequences, and negotiate collective decisions, even if dispositional LOC remains unchanged. The note argues that future work should measure self-efficacy and other situational perceptions of control, which are more sensitive to experiential learning, rather than relying mainly on LOC scales.

In terms of practical recommendations, the authors propose:

- Using foresight-based simulations with local leaders to train anticipation and collective decision-making
- Deploying communication strategies (including nudges) that encourage self-protection and strengthen citizens' perceived capacity to act

- Running participatory formats (e.g. world cafés) targeting “influencers” such as teachers and association leaders
- Mobilising seniors as credible messengers to reinforce self-protection norms and critical appraisal of information flows
- Systematically tailoring all actions to the population’s attitudes towards public authorities, in line with trust diagnostics

Overall, the note concludes that acting on perceived control and self-efficacy—via simulations, foresight, and tailored communication—is a key operational avenue to enhance populations’ resilience, while LOC should be treated mainly as a relatively stable background disposition

2. Population resilience and risk management: general framework

Population resilience refers to a group's ability to cope with adverse events while maintaining its essential functions, by mobilising appropriate responses at different levels and among various actors. From a systemic perspective, resilience can be understood as a meta-capacity that allows internal diversity (skills, networks and modes of governance) to be aligned with the diversity of external disruptions in order to preserve overall functionality in the face of uncertainty (Muller et al., 2025). It is based on three complementary dimensions: anticipation, understood as the ability to identify and prepare for potential threats before they occur; adaptation, which refers to the adjustment of behaviours, structures and resources in order to absorb shocks and restore stability; and learning, defined as the integration of lessons learned from past experiences in order to improve future responses and transform practices in a sustainable manner.

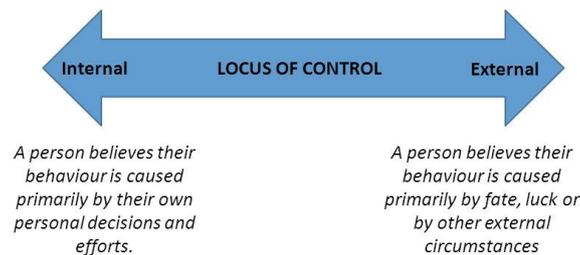
While resilience is often discussed in terms of the robustness of infrastructure or organisational mechanisms, a growing number of publications emphasise that its determinants are also psychosocial. The capacity to anticipate, adapt and learn depends on how individuals perceive threats, assess their scope for action and mobilise their individual and collective resources. Recent work has shown that risk perception, motivation to act, self-help skills and social cohesion are central elements of societal resilience, complementing the material dimensions (Gerhold, Karutz and Rohs, 2025). As such, resilience cannot be reduced to a strictly structural property: it constitutes a socio-psychological dynamic in which beliefs about control, representations of risk and forms of action play a decisive role, while remaining anchored in broader social, economic and institutional contexts.

In the face of major crises, whether economic disruptions, natural disasters or pandemics, the response capacities of individuals and groups appear heterogeneous and strongly influenced by psychosocial factors such as threat perception, coping strategies, and individual and collective resources (Gerhold, Karutz, & Rohs, 2025). In this perspective, among the conceptual frameworks used to analyse these psychosocial dynamics, locus of control (Rotter, 1966) occupies a central place. It refers to an individual's belief in their ability to influence events in their life through their actions and thus provides a relevant framework for understanding how populations perceive their ability to act in the face of uncertainty and disruption.

3. Locus of control as a framework for interpreting behaviour in the face of risk

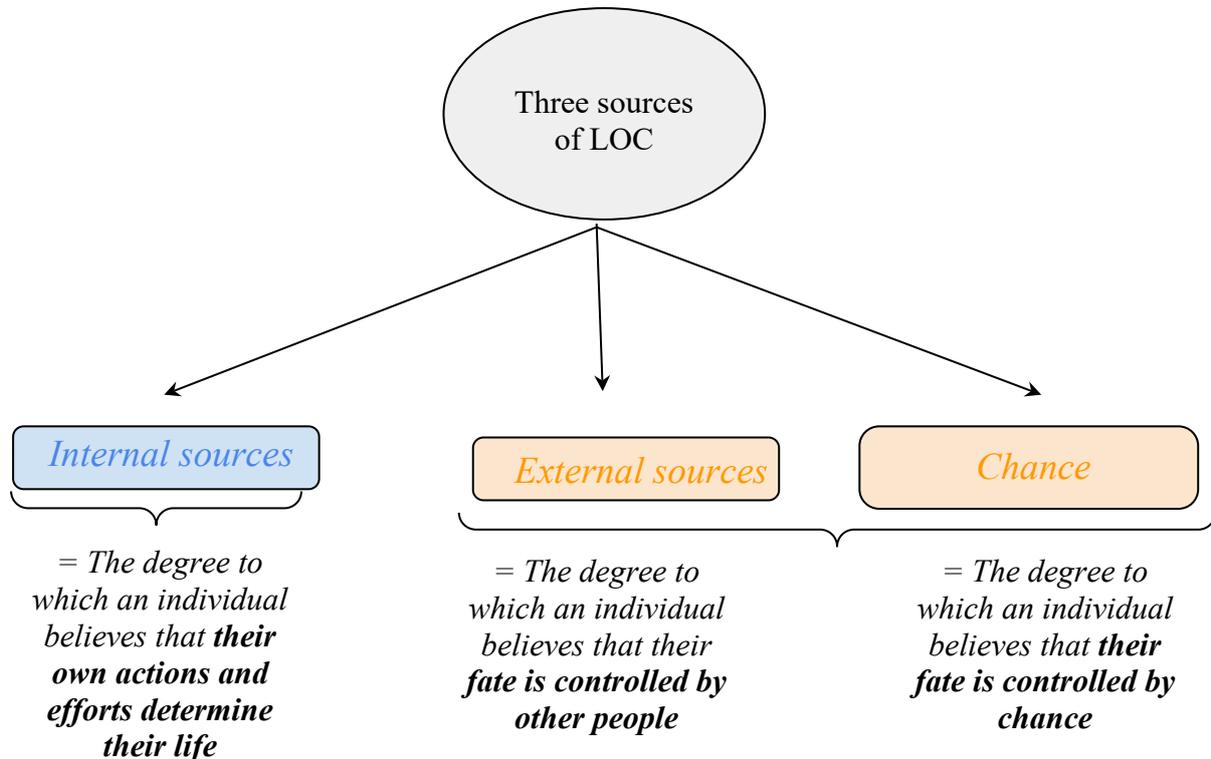
Locus of control refers to the degree to which individuals believe they can influence events that affect their lives. In his initial formulation, Rotter (1966) conceptualised locus of control as a one-dimensional construct on a continuum ranging from internal to external orientation. People with a more internal orientation tend to attribute outcomes to their actions, skills, or decisions, while those with a more external orientation perceive events as dependent on external factors such as chance, fate, or the influence of others. This one-dimensional model, illustrated in Figure 1, has provided an important basis for the study of beliefs about control in contexts of uncertainty.

Figure 1. Unidimensional construct of Locus of Control (LOC) by Rotter (1966)



In order to better distinguish between different forms of externalities, Levenson (1973) proposes a multidimensional approach to locus of control, differentiating between three perceived sources of control: an internal dimension (I) and two distinct external dimensions, namely "powerful others" (P), which refer to the influence of institutional actors or authorities, and "chance" (C), associated with a worldview perceived as unpredictable. This distinction, illustrated in Figure 2, is particularly relevant from a risk management perspective, where trust in authorities, infrastructure and warning systems can influence perceived control and behavioural responses to hazards (Nicholas et al., 2026).

Figure 2. Multidimensional construct of Locus of Control (LOC) by Levenson (1973)



In line with this multidimensional approach, locus of control can serve as a framework for interpreting individuals' preparedness and coping behaviours in the face of crises and uncertainty. Research suggests that more "internal" orientations are often associated with active coping strategies and greater engagement in the face of uncertainty (Ng et al., 2006). However, these dynamics must be interpreted in light of social and cultural contexts. In some collective contexts, an orientation towards "powerful others" may reflect institutional trust or reliance on community resources rather than a sense of individual powerlessness (Hofstede, 2001). Recent systematic reviews also show that institutional trust can both promote compliance with protective measures and reduce individual preparedness when control is delegated to authorities (Nicholas et al., 2026). Thus, locus of control should not be understood as a normative indicator, but as a framework for analysing beliefs about control that can differently guide risk-related behaviours.

While locus of control is a relevant framework for understanding risk-related behaviours, the question of how it evolves remains a subject of debate in the literature. Some approaches consider it to be a relatively stable disposition, while others emphasise the possibility of gradual adjustments in control beliefs based on lived experiences and social contexts. This tension between stability and flexibility invites us to distinguish between locus of control as a general

orientation and perceived control as a lever that can be more directly mobilised in resilience mechanisms.

4. A central debate: relative inertia of locus of control and the role of perceived control

4.1 LOC: a disposition characterised by strong inertia

Locus of control is often conceptualised as a relatively stable orientation that influences how individuals interpret events in their lives. However, despite the importance attached to this concept in many areas of research, empirical knowledge about its long-term evolution remains limited. The majority of studies are based on cross-sectional approaches, leaving open the question of the actual stability of control beliefs and their trajectories over time.

The few longitudinal studies available suggest moderate stability of locus of control in adulthood, while showing that certain life trajectories may be associated with gradual changes in control beliefs. For example, a six-year study of parents found moderate pre-post correlations, as well as variations linked to significant life experiences, such as parenthood (Nowicki et al., 2018).

Similarly, recent research conducted in the context of the COVID-19 pandemic suggests that locus of control functions more as a relatively stable moderating disposition than as a dynamic mechanism that is likely to vary significantly in the short term (Miczka & Boer, 2026). These findings suggest that control beliefs are unlikely to be changed rapidly by one-off interventions, but may evolve gradually in specific social and experiential contexts. However, these conclusions should be interpreted with caution, as longitudinal data are still limited for determining precisely the conditions and mechanisms of change in control beliefs.

From this perspective, if locus of control can be understood as a relatively stable generalised orientation, constructed through social learning experiences, the question arises as to which levers can actually be mobilised in resilience approaches. Recent literature thus highlights the importance of distinguishing between locus of control, as a generalised expectation derived from Rotter's work, and perceived control, which is considered to be a more contextual and potentially more flexible assessment of the capacity to act (Skinner, 1996; Bandura, 1991; Miczka & Boer, 2026). Although these conceptual frameworks are closely related, they differ in scope and operationalisation. This distinction opens up operational perspectives, particularly in risk communication and self-efficacy development mechanisms, where interventions seem to have a greater impact on specific perceptions of control than on general orientations constructed over the longer term.

4.2 Perceived control as an operational lever

Perceived control refers to the subjective dimension of control, i.e. an individual's beliefs about the degree of control they have in a given situation (Skinner, 1996). The literature distinguishes

between objective control, which is linked to the actual conditions of action, and perceived control, which corresponds to the individual's assessment of these possibilities for action. This distinction is central, insofar as behaviours and emotional responses seem to be influenced more by beliefs about control than by the objective conditions themselves.

In this context, Skinner (1996) emphasises that locus of control is a more general and relatively stable attribution, while other forms of perceived control, such as self-efficacy, are more prospective and specific to a particular situation or domain. Thus, while locus of control refers to generalised expectations about the origin of outcomes, perceived control reflects more contextual beliefs about both the competence to act and the contingency linking actions to consequences. This situational dimension allows perceived control to be considered as a key operational lever in resilience approaches, particularly through measures aimed at strengthening the sense of agency and self-efficacy in situations of uncertainty.

In the field of risk management, several studies show that preparedness behaviours are strongly influenced by socio-cognitive variables such as self-efficacy, outcome expectations and perceptions of available resources (Paton, 2003). This research suggests that interventions aimed at strengthening resilience have less of an impact on general dispositional orientations than on specific beliefs about the ability to act and the effectiveness of the actions taken.

In this context, experiential tools such as foresight and crisis simulations can be considered as contexts likely to reinforce these specific perceptions of control.

5. Foresight, crisis simulations and risk culture: acting on perceived control

Based on these elements, experiential mechanisms such as foresight and crisis simulations can be considered as contexts that promote the concrete exploration of control in situations of uncertainty. These approaches do not necessarily aim to directly transform the locus of control as a general disposition, but can help to reinforce perceptions of control linked to the context through anticipation, participation and collective learning.

5.1 Foresight and scenario anticipation

Foresight approaches are based on the construction of prospective scenarios that allow participants to project themselves into uncertain futures and collectively reflect on possible responses. As part of the activities of the R-SQUAD research group at the University of Kehl and the University of Strasbourg¹, these approaches have been used in several projects aimed at strengthening resilience and anticipation in the face of crises (Muller et al., 2024).

In particular, two simulations were developed as part of the R&R project², aimed at supporting municipalities in the Upper Rhine region in developing resilience strategies and preparing for

¹ See <https://www.r-squad.eu/>

² See <https://www.hs-kehl.de/rhenus-et-resilire/>

extreme events. The aim of these exercises was to train participants to make decisions in contexts of uncertainty, anticipate consequences at different time scales and develop appropriate collective responses.

5.2 Simulations and crisis exercises

The simulation within the R&R project consisted of a crisis scenario in a fictitious cross-border municipality called "Waldwiller". It took place in a gradual and structured manner in three main phases: a contextualised introduction, an active crisis management phase within the fictitious municipality, and then a collective feedback session (RETEX). Participants were invited to jointly develop operational responses to a series of crises affecting a municipality representative of the specific characteristics of small and medium-sized territories in the Upper Rhine region.

The exercise was based on a clear division of roles, each associated with specific objectives. The roles of mayor and psychologist were played by the project manager and a member of the team respectively, in order to guide the simulation and provide support to participants when necessary. The participants played the roles of municipal council members, representing the actors involved in risk management and responsible for collectively developing appropriate responses to the crisis situation. Observers, also members of the project team, were present to ensure that the exercise ran smoothly and to follow up on it.

After a general presentation of the municipality, the participants worked in three successive sequences corresponding to the management of crises that gradually accumulated during the exercise. From a social learning perspective, this type of exercise can be seen as a context that can influence control expectations through direct experience of the links between actions and consequences (Rotter, 1966). Simulations provide situations in which participants experiment with decisions, observe their effects and adjust their strategies collectively, which can help to change perceptions of control.

In previous simulations conducted by the team, no specific measurement of feelings of control had been carried out. It was only in the last two simulations of the R&R project that an exploratory measure of locus of control was introduced, based on Levenson's multidimensional scale (1973), administered to participants before and after the simulation in order to observe any variations in control beliefs. The questionnaires were available in French and German to accommodate the cross-border nature of the participating audience.

5.3 Risk culture and collective participation

Beyond individual learning, the simulations are also part of a risk culture dynamic based on collective participation. Participants were asked to work together to develop responses to the crisis in a collaborative setting, which encouraged the exchange of experiences and joint reflection on strategies for action. This type of approach can help to strengthen a sense of empowerment, understood here as the opportunity for participants to take an active part in decisions and to act collectively in response to the situation.

By playing an active role in the decision-making process, participants can also develop a sense of self-efficacy, strengthening their perception of competence and their ability to act in a crisis context.

5.4 Exploratory results

5.4.1 Pre-post LOC measurements

In order to empirically explore the possible links between experiential devices and beliefs about control, pre-post measures of locus of control were collected during the simulations. Given the limited sample size, the analyses presented here remain descriptive and exploratory.

Two simulations were conducted, during which LOC was measured in pre- and post-tests. The first was carried out with eight Franco-German students from the Hochschule Kehl and the University of Strasbourg; only the results of five students were retained for analysis, as the other questionnaires were incomplete or only included the post-test due to a delay. The second simulation brought together representatives from two German municipalities and one French municipality: out of five participants, four were selected for analysis, as one participant was absent from the pre-test due to a delay.

As mentioned above, we opted to use Levenson's LOC test in order to have an operational instrument for measuring changes in participants' perceived control before and after the simulation. The objective was not to re-evaluate the theoretical model as such, but to observe empirically whether participation in a collective situation influenced the balance between the different dimensions of locus of control. In this context, the scale was used as a tool for monitoring psychosocial dynamics, in order to examine possible shifts towards a more internalised perception of control or, conversely, increased dependence on institutional actors and external factors. Its use is thus part of a pre-post comparison based on a multidimensional measurement of perceived control.

5.4.2 Descriptive results

Given the small sample sizes, the analyses presented below are strictly descriptive and exploratory in nature. They aim to identify general trends and document individual variations observed between pre- and post-simulation measurements, without claiming to provide statistical validation of the effects.

General trends

An examination of the pre- and post-test averages suggests distinct dynamics depending on the status of the participants. Among public officials, a moderate decrease is observed on the three dimensions of locus of control after the simulation (internal, other powerful people and chance). Among students, the trend appears to be different: participation in the simulation is accompanied by a more marked decrease in internal locus of control and a relative increase in the attribution of control to "other powerful people", while the "chance" dimension remains

broadly stable.

Furthermore, pre-simulation scores indicate that professionals initially have a higher internal locus of control and lower external scores than students (see Table 1), although this observation remains strictly descriptive.

Table 1. Descriptive means of pre-simulation LOC scores by group

Groups	Internal (pre-simulation)	Powerful Others (pre-simulation)	Chance (pre-simulation)
Students	33.2	20.3	24.8
Public servants	38.3	18.8	18.0
Mean difference (Public Servants – Students)	+5.1	-1.5	-6.8

Note: Averages presented for exploratory purposes only.

Individual variations

Beyond the average trends, individual trajectories appear to be heterogeneous. In the student group, four out of five participants showed a decrease in internal locus of control after the simulation, while some showed an increase in the score associated with "other powerful people". Among public officials, the variations appear more nuanced, with simultaneous changes across several dimensions, suggesting an overall reconfiguration of perceived control rather than a unidirectional shift towards a specific source. These inter-individual differences invite consideration of the possible role of contextual factors such as professional experience or familiarity with crisis situations, hypotheses that go beyond the exploratory scope of this study.

Absence of strong statistical inference

Due to the very limited sample size, no robust inferential conclusions can be drawn. Exploratory analyses (Wilcoxon tests) reveal no statistically significant differences between pre- and post-simulation measurements on the three dimensions of locus of control. Nevertheless, a trend towards a decrease in internal locus of control appears when considering all participants, without reaching the conventional significance threshold, which calls for a cautious interpretation of the results. Thus, these observations should be considered as preliminary indications, intended to guide future research based on larger samples and more robust analytical methods. However, the descriptive trends observed do not point to a strengthening of internal locus of control as initially envisaged. On the contrary, several participants show a slight decrease in this dimension after the simulation, which is consistent with the hypothesis of relative stability of locus of control and invites consideration of other indicators that are more sensitive to situational dynamics.

One interpretative avenue, which would need to be explored more systematically, concerns the absence of explicit feedback on the effectiveness of the actions proposed during the simulation. The lack of clear signals regarding the resolution of the crisis may have contributed to a less

assertive perception of control among some participants. Furthermore, the cognitive and emotional intensity inherent in simulation exercises, as well as a possible fatigue effect at the end of the exercise, may also have influenced post-test responses by temporarily modulating the perception of control.

5.4.3 Theoretical interpretation

The trends observed can be linked to studies that consider locus of control to be a relatively stable disposition, with limited short-term variations, particularly in experimental settings of limited duration. Thus, simulation can be seen less as a lever for direct transformation of locus of control than as a space for experimenting with perceived control, in which participants test different forms of action and interaction without this necessarily implying a lasting change in their dispositional beliefs. The value of the device would thus lie more in the development of a sense of situated agency, linked to the possibility of acting, experimenting and negotiating collective decisions in a simulated environment.

These dynamics can thus be likened to psychosocial approaches to population resilience. By placing participants in a situation where they can experience perceived control and express a form of situated agency, simulation systems seem to contribute to the strengthening of certain individual and collective resources mobilised in the face of uncertainty. However, this does not mean that there is a direct transformation of resilience, but rather that these environments should be considered as learning spaces where participants can perceive themselves as actors in complex situations.

From this perspective, instruments focused on feelings of self-efficacy or perceived control could usefully complement the measurement of locus of control. These tools, which are more sensitive to situational variations, would allow for a more detailed exploration of how participants assess their ability to act.

6. Acting on perceived control: a key to helping populations become more resilient

Rather than seeking to directly modify locus of control, the approaches proposed here focus on mechanisms aimed at strengthening the sense of self-efficacy, which is more context-related and likely to evolve over the course of lived experiences. Recent work shows that self-efficacy can play a mediating role between locus of control and resilience, highlighting that beliefs about control that are most closely linked to concrete action are the most effective levers for intervention (Papoulidi & Maniadaki, 2025).

Given that experiences of mastery are one of the major determinants of self-efficacy, allowing people to directly experience the links between actions and results (Bandura, 1997), crisis simulations can be seen as contexts that promote this type of learning and are likely to gradually strengthen participants' sense of competence, particularly when the exercise leads to a feeling of resolution or progress in managing the situation. This reinforcement could also be based on social learning mechanisms, in particular through the observation of peers successfully coping with similar situations.

With this in mind, future work could incorporate measures of perceived self-efficacy in order to examine the effects of these experiential mechanisms in greater detail.

7. Prospects for action

Beyond future academic investigation, we can already identify a number of recommendations aimed at strengthening perceived control:

- The implementation of foresight-based simulations with key local authority stakeholders (elected officials, security and emergency response managers, policy makers, etc.).
- The deployment of communication initiatives aimed at encouraging the population to protect themselves, the introduction of nudges in public communication, the reorientation of existing communication initiatives, and the strengthening of expertise among communication managers in the area of citizen behaviour.
- Interventions in a suitable format, such as "world café", aimed at providing relevant information to "influencers": teachers, association leaders, and anyone in a position to influence a network.
- Mobilising the senior population to reinforce the relevance of messages encouraging self-protection and a critical approach to the flow of information to which the general population is subjected.
- All actions must be tailored to the characteristics of the population, in particular their attitude towards public authorities.

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