

Space Law and Policy

Series Editor

Maria A. Pozza, Gravity Lawyers, Christchurch, New Zealand

Space activities across the Asia-Pacific, specifically in Australia and New Zealand, are increasing and diversifying. Over the last decade, countries in this region have seen significant growth within their national space industries and economies which in turn benefit their wider societies due to the downstream application and use of, space-related technologies, products, and services. This phenomena presents not only a great opportunity for these countries, but also represents a situation necessitating considered and fit-for-purpose space law and policy. Robust yet flexible regulatory regimes are needed if countries in the Asia-Pacific, such as Australia and New Zealand, are to benefit from the strategic and commercial advantages associated with a presence in outer space and functioning domestic space sector. These regulatory regimes must respond to, and address, numerous challenges ranging from adherence to international legal obligations to issues of geo-political space security and military concerns through to questions about how best to regulate and support commercial space endeavours. These myriad factors will have an impact upon how countries develop, implement, and refine their space laws and policies. This series offers a unique perspective from this region and intends to act as a source of knowledge and guidance for space actors across government, the private sector and academia in the pursuit and furtherance of their respective space activities and operations. The contributors to this series are all experts in their field who share a common interest in strengthening space governance via the promotion and development of space law and policy.

Sandeepa Bhat B · Adithya Variath
Editors

Legal Responses to Space Resource Utilisation

 Springer

Editors

Sandeepa Bhat B
The West Bengal National University
of Juridical Sciences
Kolkata, West Bengal, India

Adithya Variath
Jindal Global Law School
O.P. Jindal Global University
Sonapat, Haryana, India

ISSN 2662-9054

ISSN 2662-9062 (electronic)

Space Law and Policy

ISBN 978-981-95-8863-3

ISBN 978-981-95-8864-0 (eBook)

<https://doi.org/10.1007/978-981-95-8864-0>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2026

This work is subject to copyright. All rights are solely and exclusively licensed 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.

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.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd. The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

If disposing of this product, please recycle the paper.

Preface

The journey of this book traces back to our earlier edited volume on the Artemis Accords, which itself emerged from the deliberations at the *Global Conference on Resource Mining in Outer Space: Artemis Accords and Beyond*, an event we curated in 2023. That project brought together an extraordinary range of scholars and practitioners to grapple with the legal and political dimensions of space resource activities and the geopolitics around Artemis Accords. It revealed not only the urgency of the subject but also the diversity of perspectives that could enrich the debate. This present book is a natural continuation of that effort. However, it also marks an important shift in our approach. While the first book, *Artemis Accords and Resource Mining in Outer Space* (Springer, 2025), concentrated primarily on the Artemis Accords and its implications, this second project moves beyond and offers theoretical frameworks, normative debates, and national approaches to the governance of space resources.

The expanding presence of States and private actors in outer space is forcing the international community to revisit fundamental principles of space law. Questions concerning appropriation, benefit-sharing, and cooperation have gained unprecedented prominence. While the United Nations is still deliberating on many of these issues in situating the resource utilisation within broader patterns of international law and diplomacy, this book attempts to capture the evolving landscape of governance of outer space resources.

As we read this book, the field of space mining is undergoing a remarkable transformation. Unprecedented advancements are being made in asteroid mission technologies and the exploration of lunar resources, with private companies announcing ambitious asteroid missions and pursuing the use of lunar regolith for in-situ resource utilisation. These multi-million dollar investments are flowing into critical infrastructure, ranging from next-generation lunar landers to advanced propulsion systems to integration of artificial intelligence in space technologies. These developments underscore the timeliness and urgency of answering the questions explored in this book.

This book is organised into two parts. The first part addresses theoretical and normative frameworks, critically interrogating the foundations of space law and governance in light of emerging resource challenges. The second part examines

diverse national approaches, spanning the United States, China, Australia, the United Kingdom, Japan, New Zealand, and the United Arab Emirates, illustrating how domestic legal developments and strategic choices intersect with international norms. Together, these contributions provide a comprehensive and comparative view of the global discourse on space resource utilisation.

As editors, our intention has been to develop a project where contrasting perspectives can coexist. We have not sought uniformity of opinion but rather diversity and multiplicity of analysis, so that readers can appreciate the richness and complexity of the debate. We believe that such academic disagreements and agreements foster a deeper understanding of the legal, geopolitical, and ethical issues surrounding the exploitation and utilisation of celestial resources.

We remain grateful to the contributors for their intellectual generosity and commitment, and to Springer for once again providing a scholarly home for this project. We are also grateful to Mamun Mishra for her support and belief in this project. We also thank Cynthia Kroonen and Raghavi Jayagopal for coordinating this book project. This book stands as a collective endeavour, enriched by the insight and dedication of all involved. This book is as much a reflection of our contributors' dedication as it is of our own. We hope that it will contribute meaningfully to ongoing discussions on resource utilisation and space governance, inspire future research, and guide policy-makers, industry stakeholders, and academics and scholars in shaping a sustainable framework for space resource utilisation.

Kolkata, India
Sonipat, India

Prof. (Dr.) Sandeepa Bhat B
Adithya Variath

Contents

Theoretical and Normative Frameworks for Space Resource Utilisation	
Changing Legal Dimensions of Mining Space Resources	3
Sandeepa Bhat B	
The Development of an International Legal Framework for Space Resource Activities	19
Stacey Henderson and Joel Lisk	
The Legality of the Appropriation of Space Resources: Current International Framework and Future Legal Developments	37
Leonardo Alberto López Marcos and Charles W. Stotler	
Artemis Accords Diplomacy and Resource Utilisation: Strategic Coalitions and Norms Setting Beyond Multilateralism	63
Adithya Variath	
Space Mining for the Benefit of All? Advancing International Cooperation through Standards and Interoperability in the Artemis Accords and International Lunar Research Station	95
Art Cotterell	
Space Resources in Markets and Politics: Considerations on Property in the Interests of Social and Environmental Welfare	125
Scott Schneider	
Space Diplomacy Toward a Legal Regime for Space Resource Activities on the Moon	151
Nancy Riordan, Miloslav Machoň, and Lucia Kozák Csajková	
Exploitation of Celestial Mineral Resources: Challenges and Solutions	179
G. S. Sachdeva	

National Approaches to Space Resource Utilisation

United States Space Laws: A Roller Coaster of Space Resource Ambition	195
Michelle L. D. Hanlon	
Chinese Legal Response to Space Resource Utilisation	221
Fabio Tronchetti	
Space Resource Utilisation: Legal Developments in Australia	241
Melissa de Zwart	
Industrial Revolution to Economic Evolution: The UK Approach to Outer Space Resources	259
Christopher J. Newman and J. Lauren Napier	
Japan's Space Resources Act: A Legal Approach to Responsible Space Resource Utilisation	279
Yumiko Takatori	
New Zealand, the Artemis Accords and Asteroid Mining: Critiquing the Legal Challenges for Its Indigenous People	301
Anna Marie Brennan	
The UAE's Approach to Space Resource Governance: International Cooperation or National Interests?	317
Chelsea Francek	
Afterword	
Mining the Sky: Reflections, Challenges, and Some Ending Thoughts	337
Karl Grossman	

Editors and Contributors

About the Editors

Sandeepa Bhat B is working as a Professor of Law, Dean—Post Graduate Studies, and the Director of the Centre for Aviation and Space Laws at the National University of Juridical Sciences, Kolkata. He has the teaching and research experience of over twenty-two years after completing his master's degree with first rank and double gold medals in 2003. His seven Major Research Projects are sponsored by the World Bank, ISRO, the WB Judicial Academy, the Ministry of Justice, the Ministry of Environment, Forest and Climate Change, the Ministry of Commerce, and the Government of West Bengal. He holds the unique feat of being the first Indian to be inducted as the UNIDROIT Correspondent for India. He has been a member of four distinguished international bodies, including the American Society of International Law. Dr. Bhat has published thirteen books, nine of which are on aviation and space laws. In addition, he has published more than seventy articles in the journals of international and national repute. He also has the distinction of being a member of the Indian Space Research Organization's Expert Group for drafting the National Space Act for India.

Adithya Variath is an Assistant Professor and Associate Dean at the Jindal Global Law School, O.P. Jindal Global University, India. Adithya was an Elizabeth Moir Scholar at the Oxford India Centre for Sustainable Development at the Oxford Department of International Development, University of Oxford. Before moving to Oxford, he served as an Assistant Professor of Law and founding Coordinator of the Centre for Research in Air and Space Laws at Maharashtra National Law University Mumbai. He is the recipient of the 2025 Sachdeva Award for Space Law. Adithya's research focuses on space and aviation laws, emerging technologies, and global institutional design. He is the recipient of the 2025 Sachdeva Award for Space Law.

Contributors

Sandeepa Bhat B Centre for Aviation and Space Laws, The WB National University of Juridical Sciences, Kolkata, India

Anna Marie Brennan University of Waikato, Hamilton, New Zealand

Art Cotterell Faculty of Law and Justice, University of New South Wales, Sydney, NSW, Australia

Lucia Kozák Csajková Prague University of Economics and Business, Prague, Czech Republic

Melissa de Zwart Andy Thomas Centre for Space Resources, ARC Centre of Excellence in Plants for Space, Adelaide University, Adelaide, South Australia, Australia

Chelsea Francek University of Waikato, Hamilton, New Zealand

Karl Grossman State University of New York at Old Westbury, Old Westbury, NY, USA

Michelle L. D. Hanlon Center for Air and Space Law, The University of Mississippi School of Law, Oxford, MS, USA

Stacey Henderson Jeff Bleich Centre for Democracy & Disruptive Technologies, Flinders University, Adelaide, Australia

Joel Lisk Jeff Bleich Centre for Democracy & Disruptive Technologies, Flinders University, Adelaide, Australia

Miloslav Machoň The Ambis University, Prague, Czech Republic

Leonardo Alberto López Marcos Department of Public International Law, Complutense University of Madrid, Madrid, Spain

J. Lauren Napier Northumbria University, Newcastle, UK

Christopher J. Newman Northumbria University, Newcastle, UK

Nancy Riordan University of Massachusetts, Boston, MA, United States

G. S. Sachdeva Chandigarh University, Mohali, Punjab, India; NALSAR University of Law, Shameer Pet, Hyderabad, India

Scott Schneider Special Counsel, International Aerospace Law & Policy Group, Brisbane, Australia

Charles W. Stotler University of Mississippi School of Law, Oxford, USA

Yumiko Takatori Takatori Law Office, Tokyo, Japan

Fabio Tronchetti Northumbria Law School, Northumbria University, Newcastle upon Tyne, UK

Adithya Variath Jindal Global Law School, O.P. Jindal Global University,
Sonipat, India