

# **Informal Manufacturing and Environmental Sustainability**

This page intentionally left blank

# **Informal Manufacturing and Environmental Sustainability: A Global Perspective**

EDITED BY

**MIHIR KUMAR PAL**

*Vidyasagar University, India*

AND

**PINAKI DAS**

*Vidyasagar University, India*



United Kingdom – North America – Japan – India – Malaysia – China

Emerald Publishing Limited  
Emerald Publishing, Floor 5, Northspring, 21-23 Wellington Street, Leeds LS1 4DL

First edition 2025

Editorial matter and selection © 2025 Mihir Kumar Pal and Pinaki Das.  
Individual chapters © 2025 The authors.  
Published under exclusive licence by Emerald Publishing Limited.

**Reprints and permissions service**

Contact: [www.copyright.com](http://www.copyright.com)

No part of this book may be reproduced, stored in a retrieval system, transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without either the prior written permission of the publisher or a licence permitting restricted copying issued in the UK by The Copyright Licencing Agency and in the USA by The Copyright Clearance Centre. Any opinions expressed in the chapters are those of the authors. Whilst Emerald makes every effort to ensure the quality and accuracy of its content, Emerald makes no representation implied or otherwise, as to the chapters' suitability and application and disclaims any warranties, express or implied, to their use.

**British Library Cataloguing in Publication Data**

A catalogue record for this book is available from the British Library

ISBN: 978-1-83549-999-3 (Print)

ISBN: 978-1-83549-998-6 (Online)

ISBN: 978-1-83608-020-6 (Epub)



INVESTOR IN PEOPLE

*To our beloved students for inspiring the future*

This page intentionally left blank

# Contents

List of Figures and Tables	<i>xi</i>
About the Editors	<i>xv</i>
About the Contributors	<i>xvii</i>
Foreword	<i>xxv</i>
Preface	<i>xxvii</i>
Acknowledgements	<i>xxviii</i>

## **Part I: Conceptual and Theoretical Framework**

<b>Chapter 1 Impacts of Informal Economy on the Glocal Sustainable and Inclusive Development and Sustainability: From the Political Economy and Ethics Perspectives</b>	<b>3</b>
<i>Begum Sertyesilisik</i>	
<b>Chapter 2 Leveraging on the Application of Indigenous Technology in the Informal Manufacturing Sector for Advancing Sustainable Development in Nigeria</b>	<b>15</b>
<i>Abu Aminu and Kediehor Collins</i>	
<b>Chapter 3 Foreign Capital Inflow and Expansion of Subcontracting in the Informal Manufacturing Sector: A General Equilibrium Approach</b>	<b>29</b>
<i>Akash Dandapat, Pinaki Das and Soumita Dasgupta</i>	

<b>Chapter 4 Informal Economy and Environmental Sustainability: An Optimal-Growth Theoretic Analysis</b>	45
<i>Mainak Bhattacharjee</i>	

<b>Chapter 5 Economic Enhancement Through Green Innovation in Informal Manufacturing Sector of Bangladesh: An Analysis</b>	57
<i>Muhammad Mahboob Ali, José G. Vargas-Hernández and Jorge H. Zamudio-Abdala</i>	

<b>Chapter 6 Unconditional Cash Transfers, Environmental Degradation and Sustainable Livelihood in an Informal Economy: A Trade-Theoretic Perspective</b>	67
<i>Nilavo Roy and Kausik Gupta</i>	

**Part II: Nature of Growth and Productivity of Informal Manufacturing**

<b>Chapter 7 Growth Performance of the Unorganised Manufacturing Sector in India During 1984–85 to 2015–16: An Activity Level Analysis</b>	83
<i>Mousumi Mitra</i>	

<b>Chapter 8 Pattern of Growth of Unorganized Food and Beverage Enterprises: An Analysis Across States of India</b>	101
<i>Debashruti Jana, Mihir Kumar Pal and Akash Dandapat</i>	

<b>Chapter 9 Informal Manufacturing Sector Job Displacement Due to COVID-19 Pandemic: Myth or Reality?</b>	115
<i>Shrabanti Maity, Paramita Bakli and Snigdha Sarangi</i>	

<b>Chapter 10 Total Factor Productivity Growth of Formal and Informal Manufacturing Industries in India: An Insight From the KLEMS Database</b>	129
<i>Susobhan Maiti and Chandrima Chakraborty</i>	



**Part III: Environmental Pollution of Informal Manufacturing Enterprises**

- Chapter 11 Does Environmental Pollution Impact the Ownership of Informal Enterprises in Indian Cities?** 143  
*Sabyasachi Tripathi and Jyoti Chandiramani*
- Chapter 12 Environmental Pollution by the Informal Manufacturing Enterprises in Bangladesh: The Question of Sustainable Development and Environmental Governance** 161  
*Debasish Nandy*
- Chapter 13 Nexus Between Environment and Informal Economy: Analysis of BRICS Economies** 175  
*Nilendu Chatterjee*
- Chapter 14 Status of Growth of Informal Manufacturing Enterprises of India and Its Role on the CO<sub>2</sub> Emission Intensity** 191  
*Pinaki Das and Akash Dandapat*
- Chapter 15 Impact of Informal Manufacturing Sector on Environmental Degradation: Evidence From Emerging Asian Economies** 207  
*Swati Sinha Babu and Sk Md Abul Basar*
- Chapter 16 Impact of Growth of Informal Manufacturing Activity on Environmental Sustainability and Aggregate Economic Activity: Global Perspectives** 221  
*Suparna Banerjee and Aparna Banerjee*

**Part IV: Drivers, Barriers, Solutions and Best Practices for Informal Manufacturing in a Green Economy**

- Chapter 17 Manufacturing, Consumption, and the Recycling of Nature-Resistant Materials and Environmental Sustainability of Lagos, Nigeria** 237  
*Moses Metumara Duruji and Omolola Silva Asagba*

<b>Chapter 18 Organizational Socioecology: Regulation and Green Technological Innovation</b>	251
<i>José G. Vargas-Hernández, Omar A. Guiñette-Barbosa, Selene Castañeda-Burciaga, Francisco J. González-Ávila and M. C. Omar C. Vargas-González</i>	
<b>Chapter 19 Green Growth Through Micro-Entrepreneurship: Empowering Women for Sustainable Development in West Bengal</b>	265
<i>Shama Firdaush, Shiuli Baidya, Upali Bera and Satyanarayan Kumbhakar</i>	
<b>Chapter 20 The Community Participation of Tribal People Through Informal Manufacturing for a Green Economy and Sustainable Development</b>	279
<i>Swapan Kumar Maity and Golam Ahammad</i>	
<b>Chapter 21 Unravelling Bangladesh's Informal Manufacturing Sector With a Focus on Textile and Garments</b>	293
<i>Naman Mishra, Megha Jain, Palakh Jain and Nilanjan Chattopadhyay</i>	
Index	305

# List of Figures and Tables

## Figures

Fig. 1.1.	Relationship Between Sustainable and Inclusive Glocal Development and Strategically Effective Political Economy to Deal With IE.	8
Fig. 3.1.	Conceptual Framework.	33
Fig. 3.2.	Capital Inflow in Formal and Informal Enterprises.	38
Fig. 5.1.	Conceptual Framework.	61
Fig. 6.1.	Determination of Equilibrium Interest Rate and Output of Informal Manufacturing Sector.	73
Fig. 6.2.	Effect of UCT on Interest Rate and Output of Informal Manufacturing Sector.	74
Fig. 8.1.	Relative Share Food & Beverage Enterprises Vis-à-Vis Other Enterprises in Terms of Number of Enterprises, Employment and GVA.	107
Fig. 9.1.	Structural Break Points of Rural Male.	122
Fig. 9.2.	Structural Break Points of Urban Male.	123
Fig. 9.3.	Structural Break Points of Total Male.	123
Fig. 11.1.	The Spatial Concentration of Workers and Consumers (i.e. Producers of Consumer Products) Is Circular in Causality.	147
Fig. 13.1.	Per Capita CO <sub>2</sub> Emission in BRICS Economies 2000–2020.	177
Fig. 13.2.	EF in BRICS Economies 2000–2022.	178
Fig. 14.1.	Analytical Framework.	195
Fig. 16.1a.	Total Kerosine Consumption vs GDP Growth.	229
Fig. 16.1b.	Total Kerosene Production vs GDP Growth.	230

*xii List of Figures and Tables*

Fig. 16.2a.	Sector wise Absolute Consumption of Total Kerosene.	231
Fig. 16.2b.	Sector wise Relative Consumption (%) of Total Kerosene.	231
Fig. 19.1.	The Percentage Share of Women Entrepreneurs Engaged in Different Types of Entrepreneurial Activities.	271
Fig. 19.2.	Percentage Share of Empowered Women Across the Indicators of Empowerment in Three Backward Districts of West Bengal.	272
Fig. 19.3.	Percentage Share of Women Entrepreneurs by the Nature of Challenges.	274
Fig. 21.1.	Percentage of Labour Force in Informal Economy.	297
Fig. 21.2.	Growth of Export of the RMG.	297
Fig. 21.3.	Number of Garment Factories.	298

**Tables**

Table 7.1.	Share of Employment and Gross Value Added of Fifteen Major Activities of the UMS.	88
Table 7.2.	Growth Rate of Employment, GVA and Labour Productivity of the UMS Activity-Wise During 1984–85 and 1994–95, 1994–95 and 2005–06 and 2005–06 and 2015–16.	91
Table 7.3.	Logit Regression Results.	96
Table A1.	Concordance Table for Adjustment of Data over Various Rounds of the NSSO	98
Table 8.1.	AAGR of Food and Beverages Industries Across the Major States of India, 2010–2011 to 2015–2016.	108
Table 8.2.	Percentage Share of Enterprises by the Status of Growth Across States of India.	109
Table 8.3.	Determinants of Status of Growth (STGR) of Food and Beverage Industries.	112
Table 9.1.	Description of Variables.	120

Table 9.2.	Descriptive Statistics and Phillips-Perron Unit Root Test of the Number of Days Actually Worked in a Week (CWS).	121
Table 9.3.	Growth Rate of Average No. of Days Actually Worked in a Week With Broad Status in Employment in CWS for Male.	124
Table 10.1.	Year Wise TFPG of Manufacturing <i>t</i> Industries for the Period 1981–1982 to 1999–2000.	136
Table 10.2.	Year Wise TFPG of Manufacturing Industries for the Period 2000–2001 to 2019–2020.	137
Table 10.3.	Average and Overall TFPG of Manufacturing Industries for the Period 1981–2020.	138
Table 11.1.	Ownership Types of Enterprises at All India and Metropolitan Levels, 2015–2016.	150
Table 11.2.	Statistical Analysis for a Micro-Level Factors.	151
Table 11.3.	Probit Regression Coefficients for the Micro Factors Influencing Business Ownership.	152
Table 11.4.	Total Variance Explanation.	154
Table 11.5.	Coefficients of Probit Regression for the Macro Variables Affecting Company Ownership.	156
Table 13.1.	Outcome of Panel Cointegration Test (Pedroni Residual) for CO <sub>2</sub> and IE and for IE and EF.	183
Table 13.2.	Wald Test – Short-Run Causality.	186
Table 13.3.	Long-Run Effects of IE on CO <sub>2</sub> and EF in BRICS Economies.	187
Table 14.1.	Number and Employment (in ‘000) of Informal Manufacturing Enterprises by Status of Growth.	198
Table 14.2.	CO <sub>2</sub> Emission Intensity by the Status of Growth of Enterprises.	199
Table 14.3.	Result of Pooled Regression Model of CO <sub>2</sub> Emission Intensity.	200
Table 15.1.	Descriptive Statistics of the Considered Variables.	212
Table 15.2.	Correlation Among the Variables.	213
Table 15.3.	Fixed Effect and Random Effect Panel Regression Results for All Countries.	213
Table 16.1.	Results of Correlation Analysis.	229

Table 17.1.	Primary Forms of Plastic Imported to Nigeria and Use.	241
Table 17.2.	List of Registered Recyclers for Household Collection and Their Local Areas.	246
Table 19.1.	Multidimensional Disempowerment Indices Among the Women Micro-entrepreneurs and Non-entrepreneurs.	273
Table 19.2.	Results of Ordered Logit Model: Determinants of Women's Disempowerment.	274
Table 20.1.	Tribal Informal Manufacturing and Their Sustainable Alternatives.	282
Table 20.2.	Overview of Products, Sales, and Funding for Informal Manufacturing at Van Dhan Vikas Kendras in India.	286

## About the Editors

**Mihir Kumar Pal**, PhD, is a Professor, Department of Economics, Vidyasagar University, India with more than 25 years of research and teaching experience. He was awarded Gold Medal at both UG and PG level in Economics from the University of Kalyani. He has completed a number of research projects under UGC and published several books, articles in reputed national and international journals. His areas of research interest are Environmental Economics, Industrial Productivity, Capacity Utilisation and Applied Econometrics.

**Pinaki Das**, PhD, is a Professor and former Head of the Department of Economics at Vidyasagar University, India, awarded a gold medal in MSc Economics. He has directed major research projects funded by DST, UGC and ICSSR. He coordinated a MOOC on the Indian Economy and has got over 100 seminar presentations and 63 research publications in internationally reputed journals. He has also authored six books on topics such as Rural Non-Farm Employment and Social Protection Programmes in India, earning acclaim in academic circles.

This page intentionally left blank



## About the Contributors

**Golam Ahammad** was a research scholar in the Department of Education, Sidho-Kanho-Birsha University, Purulia, India. Under the careful guidance of his research supervisor Dr Swapan Kumar Maity, he has published research papers in national and international journals, and written a few chapters in the field of environmental education, educational technology and peace education.

**Abu Aminu**, PhD, is a Senior Lecturer in Co-operative Economics and Management at Auchi Polytechnic, Nigeria. With a PhD in Environmental Economics and Policy, he specialises in Decarbonisation, Green Energy Transition, Just Transition, Climate Change Resilience and Sustainable Development. As research fellow at the Johnbosco Research Institute, he has extensively studied the informal economy, published numerous papers and presented at various national and international conferences. He has also mentored many postgraduate and professional students.

**Muhammad Mahboob Ali** is a Chairman, Center for Breakthrough Thinking in Bangladesh. He was former Professor of Economics and Founder Programme Coordinator, Entrepreneurship programme at Dhaka School of Economics, University of Dhaka, Bangladesh. With extensive academic qualifications including a Postdoctoral in Entrepreneurship from Thailand, PhD in Macroeconomics and more, he has held significant roles such as Vice Chancellor and Dean at Presidency University, Bangladesh, and Director at Daffodil International University. Ali has contributed as a peer reviewer, editorial board member and quality assurance expert across various international journals and organisations. His career began in banking, and he has been actively involved in editorial and academic leadership roles globally.

**Omolola Silva Asagba** is a postgraduate researcher from Covenant University, Ota, Nigeria in the Department of International Relations.

**Swati Sinha Babu** is currently working as an Assistant Professor in the Department of Economics, Sidho-Kanho-Birsha University, Purulia, India. She has been teaching at the post graduate and under graduate level for the last 10 years. Her research interests include environmental economics, development economics and gender issues. She has published papers in journals of international repute, including *Inderscience*, *Springer* and *Taylor and Francis*.

**Shiuli Baidya** is a research scholar in the Department of Economics, Vidyasagar University, India. She works as a field investigator in the ICSSR Project at Vidyasagar University. She received a gold medal in BSc and achieved second position in MSc. She has a Diploma in Data Science in Vidyasagar University. Her research interest revolves around Women's empowerment, micro-finance and micro-entrepreneurship.

**Paramita Bakli** gained her MSc degree from Vidyasagar University in the year 2023. She had specialisation in agricultural economics. She is currently a research scholar in the Department of Economics, Vidyasagar University, India. She is pursuing her PhD under the supervision of Dr Shrabanti Maity. Her area of interest is in applied econometrics, human facets, crime economics and study areas related to women. She was employed as a research assistant under ICSSR funded research projects.

**Aparna Banerjee** is currently working as an Assistant Professor of Economics in Serampore College, West Bengal, India. She had been awarded both MSc Degree and Doctoral degree in Economics from Calcutta University. She attended and presented various papers in both International/National workshops/seminar/conferences. She had almost 25 publications in reputed International/National Journals/Edited books such as *Elsevier*, *ITUP*, etc. She has research interests in various fields of Economics.

**Suparna Banerjee** is currently working as an Associate Professor in Bangabasi Evening College, Kolkata, India. She had been awarded MSc Degree from Calcutta University and Doctoral degree from Jadavpur University. She attended and presented various papers in both International/National workshops/seminar/conferences. She had almost 21 publications in reputed International/National Journals/Edited books and she is also author of some text books. She had research interests in various fields of Nanoscience.

**Sk Md Abul Basar** is currently working as an Assistant Professor in Economics at Sidho-Kanho-Birsha University, Purulia, India. He received his MPhil and PhD Degree from Vidyasagar University. He has more than 5 years of teaching experience at Postgraduate level. He has published his paper in internationally reputed journals including *Sage*, *Springer-Nature* and Other prestigious publication houses. His thrust areas of research include food security, nutritional security, gender issues, social protection and poverty.

**Upali Bera** is a graduate student from Department of Statistics, Kirori Mal College, University of Delhi, India, majoring in Statistics with Hons.

**Mainak Bhattacharjee** is presently an Assistant Professor in Economics at Loreto College, Kolkata, India and formerly in The Heritage College, Kolkata, India. He has obtained MPhil and MA degrees in Economics from the Jadavpur University, Kolkata. He has been working in the areas of Macroeconomics and

International Trade. He has contributed many research articles in reputed journals and chapters in edited volumes with international publications, along with having a number of undergraduate level textbooks to his credit.

**Selene Castañeda-Burciaga**, with MA and dual PhD degrees in Education and Strategic Business Administration, is currently affiliated with the Polytechnic University of Zacatecas and the Autonomous University of Fresnillo. Her career spans administrative, financial and teaching roles in education, earning her membership in the Mexican National System of Researchers. Her primary research focuses on emotional intelligence within the educational sector and anxiety among university students, alongside other administrative studies.

**Chandrima Chakraborty**, PhD, is working an Assistant Professor in the Department of Economics, Vidyasagar University, India. Her major area of academic interest includes applied econometrics, Industrial growth, Productivity and Efficiency, Environmental economics, Gender studies, Health as well as Education.

**Prof Jyoti Chandiramani** is presently the Director Symbiosis School of Economics, Dean Faculty of Humanities and Social Sciences and Head, Symbiosis Centre for Urban Studies – Symbiosis International (Deemed) University, India. Her research interests are aligned with the Indian economy, urban economic development as well as international development cooperation. She has been keenly following the implementation and progress of the Sustainable Development Goals in her research. She has published number of papers in reputed journals on urban infrastructure, crowdfunding, urban transport policy, socio-economic growth of urbanisation in South Asia and others.

**Nilendu Chatterjee**, PhD, is an Assistant Professor in the Department of Economics at Bankim Sardar College, affiliated with the University of Calcutta, India, who specialises in Resource, International, Econometrics and Development Economics. He has published extensively in international journals and edited volumes. Chatterjee led a significant research project on ‘Forestry, Fishery, and Sustainable Livelihood’ in the Indian Sundarbans, funded by the Indian Council of Social Science Research – Eastern Regional Council.

**Nilanjan Chattopadhyay** is the Dean of School of Management at Bennett University, India. Prior to this he has worked with institutions like IMT Ghaziabad, SPJIMR Mumbai, IIFT New Delhi, Presidency University Bangalore, Manipal University Jaipur and Dubai. He has chaired sessions at renowned conferences all over the world and his research papers are published in reputed indexed international journals. He holds a Doctoral degree in Management from the University of Rajasthan and he is a merit holder from ICWAI.

**Kediehor Collins**, PhD, is a Senior Lecturer in the department of Mass Communication, Dennis Osadebay University, Asaba, Nigeria. He holds a BSc in Mass Communication, Masters of Arts in Theatre and Media Studies and a PhD in Media Studies. His research interests include development communication, journalism and media studies, public relations and advertising. He has written

several research papers and attended many national and international leaned conferences.

**Akash Dandapat** is working as an Assistant Professor of Economics at Dukhual Nibaran Chandra College, Murshidabad, India. He was an ICSSR Doctoral Fellow at the Department of Economics, Vidyasagar University, India. He worked as a Junior Research Fellow at IIT Kharagpur. He received MPhil in Economics from Vidyasagar University. He has qualified UGC-NET five times and received Gold medal in BSc and MSc for securing first position. He has published some papers in reputed peer-reviewed journals. He has a deep research interest in the informal manufacturing sector.

**Soumita Dasgupta** is pursuing PhD at the Department of Economics, Vidyasagar University, West Bengal, India. She worked as a Research Assistant at Indian Institute of Technology, Kharagpur. She has completed MPhil in Economics from Vidyasagar University. She was awarded Silver medal in MSc in Economics for securing the second position. She has published some papers in reputed peer-reviewed journals. She has deep research interest in the informal sector of India.

**Moses Metumara Duruji** is an Associate Professor of Political Science, Covenant University, Ota, Nigeria. Duruji is an alumnus of Harry Frank Guggenheim Foundation. He was the pioneer chairman of Covenant University Conference on E-Governance in Nigeria (CUCEN) and Covenant University Conference on Leadership and Development (CUCLD). Duruji is the editor-in-chief of Covenant University Journal of Politics and International Affairs (CUJPIA) and has published widely in local and international academic outlets. He is author of 'Ethnic Militia and Sub-Nationalism in Nigeria'.

**Shama Firdaush** currently serves as an Assistant Professor of Economics at Jogamaya Devi College, Kolkata, India. Formerly, she was an ICSSR Doctoral Fellow at the Department of Economics, Vidyasagar University, India. With a focus on social well-being, her research interests encompass domestic violence, women's empowerment, poverty, child health and deprivation and the informal sector. She has authored more than 12 research articles for publication in national and international peer-reviewed journals, some of which are indexed in Scopus.

**Francisco J. González-Ávila** is PhD in Administration, Research Professor and currently Director of the National Technological Institute of México at Higher Technological Institute of Fresnillo. He has published several articles on management.

**Omar A. Guirette-Barbosa** holds a PhD in Administration and serves as a Research Professor at the Polytechnic University of Zacatecas, specialising in management systems 9001, 17025, 22001 and 14001. With a strong research and academic background, he has extensively contributed to these areas. As a full-time researcher and a lead evaluator for the Mexican Accreditation Entity (EMA), Guirette Barbosa is dedicated to advancing management systems' understanding and ensuring compliance with international standards.

**Kausik Gupta** is a Professor and currently the Head of the Department of Economics, University of Calcutta, West Bengal, India. He is also the former Vice Chancellor of West Bengal State University, Barasat. He did his postgraduation from University of Calcutta, PhD from Jadavpur University, postdoctoral research (as a World Bank Environmental Economics Post-Doctoral Fellow) from the University of York, UK. His main areas of specialisation are international economics and environmental and resource economics and he has published a large number of research papers in reputed international and national journals in these areas.

**Megha Jain** is currently an Assistant Professor in Shyam Lal College (M), University of Delhi, India. She has MBA (Finance) from FMS, Delhi, and graduated from Shri Ram College of Commerce. She has several renowned international research papers and book chapter publications to her credit. She has been accorded with best paper awards by IITs and IIMs. She is affiliated with NCAER, SIAM, etc. She has served as a Co-PI in ICSSR sponsored projects in past along with one project by IoE, University of Delhi. She has served in an Auto MNC giant for more than a decade post her MBA from FMS.

**Palakh Jain** is an Associate Professor in the School of Management at Bennett University, India, and Independent Director on Board of few companies. She has research interests in outward FDI, international economics and labour economics. She holds a PhD in Economics from Indian Institute of Management, Ahmedabad alumnus of Delhi School of Economics, University of Delhi. She has been chosen as the 'Exclusive 20 Emerging Female Leaders' from India by Women in The World, New York. She has authored many books and writes regularly for leading national and international newspapers/magazines on various issues.

**Debashruti Jana** is pursuing PhD at the Department of Economics, Vidyasagar University, West Bengal, India. She has completed MPhil in Economics from the Department of Economics, Vidyasagar University, West Bengal, India. She has deep research interest in the MSMEs sector of India. She has published some papers in peer-reviewed journals.

**Satyanarayan Kumbhakar** is an ICSSR doctoral fellow pursuing his PhD research from Department of Economics, Vidyasagar University, India. He is actively publishing his work in national and international peer-reviewed journals and book chapters. He is an expert in field investigation and data processing. His research interests embrace health economics and development economics and social welfare economics.

**Susobhan Maiti**, PhD, is an Assistant Professor in the Department of Economics, Jain (Deemed-to-be University), Bangalore, India. He has published many research papers in the area of industry, macroeconomics and development economics in both national and international journals.

**Shrabanti Maity** earned her MSc in Economics, focusing on Statistics and Econometrics, from the University of Calcutta, followed by a PhD from The

University of Burdwan, and completed her postdoctoral research at Ghent University, Belgium. She is now an Associate Professor of Economics at Vidyasagar University, West Bengal, India. With over 80 publications in esteemed journals and edited books, She has also supervised six PhD and three MPhil dissertations, with five PhD candidates currently under her guidance. She authored 'A Study of Measurement of Efficiency', published by Verlag Dr Muller (VDM), and specialises in Applied Econometrics, Human Development, Gender Studies, etc.

**Swapan Kumar Maity** is an Assistant Professor in the Department of Education, Sidho-Kanho-Birsha University, Purulia, India. In his long and illustrious career in the field of education he has published many research papers in national and international journals in the field of value education, educational technology and economics of education. His published book includes 'Inflation of Different Dimensions and Education', 'Education in the Transforming World', 'Modern Technology and Education' and 'Yoga Education-an Introductory Course Book'.

**Naman Mishra** is a Postgraduate Researcher from FS University, India, where he has been actively contributing to the field of Economics by means of various papers, articles and op-eds. His major research areas include green economics, sustainability goals, industrial dynamics as well as a focus on the amalgamation of technology 4.0 and economics.

**Mousumi Mitra** is working as an Assistant Professor in Economics in Seva Bharati Mahavidyalaya, Jhargram, West Bengal, India. She received MSc, MPhil and PhD degree from University of Calcutta. She has research interest in labour economics, industrial economics and informal sector economy. She has some publications in reputed journals.

**Debasish Nandy**, PhD, serves as an Associate Professor in Political Science at Kazi Nazrul University, India, and coordinates their Centre for Studies of South and South-East Asian Societies. He has held Visiting Faculty positions at Tajik National University, where he was also honoured as the Indian Cultural Ambassador to Tajikistan by the Tajik Society of Friendship with Foreign Countries in 2019. Additionally, Dr Nandy contributed as Visiting Faculty to the University of Dhaka's Department of Japanese Studies in 2022 and Frankfurt University of Applied Sciences, Germany.

**Nilavo Roy** is an Assistant Professor in the Department of Economics, Loreto College, Kolkata, India. He completed his postgraduation in Economics from University of Calcutta and is currently pursuing his PhD in the Department of Economics, University of Calcutta. His research interests include development microeconomics, labour economics and international economics.

**Snigdha Sarangi** gained her MA degree from Vidyasagar University in the year 2021. She had specialisation in econometrics. She is currently a research scholar in the Department of Economics, Vidyasagar University, India. She is pursuing her PhD under the supervision of Dr Shrabanti Maity. Her area of interest is in applied econometrics, human facets, crime economics and study areas related to

women. She was employed as a research assistant under NABARD funded by R&D.

**Begum Sertyesilisik** is a Professor in the Faculty of Architecture at the Istanbul University, Türkiye. She has been awarded her PhD degree at the Middle East Technical University, and her MSc, MBA and BSc degrees at the Istanbul Technical University. She has been specialised in sustainable built environment, sustainable construction project management and sustainability.

**Sabyasachi Tripathi** works as an Associate Professor at Symbiosis School of Economics, India. At the National Research University Higher School of Economics, Moscow, Russia, he completed a postdoc on urbanisation and innovation in developing countries. He earned a PhD from the University of Mysore through the Institute for Social and Economic Change (ISEC). ISEC, Bangalore, awarded him the Shri T R Satishchandra Memorial Best Thesis Prize in Economics. His research focuses on urbanisation, economic growth, poverty and inequality. He is among India's top 100 economists, ranked by the IDEAS/REPEC as of February 2024.

**M. C. Omar C. Vargas-González** is a Professor and Head of the Department of Systems and Computing at the Technological National of Mexico Campus Ciudad Guzmán, Professor of Telematics Engineering at the University Center of the South of the University of Guadalajara, with a master's degree in Computer Systems. He has received training in Entrepreneurship and Multidisciplinary Innovation at Arizona State University (2018) as well as a diploma in Ecosystems of Innovation and Entrepreneurship from the Harvard University School of Business. He currently conducts research in diverse areas such as entrepreneurship, economics, statistics, mathematics and information and computer sciences, has collaborated in the publication of more than 15 articles in magazines and directs innovation and technological development projects.

**José G. Vargas-Hernández** is currently a Research Professor at National technological Institute of México, ITS Fresnillo and a Research Professor at Broward International University (Miami). He is a member of the National System of Researchers of Mexico. Professor Vargas-Hernandez holds a PhD in Economics from Keele University and a PhD in Public Administration from Columbia University. His main research is in organisational economics and strategic management. He teaches for several doctoral programs and has won 17 international awards. His main research focuses on the organisational economics, and green economy in sustainable green urban planning for urban green innovation areas.

**Jorge H. Zamudio-Abdala** has a doctorate in administrative sciences, master's in administration with a degree in management skills and bachelor's degree in administrative computing and psychology. With more than 30 years of work experience, his last job at Petróleos Mexicanos (29 years) was as technical support to end users. He has more than 12 years of experience as a teacher for bachelor's, specialty and master's degrees in three modalities, online, hybrid and in-person.

This page intentionally left blank



# Foreword

In the contemporary discourse of inclusive and sustainable development, the intersection of informal manufacturing with environmental sustainability emerges as both a challenge and an opportunity of unparalleled significance. In this perspective, the book entitled, 'Informal Manufacturing and Environmental Sustainability: A Global Perspective' arrives as a timely and important contribution to our understanding of this complex nexus. As the invited author to pen this book foreword, I am both honoured and humbled to introduce a work that encapsulates the essence of global efforts to harmonise inclusive development with ecological sustainability. A comprehensive and interconnected collection of chapters in the book also provides useful directions for future research along with fine-tuning of existing policies and institutions.

The editors, Professor Mihir Kumar Pal and Professor Pinaki Das, have curated a volume that stands distinct for the depth, breadth and diversity of perspectives and issues in its coverage. Through meticulous and logical organisation of the book into four distinct yet interconnected parts, they have comprehensively interlaced a narrative that captures the multifaceted relationships between informal manufacturing sector and the environment. This book is not merely an academic exercise. It is also a clarion call for necessary interventions and reflections on the part of policymakers, industry stakeholders, academicians and civil society along with the people at large.

The contributors to this volume, hailing from varied geographical and disciplinary backgrounds, bring forth insights based on rigorous research and enriched with varied local contexts and dynamics. The chapters serve as a testament to the global nature of the challenges at hand, while also highlighting the local level intervention strategies that hold the potential for a broader applicability. From the emerging markets of Lagos (Nigeria), to the informal manufacturing heartlands of India and Bangladesh, this book takes readers on a journey through the landscapes of this important sector, revealing the inherent possibilities for inclusive and sustainable industrial transformation.

What sets this volume apart is its unwavering focus not only in delineating the problems, but also elucidating the pathways towards inclusive and sustainable solutions in the contemporary development discourse. In addressing the environmental impacts of informal manufacturing, the book focuses on the complexities of policymaking, technological innovation, gender empowerment and community participation. It also advocates for a holistic approach that recognises

the interconnectedness of economic growth, inclusiveness and environmental sustainability.

As the world grapples with the dual imperatives of advancing economic development and ensuring environmental sustainability, the insights offered in this book are more relevant than ever. The 2030 Agenda for Sustainable Development, with its well-defined Sustainable Development Goals (SDGs), provides a global blueprint for necessary interventions. In this connection, the book 'Informal Manufacturing and Environmental Sustainability: A Global Perspective' contributes to this global agenda by highlighting the critical role of the informal sector – a sector that requires greater emphasis on mainstream discourses of inclusive and sustainable development.

In closing, I would like to commend the editors and contributors for their efforts in bringing this book to fruition. Their collective works not only enrich our understanding of the related issues and dynamics, but also inspires hopes and actions towards a more sustainable and equitable world. Thus, the ideas and analyses presented in the book will provide useful insights in respect of both future research and policies. May this volume serve as an encouragement, guiding the readers towards innovative strategies and interventions for sustainable development in informal manufacturing and beyond!

Professor Pulak Mishra  
Professor  
Humanities and Social Sciences  
Indian Institute of Technology Kharagpur  
India

# Preface

In a world increasingly defined by the push and pull between economic growth and environmental stewardship, the informal manufacturing sector stands at a unique crossroads. This sector, vibrant with activity, serves as the backbone of economies, particularly in developing and emerging nations. Yet, it navigates the complexities of sustainability and environmental impact, often outside the formal regulatory frameworks that guide its formal counterparts. 'Informal Manufacturing and Environmental Sustainability: A Global Perspective' illuminates this critical, yet underexplored, terrain where economic livelihoods intersect with environmental challenges, offering fresh insights into a global issue that touches millions of lives.

The genesis of this volume lies in a simple, yet profound realisation: the informal manufacturing sector, despite its significant contributions to global economies, remains largely overlooked in academic and policy discussions on environmental sustainability. This oversight not only underestimates the sector's impact on the global environmental landscape but also overlooks the potential pathways to harmonising economic activities with sustainable practices. The present volume aims to bridge this gap. It endeavours to bring to the fore the intricate dynamics of informal manufacturing, highlighting both its economic indispensability and its environmental footprints. By offering a global perspective, it sheds light on the diverse challenges and innovative sustainable practices emerging within this sector across different geographies.

Moreover, the rationale for this book is anchored in the urgency of the times we live in. As the world grapples with escalating environmental crises and strives towards the Sustainable Development Goals (SDGs), understanding and integrating informal manufacturing into the sustainability discourse is not just relevant but necessary. Through this publication, we seek to catalyse a more inclusive and comprehensive approach to environmental sustainability, one that recognises the nuances of informal manufacturing and leverages its potential for positive change.

This volume is conceived as a timely and significant contribution to the discourse on sustainable development. It aims to foster a deeper understanding of the role of the informal manufacturing sector in global economies and its critical relationship with the environment, paving the way for policies, research and practices that embrace sustainability at their core.

The informal manufacturing sector, often termed as the unorganised sector, encompasses a vast and diverse portion of the global economy, operating beyond formal regulatory confines. This sector includes a variety of activities such as

handicrafts, cottage industries, micro-enterprises, small-scale industries and home-based production. It plays a pivotal role in offering employment, income and livelihood opportunities to millions, particularly in developing and emerging countries. The International Labour Organization (ILO) highlights its significance, as it contributes 15% of global GDP and 60% of the global workforce. With over 500 million workers employed in informal manufacturing, it represents a substantial share of manufacturing employment across different income levels – 80% in low-income, 60% in lower middle-income and 40% in upper middle-income countries (ILO, 2013).

In some emerging economies, informal manufacturing plays a significant role in the industrial sector. For instance, in 2015–2016, it accounted for 84.4% of the total manufacturing employment and 24.6% of the total manufacturing output in India. The respective proportions in China were 41.3% and 15.9% and Brazil 26.1% and 10.5%. The unorganised manufacturing employment is more prevalent in Southern Africa than in Latin America with Angola having the highest share of unorganised manufacturing employment (87.6%), followed by Zimbabwe (78.3%) and Zambia (75.4%). Among the Latin American countries, Venezuela has the highest share (52.7%), followed by Argentina (47.8%), Colombia (47.3%), Mexico (38.5%) and Uruguay (34.3%) (ILO: Statistics on Informal Economy). According to the 2022 World Bank report, informal enterprises account for one-third of all enterprises in the manufacturing sector in emerging market and developing economies (EMDE). That is a significant portion of employment has been generated in unorganised manufacturing in numerous countries in the world. Despite employment and income, the informal manufacturing also offers some opportunities and benefits, such as contributing to local economic development and social inclusion; enhancing innovation and entrepreneurship; promoting cultural diversity and traditional skills; reducing dependence on imports and foreign exchange; and engaged poor and marginalised people (Das et al., 2021; Das & Dandapat, 2021; Ganguly, 2018; Marjit & Kar, 2009; Rani & Unni, 2004).

However, the unorganised manufacturing also poses serious environmental challenges, as it often relies on inefficient and polluting technologies, consumes large amounts of natural resources, generates high levels of emissions and wastes and lacks adequate environmental management and compliance mechanisms with environmental standards and regulations. These environmental impacts not only affect the health and well-being of the workers and communities involved in informal manufacturing, but also undermine the long-term sustainability of the sector and the economy as a whole (Saget et al., 2022). The high incidence of informal in manufacturing is also a major challenge for the realisation of decent work for all and sustainable and inclusive development (Das et al., 2022, 2023; Pal, 2023). Therefore, informal manufacturing is a vital component of the global economy that requires appropriate policy interventions and support from various stakeholders, such as governments, civil society, private sector and international organisations. Moreover, in the context of sustainable development, which aims to balance the economic, social and environmental dimensions of human progress, there is an urgent need to address the environmental challenges and opportunities of informal manufacturing.

This volume aims to explore the intricate dynamics of informal manufacturing and its environmental implications within the framework of sustainable development. The edited volume sets forth several objectives: (a) To offer a comprehensive overview of the informal manufacturing sector's current state and environmental impacts worldwide, with an emphasis on developing and emerging economies; (b) To analyse the sector's growth, productivity, efficiency and competitiveness, exploring the causes and consequences of environmental pollution and examining energy emissions and intensity; (c) To investigate the drivers and barriers to environmental performance and innovation within the sector, identifying factors that facilitate the adoption of cleaner production technologies and practices; and (d) To highlight best practices, policies and perspectives that support informal manufacturing within a green economy framework, providing policy recommendations and directions for future research and action.

The volume is meticulously structured into four distinct parts, each delving into different facets of informal manufacturing and its interplay with environmental sustainability. This structure is designed to guide readers through a comprehensive exploration of the sector, from foundational theories to practical solutions for fostering a greener economy. Below is an overview of the key themes and focus areas of each part.

Conceptual and Theoretical Framework (Part I) is the initial section which lays the groundwork for understanding the complex relationship between informal manufacturing and sustainable development. It introduces readers to the essential concepts and theories that elucidate the impact of informal manufacturing on the environment and global economy. Topics covered include the application of indigenous technology in promoting sustainable development, the effects of foreign capital inflow on informalisation and the relevance of optimal-growth theory to environmental sustainability. This part serves as a critical foundation for the discussions that follow, framing informal manufacturing within the broader discourse on sustainability.

Nature of Growth and Productivity of Informal Manufacturing, part II, shifts focus to the economic dimensions of informal manufacturing, examining growth dynamics, productivity trends and their implications for sustainable development. Through a series of detailed analyses, this section sheds light on the characteristics and growth patterns of informal enterprises across various regions, with a particular emphasis on the food and beverage sector in India. It also tackles the impact of external factors like the COVID-19 pandemic on job displacement within the sector, providing insights into the resilience and vulnerabilities of informal manufacturing.

Part III, one of the book's central themes, addresses the Environmental Pollution of Informal Manufacturing Enterprises. This part explores the environmental challenges associated with informal manufacturing. It discusses the sector's reliance on polluting technologies, resource consumption and the consequent emissions and waste generation. This section delves into the governance and sustainability challenges faced by informal enterprises and the communities around them, highlighting the need for effective environmental management and compliance with standards to mitigate pollution and enhance sustainability.

Part IV, the concluding part of the book, focuses the Drivers, Barriers, Solutions and Best Practices, and it integrates informal manufacturing into a green economy. It examines the drivers and barriers to environmental performance and innovation in the sector, showcasing successful examples of cleaner production technologies and sustainable practices. This part aims to inspire action by presenting best practices, policy recommendations and perspectives on promoting environmental sustainability within informal manufacturing, encouraging a collaborative effort among stakeholders to achieve sustainable and inclusive development.

Part I introduces readers to the foundational theories and ethical considerations underpinning the relationship between informal manufacturing and global sustainable development. This section unfolds through six meticulously crafted chapters, each contributing to a nuanced understanding of the informal economy's impact on global sustainability from diverse perspectives.

Chapter 1 by Begum Sertyesilisik delves into the 'Impacts of the Informal Economy on Global Sustainable and Inclusive Development'. Through a thorough literature review, Sertyesilisik investigates the informal economy's multifaceted influence from political, economic and ethical lenses. The exploration reveals the sector's substantial effect on fair competition, circular economy and socio-economic dynamics, culminating in robust recommendations for fostering global sustainable development by curbing the informal economy's negative repercussions.

Chapter 2, presented by Abu Aminu and Kediehor Collins, focuses on 'Leveraging Indigenous Technology in Nigeria's Informal Manufacturing Sector'. This chapter paints a vivid picture of how indigenous technology serves as a linchpin for sustainable development within Nigeria. Aminu and Kediehor argue for the modernisation of indigenous practices to combat environmental challenges, thereby positioning the informal sector as a leader in Africa's sustainable transformation.

In Chapter 3, Akash Dandapat, Pinaki Das and Soumita Dasgupta offer an insightful analysis titled 'Foreign Capital Inflow and the Expansion of Subcontracting in the Informal Manufacturing Sector'. Through a general equilibrium approach, this chapter dissects the nuanced ramifications of Foreign Direct Investment (FDI) in India, emphasising how FDI-induced subcontracting bolsters the informal sector, thereby advocating for policies that nurture this synergistic relationship.

Chapter 4 by Mainak Bhattacharjee, *Informal Economy and Environmental Sustainability: An Optimal-Growth Theoretic Analysis*, bridges theoretical economics with environmental sustainability. Bhattacharjee crafts a compelling argument regarding the dynamic instability brought about by partial environmental regulations, suggesting a comprehensive policy outlook that includes the informal sector.

Chapter 5, *Green Innovation Management for Economic Benefits through Green Enterprises*, penned by José G. Vargas-Hernández, Muhammad Mahboob Ali and Jorge H. Zamudio-Abdala, champions green innovation as a crucial driver for economic and environmental harmony. The authors make a case for

enhancing green enterprises worldwide, underlining the role of green innovation in navigating the challenges of environmental degradation.

Chapter 6 explores Unconditional Cash Transfers, Environmental Degradation and Sustainable Livelihood in the informal economy through the lens of Nilavo Roy and Kausik Gupta. This chapter introduces a trade-theoretic perspective to critique the efficacy of Unconditional Cash Transfers (UCT) in safeguarding livelihoods amidst environmental degradation, presenting a nuanced examination of social protection policies in developing countries.

Together, these chapters lay a comprehensive groundwork that not only conceptualises the informal manufacturing sector's intricate ties with sustainability but also sets a scholarly discourse for the ensuing exploration in the book. Through these initial discussions, readers are equipped with a broad yet detailed framework, paving the way for deeper dives into specific challenges, opportunities and solutions in the realm of informal manufacturing and environmental sustainability.

Part II shifts focus towards the growth dynamics and productivity patterns within the informal manufacturing sector, providing an empirical lens through which the contributions and challenges of this sector to sustainable development are further explored. This section comprises four insightful chapters.

Chapter 7 by Mousumi Mitra, 'Growth Performance of the Unorganised Manufacturing Sector in India during 1984–1985 to 2015–2016 – An Activity Level Analysis', embarks on a comprehensive exploration of India's Unorganised Manufacturing Sector (UMS). Through NSSO unit-level data, Mitra meticulously categorises the diverse activities within UMS, assessing their growth in terms of employment, gross value added and labour productivity. This analysis not only underscores the heterogeneity and resilience of UMS under shifting policy regimes but also identifies the sectors that have been pivotal in generating new employment opportunities amidst economic liberalisation.

Chapter 8, presented by Debashruti Jana, Mihir Kumar Pal and Akash Dandapat, delves into the 'Pattern of Growth of Unorganised Food and Beverage Enterprises: An analysis across States of India'. Utilising NSSO survey data, this study paints a detailed portrait of the unorganised micro food and beverage enterprises' growth across major Indian states from 2010–2011 to 2015–2016. Highlighting the sectors' expanding footprint in terms of enterprises, employment and Gross Value Added (GVA), this chapter reveals a positive growth trend and emphasises the crucial role these enterprises play in India's socio-economic fabric.

Chapter 9, 'Informal Manufacturing Sector Job displacement due to COVID-19 Pandemic: Myth or Reality?' by Shrabanti Maity, Paramita Bakli and Snigdha Sarangi, investigates the pandemic's impact on India's informal manufacturing labour force. With a focus on male workers, this timely analysis utilises 'The Periodic Labour Force Survey' and other government reports to assess job displacement during the initial months of the COVID-19 lockdown. Through structural break analysis and Poirier's Spline function approach, the authors provide a nuanced understanding of the pandemic's short-term effects on employment within the informal manufacturing sector, offering policy insights for mitigating such crises in the future.

Chapter 10 by Susobhan Maiti and Chandrima Chakraborty, 'Total Factor Productivity Growth of Formal and Informal Manufacturing Industries in India: An insight from KLEMS Database', contrasts the productivity trends within India's formal and informal manufacturing industries over four decades. Using KLEMS data, this chapter presents a comparative analysis of total factor productivity growth across 10 industry groups, uncovering fluctuating growth rates and highlighting the divergent paths of productivity evolution in the formal and informal segments. This nuanced examination not only addresses concerns regarding the manufacturing sector's stagnant contribution to GDP but also signals potential directions for policy interventions aimed at revitalising manufacturing-led economic growth.

Part III embarks on a detailed examination of the environmental challenges posed by the informal manufacturing sector, presenting a series of in-depth analyses that draw on empirical data and theoretical insights to explore the sector's impact on pollution and sustainability governance. This section is comprised of six chapters, each contributing a unique perspective on the intricate relationship between informal manufacturing activities and environmental degradation.

Chapter 11, 'Environmental Impact on Informal Enterprises Ownership in Indian Cities' by Sabyasachi Tripathi and Jyoti Chandiramani, offers a pioneering investigation into how city-level environmental pollution influences the ownership structure of informal enterprises in India's metro cities. The study uniquely integrates micro (entrepreneurship-level) and macro (city-level) factors, including access to waste management facilities and vehicular emissions, to assess their effects on business ownership. The findings highlight a disproportionate risk to female-owned businesses due to environmental degradation, underscoring the critical need for enhanced infrastructure and gender-sensitive policymaking to support sustainable urban entrepreneurship.

Chapter 12, 'Pollution and Governance Challenges in Bangladesh's Informal Manufacturing', by Debasish Nandy delves into the environmental dilemmas confronting Bangladesh, a country grappling with industrial policy gaps and technological backwardness. Focusing on sectors like brick kilns and leather tanning, Nandy critiques the lack of environmental governance and its implications for achieving the Sustainable Development Goals (SDGs). This chapter calls for a concerted effort to enforce environmental regulations and promote industrial policy reforms to mitigate pollution in Bangladesh's rapidly growing informal sector.

Chapter 13, 'The Environment-Informal Economy Nexus in BRICS Economies', by Nilendu Chatterjee presents an empirical analysis of the environmental repercussions of informal economic activities within the BRICS nations, emphasising energy use and ecological footprints. Through sophisticated econometric techniques, Chatterjee reveals the long-term adverse effects of informal activities on environmental quality. The study advocates for the formalisation of informal activities, enhanced governance and the adoption of renewable energy sources as strategies for promoting green growth and sustainability.



Chapter 14, 'CO<sub>2</sub> Emission Intensity and Growth of India's Informal Manufacturing Enterprises', by Pinaki Das and Akash Dandapat investigates the correlation between the growth of informal manufacturing enterprises in India and their CO<sub>2</sub> emission intensity. Utilising National Sample Survey Organisation (NSSO) data, the authors uncover a significant relationship between enterprise growth status and emissions, highlighting the urgent need for energy efficiency and technological upgrades in the sector. The chapter emphasises the role of policy in facilitating a transition towards sustainable manufacturing practices.

Chapter 15, 'Environmental Degradation and the Informal Manufacturing Sector in Emerging Asian Economies', by Swati Sinha Babu and Sk Md Abul Basar examines the impact of informal manufacturing sector growth on environmental degradation across emerging Asian economies. Employing CO<sub>2</sub> emissions as an indicator, the study identifies a U-shaped relationship with informal manufacturing growth, challenging the Environmental Kuznets Curve hypothesis and signalling the need for tailored environmental policies.

Chapter 16, 'Reassessing the Environmental Kuznets Curve: Informal Manufacturing in Emerging Asian Economies', by Aparna Banerjee and DSParna Banerjee echoes the themes of Chapter 15, offering further empirical evidence against the Environmental Kuznets Curve hypothesis within the context of emerging Asian economies. Their analysis calls for a nuanced understanding of the links between informal manufacturing growth and environmental degradation, advocating for policies that balance economic development with ecological sustainability.

Part IV scrutinises the pathways and hurdles to integrating informal manufacturing sectors into the broader context of a green economy. Through five focused chapters, this section reveals innovative practices, regulatory challenges and transformative strategies aimed at fostering environmental sustainability and economic resilience. The chapters collectively provide actionable insights and underline the importance of community participation, technological innovation and policy frameworks in achieving sustainable development.

Chapter 17, 'The Challenge and Opportunity of Recycling in Lagos-Nigeria', by Duruji, Moses Metumara, and Asagba, Omolola Silva, shines a light on Lagos, Nigeria's efforts to manage nature-resistant materials like plastics. Despite existing policies to promote recycling, this chapter identifies gaps in implementation and effectiveness, advocating for more robust government action and private-public partnerships. This analysis underpins the critical role of extended producer responsibility and highlights the potential of recycling as a cornerstone for Lagos's environmental sustainability.

Chapter 18, 'Organizational Green Technological Innovation and Environmental Sustainability Regulations', explores the intersection of green innovation and regulatory frameworks. Authored by José G. Vargas-Hernández, Francisco J. González-Ávila and Omar C. Vargas-González, this chapter delves into how organisations can leverage green technologies to meet and surpass environmental standards. The discussion extends to the impact of government subsidies and the need for a symbiotic relationship between policy and corporate practices in steering the wheel of sustainable innovation.

Chapter 19, 'Empowering Women for Sustainable Development in West Bengal', by Shama Firdaush, Shiuli Baidya, Upali Bera and Satyanaryan Kumbhakar, presents an inspiring narrative on the role of women's entrepreneurship in promoting green growth. This chapter draws on primary data from West Bengal to assess the empowerment of women through micro-entrepreneurship. The findings underscore the environmental friendliness of entrepreneurial activities and highlight the pivotal role of education, asset ownership and entrepreneurship in enhancing women's empowerment, pointing to micro-enterprise as a vital engine for sustainable development.

Chapter 20, 'Tribal Community Participation in a Green Economy', delves into the indigenous practices of tribal communities, illustrating how their life principles and manufacturing activities align with the goals of a green economy and sustainable development. Authored by Swapan Kumar Maity and Golam Ahammad, this research underscores the inherent sustainability of tribal lifestyles and their contributions to environmental stewardship, advocating for government policies that recognise and bolster these community-led initiatives.

Chapter 21, 'Textile and Garments: Bangladesh's Path to a Green Economy', by Naman Mishra, Megha Jain, Palakh Jain and Nilanjan Chattopadhyay, focuses on the informal textile and garment sector in Bangladesh. Highlighting the sector's significant growth and its contributions to the nation's development, this chapter emphasises the need for sustainable practices within these industries. Recommendations for fostering green growth include technological advancements, talent development and macroeconomic policies that encourage environmentally sustainable methods, particularly in textiles and garments, a critical area for Bangladesh's economic trajectory.

As we conclude the introduction to 'Informal Manufacturing and Environmental Sustainability: A Global Perspective', we reflect on the journey that this book represents. It is a journey through the challenges and opportunities that lie at the intersection of informal manufacturing and the quest for environmental sustainability. Through the diverse perspectives and analyses presented in this volume, we hope to have illuminated the pathways towards integrating these sectors into the global sustainability agenda.

This book is an invitation to scholars, policymakers, practitioners and students to engage deeply with the themes of informal manufacturing and sustainability. It is a call to consider the nuanced realities of those who work within these sectors and to envision policies and practices that not only mitigate environmental degradation but also promote economic equity and social inclusion.

Looking forward, we hope that this book will inspire further research into the complex dynamics of informal manufacturing and its environmental implications. We envision a future where policymaking is informed by a nuanced understanding of these sectors, leading to innovative solutions that foster both economic vitality and ecological resilience.

In closing, 'Informal Manufacturing and Environmental Sustainability: A Global Perspective' aims to be an inspiration, guiding efforts towards a more sustainable and inclusive global economy. It is an evidence to the power of collaboration and shared knowledge in addressing some of the most pressing

challenges of our time. May this volume serve as a foundation for future endeavours in creating a sustainable world for generations to come.

Mihir Kumar Pal  
Department of Economics, Vidyasagar University, Midnapore,  
West Bengal, India  
Pinaki Das  
Department of Economics, Vidyasagar University,  
West Bengal, India

## References

- Das, P., & Dandapat, A. (2021). Growth and productivity of unorganized manufacturing enterprises: An analysis across states/UTs in India. In *Productivity growth in the manufacturing sector: Mitigating global recession* (pp. 167–182). Emerald Publishing Limited.
- Das, P., Ghosh, S., & Paria, B. (2022). Multidimensional poverty in India: A study on regional disparities. *GeoJournal*, 87(5), 3987–4006.
- Das, P., Ghosh, S., & Paria, B. (2023). Multidimensional poverty in India: Patterns of reduction across population subgroups and geographical locations during 2005–06 and 2019–21. *GeoJournal*, 88(4), 3851–3870.
- Das, P., Paria, B., & Firdaush, S. (2021). Juxtaposing consumption poverty and multidimensional poverty: A study in Indian context. *Social Indicators Research*, 153(2), 469–501.
- Ganguly, S. (2018). The small scale industrial policy in India and performance of unorganised manufacturing: A comparative analysis with East Asian countries. In *Entrepreneurship and structural change in dynamic territories: Contributions from developed and developing countries* (pp. 297–315). Springer.
- International Labour Organisation (ILO). (2013). *Measuring informality: A statistical manual on the informal sector and informal employment*. ILO.
- Marjit, S., & Kar, S. (2009). A contemporary perspective on the informal labour market: Theory, policy and the Indian experience. *Economic and Political Weekly*, 44(21), 60–71.
- Pal, M. K. (Ed.). (2023). *The impact of environmental emissions and aggregate economic activity on industry: Theoretical and empirical perspectives*. Emerald Publishing Limited.
- Rani, U., & Unni, J. (2004). Unorganised and organised manufacturing in India: Potential for employment generating growth. *Economic and Political Weekly*, 39(25), 4568–4580.
- Saget, C., Karimova, T., Luu, T., Maître, N., & Ananian, S. (2022). *Greening enterprises: Transforming processes and workplaces*. International Labour Organization.

This page intentionally left blank

# Acknowledgements

The journey of bringing ‘Informal Manufacturing and Environmental Sustainability: A Global Perspective’ to life has been a collaborative endeavour of immense proportions, marked by the generous contributions of time, expertise and spirit from a diverse group of individuals and institutions. It is with deep gratitude that we acknowledge those who have made this book not just a reality but a landmark publication in its field.

Foremost, we express our profound appreciation to Professor Pulak Mishra, Professor of Humanities and Social Sciences at the Indian Institute of Technology (IIT) Kharagpur, India, for his insightful foreword. His eloquent words set the tone for the rich discussions that follow, and his endorsement significantly elevates the stature of our work.

Our heartfelt thanks are extended to each author who has contributed to this volume. Your chapters, reflective of rigorous research and deep commitment to the subject, form the backbone of this book. Your willingness to explore the complex interplay between informal manufacturing and environmental sustainability has provided valuable insights that will undoubtedly influence both academia and practice.

The rigorous evaluation and constructive feedback from our reviewers have been instrumental in refining this publication. Your dedication to academic excellence and your detailed suggestions have enriched the quality of our collective work, ensuring its relevance and rigor. Your contributions have been invaluable, and we are deeply thankful for your involvement.

We are immensely grateful to the academic and research institutions that have supported our authors, especially Vidyasagar University, among others. Your support has been crucial, providing the environments and resources necessary for this research to flourish. Your commitment to fostering scholarly work in this critical area of study deserves our special appreciation.

Our editorial and production teams at Emerald Publishing Limited, UK, have been our steadfast partners throughout this journey. Your professionalism, patience and dedication have navigated us through the complexities of publishing, transforming our manuscript into a polished and accessible publication. We are immensely thankful for your support and expertise, which have been fundamental in bringing our vision to fruition.

In closing, we acknowledge that this book is the product of many hands and hearts. It represents a collective aspiration to advance our understanding of

*xxviii Acknowledgements*

informal manufacturing within the context of global environmental sustainability. To all who have played a part in this endeavour, please accept our sincere gratitude. Your contributions have not only made this publication possible but have also helped to light the way for future research, policymaking and practical action in pursuit of a more sustainable and equitable world.

Mihir Kumar Pal  
Pinaki Das