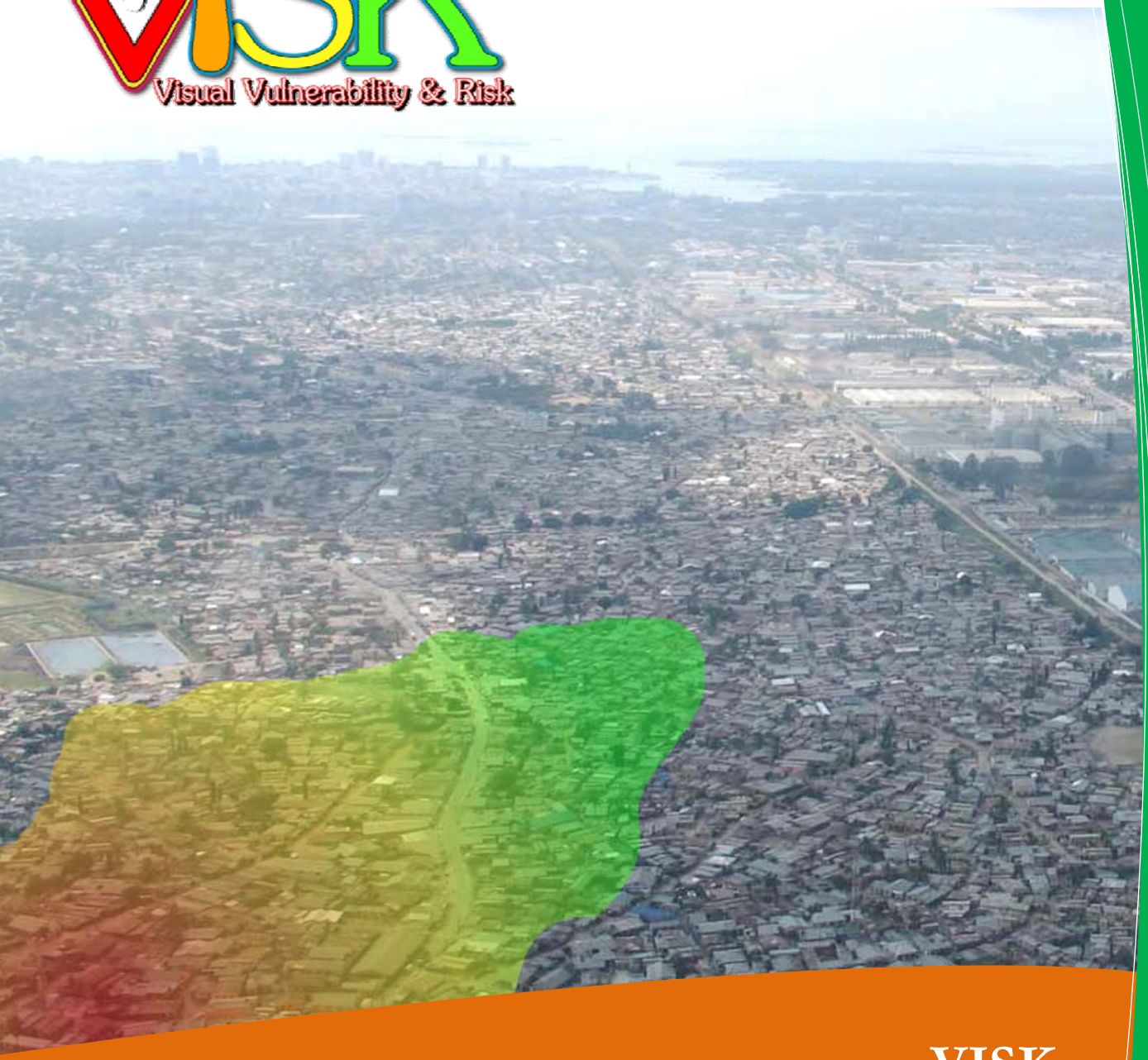

VISK

Visual Vulnerability & Risk

Flooding module

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INTRODUCTION

Delineation of flood prone areas and the evaluation of the vulnerability of buildings in the urban areas to flooding are fundamental steps in taking adaptive measures for flood risk mitigation. This demands cross-cutting scientific and technical support from different disciplines, such as but not limited to, climate modeling, hydraulic engineering, structural engineering, risk modeling and urban policy making. In this work, a new GIS-compatible computer platform and matlab-based user interface is presented: VISK, "Visual Vulnerability & Risk", flooding module. This integrated platform puts together probabilistic, vulnerability and risk assessment modules for flooding in order to generate detailed (micro-scale) risk maps for building stock with more-or-less similar characteristics. These maps can be potentially used as supplementary technical support for flood risk mitigation, emergency preparedness, response and recovery . The GIS compatibility allows for graphical processing of both input and output to the program. Moreover, this facilitates an efficient visualization of flooding risk.

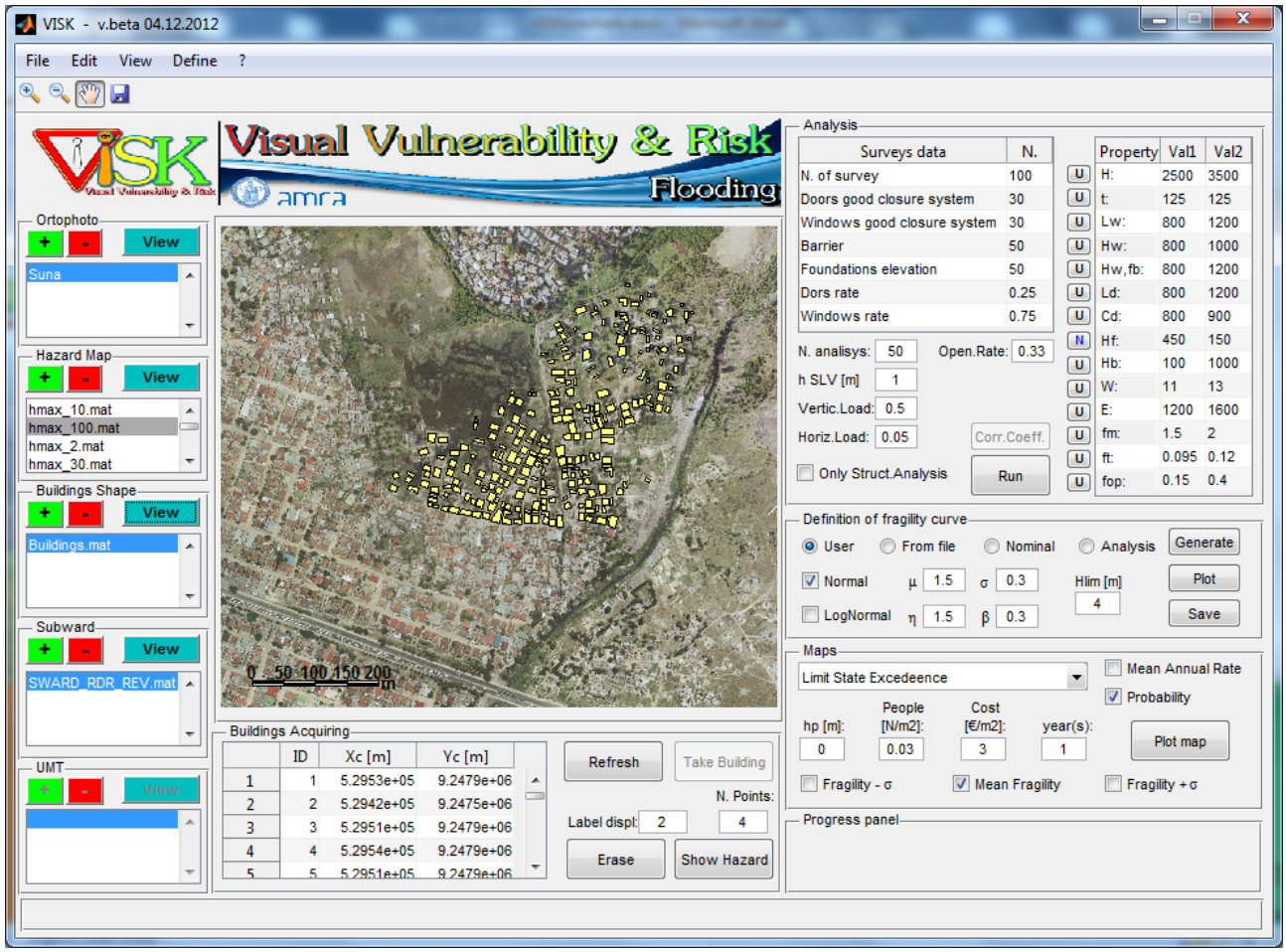

Figure 1 - Main frame of the Software.

HOW DOES IT WORK

At the core of the this platform lies a comprehensive probability-based logic-tree algorithm for the assessment of the vulnerability of a specific building or a class of buildings to flooding. This algorithm is based on assigning pre-defined analytic bi-modal probability distributions for characterizing the flooding structural fragility functions. The prescribed probability distributions take into account the infiltration of flow in cases in which the building is not sufficiently sealed. This allows for efficient small-sample (around 20-30) evaluation of structural fragility based on standard Monte Carlo Simulation. Moreover, the Bayesian parameter estimation is employed in to order to build a confidence interval for the structural fragility curve(s). The fragility evaluations are based on a bi-dimensional structural model constructed using Opensees software and subjected to increasing water levels.

The uncertain structural modeling parameters are characterized through, orthophoto recognition, sample in-situ building survey, laboratory test results for material mechanical properties and literature survey.

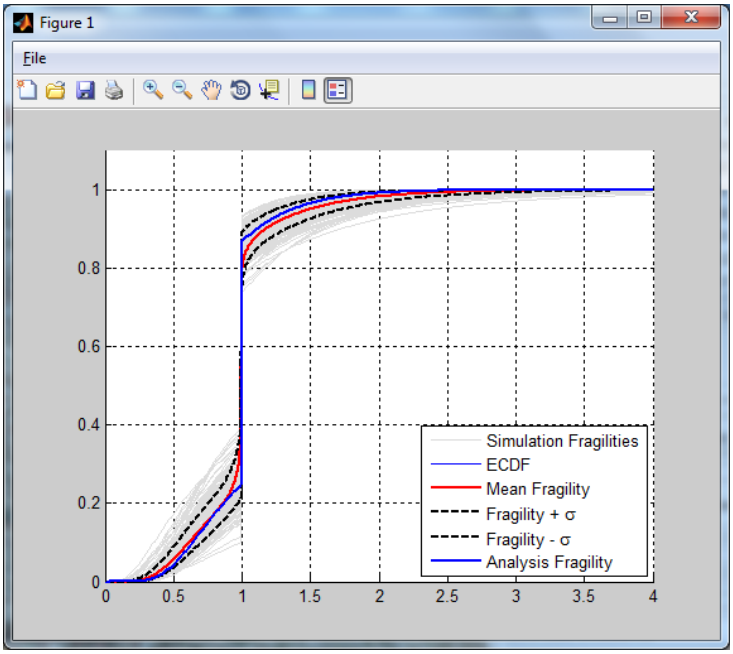

Figure 2 - Fragilities automatically obtained from the routine.

Finally, the risk map is generated by integrating the flooding hazard and fragility taking into account additional information on the exposure (e.g., repair costs, number of affected people, etc.). The result can be visualized both in a detailed building-to-building scale (of potential interest to single house-holds) or as overall estimates for the entire area (of interest to policy makers).

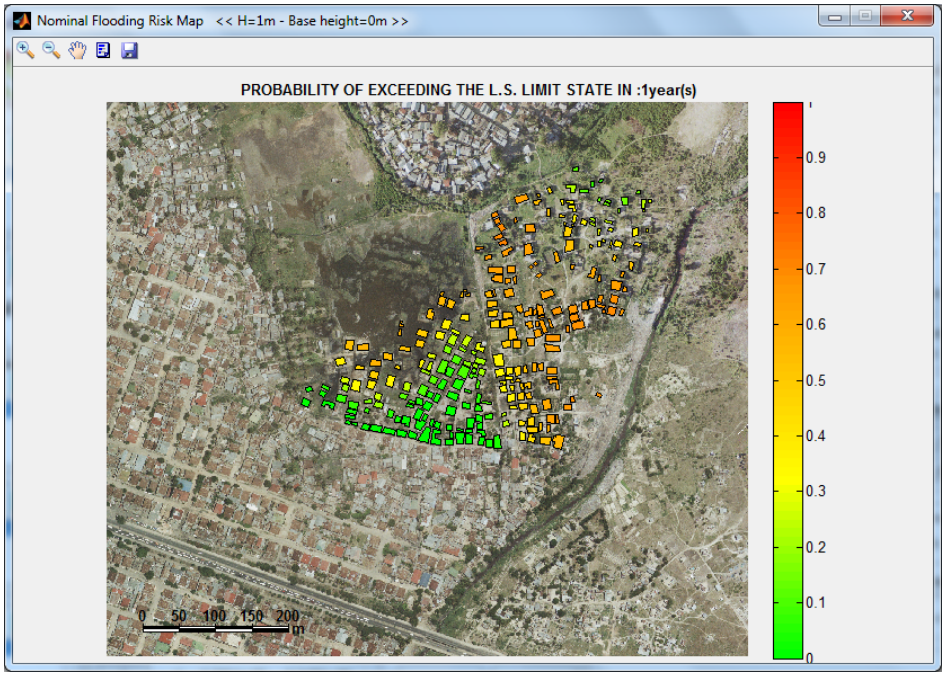

Figure 3 - Risk map for the case study area.

Acknowledgment :

CLUVA

SEVENTH FRAMEWORK PROGRAMME

CLIMATE CHANGE AND URBAN VULNERABILITY IN AFRICA
Grant agreement no: **265137**

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