

PLANNING POST-EARTHQUAKE SURVEYS: ASSESSMENTS AND RECONSTRUCTION OF SMALL HISTORICAL CENTRES

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SUMMARY

The contribution presents a methodological procedure for the management and planning of interventions after earthquake events in small historic centres. Reference is made to the case study of Castelluccio di Norcia, a village in the Apennine Mountains affected by the seismic sequence that hit Central Italy in 2016. The earthquake risk of the area and the damaging events of 2016 are critically reviewed. The implementation of cognitive analysis and the application of advanced survey techniques involving the use of Unmanned Aerial Vehicles (UAVs) for the purposes of emergency management and monitoring of damaged areas are analysed. The outcomes, combined with the direct involvement of the local population, represent a complete and integrated approach allowing the definition of a) possible intervention strategies, b) related decision criteria and c) practical recommendations for the reconstruction and regeneration of Castelluccio, and, in general, of small historic centres damaged by catastrophic events.

Keywords: *Digital surveys, Post-earthquake Study, Resilience, Urban Reconstruction.*

1. INTRODUCTION

Post-earthquake reconstruction in small historic centres is a challenging task due to the varying properties of building materials, construction based on traditional techniques, and high building density. Detailed information, necessary to address this issue, has to be acquired by safe and efficient investigations of a damaged area, and in-depth knowledge of post-disaster situations in damaged areas is required. UAV (Unmanned Aerial Vehicle)-based photogrammetry has recently proven to be an innovative and effective survey technique allowing the rapid and accurate assessment of affected areas [1].

Considering several aspects related to the redevelopment of a territory after a natural hazard, this study defines UAV-supported methodological procedures for management and planning of interventions in minor historic centres damaged by catastrophic events. Between August and October 2016, the earthquakes in Central Italy destroyed numerous villages in the Umbria-Marche Apennines that had to be reconstructed. By analysing the case of Castelluccio di Norcia, a village in Region Umbria where an earthquake with magnitude of 6.5 destroyed a considerable part of the inhabited centre, the following procedures are reviewed and implemented:

- cognitive analysis: identification of the layout of the village before the earthquake, based on the evaluation of past survey data and comparison between observed and predicted values of ground motion parameters;
- social inclusion: involvement of the population in the reconstruction process by analysing the results of opinion polls among the inhabitants;
- digital survey analysis: examination of the post-catastrophe phase, in order to understand the damage caused by the seismic event to buildings and aggregates.

Thereby, the development of 3D models starting from survey data based on UAVs allows a comparison of the configurations of Castelluccio in the pre and post-earthquake phases. Finally, possible intervention strategies,