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DIRECTORATE GENERAL FOR DEVELOPMENT COOPERATION

GEOLOGICAL DISASTERS IN THE PHILIPPINES

THE JULY 1990 EARTHQUAKE AND THE JUNE 1991 ERUPTION OF MOUNT PINATUBO

Description, effects and lessons learned

by Giovanni Rantucci

in cooperation with the Philippine Institute of
Volcanology and Seismology (PHIVOLCS)

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The book *Geological Disasters in the Philippines* has been presented to the World Conference on Natural Disaster Reduction, Yokohama (Japan) 23-27 May 1994, within the contribution of the Italian Ministry of Foreign Affairs to the International Decade for Natural Disaster Reduction (IDNDR).

The views expressed in this volume are solely those of the Author and do not necessarily reflect those of the Italian Ministry of Foreign Affairs.

Rome, October 1994

Cover: The July 1990 ground rupture (top) in Digdig (Nueva Ecija). The picture shows the surface faulting across the road to Carranglan. Mount Pinatubo (bottom) seen from the southeast, after the June 1991 eruption and the subsequent collapse of the crater.

FOREWORD

Geologic phenomena including earthquakes, volcanic eruptions, landslides and erosional processes are an essential aspect of the evolution of the environment in which we live. The exponential growth in the earth's population that occurred in this century and the associated development have progressively resulted in the overcrowding of several vulnerable areas of the planet. Thus, the occurrence of extreme natural phenomena increasingly entails disasters with loss of numerous lives, damage to infrastructure and property, and widespread human suffering. In this sense disasters, which more and more often result from the combined effect of human development and natural forces, substantially contribute to the global environmental crisis.

The book «Geological Disasters in the Philippines» is centered on these views and is designed to improve the understanding of the recent extreme geological events which affected the Archipelago in the early 1990s. A considerable part of the work is devoted to the description of disaster impacts on physical and human environments as well as on agriculture and the economy of the Philippines.

A great deal of knowledge about geological disasters in the Italian Peninsula (and more generally in the Mediterranean Region) was gathered as a result of the abundant literature from the Roman Times onward. It is worthwhile to mention the classic work of the latin writer Lucius Annaeus Seneca (5 B.C.-A.D. 65) «De terrae motu» (On the Motion of the Earth) inspired by the destructive earthquake which struck the town of Pompeii in A.D. 62 or 63. Pompeii and Herculaneum were buried by volcanic ashes in A.D. 79, that is about 17 years later, by the explosion of Mount Somma and Vesuvius. This disaster was described by the historian Pliny the Younger (A.D. 62 - 114) who wrote the first scientific report of a volcanic eruption.

The Italian experience with disasters was greatly enlarged in this century by the recurrence in the country of a number of calamities. Beyond the high-quality data which were gathered, these disasters triggered advanced research in various fields. The descriptions by historians during several centuries combined with the information from recent research constitute the best documented data bank on disasters during the last two millennia.

In view of the recurrent threat posed by extreme geological events, Italy has recently made considerable efforts in disaster preparedness, prevention and mitigation by adequately organizing the social response.

Italian Institutions are actively participating in the IDNDR initiatives for a worldwide reduction of disaster impacts, and contribute to alleviating the effects of calamities by sharing knowledge, available data and technical know-how.

Investments by industrial countries are essential for the protection of efforts by developing countries towards economic growth and sustainable development. The Italian Development Cooperation has actively supported Developing World in the last 15 years, contributing also to disaster prevention and mitigation projects such as SEISMED, which was designed to reduce seismic risk in the Mediterranean Region.

The Author of the book, Dr. G. Rantucci, has worked for over ten years as a geologist in Asia, spending part of this period in the Philippines and a major part as Associate Professor at the Asian Institute of Technology in Bangkok. At present he is an Expert in the Technical Unit of the Italian Ministry of Foreign Affairs, Directorate for Development Cooperation. This book reflects the variety of his experience and the versatility of his expertise.

Antonio Catalano di Melilli
Deputy-Director General
Directorate General for Development
Cooperation
Italian Ministry of Foreign Affairs

PREFACE

Dr. Rantucci was one among many foreign scientists who were in the Philippines during the world class disasters that hit the Country in 1990 and 1991 - the July 16, 1990 Luzon earthquake and the 1991 eruption of the Pinatubo Volcano. He is also one of the few foreign scientists who were inspired by these two disasters to write and publish papers, but he is the only one who has produced a full monograph so far.

In the Philippines, we produced several compilations containing papers written on these two disasters by both local and foreign scientists including Dr. Rantucci. These compilations are:

- The July 16, 1990 Luzon Earthquake: a Technical Monograph;
- Proceedings of GEOCON '90, Quezon City, Philippines 5-7 December 1990;
- Proceedings of the International Scientific Conference on Mt. Pinatubo, Manila, Philippines 27-30 May 1992;
- Proceedings of GEOCON '91, Quezon City, Philippines, 4-6 December 1991.

However, only limited copies of these publications were printed and circulated locally. A technical monograph on the Pinatubo Volcano 1991-1992 eruptions and their aftermath is also in the making - a joint effort of the United States Geological Survey (USGS) and the Philippine Institute of Volcanology and Seismology (PHIVOLCS). This will have a wide international circulation but covers only the Pinatubo Volcano eruption. As a document integrating both disasters for international circulation, Dr. Rantucci's book is therefore a first.

Dr. Rantucci's book will certainly make our country famous internationally. We hope though that the image that will stick in the readers' mind will not be of a country prone to, and hard hit by disasters, where only the brave visitors and investors dare to tread. Rather, the image that should last in readers' memories is of a disaster-prone country whose leaders and citizens have learned their lessons well and taken steps toward effective disaster prevention and mitigation.

Raymundo S. Punongbayan
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of Volcanology and Seismology*

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A particular gratitude goes to my family, friends and colleagues for the support during more than two years of work.

ABOUT THE AUTHOR

Giovanni Rantucci received his Degree in Geology from the University of Rome (Italy) in 1964. During an assignment as a consultant in Central Luzon (Philippines), he witnessed the sequence of geological events described in the book: the July 1990 Luzon earthquake, the June 1991 eruption of Mount Pinatubo and the related primary and secondary effects.

During the period 1983-89 the Author served as Associate Professor at the Asian Institute of Technology in Bangkok (Thailand), Division of Geotechnical and Transportation Engineering, in a multilateral project financed by the Italian Cooperation (Ministry of Foreign Affairs) through the UNDP. Previously (1968-1983) he worked as a geotechnical engineer for a private Italian company, being involved in numerous projects in the Middle East, Far East, Africa and South America. At present he is a member of the technical staff of the Italian Ministry of Foreign Affairs (Rome) in the Directorate General for Development Cooperation.

AUTHOR'S NOTE

The phenomena described in the book 'Geological Disasters in the Philippines' are set within the framework of the theory of plate tectonics. The Author is aware of arguments for and against the theory and of questions as yet unanswered.

Each chapter deals with a well-defined topic and begins with an introductory paragraph. Thus, readers with a specific interest in one or more chapters can read the introductions of the others.

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