



## **UNIVERSITÀ DEGLI STUDI DI SALERNO**

DIPARTIMENTO DI INGEGNERIA CIVILE

**Dottorato di ricerca in  
Rischio e sostenibilità nei sistemi dell'ingegneria civile,  
edile e ambientale**

Curriculum - Tecnologie avanzate, infrastrutture  
e protezione del territorio per lo sviluppo sostenibile

XXXIV Ciclo (a.a. 2020/2021)

Tesi di dottorato in

**Urbanistica e sicurezza.**

**Un modello risk-based per la prevenzione  
ambientale del rischio da criminalità**

**ABSTRACT**

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## ABSTRACT

The topic of urban security has become highly relevant in the urban agendas of cities and metropolitan areas. One of the main requirements for well-functioning cities and their sustainability is that they have secure streets and public spaces, as confirmed by the Sustainable Development Goals (SDG) of the 2030 Agenda, in particular SDG 11.

Security in the city is hindered everyday by the occurrence of predatory crimes or incivility episodes that affect the perception of insecurity and increase fear. The latter is a real social problem, with actual and measurable impacts on the city's functioning and the economy of the whole urban structure.

The objective of making the city safer cannot be pursued exclusively through repressive or control actions, or sporadic social interventions. The complexity of the problem requires an integrated approach both in the assessment of security conditions and in the definition of appropriate intervention strategies, including environmental crime prevention strategies. The outlined strategies' effectiveness depends on the knowledge of the specific context and on a complete risk scenario analysis, which is able to combine and synthesise all the aspects that contribute to the creation of security conditions. It is also noted that no instrument available in the literature provides an unambiguous definition, a complete assessment or a mapping method for the concept of crime risk and that there is an absence of explicit guidelines in municipal urban Plans.

The research is integrated into the theme by proposing a crime risk mapping method that can be replicated in any territorial context. The composite crime risk index  $IR_c$ , structured according to the territorial risk paradigm, combines the main aspects that contribute to the characterisation of risk scenarios. Through three risk factors ( $H_c$ ,  $V_c$ ,  $E_c$ ), each of them described by appropriate indicators, it integrates: the probability of crime occurrence and, therefore, the probability of actual victimisation; the physical and functional predisposition of spaces to favour the occurrence of crimes or insecurity; information on the population, understood as an element exposed to crime risk. The crime risk map associated with the  $IR_c$  index, structured in five risk classes (R1, R2, R3, R4,

R5), gives a snapshot of the risk conditions of the studied territory. It highlights the presence, intensity and surface extension of the critical areas against which to evaluate appropriate intervention strategies. The outlined model also proposes the definition of specific actions for the municipal urban Plan in order to promote a systematic action of adapting spaces to security criteria.

The thesis is structured in 6 chapters and describes the research phases. After an overview of the subject and the research objectives definition, the state of art in this field was reconstructed. This phase was carried out through the reconstruction of the normative framework, the analysis of manuals and technical-scientific literature, the study of guidelines and some application cases of the environmental crime prevention principles, both international and national, in order to identify significant aspects and possible strategies to be adopted to guarantee a safer urban environment. The methodological proposal was then formulated, divided into three macro-phases: in the first phase, the concept of crime risk was defined and formalised and a model of construction of the composite index of crime risk  $IR_c$  and the associated map was outlined; the second macro-phase is dedicated to the sensitivity analysis of the composite index of risk  $IR_c$  construction model; the third macro-phase, starting from the evidence and recurrences that emerged in the previous macro-phases, formulates a proposal of specific actions for the municipal urban Plan to adapt, over time, urban spaces to security criteria. The model thus outlined was applied to the city of Milan. At this stage, to manage the complexity of the crime risk map construction procedure, and to automate its implementation, a specific parametric algorithm was constructed as Model Builder through the ArcGIS software. The methodology's application to the case study highlighted some criticalities related to the availability of crime data, which are necessary for the hazard risk factor ( $H_c$ ), and to the fragmented nature of the information related to the urban environment, for which a change is hoped in the future. After implementation of the sensitivity analysis, it became necessary to introduce a further methodological step of accessibility analysis, at a detailed scale, which led to the construction of the composite index of accessibility  $IAC$ , also with spatial character. The methodology's application to the city of Milan has also highlighted its potential. The constructed risk model is configured as a concrete

and replicable tool to integrate the theme of urban security into urban and metropolitan planning tools. Its usefulness consists in the possibility to develop cognitive frameworks by simulating different crime risk scenarios. The latter, if included as cognitive elaborations in the ex-ante phase to the municipal urban Plan formation, allow to highlight the crime risk conditions of the territory, to evaluate the proposed planning choices and to establish an adequate framework of rules aimed at increasing the city' s security. In addition, the composite index of accessibility  $IA_c$  makes it possible to further define the cognitive framework at a detailed scale. It highlights the potential of each neighbourhood to provide an answer to the problem of urban crime by virtue of its accessibility conditions. Moreover, the crime risk scenarios are configured as important cognitive elaborations also in the delineation of the general metropolitan territorial Plan objectives and contents.

In conclusion, the knowledge of the current risk conditions and of their variation due to the effect of planned or proposed physical-functional changes of the territory, allows to orient the urban project towards crime risk prevention and to reconsider the canonical aims of urban planning for a better spatial and functional organisation of the city in the perspective of urban security.