



Subsidence Management Handbook

Naresh C. Saxena

SUBSIDENCE MANAGEMENT HANDBOOK

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Published by:
PAWAN KUMAR
Scientific Publishers (India)
5-A, New Pali Road, P.O. Box 91
JODHPUR - 342 001
Tel.: +91-291-433323
Fax : +91-291-512580
E-mail: artrans@tantramail.com
www.scientificpub.com

Print: 2018

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ISBN: 978-81-72333-17-1
eISBN: 978-93-87869-46-2

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Lasertype set : Rajesh Ojha
Printed in India

DEDICATION

*The handbook is dedicated to
My wife Sudha for all the pains she
has been taking in bearing with me,
and her encouragement;*

*My daughters Gabboo, Babli and Kukki
for their love and affection;*

*My son-in-laws Shridhar and Pintoo
for their love and affection;*

*My grandchildren Minnu, Chittoo and Riya
who are my inspiration.*

PREFACE

Subsidence, also termed as land subsidence, has been attracting attention of one and all due to its impacts not only on the surface but also on the sub-surface and underground properties. Over the globe, the subsidence movements have been found to have taken place due to various natural and manmade activities and the Man has been trying to find out the ways and means for minimizing the damages, prediction of subsidence movements, measurement of the movements, and finally the management of, the subsidence movements. Vast areas on the globe have experienced subsidence movements and related impacts and as of now many areas are experiencing these movements. The importance of the subsidence movements enhances with the importance of land areas as, with the growth of the population the per capita availability of the useful land is decreasing.

Among the various subsidence causing activities, the author considers the underground mining in sedimentary deposits and the withdrawal of water from the underground sources are as the most important and prominent activities in the Indian context. Underground mining of sedimentary deposits has been going on in the country for more than 225 years while extensive pumping of water from the underground sources is comparatively a recent phenomenon.

The subsidence know-how in respect of the underground mining of sedimentary deposits, though well-developed, has not been properly documented and the published literature on this subject does not make the operators self-reliant to take on the spot decisions, which, in the opinion of the author is necessary for efficient running of the industry. Therefore, in this handbook efforts have been made to present the subsidence management methodology in such a manner that in majority of the situations, the operating managers/engineers would be in a abled position to take decisions on their own and only in the situations involving complications the expert advice will be required. The handbook is also expected to be useful to the planners and the officials of the regulatory agencies, e.g., the Directorate General of Mines Safety

and the Indian Bureau of Mines. It will also be of use to the faculty in the teaching institutions and will be an asset in the libraries.

In respect of the ground water withdrawal, the subsidence know-how in the country is very limited and there is a need to develop this as quickly as possible, as the dependence of the industries and the population on this source of water is increasing day-by-day and more-and-more number of tube-wells are being made wherever, ground water is available without considering the consequences. Therefore, an effort has been made by the author in this handbook to bring forth the importance of this subject for the future of the Nation as also to present some suggestions on the management of the subsidence in the areas having ground water withdrawal. The author anticipates that the handbook will initiate action towards developing the understanding of the subsidence phenomenon with respect to the withdrawal of water from the underground sources and the consequences of these movements, ultimately leading to the management of the activities such that the damages are minimum possible. This will also help in the development of the know-how for the prediction of the subsidence movements due to ground water withdrawal. The handbook will thus, be useful to the planners and managers of projects involving in utilization of water from the underground water sources. The handbook will also be useful to the students of civil and other related engineering disciplines.

This handbook presents the three chapters — the first chapter gives rise an overview of subsidence due to underground mining and ground water withdrawal — the second chapter deals exclusively with the management of subsidence due to underground mining of sedimentary deposits — the subsidence management aspects of ground water withdrawal are dealt in the third chapter.

The author has used the subsidence know-how in respect of the underground mining of sedimentary deposits in studying more than 100 cases related to the extraction of coal seams underneath and in the vicinity of surface and underground properties in the Indian coalfields. Most of the recommendations made in these studies have been implemented with the results that the coal mining industry has been able to extract more than 20 million tonne of coal from underneath and in the vicinity of the surface properties. In addition, the prediction of the subsidence movements and their impacts have also been done for a number of mines for the development of their Environmental Management Plans. Some of the case studies are presented briefly in the text.

The author is thankful to his friends and colleagues who helped him in the development of the subsidence know-how and who worked with him in monitoring of the subsidence movements in coal mining areas in the country. Special mention is being made for Dr. B. Kumar, Scientist, CMRI, Dhanbad and S/Shri R. Sinha, B.N. Pandey, S.D. Tiwary, S.N. Prasad, S.K. Singh and R.K. Sinha also of CMRI, Dhanbad. The author is also thankful to the critics who left no stone unturned in having their say. Thanks are also due to Shri Durga Das Chandra for helping in preparation of the text of the handbook on the computer and to Shri A. Bhattacharya for helping in preparation of the drawings for the handbook. The author is grateful to the friends who encouraged him to bring out this handbook for the benefit of the Indian community.

Dhanbad

Naresh C. Saxena

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