REDUCTION OF THE ECONOMIC-FINANCIAL EXPOSURE OF THE STATE AND PROTECTION OF HUMAN LIVES

MODELS FOR THE PREVENTION AND MITIGATION OF DAMAGES TO PEOPLE AND PROPERTIES THROUGH AN INSURANCE COVERAGE

PROJECT OVERVIEW

Rodolfo Console

Centre of Integrated Geomorphology fo the Mediterranean Area
CGIAM

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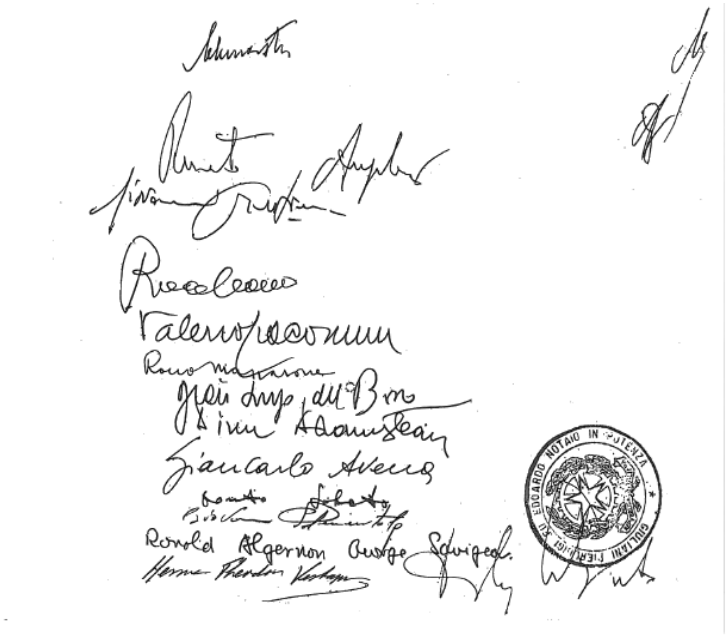
CGIAM

After a series of meetings started at the end of the ‘60s, CGIAM was legally founded in 1979 with the participation of UNESCO, the Basilicata Region and other relevant international institutions.



CGIAM Mission

The **Centre of Integrated Geomorphology for the Mediterranean Area** is a **scientific body of public law** engaged in the definition of scientific methodologies, technological development and implementation of tools and services for the **observation, analysis, monitoring of territory and environment in order to mitigate the damages to people and properties from natural risks, first of all seismic and hydrogeological-environmental risks**

CGIAM

Technical-Scientific Council

Art. 10 CGIAM bylaws states:

"The Technical-Scientific Council can express opinions and formulate proposals on the CGIAM programmes, and it carries out advisory activities on any subject of scientifc character, upon request from the Executive Board".

Suggestions from the CGIAM TSC

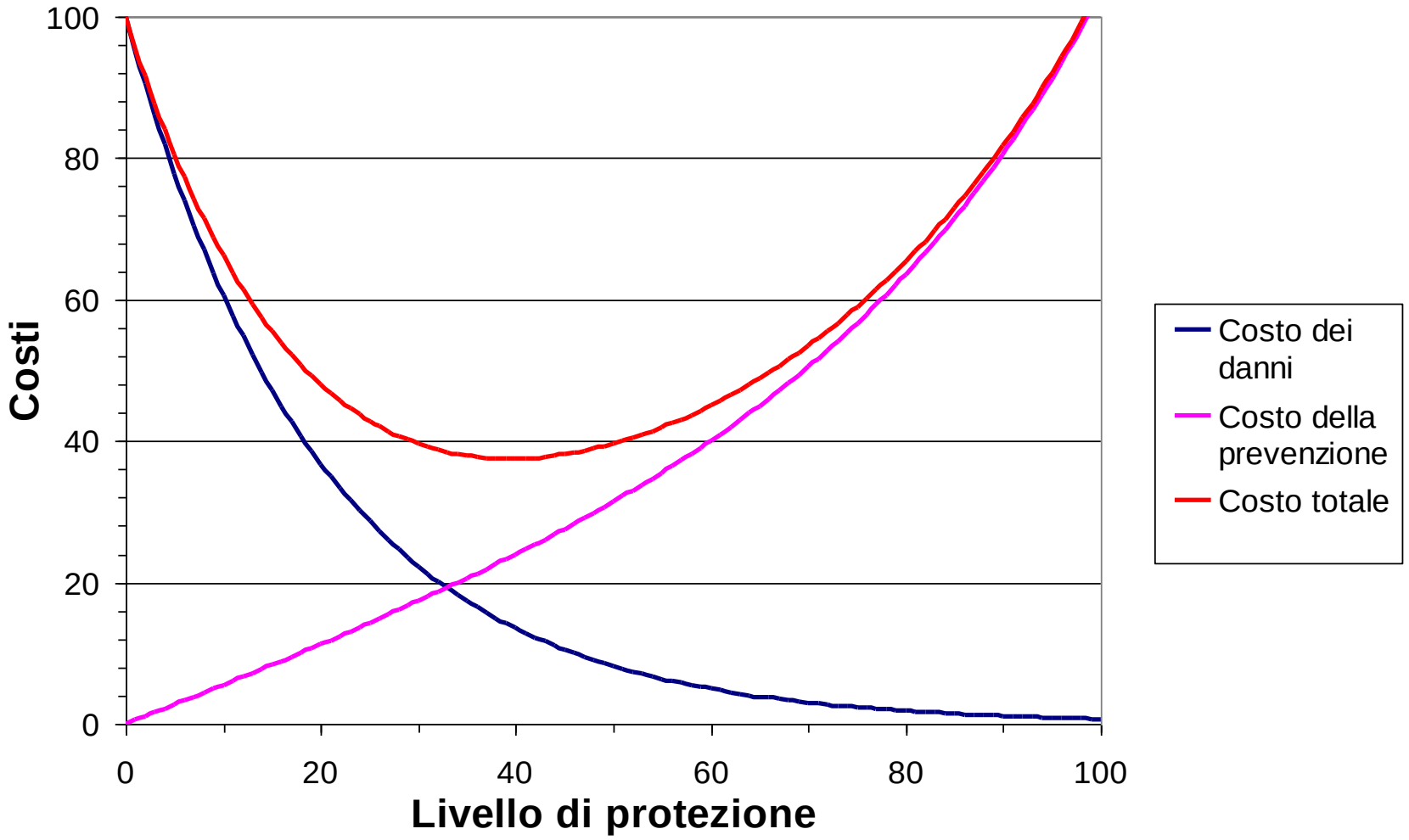
The CGIAM TSC met during the days 11-12 March 2014 with experts of the National Institute of Geophysics (INGV), experts of the Network of Italian University Laboratories of Seismic Engineering (ReLUIS), and other international experts.

They discussed a draft proposal for a project to study earthquake risk mitigation measures beyond the present state-of-the-art.

Project motivation

It was recognized, after recent seismic events, that the present disaster risk assessment in Italy is still subject to significant improvement for earthquake disaster mitigation. Thus, we propose to develop a system for establishing ground motion parameters as input to building and engineering codes and to a proposed insurance system. The improved codes are expected to dramatically mitigate casualties and other damages from earthquakes.

AN IDEAL STRATEGY FOR THE MITIGATION OF NATURAL RISKS



Benefits of an insurance system

The insurance system doesn't have direct influence on the total costs: rather, it shares the cost among all the individuals subject to the same risk and distributes the cost uniformly in time. However, a tax break and a reduction of the insurance premium for the individuals who decide to upgrade their buildings, can produce an incentive to implement risk mitigation measures, which influence the vulnerability factor and so contribute to the reduction of risk itself.

Project task

The proposal seeks to establish ground motion parameters at the surface from the seismic source characterization. This characterization will be based on a multidisciplinary approach focused on a study area selected in Southern Italy, because of its tectonic complexity. The results are expected to be applicable on other hazardous seismic areas of Italy. This multidisciplinary approach includes both geophysical and engineering studies.

MODULE I: SEISMIC HAZARD ANALYSIS OF THE STUDY AREA

Modern seismological studies:

- Evaluation of historical information
- Deployment of a local network
- Velocity structure
- Earthquake relocation (CC & DD)
- Fault plane solutions
- Identification of active structures
- Stress field determination
- Seismic reflection studies

MODULE I: SEISMIC HAZARD ANALYSIS OF THE STUDY AREA

Complementary Geophysical studies:

- **Magnetics (Marine, Terrestrial, Airborne, Satellite);**
- **Gravity (Marine, Terrestrial, Airborne, Satellite);**
- **Remote sensing;**
- **InSAR;**
- **LiDAR (Airborne);**
- **GPS;**
- **Borehole stress.**

MODULE I: SEISMIC HAZARD ANALYSIS OF THE STUDY AREA

Time-independent and time-dependent modelling of earthquake occurrence

- **- Renewal models**
- **- Simulations**

Stochastic assessment of ground shaking

- **- Attenuation law;**
- **- Microzonation;**
- **- Near Fault and Far Fault Events;**

MODULE I: SEISMIC HAZARD ANALYSIS OF THE STUDY AREA

Synthesis of results

The results of the study will be applicable to other earthquake prone areas of Italy that critically affect public administrations and insurance companies and also significantly contribute to the engineering assessment of seismic risk.

MODULE II - DEVELOPMENT OF A VULNERABILITY MODEL FOR SEISMIC RISK ASSESSMENT

Cost analysis of Italian earthquakes:

- **Definition of the cost of the past earthquakes;**
- **Expected cost in the next years;**
- **Evaluation of the expected economic annual loss as function of the seismic resilience of the Italian buildings;**

MODULE II - DEVELOPMENT OF A VULNERABILITY MODEL FOR SEISMIC RISK ASSESSMENT

Statement:

- Government can't sustain the cost to repair damages of next earthquakes;

Strategy:

- Encourage the insurance companies to provide earthquake damage coverage;
- Reduce recovery costs, building vulnerability and cost of insurance taking into account possible public or private incentives;
- From module 1 (geophysics):

  Maximum expected magnitude, Acceleration-Velocity-Displacement Response Spectra, Return Period, Site fault Information (far fault and near fault earthquakes - vertical components importance - Soil-structure interaction, site amplification problems);

MODULE II - DEVELOPMENT OF A VULNERABILITY MODEL FOR SEISMIC RISK ASSESSMENT

Strategy (cont'd):

- Development of the fast strategies for structural assessment as function of the different typologies.
  - state of the art vulnerability studies, considering the diversity of building types, materials and ages in the territory
  - Historical Analysis of the existing structural typologies;
  - Combination of classical (sclerometric, pacometric, ultrasonic) and innovative test procedures (dynamic identification tests, georadar, electromagnetic techniques;
  - Building model updating;
- Calibration of the fragility curves starting from assessment of real benchmarks structures (Stochastic approach instead of probabilistic approach);
- Improvements and simplification of innovative seismic retrofitting techniques for the building vulnerability reduction (developed for specific building typologies).