

Measuring, Monitoring and Enhancing Crisis Fitness of Municipal Administrations

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ABSTRACT

Municipal administrations play a pivotal role in crisis management under Germany's federal system, yet research highlights persistent deficits in preparedness, organizational awareness, and structured resilience-building. Existing business continuity and organizational crisis management approaches remain difficult to transfer to heterogenous and resource-constrained local authorities. This paper proposes an indicator-based, modular Self-Evaluation Tool (SET) for municipal administrations for the assessment and improvement of their *crisis fitness*. Based on a multi-method design—including systematic literature review, expert interviews, participatory workshops, and qualitative content analysis—approximately 60 Crisis Fitness Indicators (CFI) were identified and partially prioritized. The SET incorporates these indicators within a structured, dashboard-based assessment framework aligned with the crisis management cycle and complemented by a legal register and glossary. Ongoing research focuses on the operationalization and validation of qualitative CFI as well as a two-step network analysis to capture interdependencies within municipal administrations.

Keywords

Municipal Crisis Management, Critical Infrastructure resilience, Resilience assessment, Crisis Fitness

INTRODUCTION

Crises and catastrophes are an eminent part of our modern society. In recent years, several large-scale and sometimes even Europe-wide and international crises have occurred, including e.g. the refugee situation in 2015, the COVID-19-pandemic 2020 to 2023 and the heavy rainfall events in central Europe in June 2021 or in Spain in October 2024 (cf. Schulte et al., 2022). In addition to social and climate-related events, hybrid threads such as cyber-attacks on public institutions (cf. Mallwitz, 2026; Tagesschau, 2023; Westdeutscher Rundfunk, 2024) as well as arson and bomb attacks on critical supply networks like Nord Stream II (cf. Der Tagesspiegel, 2022) or the electrical power network in Berlin (cf. Deutschlandfunk.de, 2026) are becoming more frequent.

Under Germany's federal constitutional order as set out in the German Basic Law (dt. Grundgesetz [GG]) in Articles 30, 70 and 83 GG, and given the municipal self-government guaranteed by Article 28(2) GG, municipalities assume a particularly central role in crisis management (cf. Bogumil, 2005; Floeting, 2023). In any crisis, local authorities form the primary level of response, maintaining their operational responsibility even when higher-level authorities assume overall coordination. However, in many crises municipal administrations and their employees are affected themselves, and thus find themselves in a dual role of managing their own recovery while simultaneously supporting the population and the economy (cf. Schulte et al., 2023). Despite their outstanding importance for state crisis management in Germany, local authorities were hardly part of security research until the refugee situation starting in 2015 (cf. Schütte et al., 2022). Past research has revealed significant shortcomings in the preparedness of local authorities in Germany beyond emergency services (cf. e.g. Schätzle & Trapp, 2025; Schulte et al., 2024). Moreover, current research has shown that many local authority employees are not aware of

their dual status as crisis management actors and critical infrastructure providers (cf. Karsten & Voßschmidt, 2022; Schulte et al., 2022).

Many actors in critical infrastructure (CI) sectors already utilize a Business Continuity Management System (BCMS; e.g., ISO 22301) to increase their resilience against disruptive events. However, such practices have not yet become a standard procedure for local government administrations. The exact causes for this are difficult to determine, but it can be assumed that it is a combination of various factors. Local authorities are complex and involve heterogeneous actors, which severely limits the applicability of existing tools. Furthermore, the implementation and usage of a comprehensive BCMS is very personnel- and cost-intensive. In view of the lack of human and financial resources, especially smaller, but also medium sized municipalities cannot afford this.

The aim of the research project KRISENFIT¹, which is presented below, is to facilitate the initial evaluation and subsequent improvement of crisis preparedness within municipal administrations. To this end, an indicator-based self-evaluation-tool (SET) is being developed. Additionally, a glossary and a legal register for municipal crisis management are being compiled, which are going to be linked to the SET and published as open source and open access after the completion of the project, together with an accompanying user manual. Furthermore, the projects' results will be incorporated into the (further) development of training and continuing education concepts of relevant institutions involved in the project.

DEFINITION OF CRISIS FITNESS

Before presenting the SET and further aims of the project, the term *crisis fitness* needs to be defined:

Municipal crisis fitness describes a municipality's ability to anticipate and prevent risks, prepare effectively for crises and disasters, manage them and learn from them. As a dynamic model, it encompasses social, political, organizational, structural and technical measures to strengthen resilience. At the same time, it serves as a strategic objective that promotes exchange and supports flexible, forward-looking crisis management. (Definition of the KRISENFIT project consortium, 2025)

As a combination of the concepts of resilience and municipal crisis management, the definition—which is based on a systematic analysis of literature in these fields—includes all major elements and facets that are relevant to the scope of the research project as well as the resulting tools and outcomes.

CRISIS-FITNESS INDICATORS

One of the project's core objectives is the development and deployment of an indicator-based, modular SET. In accordance with the all-hazards approach, the SET will be structured independently of specific scenarios, and the results will be presented accordingly. Only in this way can comprehensive coverage of all areas relevant to municipal crisis preparedness be ensured. To identify the relevant indicators required to measure and evaluate the crisis fitness level of municipal administrations, the project follows a multi-method-approach: First, indicators have been collected in a systematic literature review. Following this, two workshops with representatives of two municipal administrations in different federal states of Germany were carried out in which the identified indicators were discussed and more have been collected in a world café and subsequent discussion rounds. As a third data source, around 20 expert interviews with a duration between 45 and 90 minutes were conducted and analyzed by following the methodology of the qualitative content analysis according to Mayring (2022). In this way, around 60 crisis fitness indicators (CFI) have been identified to date.

Many of the CFI identified to date are qualitative in nature, and translating them into a quantitative assessment framework is far from trivial. We are therefore currently examining how these qualitative CFI can be defined, operationalized and captured as objectively, precisely and meaningfully as possible, while keeping the workload for respondents at an acceptable level. For several of the factors under consideration, no previously published scales or assessment methods could be identified, suggesting that the development of such instruments may constitute a substantial scientific contribution.

In order to prioritize the CFI identified so far, 35 of the 60 CFI were selected to be ranked according to their importance in a participatory ballot box voting. Therefore, the CFI were printed on cards with a brief description and handed out to the participants of the workshop. They were asked to assess the importance of each indicator by sorting every card in one of five boxes labelled with numbers from zero to four. The numbers represented the importance of each indicator in an ascending order, from zero meaning *not relevant* up to four for *very important*. The labelling of the boxes, translated into English, is described in Table 1.

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Table 1 Labels of the boxes for the participatory ballot box voting.

Box	Label
0	NOT RELEVANT – Practically meaningless for crisis management; does not contribute to crisis management
1	RATHER UNIMPORTANT – Only significant in special cases; marginally relevant; occasionally relevant
2	PARTIALLY RELEVANT – Helpful or important in some situations but not a priority or central
3	IMPORTANT – Should be considered in crisis management; frequently relevant
4	VERY IMPORTANT / CENTRAL – Core factor; central or essential prerequisite for crisis management

The method is based on the card sorting method described by Spencer (2009) and adjusted for project purposes. The process can be designed to be open, closed or hybrid. Advantages of card sorting and related methods lie in its tactile, intuitive scaling and its low-threshold participation and anonymous analysis. All votes carry the same weight, and the evaluation is relatively straightforward to perform (cf. Tchivi et al., 2025).

Overall, 18 people participated in the workshop—ten of which working in municipal administrations and eight working in the field of crisis management research or consulting. Due to the small sample size, the results are not representative; however, they provide valuable preliminary insights. Figure 1 shows the average evaluation score of all 18 participants for each of the selected CFI.

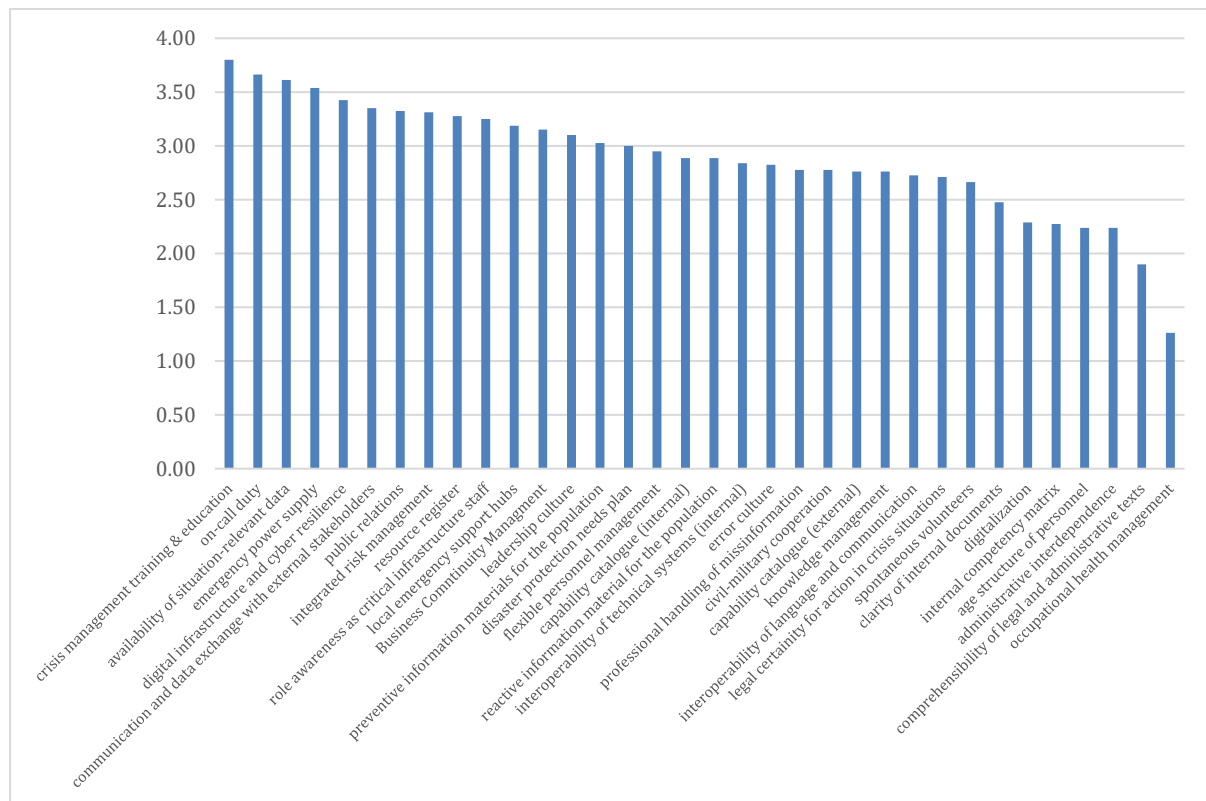


Figure 1 Results of the participatory ballot box voting (overall average).

In total, the average evaluation of 15 out of the 35 indicators is 3.0 or above which corresponds to a significant importance for municipal crisis management. These indicators can be grouped into the five thematic clusters *qualification, organization and management, knowledge and information management, technology and communication*.

In contrast to this, the average evaluation score of only two CFI, *comprehensibility of legal and administrative texts* and *occupational health management*, are below 2.0 which indicates a minor importance.

The detailed evaluation of the workshop results showed that people from local administrations tended to prioritize factors relating to operational capacity and resource availability. In contrast, external experts placed greater emphasis on overarching topics such as communication and risk management. Both groups showed a clear focus on infrastructure, organization and staff availability as the basis for crisis fitness.

Following the ballot-box voting, the workshop participants were divided into three groups for a 60-minute group discussion regarding the methodology applied, the evaluated CFI, and the specific requirements for the SET. The results of the voting were not yet communicated at that time.

The participants described the CFI classification process as varying in difficulty. While many could perform the classification intuitively, it became evident that the assessment of individual indicators would often depend heavily on the underlying scenario and crisis management phase. Therefore, some participants noted that rating of certain CFI would only be possible if specific scenarios were provided. This was countered by the view that thinking too much in terms of scenarios might overly simplify the complexity and dynamic nature of crisis and catastrophes.

Besides the category of *technical and personal resources*, the discussion showed that especially *organizational and leadership* related factors are considered important for crisis management. This is consistent to the voting results, where *leadership culture* and *communication related CFI* scored above the overall average rating of 2.89. Additionally, *knowledge management* and *error culture* were considered to be rather important.

Self-Evaluation Tool (SET)

Crisis management can be predominantly understood as a circular process that follows the crisis management cycle shown in Figure 2 (cf. Pursiainen, 2018).

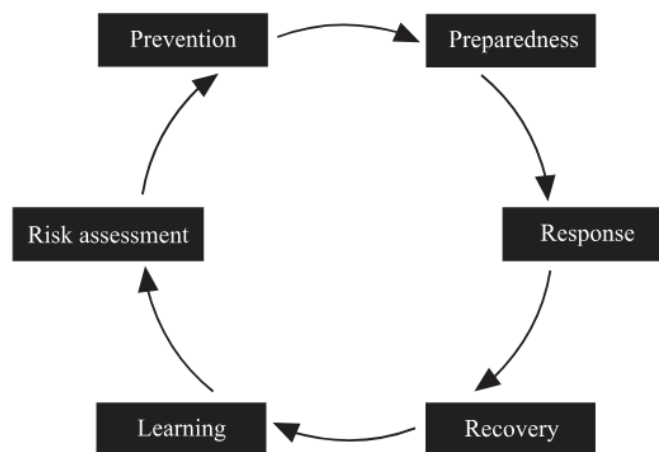


Figure 2 The crisis management cycle (Pursiainen, 2018)

The SET is intended to support municipal actors particularly in the crisis management phases *risk assessment* and *prevention*, but it also addresses the fields of *learning* and *preparedness*. For this, the modular SET can be used for both, the evaluation of the crisis fitness of a single organizational unit (e. g. office or department) as well as for the municipal administration in its whole. However, its use for the entire organization should be preferred whenever possible, as crisis management should be understood as a fundamental task for the entire organization—especially in the case of municipal administrations, as mentioned in ISO 22313:2020 and ISO 22361:2023. As currently planned, the set is intended to serve as a quick, low-level solution for establishing a crisis management system and enhancing the crisis resilience of the relevant administration. Established systems, such as a BCMS, cannot and should not be replaced by this tool, but rather supplemented. The Business Process Modelling Language (BPMN) diagram in Figure 3 shows the ideal workflow which should be followed by the implementation of the SET.

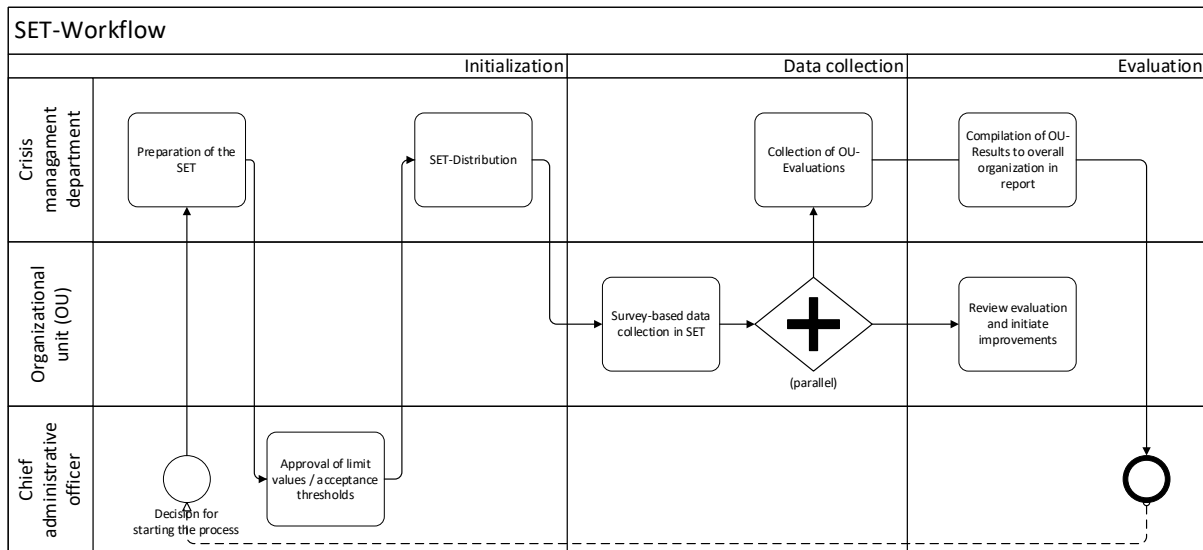


Figure 3 Workflow for implementation and usage of the SET for the whole organization (compiled version)

The workflow stipulates that the process of using the SET should ideally be initiated and launched officially by the city council or the chief administrative officer. The department that is mainly responsible for crisis management coordination (e. g. civil protection or disaster management departments) should then prepare for the deployment of the SET. In particular, this involves determining which CFI-groups are relevant for which departments and which threshold values should be applied in the tool. The latter should then be approved by the head of municipal administration. Once approved, the questionnaire and dashboards provided in the tool are distributed to all organizational units, which answer the questionnaires that query the respective status of relevant CFI.

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The assessment scales are tailored to each specific CFI and will be continuously tested and refined as the project progresses. Once the questionnaires have been completed, the SET automatically processes the responses and translates them into the Likert-scale-based evaluation shown in Table 2. This scale is adapted from the benchmarking approach proposed by Pescaroli et al. (2020) and enables a standardized interpretation of the reported CFI status.

Table 2 Possible results in the SET (based on Pescaroli et al., 2020)

Numeric value	Label	Acceptable
0	not present	No
1	insufficient	No
2	deficits	Depends
3	sufficient / fully established	Yes

The scale differentiates between four different measures from zero up to three. Zero represents the lowest rating (*not present*) and three the highest one (*sufficient / fully established*) for the overall representation of crisis fitness based on the weighted sum of the individual CFI. In addition, the individual CFI are grouped into CFI groups (CFG). After completion, the results of the organizational unit’s internal crisis fitness analysis can be presented

to its members via the SET-dashboard. For a better understanding, the dashboard will—among other information—compile and present the results in partially interactive spider-web diagrams as shown in Figure 4.

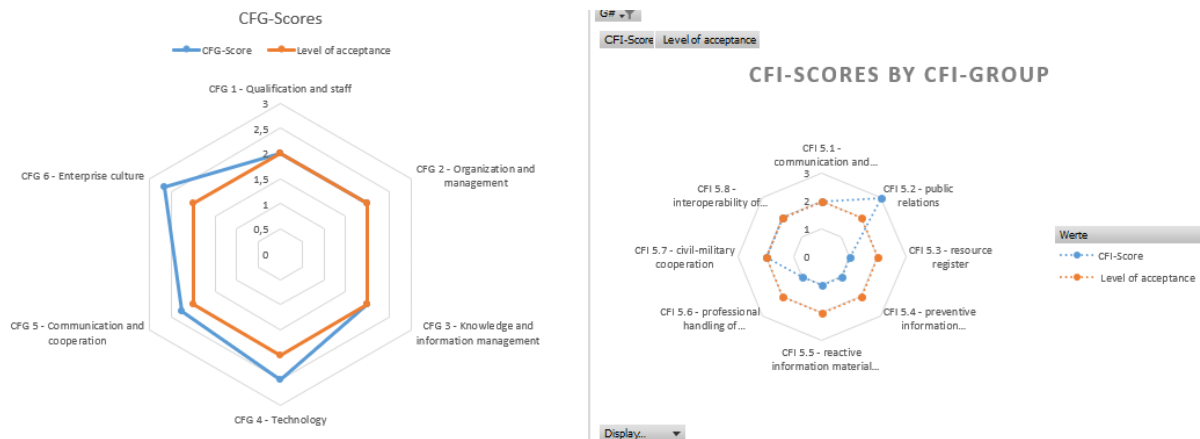


Figure 4 Example for the presentation of compiled CFI-Scores in the SET.

In this example, despite the measured CFI-Scores (blue lines), each diagram also includes a visualization of the acceptance threshold (orange lines) which should be defined by the chief administrative officer or the responsible department during the preparation phase of the. Simultaneously, the responsible crisis management unit can aggregate individual results into a comprehensive report via a dashboard. This report may serve as a benchmark for subsequent years and inform the development of strategic resilience measures.

A legal registry and a glossary complement the SET by linking legal norms to CFI and defining key terms. The outputs are integrated into existing and new training courses for German crisis management institutions.

Prospects and Current Challenges

The forthcoming project phase focuses on the refinement of the evaluation methodology for each single CFI. For indicators that are quantitatively measurable, such as temporal metrics or countable resources, this process is comparatively straightforward. However, the operationalization of indicators addressing qualitative dimensions of crisis fitness remains methodologically challenging. Additional expert interviews will be utilized for translating qualitative constructs into empirically grounded quantitative metrics. The findings from these interviews will be triangulated with insights from systematic literature reviews and empirical data obtained through project workshops, thereby strengthening the validity and reliability of the proposed evaluation framework.

Furthermore, to capture CFI arising from intra- and interorganizational interdependencies within municipal administrations, a two-step network-analysis approach will be applied. In the first phase, data obtained from workshops and interviews will be used to visualize the essential interdependencies between organizational units as well as their core external dependencies. In the second phase, a novel hybrid method will be implemented that combines network-analytical techniques with data-collection principles from Business Impact Analysis (BIA), as outlined in BSI Standard 200-4 (Bundesamt für Sicherheit in der Informationstechnik, 2023) and ISO/TS 22317:2021. This approach will be deployed in two municipal administrations to generate a substantially deeper and more granular understanding of internal, external, geographical and resource-based interdependencies among the actors within the project's scope.

Following the final implementation of the tool, a concluding evaluation will be conducted by crisis management trainers from the North Rhine-Westphalia Fire Department Institute and their course participants. In order to evaluate the results, and in particular the identified CFIs, in their entirety and across municipalities, a final conference will be held at the end of the project, during which the project results will be evaluated and discussed in workshops by representatives from a wide range of German local governments and other stakeholders.

CONCLUSION

The SET offers a novel opportunity for municipal administrations, as an important part of critical infrastructure, to measure their crisis fitness in a prestructured manner. The SET's CFI cover a large variety of facets of municipal crisis management and resilience. The output of the SET thus represents a valuable metric that can help local authorities to better assess and review their capabilities in order to improve their crisis management. This may contribute to improving the response and recovery phases of the municipal crisis management. From a scientific perspective, the SET provides a structured means of capturing and evaluating both quantitative and qualitative

indicators that reflect municipal crisis fitness and organizational resilience. To achieve this, the tool incorporates procedures that enable the systematic quantification and objective assessment of qualitative resilience factors.

Beyond its primary functions, the SET—including its legal registry and glossary—promotes crisis management awareness among municipal administrative employees, anchoring the topic more firmly across different administrative units.

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