

FUNDAMENTALS OF PHYSICAL GEOGRAPHY

TEXTBOOK FOR CLASS XI

विद्यया ऽ मृतमश्नुते



एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

ISBN 81-7450-518-0

First Edition

March 2006 Phalguna 1927

Reprinted

October 2006 Kartika 1928

November 2007 Kartika 1929

December 2008 Pausa 1930

January 2010 Pausa 1931

January 2011 Magha 1932

March 2012 Phalguna 1933

January 2013 Magha 1934

November 2013 Kartika 1935

PD 35T RNB

© **National Council of Educational
Research and Training, 2006**

₹ 65.00

Printed on 80 GSM paper with NCERT
watermark

Published at the Publication Division by the
Secretary, National Council of Educational
Research and Training, Sri Aurobindo Marg,
New Delhi 110 016 and printed at
Vijayalakshmi Printing Works Pvt. Ltd.,
B-117, Sector-5, Noida 201 301 (UP)

ALL RIGHTS RESERVED

- ❑ No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior permission of the publisher.
- ❑ This book is sold subject to the condition that it shall not, by way of trade, be lent, re-sold, hired out or otherwise disposed of without the publisher's consent, in any form of binding or cover other than that in which it is published.
- ❑ The correct price of this publication is the price printed on this page. Any revised price indicated by a rubber stamp or by a sticker or by any other means is incorrect and should be unacceptable.

**OFFICES OF THE PUBLICATION
DIVISION, NCERT**

NCERT Campus
Sri Aurobindo Marg
New Delhi 110 016

Phone : 011-26562708

108, 100 Feet Road
Hosdakere Halli Extension
Banashankari III Stage
Bengaluru 560 085

Phone : 080-26725740

Navjivan Trust Building
P.O. Navjivan
Ahmedabad 380 014

Phone : 079-27541446

CWC Campus
Opp. Dhankal Bus Stop
Panihati
Kolkata 700 114

Phone : 033-25530454

CWC Complex
Maligaon
Guwahati 781 021

Phone : 0361-2674869

Publication Team

Head, Publication Division	: Ashok Srivastava
Chief Production Officer	: Kalyan Banerjee
Chief Business Manager	: Gautam Ganguly
Chief Editor (Contractual Service)	: Naresh Yadav
Editor (Contractual Service)	: R.N. Bhardwaj
Production Officer	: Vikas B. Meshram

Cover
Shweta Rao

Illustrations

K.N. Prudhvi Raju
Nidhi Wadhwa
Dilip Kumar

Cartography

Cartographic Designs
Agency

FOREWORD

The National Curriculum Framework (NCF), 2005, recommends that children's life at school must be linked to their life outside the school. This principle marks a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home and community. The syllabi and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and the maintenance of sharp boundaries between different subject areas. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy on Education (1986).

The success of this effort depends on the steps that school principals and teachers will take to encourage children to reflect on their own learning and to pursue imaginative activities and questions. We must recognise that, given space, time and freedom, children generate new knowledge by engaging with the information passed on to them by adults. Treating the prescribed textbook as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. Inculcating creativity and initiative is possible if we perceive and treat children as participants in learning, not as receivers of a fixed body of knowledge.

These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table is as necessary as rigour in implementing the annual calendar so that the required number of teaching days are actually devoted to teaching. The methods used for teaching and evaluation will also determine how effective this textbook proves for making children's life at school a happy experience, rather than a source of stress or boredom. Syllabus designers have tried to address the problem of curricular burden by restructuring and reorienting knowledge at different stages with greater consideration for child psychology and the time available for teaching. The textbook attempts to enhance this endeavour by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups, and activities requiring hands-on experience.

The National Council of Educational Research and Training (NCERT) appreciates the hard work done by the textbook development committee responsible for this book. We wish to thank the Chairperson of the advisory committee for textbooks in Social Sciences, at the higher secondary level, Professor Hari Vasudevan and the Chief Advisor for this book, Professor M.H. Qureshi for guiding the work of this committee. Several teachers contributed to the development of this textbook; we are grateful to their principals for making this possible. We are indebted to the institutions and organisations

which have generously permitted us to draw upon their resources, material and personnel. We are especially grateful to the members of the National Monitoring Committee, appointed by the Department of Secondary and Higher Education, Ministry of Human Resource Development under the Chairpersonship of Professor Mrinal Miri and Professor G.P. Deshpande, for their valuable time and contribution. As an organisation committed to systemic reform and continuous improvement in the quality of its products, NCERT welcomes comments and suggestions which will enable us to undertake further revision and refinement.

New Delhi
20 December 2005

Director
National Council of Educational
Research and Training

TEXTBOOK DEVELOPMENT COMMITTEE

CHAIRPERSON, ADVISORY COMMITTEE FOR TEXTBOOKS IN SOCIAL SCIENCES AT THE HIGHER SECONDARY LEVEL

Hari Vasudevan, *Professor*, Department of History, University of Calcutta, Kolkata

CHIEF ADVISOR

M. H. Qureshi, *Professor*, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi

MEMBERS

Indu Sharma, *PGT*, Geography, RIE Demonstration School, Ajmer

K. Kumaraswamy, *Professor*, Department of Geography, Bharatidasan University, Tiruchirapalli

K. N. Prudhvi Raju, *Professor*, Department of Geography, Banaras Hindu University, Varanasi

K. S. Sivasami, *Professor (Retd.)*, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi

L. Cajee, *Reader*, Department of Geography, North-Eastern Hill University, Shillong

P. K. Malik, *Lecturer*, Geography, Govt. College, Tavru, Gurgaon

S. R. Jog, *Professor (Retd.)*, Department of Geography, University of Pune, Pune

MEMBER-COORDINATOR

Aparna Pandey, *Lecturer*, Geography, DESSH, NCERT, New Delhi

ACKNOWLEDGEMENTS

The National Council of Educational Research and Training acknowledges the contribution of Ashok Diwakar, *Lecturer*, Geography, Govt. College, Sector-9, Gurgaon in the development of this textbook.

The Council also gratefully acknowledges the support of individuals and organisations as listed below for providing various photographs, and other materials such as articles used in this textbook : R. Vaidyanadhan (Fig. 6.3 and 7.1); N. S. Saini (Fig. 6.4, 6.7 and 7.4); Y. Ramesh and Krishnam Raju, VSVG, (USA) (Fig. 7.11); K. N. Prudhvi Raju (Fig. 7.2, 7.5, 7.7, 7.9, 7.12 and 7.15); ITDC/Ministry of Tourism, Govt. of India, (Fig. 11.1 and 11.2); Ministry of Environment and Forests, Govt. of India (Fig. 16.1, 16.2, 16.3 and 16.4); *The Times of India*, New Delhi (Photograph on earthquake destruction, Collage on tsunami on page 25 and global warming on page 109); *Social Science* Textbook for Class VIII, Part II (NCERT, 2005), (Photographs related to volcanoes on page 26-27).

Acknowledgements are due to Savita Sinha, *Professor* and *Head*, Department of Education in Social Sciences and Humanities for her support and finalising this textbook.

The Council also gratefully acknowledges the contributions of Ishwar Singh and Arvind Sharma, *DTP Operators*; Sameer Khatana and Amar Kumar Prusty, *Copy Editors*; Bharat Sanwaria, *Proof Reader*; Dinesh Kumar, *Computer Incharge*, who have helped in giving a final shape to this book. The contribution of the Publication Department, NCERT are also duly acknowledged.

CONTENTS

FOREWORD	iii
UNIT I : GEOGRAPHY AS A DISCIPLINE	1-12
1. Geography as a Discipline	2
UNIT II : THE EARTH	13-38
2. The Origin and Evolution of the Earth	14
3. Interior of the Earth	21
4. Distribution of Oceans and Continents	30
UNIT III : LANDFORMS	39-74
5. Minerals and Rocks	40
6. Geomorphic Processes	45
7. Landforms and their Evolution	58
UNIT IV : CLIMATE	75-110
8. Composition and Structure of Atmosphere	76
9. Solar Radiation, Heat Balance and Temperature	79
10. Atmospheric Circulation and Weather Systems	88
11. Water in the Atmosphere	98
12. World Climate and Climate Change	103
UNIT V : WATER (OCEANS)	111-125
13. Water (Oceans)	112
14. Movements of Ocean Water	120
UNIT VI : LIFE ON THE EARTH	126-140
15. Life on the Earth	127
16. Biodiversity and Conservation	135
GLOSSARY	141-144

CONSTITUTION OF INDIA

Part III (Articles 12 – 35)

(Subject to certain conditions, some exceptions
and reasonable restrictions)

guarantees these

Fundamental Rights

Right to Equality

- before law and equal protection of laws;
- irrespective of religion, race, caste, sex or place of birth;
- of opportunity in public employment;
- by abolition of untouchability and titles.

Right to Freedom

- of expression, assembly, association, movement, residence and profession;
- of certain protections in respect of conviction for offences;
- of protection of life and personal liberty;
- of free and compulsory education for children between the age of six and fourteen years;
- of protection against arrest and detention in certain cases.

Right against Exploitation

- for prohibition of traffic in human beings and forced labour;
- for prohibition of employment of children in hazardous jobs.

Right to Freedom of Religion

- freedom of conscience and free profession, practice and propagation of religion;
- freedom to manage religious affairs;
- freedom as to payment of taxes for promotion of any particular religion;
- freedom as to attendance at religious instruction or religious worship in educational institutions wholly maintained by the State.

Cultural and Educational Rights

- for protection of interests of minorities to conserve their language, script and culture;
- for minorities to establish and administer educational institutions of their choice.

Right to Constitutional Remedies

- by issuance of directions or orders or writs by the Supreme Court and High Courts for enforcement of these Fundamental Rights.