

Khazan Ecosystems of Goa

Advances in Asian Human-Environmental Research

Series Editor

Prof. Marcus Nüsser
South Asia Institute, University of Heidelberg, Germany

Editorial Board

Prof. Eckart Ehlers, University of Bonn, Germany
Prof. Harjit Singh, Jawaharlal Nehru University, New Delhi, India
Prof. Hermann Kreutzmann, Freie Universität Berlin, Germany
Prof. Ken Hewitt, Waterloo University, Canada
Prof. Urs Wiesmann, University of Bern, Switzerland
Prof. Sarah J. Halvorson, University of Montana, USA
Dr. Daanish Mustafa, King's College London, UK

Aims and Scope

The series aims at fostering the discussion on the complex relationships between physical landscapes, natural resources, and their modification by human land use in various environments of Asia. It is widely acknowledged that human-environment-interactions become increasingly important in area studies and development research, taking into account regional differences as well as bio-physical, socio-economic and cultural particularities.

The book series seeks to explore theoretic and conceptual reflection on dynamic human-environment systems applying advanced methodology and innovative research perspectives. The main themes of the series cover urban and rural landscapes in Asia. Examples include topics such as land and forest degradation, glaciers in Asia, mountain environments, dams in Asia, medical geography, vulnerability and mitigation strategies, natural hazards and risk management concepts, environmental change, impacts studies and consequences for local communities. The relevant themes of the series are mainly focused on geographical research perspectives of area studies, however there is scope for interdisciplinary contributions.

For further volumes:
<http://www.springer.com/series/8560>

Sangeeta M. Sonak

Khazan Ecosystems of Goa

Building on Indigenous Solutions to Cope
with Global Environmental Change

 Springer

Sangeeta M. Sonak
Centre for Environment and Natural
Resource Management, Srujan
Panaji, Goa, India

ISSN 1879-7180 ISSN 1879-7199 (electronic)
ISBN 978-94-007-7201-4 ISBN 978-94-007-7202-1 (eBook)
DOI 10.1007/978-94-007-7202-1
Springer Dordrecht Heidelberg New York London

Library of Congress Control Number: 2013948750

© Springer Science+Business Media Dordrecht 2014

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Cover image: Nomads near Nanga Parbat, 1995. Copyright © Marcus Nüsser (used with permission)

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Khazans are predominantly rice and fish fields. They are reclaimed wetlands, salt marshes and mangrove areas, where tidal influence is regulated by the construction of embankments and sluice gates. The *khazan* ecosystem is a human made ecosystem, developed by traditional, primitive, tribal communities of Goa through a highly structured system of dykes, canals, furrows and sluice gates from resources that were amply available locally. The *khazan* engineering system has a very simple architectural design, which is self-operating using tidal, hydro and solar energy, and is one that integrates highly complex, eco-friendly agriculture–aquaculture–salt panning functions, having been functional for the last more than 3,500 years.

As a child, I was always more interested in *khazan* fish than in *khazan* history. We relished different fish delicacies prepared by my mother as my father brought home ‘*manoxeche nuste*’ (fish from sluice). Even after my marriage, my interest in ‘*manos*’ grew, as I started buying fish from local fisherwomen selling fish in the local fish market. I was fascinated watching them hail out to the potential customers with constant calls, ‘*Bay, manoxeche nuste var go*’ (‘Oh lady, please buy fish from sluice’) or ‘*Bori manoxechi sungata ayalyat mago*’ (‘Good quality prawns from sluice are being sold in the market’). Often they would prescribe some fish recipes while buying fish, such as ‘*Bay, tora ghalun bes bori sungatachi kodi kar go*’ (‘Prepare tasty prawn curry with raw mango’).

While I was working for The Energy and Resources Institute (TERI) in the late 1990s, the then Tata Energy Research Institute, I came across some information cited from a report submitted by Dr Nandkumar Kamat on *khazans*, a consultant for TERI. Around the same time, Dr Ligia Noronha, the then Head and In-Charge of TERI’s Western Regional Centre in Goa, entrusted me with studies on aquaculture for a European Commission project titled ‘Interactions between environment, society and technology’ (INTEREST). I opted for traditional aquaculture systems in Goa, *khazans*. Thus, my journey with *khazan* ecology began in the late 1990s. I continued my work with *khazans* for 5 years in TERI with another project, ‘Role of institutions in global environmental change’, funded by the Asia Pacific Network (APN), Japan. However, during these years, work was restricted to *khazans* of

Divar. I had to break this journey while I worked and coordinated other research projects in TERI, such as ‘Assessing impacts of tributyltin on multiple coastal uses’, or ‘TBTimpacts’, funded by the European Commission. Later, as I moved to the Centre for Environment and Natural Resource Management, Srujan, I worked on a larger project titled ‘Seas and shores around us’. My obvious choice was *khazan* ecosystems. This stint generated an emotional bond and intimate association with *khazans*. Human migrations in Goa, arrival of *Gaud Saraswat Brahmins* (GSBs), various legends on Goa, history of *khazans*, indigenous resource management institutions and their metamorphosis into formal institutions, the *gaunkari* system, names of places and persons, cultures and traditions involving ecological knowledge, the Portuguese colonial regime in Goa ..., there seemed to be no end to *khazan* links with Goa. Everything in Goa and in the life of Goans appeared to be connected with *khazans*. Till date, the staple diet of Goans, that is fish curry and rice, is obtained from *khazans*. The rising sun of each day reminds market-going Goans of *khazans*, and as the sun sets over the Arabian Sea, the day of most Goans generally ends with ‘*agorache niste*’ (fish from *khazan* aquaculture farm). Goans perceive *khazans* as dear to them as salt.

Primitive communities of Goa might have developed *khazans* to provide them abundantly with their daily needs of food. Particularly for the *Gaud Saraswat Brahmins* (GSBs), who had faced famine on the banks of the now extinct River Saraswati, Goa provided a rich haven with her replete natural resources. *Gauda* settlements in hilly areas helped them with their ecological knowledge. *Khazans* were developed in such an environment that was highly conducive to aquaculture, by people who had migrated from adverse environmental conditions. Human migration in Goa dates back to the Palaeolithic era. Migration of coastal settlers on the central and southwest coast of India perhaps has Harappan affiliation. Ancient civilizations generally flourished along the banks of fertile river valleys. Primitive coastal settlers of Goa converted saline estuarine plains, then regarded as wastelands, into a rich medley of green, blue and white with integrated knits of agriculture, aquaculture and salt pans. Indigenous ecological knowledge (IEK) embedded in the construct of *khazans* is evident. Much can be learnt from IEK entrenched in *khazans*. *Khazan* experiments successfully conducted by the traditional communities of Goa can be replicated in other parts of the world as adaptation mechanisms to cope with the global environmental change (GEC).

Khazan lands of Goa that fascinated primitive settlers of Goa also appealed to the local Goan artists and writers. ‘*Samudratali chandi*’ (‘silver from the sea’, referring to fish from the sea) and ‘*bimalan ros*’ with ‘*manoxechi sungata*’ fascinated a renowned Goan poet, B. B. Borkar. To this day, harvests from *khazans* entice the Goan as well as the floating tourist population. *Khazans* are intricately associated with Goan life till date. Unfortunately, there is a degradation of these unique and ancient heritage ecosystems as certain groups find profits in the conversion of such systems for building and non-agricultural purposes. Such groups often seem to forget that conservation of *khazan* ecosystems is conservation of local culture and global biodiversity. *Khazan* ecosystems qualify as world historical or world heritage sites, and these endemic and heritage ecosystems deserve conservation not just as

gifts from our forefathers but as debts from our children. To quote John James Audubon's words, 'A true conservationist is a man who knows that the world is not given by his fathers, but borrowed from his children'.

My interest in the ecological history of *khazans* only grew as I continued reading bits and pieces of literature written by Goan authors, in local languages as well as in English. Therefore, when I was invited to write a book by Springer Verlag, I put forward a proposal on *khazans*, which, realizing the importance of the subject, Springer was pleased to accept. For this, I am truly grateful to Dr Robert Doe, Senior Publisher, and Naomi Portnoy, Project Coordinator, at Springer Netherlands. The publication of this book shall assist me and, consequently, the *khazan* ecosystems to reach a wide national and international audience. We are hopeful that this, in turn, will greatly assist the case of conservation of these ecosystems at this crucial juncture when short-term gains towards modern technological advances tend to run down the heritage and wisdom of indigenous traditional knowledge. I am constantly reminded of late Dr Elinor Ostrom who encouraged me to write on *khazans*. I am, indebted to her for her support. I am also grateful to all those, particularly many *khazan* farmers and fishers of Goa, who richly contributed to my knowledge base on *khazans*. The last few months, I lived in the world of *khazans*. My entire family, too, often visited my world of *khazans*, offering their time, intellect and enthusiasm in the form of insights, suggestions, information, critique, feedback, etc. The contribution of my husband, Mahesh, to my world of *khazans* is great. *Khazans of Goa* assumed a better shape with his support and comments. My 11-year-old son, Eeshan, always ready to help me with my fieldwork, had to endure much inconvenience. My parents provided valuable information on the importance and use of biodiversity and indigenous knowledge in Goan rituals and festivals. My mother-in-law read my drafts with great interest and offered advice. My sister-in-law, Sushama, provided a book on Vengurla with some bits of information, which are included in the cultural aspects of *khazans*. My friends Savita Kerkar, Janet Rubinoff and Nandkumar Kamat helped in enriching the book by providing me access to their research papers on *khazans*. Lastly, my list of acknowledgements cannot be complete without thanking Mr. Janmejy Kandolkar (Jalmi), who drove me around during my field trips and offered assistance in my fieldwork. With gratitude to all those who contributed to *Khazans of Goa*, I present to the readers the world of *khazans*.

Contents

1 Indigenous Ecological Knowledge and Global Environmental Change	1
1.1 Introduction.....	1
1.2 IEK and Its Evolution.....	3
1.2.1 Indicators Used by Traditional Communities	5
1.2.2 Evolution of IEK.....	5
1.2.3 Transfer of IEK	6
1.3 Global Environmental Change.....	6
1.3.1 Role of IEK in Coping with GEC	7
1.3.2 Issues Related to IEK.....	7
References.....	13
2 An Introduction to Goa and <i>Khazan</i> Ecosystems	15
2.1 Introduction.....	15
2.1.1 Physiography.....	16
2.1.2 Geology	16
2.1.3 Soils of Goa.....	17
2.1.4 Hydrography	18
2.1.5 Climate	18
2.1.6 Biodiversity	19
2.1.7 Coast.....	19
2.1.8 Various Dynasties That Ruled Goa	20
2.1.9 Institutional Framework in India.....	21
2.1.10 Demography.....	23
2.1.11 Economic Activities	23
2.2 History of Human Migration and Beginning of Agriculture in Goa	26
References.....	30

3	Traditional Ecological Knowledge and Environmental Sustainability in <i>Khazans</i>	33
3.1	Introduction	33
3.2	<i>Khazan</i> Engineering System	34
3.3	Types of <i>Khazan</i> Farms	38
3.3.1	Integrated <i>Khazan</i> Ecosystem Involving Agriculture and Aquaculture	39
3.3.2	Fish Farms or <i>Agor</i> or <i>Khani</i>	42
3.3.3	Salt Pans	42
3.4	Processes Involved in <i>Khazan</i> Farms	44
3.4.1	Harvesting and Processing of Rice	44
3.4.2	Coconut Plucking	46
3.4.3	Harvesting of Fish Through Sluice Gate	46
3.4.4	Fish Migration	47
3.4.5	Lease of Fishing Rights	47
3.4.6	Lunar Calendar	48
3.4.7	Moratorium	48
3.4.8	Fish Processing and Marketing	48
3.5	Role of Women in <i>Khazan</i> Ecosystem	48
3.6	Rules and Regulations	50
3.7	Microorganisms from <i>Khazan</i> Ecosystem and Their Products	50
3.8	Other Flora and Fauna Associated with <i>Khazans</i>	51
3.9	Indicators and Calendars Used by Traditional Communities	52
3.10	Cultural Aspects and Traditions Associated with <i>Khazans</i>	52
3.10.1	Rituals and Festivals	52
3.10.2	Deities	54
3.10.3	Place Names	56
3.10.4	Literature	56
3.11	Traditional Ecological Knowledge in <i>Khazans</i>	57
3.12	Ecological Services Provided by <i>Khazans</i>	58
	References	60
4	Management of <i>Khazan</i> Ecosystems: Contested Environments, Competing Interests and Changing Institutions	61
4.1	Introduction	61
4.2	Historical Evolution of <i>Khazan</i> Management Systems in Goa	62
4.2.1	Pre-Colonial	62
4.2.2	Colonial Period	66
4.2.3	Post-Colonial	70
	References	73

5 Erosion of Indigenous Resource Base: Causes and Challenges	75
5.1 Introduction	75
5.2 Factors Affecting <i>Khazan</i> Ecosystem	76
5.2.1 Ecological Factors	76
5.2.2 Socio-economic Factors	81
5.2.3 Institutional Factors	84
5.3 Recommendations for Conservation of <i>Khazans</i>	88
5.3.1 Carrying Out Strategic Environmental Assessments	88
5.3.2 Reserving Some <i>Khazans</i> as Protected Areas	89
5.3.3 Mainstreaming <i>Khazan</i> Ecosystem Services into Economic and Developmental Planning	89
5.3.4 Combining Indigenous Knowledge with Modern Scientific Knowledge.....	90
5.3.5 Issuing Guidelines for Carrying Out Good Practices and Establishing Certification System	91
5.3.6 Strengthening Local Community Rights to Use <i>Khazan</i> Ecosystem Services.....	91
5.3.7 Introducing Environmental Education Programmes	92
5.3.8 Providing Access to Public to Information and Participation	92
5.3.9 Developing Effective Partnerships.....	92
References	93
6 A Framework for Ecosystem Performance Using <i>Khazan</i> Example	95
6.1 Introduction	95
6.2 Ecosystem Services Provided by <i>Khazan</i>	96
6.3 Ecosystem Performance	99
6.4 Conceptual Framework for <i>Khazan</i> Ecosystem Performance.....	103
6.4.1 Step I.....	106
6.4.2 Step II	107
6.4.3 Step III	107
6.4.4 Step IV	107
6.4.5 Step V	108
References	108
7 Building on Indigenous Resource Management Systems: Key to Finding Solutions	111
7.1 Indigenous Knowledge of Local Ecology	111
7.1.1 Indigenous Indicators	112
7.1.2 Indigenous Ecological Calendars	113
7.1.3 Eco-Friendly Traditional Resource Management Practices.....	113
7.1.4 Use of Locally Available Resources	114
7.1.5 Sustainable Resource Extraction and Harvesting	114

- 7.1.6 Integrated Resource Management Systems 115
- 7.1.7 Role of Indigenous Institutions 116
- 7.2 Traditional and Indigenous Institutions of Resource Management..... 116
 - 7.2.1 Protection to Habitats..... 117
 - 7.2.2 Protection to Some Biological Species 118
 - 7.2.3 Protection to Critical Stages in Life History 118
 - 7.2.4 Organizing Resource Harvests Under the Supervision of a Local Expert..... 119
- 7.3 Other Religious Traditions 120
 - 7.3.1 Creating Local Markets..... 120
 - 7.3.2 Imparting Special Importance to Certain Species..... 121
 - 7.3.3 Raising Awareness and Information Among Community Members..... 122
- 7.4 Benefits of Using IEK in Environmental Management and Issues Related to IEK 124
- 7.5 Key to Finding Solutions..... 125
- References..... 128

- Glossary** 131

- Index**..... 135