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RESOURCES MATTER

ENDING POVERTY WHILE PROTECTING NATURE

Tony Addison and Alan Roe

UNU-WIDER STUDIES IN DEVELOPMENT ECONOMICS

Endorsements

This authoritative study serves as a vital reality check against complacent thinking that developing countries will not – or should not – seize opportunities to extract their resource endowments. Addison and Roe convincingly argue that global net zero climate ambition will require greater extraction of non-renewable resources. They provide an invaluable guide for countries facing immense challenges to maximize the developmental potential of their material resources while minimizing the risks to people and planet.

John Hicklin, Non-Resident Fellow, Center for Global Development, and former Deputy Director of the IMF's Independent Evaluation Office

This new book by Tony Addison and Alan Roe on the Extractive Industries is both timely and practical. There is an unnecessary tension between achieving development goals and protecting nature as well as fighting climate change. Their earlier seminal book *Extractive Industries: The Management of Resources as a Driver of Sustainable Development* was influential in UN decision making circles, including at the regional level, where a series of roundtables based on its outcomes and policy implications were conducted in cooperation with the UN Regional Economic Commission and the participation of top government officials, business leaders and civil society organizations. I have no doubt that this new contribution to our knowledge in this field will be as influential, as the world is moving fast towards the finishing line of the 2030 SDG Agenda, with gaps of material resources which could be bridged by the more effective utilization of domestic resources including from the extractive industries.

Mahmoud Mohieldin, UN Special Envoy for Financing the 2030 Sustainable Development Agenda and UN Climate Champion for COP27

Addison and Roe's new book takes on an enormously critical challenge. In an age of superficial sound bites, they offer a deeply founded and carefully crafted policy agenda — bridging low-, medium- and high-income countries — that seeks ongoing poverty reduction, ecosystem regeneration, a net-zero future, and the realization of the extractive industry's development potential. They link theory and concrete action. Few would have the courage to take this on. The result reflects their depth of understanding and their passion for the topic. It is a treatise that brings hope that the needed transformation can be achieved.

R. Anthony (Tony) Hodge, President of the International Council on Mining and Metals (ICMM) 2008–15

This is an impressively authoritative book which ranges across the economics and politics that will shape the paths of development and poverty reduction of resource-dependent countries. It sets out an array of risks to progress and the attendant challenges of governance and policy. It is masterful in placing the opportunities for development into the context of the energy transition and the broad context of the global environmental and climate risks that will define the state of the world for the next generation.

Mark Henstridge, Chief Executive Officer of Oxford Policy Management Ltd.

Resources Matter

The UNU World Institute for Development Economics Research (UNU-WIDER) was established by the United Nations University as its first research and training centre and started work in Helsinki, Finland, in 1985. The mandate of the institute is to undertake applied research and policy analysis on structural changes affecting developing and transitional economies, to provide a forum for the advocacy of policies leading to robust, equitable, and environmentally sustainable growth, and to promote capacity strengthening and training in the field of economic and social policy-making. Its work is carried out by staff researchers and visiting scholars in Helsinki and via networks of collaborating scholars and institutions around the world.

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Resources Matter

Ending Poverty while Protecting Nature

TONY ADDISON
AND
ALAN ROE

A study prepared by the United Nations University World Institute for Development Economics Research (UNU-WIDER)

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To Lynda and Susan, for all their encouragement and support.

Foreword

The extractive industries can provide vast revenues in many developing countries, but government efforts to diversify economies away from the sectors have been far less than satisfactory. There are significant revenue shortfalls due to ineffective regulation, under-reporting by producers, poor transparency, and badly designed tax systems. And rather than protecting natural resources, incentives are still heavily skewed towards extractives.

With these pressing concerns in mind, in 2019 UNU-WIDER launched the second phase of its multidisciplinary project Extractives for Development (E4D): Risks and Opportunities to further enhance links established with senior policy-makers and international organizations—and the oil, gas, and mining industries themselves—to share experiences and lessons across sectors and regions. Our critical research looked to identify opportunities as well as risks, and ways of mitigating those risks, and to chart the future of the global extractive industries and the consequences for both low- and middle-income countries.

Three guiding questions spearheaded the research work. How can we ensure that the extractive sector contributes to poverty reduction? How can we ensure that the extractive sector has a minimal environmental impact? And how can we ensure that revenues for development from extractives are maximized?

This book is the synthesis volume covering both phases of the multidisciplinary research project. Its objective is not to provide a guidebook about how resource wealth should be managed. Rather, the authors explain the critical significance of the extractive industries vis-à-vis the global ambition for net zero and present a comprehensive menu of topics that policy-makers need to reflect on when creating national strategies. Some practical examples of successful policies are offered while being mindful that policy is so embedded in domestic politics that each country must shape their own solutions.

I sincerely thank the authors, Tony Addison and Alan Roe, for their truly excellent project leadership and sound analytical skills in bringing this critical body of work to fruition. This is a timely and gravely important area for people, for countries, and for our planet.

UNU-WIDER gratefully acknowledges the support for the project Extractives for Development (E4D): Risks and Opportunities, part of the Domestic Revenue Mobilization programme, which is financed by the Norwegian Agency for Development Cooperation (NORAD).

Kunal Sen
Director, UNU-WIDER
Helsinki, April 2024

Acknowledgements

This book arises out of research on the extractive industries that has extended for nearly a decade at UNU-WIDER, and specifically the project Extractives for Development (E4D), and its successor Extractives for Development (E4D): Risks and Opportunities. Those two projects have involved around 80 specialists, from whom we have received excellent support, covering many of the policy issues relating to oil, gas, and mining in the developing world, resulting in numerous working papers, blogs, and videos which now reside on the UNU-WIDER website (www.wider.unu.edu). Some 35 researchers contributed to the first project which resulted in our edited book *Extractive Industries: The Management of Resources as a Driver of Sustainable Development*, published by Oxford University Press in 2018.

Following that, we have continued our interactions with a large number of experts in the field through the second UNU-WIDER project, which has resulted in this book. Their support and encouragement have been particularly important in helping us to broaden the coverage of the 2018 volume, notably the climate dimensions of the extractive industries. Special mention should go to Evelyn Dietsche, Magnus Ericsson, Tony Hodge, Steve Kayizzi-Mugerwa, Olof Löf, Kathryn McPhail, and Etienne Romsom, whose advice and research is most directly reflected in this new work. The views expressed in this volume are, however, ours alone. We also benefitted from the research undertaken in a parallel UNU-WIDER project on illicit financial flows led by Professor Finn Tarp of the Development Economics Research Group (DERG) of the University of Copenhagen.

Jutta Stenholm provided invaluable assistance in managing the project, and for communications special thanks go to Eeva Nyyssönen and Anna Toppari.

Lorraine Telfer-Taivainen, editorial and publishing associate at UNU-WIDER, was, as always, superbly helpful in bringing this book to fruition. Siméon Rapin provided much efficient assistance with the publication. We thank Adam Swallow at Oxford University Press for his encouragement (and patience).

Tony Addison is grateful to DERG Copenhagen University for providing a base from which this work was undertaken, to DERG coordinator Finn Tarp for all his support, and to the Department of Economics for its administrative efficiency (in particular for the help provided by Christel Brink Hansen).

We have benefitted significantly from the invitation extended to us in 2020 by Professor Mahmoud Mohieldin (the UN secretary-general's Special Envoy

on Financing the 2030 Agenda for Sustainable Development and UN Climate Change High-Level Champion for Egypt) to be the lead resource persons in five UN Regional Round Table meetings (each hosted by a UN regional economic commission) on the extractive industries and sustainable development. The meetings were organized under the direction of the UN's deputy secretary-general, Amina Mohammed, and culminated in a UN summit, led by UN secretary-general António Guterres. These high-level meetings exposed us to a wide range of ideas and concerns, especially those of the leaders of the nations of the Global South.

Collaboration with the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) in organizing a regular series of IGF–UNU-WIDER research seminars on the issues was invaluable, and we thank in particular Thomas Lassourd, Alexandra Readhead, and Viola Tarus. Participation in the OECD's Policy Dialogues on Natural Resource-Based Development, led by OECD's Development Centre, and Lahra Liberti Head of the Natural Resources and Development Unit was also informative, especially regarding the perspectives of country policy-makers and industry representatives.

Finally, we thank Kunal Sen, UNU-WIDER director, for the opportunity to undertake this project and for his support, and Finn Tarp, UNU-WIDER's previous director, for his support of our earlier project on the extractive industries which ultimately led to this latest book.

Tony Addison
Alan Roe
Bubbenhall and Helsinki
April 2024

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List of Abbreviations

1MDB	*1Malaysia Development Berhad*
AADFI	Association of African Development Finance Institutions
ACMI	Africa Carbon Markets Initiative
AfDB	African Development Bank
AGA	AngloGold Ashanti
AI	artificial intelligence
AMSI	African Mineral Skills Initiative
AMV	Africa Mining Vision
APG	Asia/Pacific Group on Money Laundering
ASM	artisanal and small-scale mining
AU	African Union
AZ	Anglo Zimele
BDC	Botswana Development Corporation
BNDES	*Banco Nacional de Desenvolvimento Economico e Social*
BPMB	*Bank Pembangunan Malaysia Berhad*
BRI	*Bank Rakyat Indonesia*
CAP	community action plan
CAPEX	capital expenditures
CBAM	Carbon Border Adjustment Mechanism
CCCMC	China Chamber of Commerce of Metals and Minerals and Chemicals Importers and Exporters
CCD	corporate community development
CCS	carbon capture and storage
CCSI	Columbia Center on Sustainable Development
CDA	community development agreement
CDT	community development toolkit
CFEM	*Compensação Financeira pela Exploração de Recursos Minerais* (Brazil)
CNMC	China Nonferrous Metal Mining Corporation
CNOOC	China National Offshore Oil Corporation
CODELCO	*Corporación Nacional del Cobre de Chile*
COMIBOL	*Corporación Minera de Bolivia*
COP	Conference of the Parties (UN Climate Change Conferences)
CORFO	*Corporación de Fomento de la Producción* (Chile)
CREA	Centre for Research on Energy and Clean Air
CSER	corporate, social, and environmental responsibilities
CSO	civil society organization
DBN	Development Bank of Namibia
DBSA	Development Bank of Southern Africa

DDF	District Development Funds
DFI	development finance institutions
DFID	Department for International Development (UK)
DoJ	Department of Justice (US)
DRC	Democratic Republic of the Congo
E4D	Extractives for Development (UNU-WIDER)
EACOP	The East African Crude Oil Pipeline project (Uganda and Tanzania)
EC	European Commission
EFCC	Economic and Financial Crimes Commission (Nigeria)
EGPS	Extractives Global Programmatic Support
EIA	Energy Information Administration (US)
EIR	Extractive Industries Review
EITI	Extractive Industries Transparency Initiative
EPA	Environmental Protection Agency
ESG	environmental, social, and (corporate) governance
ESIA	environmental and social impact assessment
EU	European Union
EV	electric vehicle
FARI	Fiscal Analysis of Resource Industries framework (IMF)
FATF	Financial Action Task Force
FCDO	Foreign, Commonwealth & Development Office (UK)
FCPA	Foreign Corrupt Practices Act (US)
FCPF	Forest Carbon Partnership Facility (World Bank)
FDI	foreign direct investment
FIEPA	*Federação das Industrias do Pará*
FON	Friends of the Nation (Ghana)
FOSTER	Facility for Oil Sector Transparency and Reform (Nigeria)
G7	Group of Seven
G20	Group of Twenty
G77	Group of Seventy-Seven
GDP	gross domestic product
GEDI	*Gestão Económica para Desenvolvimento Inclusivo*
GFI	Global Financial Integrity
GHG	greenhouse gas
GMI	Global Mining Initiative
GMT	Global Minimum Tax
GNI	gross national income
GRI	Global Reporting Initiatives
GVC	global value chain
HIC	high-income country
HIPC	heavily indebted poor country
ICIJ	International Consortium of Investigative Journalists
ICMM	International Council on Mining and Metals
ICTD	International Centre for Tax and Development
IDC	Industrial Development Corporation (South Africa)

IEA	International Energy Agency
IFC	International Finance Corporation
IFF	illicit financial flow
IFRS	International Financial Reporting Standards
IGF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
ILO	International Labour Organization
IMF	International Monetary Fund
IMR	infant mortality rate
IOC	international oil company
IPCC	Intergovernmental Panel on Climate Change
IPIECA	International Petroleum Industry Environmental Conservation Association
IRA	Inflation Reduction Act (US)
IRENA	International Renewable Energy Agency
ISSB	International Sustainability Accounting Standards Board
IT	information technologies
KMC	Kalulushi Municipal Council
KPCS	Kimberley Process Certification Scheme
LCD	local contractor development
LCDF	Lumwana Community Development Forum
LIC	low-income country
LMIC	lower-middle-income country
LNG	liquified natural gas
MCI	Mining Contribution Index
MCI-W	Mining Contribution Index (UNU-WIDER)
MDB	Multilateral Development Bank
MDC	Maputo Development Corridor
MDG	Millennium Development Goal
MDRI	Multilateral Debt Relief Initiative
MENA	Middle East and North Africa
MIC	middle-income country
MMSD	Mining, Minerals and Sustainable Development Project
MNCs	multinational companies
MPD	Mining Partnerships for Development (MPD) Initiative
NBER	National Bureau of Economic Research
NDC	nationally determined contribution
NGFS	Network for Greening the Financial System
NGO	non-governmental organization
NNPC	Nigerian National Petroleum Corporation
NOC	national oil company
NORAD	Norwegian Agency for Development Cooperation
NPV	net present value
NRC	Natural Resource Charter
NRGI	Natural Resources Governance Institute

O&M	operations and maintenance
OCCRP	Organized Crime and Corruption Reporting Project
OCI	Oil Change International
ODA	overseas development assistance
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
OECD-DAC	Organisation for Economic Co-operation and Development, Development Assistance Committee
OFI	other financial institutions
OPEC	Organization of the Petroleum Exporting Countries
OPEX	operating expenditures
OPL 245	Oil Prospecting Licence 245 (Nigeria)
OPM	Oxford Policy Management
PACI	Partnering Against Corruption Initiative
PDAC	Prospectors and Developers Association of Canada
PDVSA	*Petróleos de Venezuela S.A.* (Venezuela)
PEMEX	*Petroleos Mexicanos* (Mexico)
PEP	politically exposed person
Petrobas	*Petróleo Brasileiro S.A.* (Brazil)
Petronas	*Petroliam Nasional Berhad* (Malaysia)
PFM	public finance management
PIAC	Public Interest Accountability Committee (Ghana)
PNG	Papua New Guinea
PPMS	Petroleum Product Marking Scheme (Ghana)
PPP	public–private partnership
PRMA	Petroleum Revenue Management Act (Ghana)
PSA	production sharing arrangements
PV	photovoltaic
PWYP	Publish What You Pay
R&D	research and development
REDES	*Redes de Desenvolvimento de Fornecedores do Pará* (Brazil)
RGI	Resource Governance Index (NRGI)
RMF	Responsible Mining Foundation
RMI	Responsible Mining Index
RSF	Rapid Support Forces
RWI	Revenue Watch Institute
SARS	South African Revenue Service
SDG	Sustainable Development Goal (UN)
SEA	South-East Asia
SEAT	Socio-Economic Assessment Toolbox
SEC	Securities and Exchange Commission (US)
SIA	social impact assessment
SLO	social licence to operate
SME	small and medium-sized enterprise
SOE	state-owned enterprise

Sonangol	*Sociedade Nacional de Combustíveis de Angola, E.P.* (Angola)
SoS MinErals	Security of Supply of Mineral Resources
SSA	Sub-Saharan Africa
SWF	sovereign wealth fund
SWIA	sector-wide impact assessment
TCFD	Task Force on Climate-Related Financial Disclosures
TPDC	Tanzania Petroleum Development Corporation
TPI	Transition Pathway Initiative
UAE	United Arab Emirates
UMIC	upper-middle-income country
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNOC	Uganda National Oil Company
UN-OCHR	Office of the United Nations High Commissioner for Human Rights
UNU-WIDER	United Nations University, World Institute for Development Economics Research
VaR	value at risk
VAT	value added tax
VIIRS	Visible Infrared Imaging Radiometer Suite
VPs	Voluntary Principles on Security and Human Rights
WEF	World Economic Forum
WGI	Worldwide Governance Indicators
WTO	World Trade Organization
WWF	World Wildlife Fund for Nature
ZCCM	Zambia Consolidated Copper Mines
ZELA	Zimbabwe Environmental Law Association
ZMDC	Zimbabwe Mining Development Corporation

Author Profiles

Tony Addison was formerly a professor of economics at the University of Copenhagen Development Economics Research Group (DERG) and chief economist and deputy director of the United Nations University World Institute for Development Economics Research (UNU-WIDER) in Helsinki. He was previously professor of development studies, Manchester University (UK), executive director of the Brooks World Poverty Institute, Manchester University, and a lecturer in economics at the University of Warwick (UK) and The School of Oriental and African Studies (SOAS), London University (UK).

He has over 40 years of experience in the field of development economics, having begun his career as an Overseas Development Institute (ODI) fellow in Tanzania's Ministry of Trade and Industry. He has worked and published extensively on issues of poverty, macro-economic policy, and post-conflict reconstruction, focusing on Africa. He has undertaken many advisory assignments for governments and for agencies such as the ILO, IMF, UNICEF, and the World Bank. His edited books include: *Poverty Dynamics: Inter-Disciplinary Perspectives*, with David Hulme and Ravi Kanbur (Oxford University Press); *From Conflict to Recovery in Africa* (Oxford University Press); *Making Peace Work: The Challenges of Economic and Social Reconstruction*, with Tilman Brück (Palgrave Macmillan); and *Debt Relief for Poor Countries*, with Henrik Hansen and Finn Tarp (Palgrave Macmillan). He has also published in: *Journal of Agricultural Economics*; *Journal of Development Economics*; *Journal of Development Studies*; *Journal of Peace Research*; *Resource and Energy Economics*; *Review of Income and Wealth*; and *World Development*, among others. He has degrees from the University of East Anglia (UEA) and London University (Birkbeck College).

Alan Roe has worked for more than 50 years as an academic economist and as a policy advisor. He has degrees from the universities of Leeds, Wales, and Cambridge. Early in his career he was a research economist at the University of Dar-es-Salaam and then the University of Cambridge (Economic Growth Project) and later a visiting professor of economics at Washington University, USA. He then taught economics for many years at the University of Warwick where he was also for a period the chairman of department. In 1994 he was appointed principal economist at the World Bank where he worked for several years on the challenges of reform in the former Soviet republics of Ukraine and Armenia.

After leaving the Bank in 2000, he returned part-time to the University of Warwick where he is now an honorary professorial fellow but also joined Oxford Policy

Management (OPM) as principal economist and a board director. In this capacity he helped to initiate OPM's involvement in the economics of mining and other natural resources issues. He has written extensively in both books and academic journals, and for other outlets. Recent publications include several country case studies on mining impacts for the ICMM and on oil and gas, for example *Tanzania: From Mining to Oil and Gas Structural Change or Just Big Numbers?* and *Extractive Industries and Development Lessons from International Experience for Mozambique*. He has also advised the British Gas Group on their large natural gas project in the Indian Ocean off the coast of Tanzania.

He co-edited with Tony Addison *Extractive Industries: The Management of Resources as a Driver of Sustainable Development* (Oxford University Press, 2018), as well as *Fiscal Policy for Development: Poverty, Reconstruction, and Growth* (Palgrave Macmillan 2004), both studies for UNU-WIDER.

1
Living in a Materials World

1.1 Introduction

When you woke up this morning, you probably checked your smartphone. Messages from loved ones, annoying emails from the boss, unwanted adverts, celebrity tweets—all human life now runs through digital devices, large and small. Whereas 10,000 years ago a stone axe was the essential tool of its day—made from the right kind of rock and some sturdy wood—today's essential tool is the smartphone, made from a myriad of metals and materials that are mined, shipped, refined, and manufactured into a device that is now central to economic, social, and political life. Yet when the digital economy first emerged nearly two decades ago it was labelled 'weightless': a dematerialized economy of services. But what a misnomer that was! In fact, the digital economy rests on something very weighty indeed: materials that go into the manufacture of the devices, the routers, and the servers as well as the whole energy infrastructure that delivers the electrons, which in turn transmit the information to our smartphones, laptops, and tablets—on which you may well be reading this book.

Indeed, almost everything that is essential to a modern society—transport and power systems, buildings, machinery, and medical devices—depends upon an economy of materials, supplied from resources like wood from forests that are renewable (if properly managed) to others like metals, minerals, and stone whose availability is finite (at least on this planet), and gooey substances like oil.

Did you forget to leave your phone on charge overnight? Too bad: the battery still needs electrons. Do you know where that energy comes from? Probably from coal-fired power plants, a technology that is more than 100 years old and still the world's top source of electricity (good for prosperity, but very bad for the planet as well as our lungs) or increasingly from gas-fired power plants (not as bad for the planet as coal but emitting greenhouse gases (GHGs) nevertheless). Perhaps the electricity came from a wind turbine—which on some very windy days can meet more than half of Britain's electricity needs—or from solar photovoltaic (PV) panels on the roof of your house (increasingly cheap and good for the planet) or from geothermal.[1] Perhaps from a nuclear power plant, once seen as the great hope for limitless cheap energy ('atoms for peace!')—still good for the planet (few emissions) but still a risky technology (as shown by Chernobyl and Fukushima). You

[1] UK energy data: www.nationalgrideso.com.

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probably do not give all this a moment's thought, but our daily life runs on coal, natural gas, uranium, and the host of materials and metals used to construct the power stations, wind turbines, and solar panels that supply the electricity. Our internet addiction is hardly energy neutral. The huge data centres needed by technology giants such as Alphabet and Amazon, and the computers 'mining' bitcoin and other crypto currencies, already produce 4 per cent of GHGs—more than civil aviation—and artificial intelligence is now demanding yet more energy.

Would buying an electric vehicle (EV) rather than a polluting diesel car make you feel virtuous? If so, do you know how the electricity to charge the car is generated or where the materials to make its batteries originate? Did the electrons stored in the battery come from a coal-fired power plant or a wind turbine? Did the lithium and the cobalt in the battery come from mines that managed their environmental footprint well and generated good jobs for their community? Most likely the cobalt came from the Democratic Republic of the Congo (DRC), which has more than half the world's reserves of the metal but which is a country wracked by corruption, poverty, and conflict with much documented use of child labour in its artisanal mines. And all electric motors need magnets and the best of these are made using neodymium—with 90 per cent of this rare earth being produced in China, a dependence that troubles Western geostrategists but is largely unknown to consumers.

If you live in an advanced economy—lucky you!—it's unlikely that you give much thought to these sorts of questions, or to where the energy that heats the water in your morning shower originates (or to the materials that make your water safe to drink), or to what materials went into making up your well-equipped home, office building, school, or hospital. If by contrast you live in a poor country, you face a very different reality: globally some three-quarters of a billion people have no reliable access to electricity—they are 'energy poor'. Most people in low-income countries (LICs) still lack access to the basic necessities of life like the clean water, electric light, and well-built homes richer societies take for granted.[2] And poorer people now need digital technology just as much as richer people. The cell phone is as useful to a Kenyan or Indian farmer checking the weather forecast or the latest crop prices as it is to a wealthy New Yorker checking the latest stock market moves.

A great deal of innovation, science, and technology goes into discovering, extracting, processing, and refining the minerals and metals which make up our materials world. And extraction and trade go together since nature does not distribute its bounty evenly. Our ancestors mined hard stone (preferably flint) to

[2] The World Bank defines LICs as economies with a gross national income (GNI) per capita of US$995 or less in 2017; middle-income countries (MICs) consist of lower-middle-income countries (LMICs) with a GNI per capita between US$996 and US$3,895; upper-middle-income countries (UMICs) with a GNI per capita between US$3,896 and US$12,055; and then high-income countries (HICs) with a per-capita income above US$12,056 (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups).

make their axes that were then traded across Europe.[3] Cornish tin was shipped to the Aegean to make bronze around 1500 BC, Afghanistan's lapis lazuli made its way into the funeral masks of the Egyptian pharaohs, camel trains took West Africa's gold across the Sahara to the cities of medieval North Africa, and coins minted using silver from the new mines of Spanish Peru circulated across seventeenth-century China. By the late nineteenth century, the first era of modern globalization was running on tin from Malaysia, gold from South Africa, iron ore from Sweden, and coal from Britain (making the UK the world's largest energy exporter on the eve of the First World War).

By the mid-twentieth century, and with the global economy running on oil, the super tanker became symbolic of the new wave of globalization that delivered not only unprecedented prosperity to the already-rich economies and the rising economies of East Asia but also unimaginable wealth to the producers of the Middle East—illustrating one theme of this book, that large-scale shifts in the demand for energy and materials correlate closely to shifts in the global patterns of trade and wealth.

Today, the liquified natural gas (LNG) carriers traversing the world's oceans are symbolic of the modern economy: their growing number reflects not only the energy transition—from coal to gas—now underway but also the sudden and massive shock to the energy market arising from the Russia–Ukraine war, the disruption to supplies of gas to Europe from Russia, and the resulting scramble for LNG with Europe and Asia competing to pay the highest prices. As with the earlier era of oil, the global gas market underpins the rising prosperity of producing nations relative to consuming nations, with new producers such as Mozambique joining older producers like Nigeria in seeing the energy, as well as the revenue, as potentially transformative for their economic development. Meanwhile, the very biggest producers—notably in the Gulf region—see the revenues from gas as a means to finance investments in the new fuel of the future: green hydrogen, produced with renewable energy. Asia now accounts for three-quarters of the global gas market, and while renewables will eventually eat into gas demand, producers will find ready markets for at least a decade if not more, not only in China but also increasingly in India as it steadily shifts from coal to gas in its energy mix.

Nations with an abundance of metals, many of them poor countries, also look to increasing their share of the wealth being created by the demand growth inherent in the world's shift to net zero. They see new possibilities in adding more value to their mineral wealth—moving away from simply exporting the ore or partially refined metal—and as a means to diversify their economies and lessen their vulnerability to the vicissitudes of the commodity cycle.[4] Cargoes of Zambian copper, Chilean lithium, Brazilian iron ore, Moroccan phosphate, Indonesian nickel,

[3] Cunliffe (2008: 150–151).
[4] On commodity cycles, see Erten and Ocampo (2013).

and Jamaican bauxite are just some of the commodities being shipped to refiners and processors, most often in China. The transition to net zero implies many more such cargoes, even as the growth in the much-needed 'circular economy' of reuse and recycling helps meet some of the materials required by global economic growth.

In short, we most certainly do live in a highly connected *materials world* in which humanity's extraction and use of resources has facilitated the increasingly complex and specialized global economy that provides the high standard of living that many of us enjoy today, as well as enabling millions more to move out of poverty. At the same time, there are still 700 million people or more in extreme poverty (according to the World Bank definition), some 9 per cent or so of the world's population, and many more millions living precariously on the edge of poverty.[5] Both LICs and LMICs look to their natural resources for the faster economic growth and greater public revenues that can help lift their citizens out of the poverty trap.

This brings us to a central issue discussed in this book. We are in a materials world where the continued extraction and burning of fossil fuels in energy generation and transport, together with the emissions associated with mining and metals refining, are taking us to levels of emissions that increasingly imperil humanity. We already see the impact in an increasing frequency of droughts, fires, and floods of rising severity. Such climate impacts endanger the world's prospects for ending poverty: over the longer term any gains in poverty reduction could be eliminated, especially by the increasing impact of climate change on agriculture which still provides the main livelihood of many of the world's poorest people (as well as underpinning food security). In addition, extractive industries have a bad record of damaging nature both through pollution, especially of water sources, and through the destruction of biodiversity through the clearance of land for mining, oil and gas wells, and associated infrastructure. And fundamentally, the natural capital embodied in forests, biodiversity, soils, fisheries, and wildlife offers, in addition to their intrinsic merits, many economic opportunities. If properly protected and maintained, these can sustain livelihoods and contribute to rising prosperity for generations to come—long after the deposits of oil, gas, and minerals are exhausted. In short, our materials world is simultaneously both part of the problem (especially fossil fuels) and part of its solution (the materials necessary for the many technologies essential to carbon-neutral pathways). The coronavirus pandemic (COVID-19) exacerbated this tension—notably by intensifying the huge vulnerabilities of African economies and their consequent need for revenue from all sources—as has the energy shock arising from the Russia–Ukraine war which is slowing progress in reducing coal in the energy mix (as cheaper coal is being substituted for more expensive gas).

[5] https://pip.worldbank.org/home.

1.2 Key concerns

This book is motivated by *three* main concerns.

First, the debate on the extractive industries among development researchers and practitioners has become lopsided in characterizing the sector as overwhelmingly toxic in its impact on both poverty and nature, leading to the conclusion that it holds little hope of contributing to inclusive and sustainable development. While we do not underestimate the damage arising from the extractive industries (which is very well documented), we must face the fact that unless the world achieves a completely circular economy—which is not technically possible at this stage (if ever)—global prosperity requires the mining industry to continue and expand. And the energy transition cannot be accomplished overnight: oil and gas extraction for electricity generation, transport, and petrochemicals will continue for at least a decade or two.

To contain the growth in global materials use while also reducing poverty, champions of 'degrowth' propose that the advanced economies cease their economic growth, and simultaneously make large transfers to the Global South to raise their living standards. While admirable as an ethical principle, this is in our view unlikely to have political traction in the Global North, not least because of the *scale* of transfer required given (i) the population of the Global South is much larger than that of the Global North and (ii) the *size* of the gap between the extreme poverty line and the average income of poor households. Moreover, one developing country, China, now contributes nearly one-third of global emissions and India, which is currently in third place after the United States in the global emissions league, is coming up fast.[6] Emissions are not simply associated with rich societies: increasingly they are generated by societies whose per-capita incomes are still low but growing—and often rapidly.

Second, the developing world has very large deposits of mineral wealth, and in some countries the actual and potential revenue streams are very large indeed relative to the size of their populations. Combine this fact with the Global North's reluctance to license new mining or oil and gas projects, and one observes a shift over the last three decades in the extractive industry towards the Global South—in mining especially.[7] And then consider the difficulty that LICs (and many MICs) face in diversifying their economies by integrating into global value chains (GVCs) when they do not yet have the infrastructure and skills essential to generating higher value-added per worker in agriculture, manufacturing, and mining. Given all of this, Southern governments understandably seek to maximize the revenues from their extractive industries (which in LICs are also one of the few sectors to attract large-scale foreign investment). Then add in the potential to use national

[6] https://ourworldindata.org/co2-emissions.
[7] Roe (2021).

gas resources for electricity generation to reduce energy poverty; to provide the stable power supplies upon which agricultural and manufacturing development rely; and to meet a growing domestic transport-fuel demand. All these factors create a powerful political momentum, making it unlikely that the governments of the developing world will volunteer to leave valuable resources in the ground, notwithstanding the vulnerability of their own countries to climate change.

Our third concern is that despite the potential associated with endowments of materials wealth, they come with serious risks—environmental, political, economic—which must be carefully managed given that there is so much momentum to continue extraction. In particular, commodity prices and therefore revenues are volatile, slumps follow booms, and both are destabilizing for economies. The COVID-19 pandemic and the resulting shock to the global economy has provided us with a recent and dramatic reminder of this inherent vulnerability: when the oil price fell sharply in 2020, hitting the finances of producers such as Angola, Ghana, and Nigeria, and when the Russia–Ukraine war created fresh uncertainties. The message from this is that countries should *not* eschew the use of their resource wealth but rather commit to understanding and managing the risks that this wealth poses. Producing countries must also face up squarely to the new stresses of the future net-zero world in which fossil fuel resources will eventually be 'stranded'. This is of course also a challenge for the many companies operating in the countries concerned. A failure of these companies to adjust consequently risks their capital drying up as investors come to attach ever greater importance to ESG (environmental, social, and governance) criteria.

These concerns are evident at successive COPs (Conference of the Parties; the United Nations' (UN's) climate change conferences). Many African governments protest increasingly loudly that they need to continue fossil fuel extraction to provide the finance for economic growth and poverty reduction, as well as for energy generation and transport to meet their own domestic needs. They point out repeatedly that the advanced economies are historically responsible for the majority of emissions now in the atmosphere. They call on a regular basis for more finance to help their nations move onto low-carbon pathways, so that renewables shoulder the burden of ending energy poverty. And still the wealthy countries fail to deliver a financial package that can achieve all this. The result is that most developing countries intend to continue with fossil fuel extraction.

Humanity faces at least two imperatives, namely the need to: (i) *end global poverty*, including energy poverty and (ii) *protect nature*, including natural capital in all its forms and to avoid changing the climate in ways that endanger both humanity and nature. We might disagree on some of the specifics (e.g., how to define poverty or what constitutes natural capital) and there are certainly lively debates on how best to *achieve* the two imperatives, but most of us would sign up to the two imperatives themselves.

Where there is strongest disagreement is over the nature of the 'materials world' necessary to achieve both imperatives, and specifically the role of the extractive

industries in it. We have already introduced our position, namely that oil, gas, and mining will continue as the energy transition unfolds and as the circular economy expands. It is easy to dismiss these industries as inherently harmful, but they remain crucial to the materials world that underpins ending poverty. That said, humanity needs to both: (i) reduce the industries' harmful impact on nature, including the climate, and (ii) maximize investments in renewable energy and other net-zero technologies together with the circular economy, in order to slow down the growth in the demand for fossil fuels and metals, until we reach a point at which fossil fuels can remain in the ground, unburnt, and 'green mining' has been achieved.

A stylized representation of these connections is shown in Figure 1.1; the arrows indicate the direction of influence that we see as linking the materials world and our two high-level imperatives.

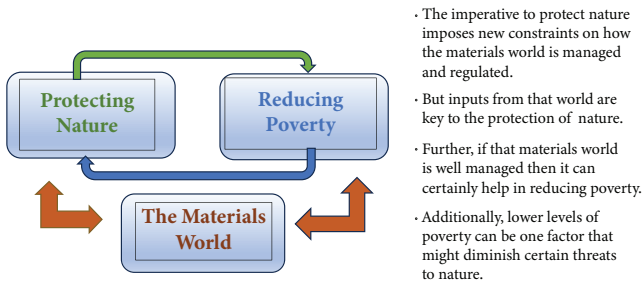

Figure 1.1 Materials and their link to the two global imperatives

Source: Authors' illustration.

There are many tasks that must be undertaken if the extractive industries are to contribute meaningfully to ending poverty and protecting nature. One is the reform of the extractive industries to further increase transparency, reduce corruption, and accelerate the reduction of the sector's emissions. The other is to improve the institutions and management practices of the governments of the host economies. Both these sets of conditions are assessed in some detail in this book, the structure of which we set out in the next section.

1.3 The scope and structure of this book

The purpose of this book is not to provide a definitive blueprint about how to manage resource wealth in the developing world, or to cover every topic.[8] Neither do we attempt to lecture policy-makers on what they should, and should not, do. Policy is so embedded in domestic politics that each country must craft its own

[8] For example, we do not cover artisanal mining in any depth. For discussion of a more comprehensive range of topics, see Addison and Roe (2018a).

solutions. Rather, our aim is to explain the critical significance of the extractive industries to the global ambition for net zero and present a comprehensive menu of topics that policy-makers need to consider in creating and implementing their national development strategies. In that spirit, we provide practical examples of successful policies but also try to offer some guidance to policy-makers in assessing the practicalities of those same policies in different circumstances.

Our book also aims to broaden the development debate around the extractive industries. Within that debate, the established narrative focuses on transparency in the collection and use of the revenues arising from oil and gas and mining to combat the resource curse traditionally associated with the sector. This focus is still highly relevant and, as we shall document, far from fully achieved—despite the considerable progress made over recent decades. Yet confining discussion to transparency is now insufficient because any discussion of the extractive sector must also grapple with the industries' pivotal role in relation to climate change; not only as a supplier of the critical metals and materials necessary if the net-zero transition is to be achieved but also as a source of the fossil fuels that contribute so much to the growth of emissions. Consequently, in this book the reader will find discussion of both the issues around transparency—as well as those of economic management per se—together with those of climate and the sector's impact on nature more broadly.

Having set out the scope of this book, we now outline the structure of subsequent chapters.

Chapter 2: Imperatives, Opportunities, and Dilemmas. The extractive industries are highly controversial but remain vitally important in much of the developing world. This chapter considers their role in reducing energy poverty and discusses scenarios for the future of the global markets for oil, gas, and metals (emphasizing the increasing importance of Asia). It then provides a snapshot of the increasing dependence of many developing countries on the extractive sector and uses that analysis to provide a perspective on the new opportunities arising from the global net-zero transition. Finally, the chapter sets out six dilemmas arising from the role of the extractive industries under the sub-headings of: poverty reduction and nature; mining and environmental risk; demand and supply imbalances; fragile states and supply-chains; strategic dependence; and technological backwardness. Overall, the chapter seeks to sketch the context, both national and global, in which policy-makers must make often hard choices.

Chapter 3: Recognizing the Risks. This chapter analyses the risks facing resource-dependent countries. These include: (i) *economic* mismanagement (the 'resource curse'); (ii) *political* mismanagement; and (iii) *environmental* damage (climate change and the destruction of natural capital). It distinguishes 'risk' (which can be addressed probabilistically) from 'uncertainty' (infrequent unpredictable events). Mozambique, with its large natural gas resource, provides examples of all the component risks and uncertainties. The chapter then explores the

risks and uncertainties arising from the global transition away from fossil fuels to renewable energy. This shift could result in 'stranded countries' as well as 'stranded assets'. Finally, the chapter explores the nature of the net-zero transition for metals, including the eventual emergence of new, cheaper materials as substitutes for critical, but expensive, minerals. Overall, the chapter recommends focusing on a nation's *entire portfolio* of natural resources in order to minimize the impact of shocks, and to mitigate risks and uncertainties.

Chapter 4: Seizing the Opportunities introduces the underlying logic of the second half of the book which focuses on the three main transformations required—in economies, states, and companies—and the related *attitudes* and *policies* that are necessary to seize the opportunities while also managing the risks. Huge investments in mining are underway, not least to meet the material needs of net zero, and judicious complementary investments and policy reforms can deliver greater benefit to national economies. The resource curse is not inevitable. At the same time, the chapter reinforces Chapter 3's message that renewable natural capital has the greatest long-run economic value. Successful economic transformation requires success in transforming the state: ensuring transparency and reducing corruption and building the capacities of local and central government—especially in project selection and management. Effective partnerships can then be built with companies, the best of which are now delivering more community benefit, decarbonization, and minimal environmental impact.

Chapter 5: Transforming Economies. This chapter argues for a change in government attitudes to their extractive industries: as enclaves useful primarily as revenue sources. This is too narrow a perspective: it fails to recognize the broader economic linkages that are invariably possible. Achieving greater economic impact requires that governments redefine how best to encourage economic diversification. Specifically, *manufacturing activities* tend to be over-emphasized—especially those based on a narrow view of local content ignoring competitiveness—while opportunities in the *renewable resource economy* are underemphasized (especially agriculture and ecosystem services, the livelihood of millions of poor people). Moreover, industrial policy will not succeed when policies and investments in energy, enterprise development (especially for small and medium-sized enterprises), and financial systems are neglected. Stronger development finance institutions can be key players—one lesson from Latin American successes. Sharing power and transport infrastructure can further strengthen the linkages from extractive industries to local and national economies.

Chapter 6: Transforming States: Transparency and Corruption is the first of two chapters on the vital role of the state. It analyses the roles that states, civil society, and international actors can play in tackling the weak governance that sometimes leads to resources being used for private rather than public benefit. It discusses the corruption that bedevils licensing and commodities trading; and oil theft which runs into billions of dollars. Ensuring transparency in revenue flows

to the state is vital to better fiscal management, building governmental accountability to citizens, and avoiding state fragility. Initiatives such as the Extractive Industries Transparency Initiative (EITI) have already achieved much, not least in improving the information base. Although corruption and theft may never be fully eliminated, they can certainly be reduced by building improved technical capacity in domestic regulation, by enhancing civil society's capacity to cast light on the sector (though dangerous work in authoritarian societies), and by strengthening transparency in supply-chains (in which information technology offers new opportunities).

Chapter 7: Transforming States: Economic Management. While market mechanisms and private initiatives can deliver much for development, public action is also necessary to maximize the economic benefits of the extractive industries; manage potentially large capital and revenues flows; minimize adverse environmental and social impacts; and steer the economy towards a net-zero future. An 'all of government' approach is desirable: to coordinate action, especially between local and central government, around a long-term sector strategy; and to provide the private sector with a consistent policy framework which encourages investment. The chapter also emphasizes improvements to public finance, including taxation, especially those tax issues relating to national strategies for net zero, as well as the politically challenging task of removing fossil fuel subsidies. The chapter discusses the many decisions involved in the macroeconomic management of resource booms, including accumulating (or paying off) debt and how much to spend and how much to save in a sovereign wealth fund (SWF).

Chapter 8: Transforming Companies. Companies in the oil, gas, and mining sectors face ever intensifying scrutiny over their ESG practices and impacts: from civil society but also from investment funds and other stakeholders with ESG mandates. Companies with good practices—and the chapter documents significant progress since 2000—can deliver substantial benefits to host economies: both local and national. The chapter suggests further ways in which they could enhance their impacts in partnerships with government. Unfortunately, there are also companies that are at best cynical about their ESG impacts, or uncaring: the worst outcomes arise when they coexist with exclusive governments favouring elite interests. The chapter also discusses the issues arising for companies from the eventual stranding of fossil fuels: international oil companies (IOCs) may exit oil and coal, and shift to renewables, at a much faster rate than national oil companies (NOCs). The latter pose a potential macroeconomic risk.

Chapter 9: Values, Knowledge, and Interests concludes the book by restating and summarizing its main arguments under three headings. The first is *values* and specifically the value that societies assign to ending poverty versus the value assigned to protecting nature (and whether nature's value is seen as instrumental or intrinsic). Given their limited finances, the governments of poor countries tend to prioritize poverty over nature. The second is *knowledge*: we now have a

great deal more evidence about how to improve the developmental role of the extractive industries. Knowledge also encompasses scientific and technological advances which have the capacity to upturn markets for metals, materials, and fuels with major consequences for the fortunes of nations. The third is *interests*: groups within society can oppose or promote desirable reforms. Additionally, nation states have interests and compete with each other; we have now entered a new geopolitical era characterized by heightened conflict, which will surely have profound implications for the prospects of the extractive industries.

1.4 Conclusions: 10 main messages

To conclude, we set out the 10 main messages of this book.[9]

1. Global climate action profoundly affects the markets for metals, minerals, oil, and natural gas, benefitting economies endowed with the critical minerals essential to the technologies of the net-zero transition, while posing risks to those endowed with fossil fuels.
2. Developing countries also have large endowments of renewable natural capital such as forests, water, soils, and biodiversity. These too offer new opportunities (sometimes as carbon sinks) and have potentially greater longer-term value than the non-renewable resources.
3. Resources matter: as sources of energy; critical materials for net zero; and, if properly managed, drivers of economic transformation and poverty reduction.
4. The extractive industries dominate foreign investment in many countries, and are frequently the largest source of government revenues and exports. Realizing the full development benefit requires a strong working relationship between companies and the state.
5. The extractive industries can contribute to diversifying economies and there are far more local and national possibilities than is generally recognized. This calls for an 'all of government' approach, with strong analytical capacity in project selection.
6. Transforming economies also implies transforming state institutions, their capacities, and their transparency (especially in managing revenues). This is highly political and country specific, but countries can now draw upon a wide range of practical and tested international initiatives.
7. Managing the macroeconomic consequences of resource revenues requires avoiding excessive borrowing, improved revenue sharing between local

[9] These messages build on an earlier UNU-WIDER project published as Addison and Roe (2018a); see in particular Addison and Roe (2018b).

and central government, better (and greener) tax systems, and greater clarity around the role of SWFs.

8. Effective and inclusive governments working with socially and environmentally responsible companies is the ideal, and there are now many international standards to help guide progress. Companies can then achieve greater development impact, both locally and nationally.
9. When governments are ineffective and exclusive (working mainly in the interests of some elite), they attract irresponsible companies. Responsible companies can still have local-level benefits, but positive national impact will be hard to achieve in fragile states.
10. The extractive industries are pivotal to development and to the achievement of net zero. The problems that characterize the sector are not unsolvable, and much can be done to improve the chances of inclusive development and support the transition to net zero.

In delivering a better future for the extractive industries, one cannot overemphasize the importance of an 'all of government' approach: a tightly coordinated set of public agencies at both local and national levels focused on devising a realistic assessment of the opportunities and risks for development from the sector. And this approach needs in turn to partner with companies, especially foreign investors who have deep and long-standing knowledge of global market conditions and trends. This is especially important for 'new producers' which, prior to the resource discovery, generally have little experience—and are therefore inclined to latch on to old ideas, potentially exposing them to repeating the errors of older resource economies.

2
Imperatives, Opportunities, and Dilemmas

2.1 Introduction

On 25 January 2019, a dam holding back 'tailings' (mining waste and water) from the Córrego do Feijão iron ore mine near the town of Brumadinho in Brazil's Minas Gerais province collapsed. At least 232 people were killed by the rapidly moving sludge, including workers trapped in a canteen at lunchtime. This followed another tailings disaster in Minas Gerais in 2015 when a dam failure at an iron ore mine, also owned by Vale SA (the world's largest producer of iron ore), destroyed the village of Bento Rodrigues, killing 19 people and dumping toxic sludge into the Doce river which flows into the Atlantic Ocean.

Such disasters reinforce the widely held view that the extractive industries are a toxic activity bedevilled by continuing abuses: environmental, social, and political. The word 'extractive' itself resonates with negative connotations, as any brief scan of the media shows.

The extractive industries have rarely had a good image, and while many of the big companies are improving their practices (see Chapter 8), systemic problems abound. Mining together with oil and gas extraction can inflict catastrophic and irreversible damage to natural capital and livelihoods. Small-scale ('artisanal') mining commonly lacks effective regulation, resulting in the pollution of water and soils (mercury is used to recover gold from sediments, for example), deforestation, child labour, and frequent accidents.[1]

The theft of revenues from mining and oil and gas continues, and corruption still plagues commodity trading. The huge resource wealth of the DRC, Libya, and Venezuela has failed to secure their prosperity—but has certainly destabilized their societies. Success stories, notably Botswana, remain rare among resource-rich countries.

The sector's standing has sunk even further with the climate crisis. Campaigners from 'Extinction Rebellion' and 'Just Stop Oil' glue themselves to the doors of Western oil companies and banks demanding 'system change not climate change'. The growth of investment funds with ESG mandates—a market worth well over US$23 trillion—has accelerated disinvestment from oil and gas extraction as well

[1] This book mostly focuses on industrial mining and oil and gas.

Resources Matter. Tony Addison and Alan Roe, Oxford University Press. © United Nations University World Institute for Development Economics Research (UNU-WIDER) (2024). DOI: 10.1093/oso/9780192872197.003.0002

as coal mining.[2] Companies are vulnerable to the eventual 'stranding' of fossil fuels and there is alarm over the potential impact on financial systems.[3] Miners of metals need to decarbonize if GVCs in agriculture, manufacturing, and services are themselves to fully decarbonize.

Nevertheless, developing countries still look to the extractive industries given their economic importance, and not least to the imperative to end poverty. With over 700 million people living without electricity (and 2.4 billion people using inefficient and polluting cooking systems), it is hard to ignore coal and gas resources (even as solar, wind, geothermal, and other renewables increasingly dominate the energy future).[4] The extractive industries are a big source of tax revenue with which to fund development spending, and they can potentially help in diversifying economies (see Chapter 5). Moreover, the sector is often the largest foreign exchange source: oil, gas, and coal together account for more than 20 per cent of total exports in 17 LICs and LMICs, while mining provides foreign exchange for even more countries (especially through the exports of critical minerals needed for the wind turbines, solar panels, EVs, and other net-zero infrastructure).[5] These are opportunities for poorer nations.

We therefore face a set of dilemmas. The extractive industries remain critically important to many developing economies and their imperative to end poverty. Building the infrastructure and technologies of global net zero requires more metals in amounts far beyond those available from recycling. Yet the sector often causes social and political harm and is a danger to renewable natural capital. Burning fossil fuels will soon exhaust the global carbon budget and is already causing large-scale climate damage in developing countries by drought, flooding, and storms.[6] Pakistan's floods in 2022 alone caused damage and economic losses of over US$30 billion (with reconstruction and recovery requiring a further US$16 billion).[7]

These dilemmas are well understood in the Global South and surface regularly at the UN's COPs, especially around the failure of wealthier nations to fulfil their commitments to funding climate adaption and mitigation—including financing clean energy and transport investments—and to take greater responsibility for their own emissions, both current and historic. Many governments are adamant

[2] www.jpmorgan.com/global/research/esg.

[3] This concern led to the creation in 2017 of the Network for Greening the Financial System (NGFS), which now consists of 121 central banks and financial supervisors. Insuring new coal mines and coal-fired power plants is also getting harder.

[4] https://sdgs.un.org/goals/goal7.

[5] Ericsson and Löf (2020: table 1). The United Nations (UN) has developed a classification system for critical minerals and other resources, which is now used by the African Union (AU) and the European Commission (EC). See https://unece.org/climate-change/press/cop28-un-urges-coordinated-action-align-soaring-critical-raw-materials.

[6] The impact of climate change on cities is of particular concern: see Bastin et al. (2019).

[7] Government of Pakistan (2022: 23).

that they must continue producing fossil fuels: prior to COP27 in 2022, Nigeria's President Buhari put it bluntly: 'don't tell Africans they can't use their own resources'.[8]

This chapter discusses the imperatives, the opportunities, and the global scenarios in which these play out. It also identifies a number of dilemmas to which this emerging future gives rise. It sets out some of the still unresolved tensions between the imperatives and within the opportunities. These can only worsen in the absence of greater international action on the net-zero transition itself as well as in assisting poorer countries to move onto lower-carbon energy pathways, adjust their resource sector strategies to net zero, and position themselves to benefit from a new world of greener GVCs.[9]

2.2 Energy poverty

Poverty, which is an imperative, has many dimensions: insufficient income to provide a decent standard of living; undernutrition and ill-health; illiteracy and a lack of skills.[10] And then there is energy poverty which goes hand in hand with income poverty as it limits the achievement of better livelihoods (via reliable power for irrigation pumps on smallholder farms, agricultural processing to add value to crops, and easy phone recharging to allow farmers and small businesses to check market conditions).[11] Firewood and charcoal, often the main fuels for household cooking, denude forests and add to emissions. Energy poverty is also a big contributor to the ill-health and illiteracy that accompanies income poverty (as clinics cannot keep essential medicines reliably refrigerated, households cannot cook nutritious food or must use fuels that cause respiratory illness, and children must study by the light of a flickering paraffin lamp or not at all). The UN's first Sustainable Development Goal (SDG)—'No Poverty'—cannot be realized unless SDG 7 is also achieved: 'ensure access to affordable, reliable, sustainable and modern energy for all'.[12]

Some 775 million people in the world, roughly equivalent to Europe's total population, lack electricity (see Figure 2.1).[13] Around 600 million people without reliable access to electricity live in Africa (and mainly in Sub-Saharan Africa

[8] Muhammadu Buhari, 'How Not to Talk with Africa about Climate Change', *Washington Post*, 9 November 2022. President Buhari went on to say: 'If Africa were to use all its known reserves of natural gas—the cleanest transitional fossil fuel—its share of global emissions would rise from a mere 3 per cent to 3.5 per cent.'

[9] The task of resolving the tension between the imperatives of poverty reduction and climate would be made easier if the wealthier world cut its own fossil fuel production. Newell and Simms (2019) propose a treaty to this effect.

[10] On poverty, see Addison et al. (2009).

[11] González-Eguino (2015) reviews the definition and measurement of energy poverty.

[12] https://sdgs.un.org/goals. On the SDGs, see Parra et al. (2021).

[13] www.statista.com/statistics/1106711/population-of-europe. This figure includes European Union (EU) and non-EU countries.

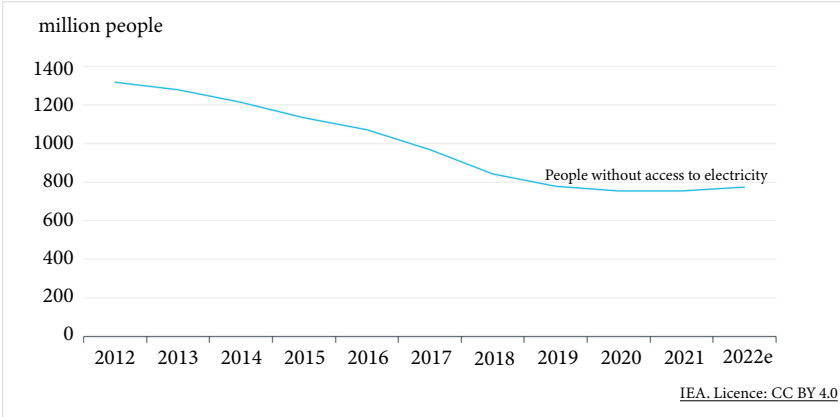

Figure 2.1 People without access to electricity worldwide, 2012–2022

Note: 2022e = estimated values for 2022.
Source: www.iea.org/data-and-statistics/charts/people-without-access-to-electricity-worldwide-2012-2022. Original published with CC-BY 4.0 licence.

(SSA)). This is more than 40 per cent of Africa's population (and 970 million Africans lack access to clean cooking fuels, according to the International Energy Agency (IEA)).[14] A decade of success in reducing global energy poverty stalled and then worsened as the COVID-19 pandemic hit economies, and later as the cost of imported energy surged with the Ukraine war. Africa accounted for much of that deterioration in global poverty.

Energy poverty is one reason why today some 40 per cent of people in SSA live below the World Bank's poverty line.[15] In contrast, the East Asia and Pacific region's progress in reducing poverty has been spectacular. The region's average (country) poverty rate fell from 62 per cent in 1990 to 3 per cent in 2015 as China's growth lifted millions out of poverty. South Asia also cut the number of poor from half a billion in 1990 to 216 million by 2015.[16] Asia's rapid advance, combined with Africa's slow progress, means that SSA is likely to account for nearly 90 per cent of the global poor by 2030, according to World Bank simulations.[17]

Energy is therefore a clear imperative for the national development goals of African governments, though many find it tough to deliver improvements due to funding shortages and institutional weakness. Rwanda, however, shows what can

[14] IEA (2022a: 35).
[15] https://blogs.worldbank.org/opendata/number-poor-people-continues-rise-sub-saharan-africa-despite-slow-decline-poverty-rate.
[16] World Bank (2018: 1). The data are for years preceding the COVID-19 pandemic. For an update, see https://blogs.worldbank.org/eastasiapacific/setting-standards-why-updating-poverty-lines-matters-east-asia.
[17] World Bank (2018: 25). The COVID-19 pandemic made matters worse (Addison et al. 2020; IMF 2019a). The pandemic increased the numbers in extreme poverty by 20 per cent, including 80 million more Africans (Sumner et al. 2020).

be done: the number of households with electricity access rose from 10 per cent in 2010 to around 50 per cent by 2020, with a target of 100 per cent by 2024.[18] This makes Rwanda a global top-performer in improving energy access. It has helped Rwandans become more productive as farmers and in business, thereby raising and sustaining economic growth (annual real growth of gross domestic product (GDP) averaged 7–9 per cent before the pandemic), and Rwanda is on course to graduate to MIC status within a decade.[19] Africa can succeed, but the continent needs considerably more help if it is to do so.

2.2.1 Achieving the necessary investments

Energy investments are expensive. They compete with other spending priorities such as health and education (key drivers of human development) for the limited public revenues that are available. Economic growth helps reduce this trade-off as it increases public revenues and the extractive sector is often the biggest contributor to revenues in resource-rich countries (see Chapter 7). Governments in those countries can look to revenues from oil, gas, and mining to fund their energy investments as well as other spending on poverty and human development. Additionally, some countries intend to use their national gas resources to build out their energy infrastructure in ways that improve energy access (Tanzania is an example). The Government of Nigeria plans to end the energy poverty of some 100 million Nigerians (nearly half the population) by increasing the use of the country's gas reserves (among the world's largest) as a 'transition fuel'. Gas will secure Nigeria's baseload electricity generation to support a growing share of renewables, with gas eventually declining as the country's target date (2060) for net zero approaches.[20]

However, for LICs and LMICs, large-scale external funding on a concessional basis (grants or low-interest loans) is also vital to boosting energy access, especially through solar and wind power. This may come via official development aid (ODA), special climate funds, or eventually from the loss-and-damage fund that was agreed at COP27 in 2022. Concessional funding can then also leverage in private finance. The IEA reckons that Africa will require funding of US$25 billion per annum to achieve universal access to 'modern' energy by 2030.[21] Yet given the difficulties of mobilizing climate finance to date, the funding task should not be underestimated and nor should the practicalities around the investments required

[18] www.usaid.gov/powerafrica/rwanda.
[19] IMF (2017a); www.worldbank.org/en/country/rwanda/overview.
[20] https://energytransition.gov.ng.
[21] IEA (2022a: 16). This is but a small part of the amount required to deliver net zero globally; see, in particular, the report of the Independent High-Level Expert Group on Climate (Songwe et al. 2022).

to reach the 2030 goal, especially to provide electricity to communities in remoter regions.[22] We return to the funding challenge in Chapter 3.

2.3 Scenarios and the global energy future

2.3.1 Drivers of global energy demand growth

In poorer economies, efforts to end poverty, including energy poverty, should be a major driver of the global energy future. One of the best means to reduce poverty is via *inclusive* economic growth (provided this is also environmentally sustainable).[23] Agricultural growth is acknowledged as especially effective at reducing poverty, since most of the poor make their livelihoods as smallholder farmers, agricultural labourers, or in the informal businesses that serve rural communities.[24] In a world where nearly a tenth of the population is hungry, household food security is a crucial basic need (including urban food security).[25] Poverty reduction via agricultural growth calls for higher productivity that in turn requires greater energy intensity in the farming methods used (not least pumps for irrigation). So improving energy access for rural households (and for peri-urban and urban agriculture) will go hand in hand with greater national energy demand and intensity. This poses exceptional challenges for sustainability as the sector's emissions will go even higher: agriculture accounts for up to a third of global emissions (and agriculture is also one of the biggest contributors to biodiversity loss, water stress, and deforestation).[26]

Energy intensity increases as per-capita incomes grow, accelerating as LICs graduate into the middle-income stage of development (when economies typically see more manufacturing activities that are much more energy-demanding than the agriculture that dominates LIC economies). Households in MICs also use, and can afford to pay for, more electricity and more energy-intensive products and services. Energy intensity then tends to flatten out around the upper-middle-income per-capita level as countries head into the high-income category where services rather than manufacturing account for an increasing share of economic activity.[27]

[22] Hogarth and Granoff (2015) discuss energy distribution.

[23] The poverty-reducing effects of growth are enhanced when countries also expand social protection and invest more in education and health: see Addison et al. (2009) and Ravallion (2017).

[24] Arndt et al. (2016) and de Janvry and Sadoulet (2009).

[25] Global hunger measured by the prevalence of undernourishment was 9.2 per cent in 2022: about 735 million people, including 282 million Africans (FAO 2023: 28, 30).

[26] Within agriculture, food accounts for 25–30 per cent of global emissions (Ritchie 2021). Food production accounts for half of the global biodiversity impacts and 60 per cent of the water impacts (UNEP 2024: 134). Many developing countries are going down the same unsustainable agricultural path as the world's richer countries. The latter have ended up with agricultural sectors characterized by large-scale emissions and environmental damage; see, for instance, Helm (2019) on the UK.

[27] Deichmann et al. (2018).

The MICs group contains the most dynamic developing economies. Whereas the LICs have the highest *shares* of poor people in their populations, the MICs have the highest *absolute* number: over 60 per cent of the world's poor currently live in the MICs (home to 75 per cent of the world's population).[28] Because the MICs stand a good chance of continuing to both grow and reduce poverty (the COVID-19 pandemic interrupted but did not fundamentally derail this trend), they are now passing through the stage in their development which typically exhibits the largest increment in a country's energy consumption: India, as the principal example, will be the single largest source of growth in global primary energy demand by 2040.[29]

Population growth is a second big driver of global energy consumption. Again, Africa comes into focus: SSA's population replacement rate (4.8) is substantially above the level of 2.1 that yields an unchanging population. In contrast, China is now an increasingly ageing society and its population is already declining.[30] By the end of the century Africa will be home to 40 per cent of humanity. Yet today Africa still only generates 6 per cent of the electricity per person (per year) of the American average.[31] Nigeria, Africa's most populous country with 216 million citizens, will have a population greater than the United States by 2050, yet today it is remarkable that the entire country consumes about the same amount of electricity as one medium-sized American city (the 100 million Nigerians in energy poverty account for about one-fifth of all energy-poor Africans).[32] Ensuring that all Africans can consume even a modestly increased amount of electricity will add up to a large increase in total energy demand, even if their average energy consumption remains well below that of the rich world.

Interconnecting with population growth is the third driver, namely *urbanization*, which adds to energy demand: cities and towns have much higher levels of per-capita energy consumption than rural villages and account already for 60–80 per cent of global energy consumption.[33] The global urban population is expected to rise from 3.5 billion to 6.5 billion by 2050 (an 86 per cent increase), again mostly in the developing world. Especially striking is the 'megalopolis' now rapidly growing along the West African coast from Côte d'Ivoire to Nigeria, taking in Benin, Ghana, and Togo along the way and which demographers predict will become the world's largest zone of continuous dense habitation. Its energy consumption, although remaining low in per-capita terms, could easily come to exceed that of most major European cities.

[28] www.worldbank.org/en/country/mic/overview.
[29] IEA (2018a: 35).
[30] Bricker and Ibbitson (2019); Lutz et al. (2004); and Prskawetz et al. (2008).
[31] EIA (2020: 3).
[32] Moss and Devermont (2018).
[33] www.undp.org/speeches/smart-and-sustainable-solutions-cities. Urbanization is also putting immense pressure on supplies of building materials, especially sand (Bendixen et al. 2019). The built environment is one of the biggest drivers of materials demand (UNEP 2024: xiv).

In short, economic growth, population growth, and urbanization in the developing world will drive the story of global energy consumption over coming decades. Consequently, in the decades up to 2040 *nearly 90 per cent of the world's growth in global electricity demand is expected to occur in the Global South.*[34]

To summarize our story so far: the governments of the developing world all aspire to achieve inclusive economic growth. But such success will lead to unprecedented energy demand on top of the already high energy consumption of the rich world. While striving to increase the share of renewables in the energy mix, most countries will still need baseload energy generation. For many this implies gas, either from their own gas fields or imported via pipelines and (increasingly) shipped in as LNG. Whereas the advanced economies together with China and India have nuclear capacity to provide baseload—and are building more—nuclear power is available to only a handful of developing countries such as Argentina, Brazil, and Pakistan (with new construction underway in Bangladesh). In Africa there is only one such country, namely South Africa, although nuclear plants are under construction in Egypt.[35] Other countries such as Mozambique have hydropower, and there is a large (but controversial) hydropower project underway in Ethiopia.

Hydrogen is also an opportunity for economies like Kenya and Namibia that are blessed with abundant renewables (geothermal and solar, respectively) to produce green hydrogen which can be liquified and exported to Asia (and used to develop their own green manufacturing base, perhaps financed by Asian investment).[36] Latin America is also seeking opportunities in green hydrogen with an eye to the regional and Asian markets (discussed later in this chapter).

2.3.2 Energy scenarios

The opportunities and market prospects for countries with resources of oil, gas, and metals depend on the key drivers already discussed but also critically on whether climate commitments are realized and how fast.[37] Delivery against those commitments will influence the pace of technological progress in renewable energy infrastructure as well as EVs, which in their turn will affect their rates of adoption. These various forces are driven by interacting decisions and outcomes—political, scientific, and commercial—that are shaping the global economy of the twenty-first century. Scenarios about the next two to three decades for the global

[34] IEA (2018a: 35).

[35] https://world-nuclear.org/information-library/current-and-future-generation/nuclear-power-in-the-world-today.aspx.

[36] Hydrogen can also be used to produce ammonia for fertilizer, which will be of great benefit to improving Africa's low yields and increasing the region's food security (IEA 2022a: 18).

[37] On the need for speed in climate action, see Stern (2015), van der Ploeg and Venables (2022), and Wallace-Wells (2019).

economy are critical information tools to help countries, as well as companies, develop coherent strategies for their own investments.

In this context, the scenarios developed by BP and the IEA help us speculate systematically about the future.[38] Although their projections differ in detail, these two authorities agree that the share of renewables in global energy consumption will be substantially higher by 2040, while the share of coal will be much lower. Notwithstanding the retreat from fossil fuels, both agree that there will be a robust demand for gas for several decades more. Although the IEA sees the share of gas declining faster than does BP, both agree that fossil fuels and especially natural gas will remain important in the global energy mix for many more years.

BP's *Energy Outlook 2022* is the most useful for our purposes: it has three scenarios for the period up to 2050, conditioned on assumptions about climate action and emissions.[39] The *Net Zero* scenario assumes that climate action targets (broadly Paris-2015 plus later COPs) will be achieved, resulting in emissions falling by 95 per cent relative to their 2019 levels by 2050. In BP's *Accelerated* scenario net zero is not reached by 2050, but BP argues that it is nevertheless 'Paris consistent' with emissions falling 75 per cent relative to their 2019 levels (the remaining emissions being in the hardest-to-abate sectors, especially heavy industry). In the *New Momentum* scenario emissions decline by only 20 per cent relative to 2019 as some climate pledges are implemented but are still well off the *Net Zero* scenario's target by 2050 (when emissions are only 20 per cent below their 2019 levels). The latter is broadly the world's current trajectory: one in which global warming will rise well above the 1.5°C target.

Figure 2.2, reproduced from BP (2022), shows total (global) final energy consumption. In the *New Momentum* scenario (the world's current pathway) total energy consumption is higher in 2050 with the emerging regions (the developing world) dominating the rise in energy consumption, consistent with our own analysis earlier. Coal still accounts for 13 per cent of the energy mix in 2050 (compared to 20 per cent in 2019) mainly because of India and other big Asian coal consumers (whereas coal's shares are much lower at 4 per cent and 3 per cent, respectively, if the *Net Zero* or *Accelerated* scenarios materialize).

The share of renewables grows strongly in all three BP scenarios: in the *Net Zero* scenario from 12 per cent of the total in 2019 to 64 per cent by 2050. In the IEA's *Renewables 2022: Analysis and Forecast to 2027* (published in December 2022), the IEA makes the largest ever upward revisions to its forecasts for renewables, factoring in the Russia–Ukraine war (which is leading to greater substitution of renewables for gas due to the disruption in gas markets) and the Biden administration's big push on energy transition (notably the Inflation Reduction Act (IRA)).

[38] In 2023, BP transferred its annual energy report to the Energy Institute: www.energyinst.org/statistical-review. It is noted that the scenario 'projections' are not forecasts; indeed, they typically consider a range of different possible futures.

[39] BP (2022).

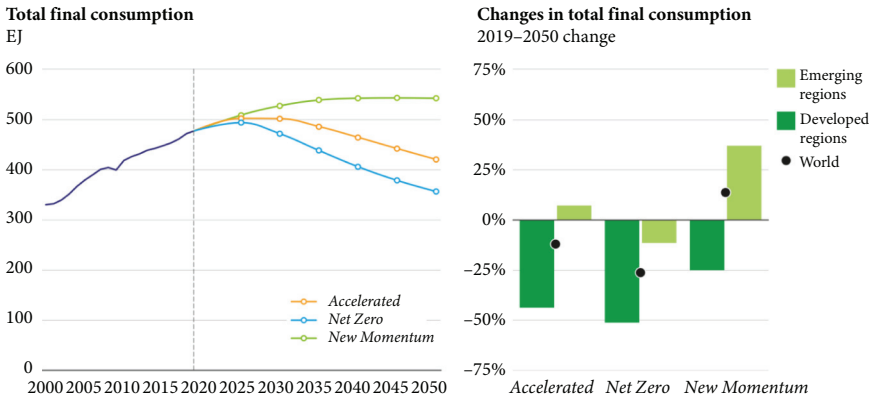

Figure 2.2 Total final energy consumption: three BP scenarios

Source: BP (2022).

It concludes that renewables will become the biggest source of global electricity generation by 2025, surpassing coal.[40]

However, gas remains the critical transition fuel with a share that remains over 20 per cent by 2050 in all three BP scenarios. In BP's *New Momentum* scenario even the absolute *volumes* of gas consumed will be 30 per cent higher in 2050 than in 2019.[41] BP's analysis was, however, completed before the Ukraine war, whereas the more recent IEA analysis lowers its expectations for gas demand (from its 2021 assessment) with demand growth through to 2030 being significantly lower than in the period 2010–2019, and then on a flat trajectory from 2030 through to 2050 with the growth in gas consumption in the developing world, especially in Asia, being offset by declines in the advanced economies (the Asian gas market is discussed later in this section).[42]

All scenarios must be hedged with caveats, and they need regular revision (not least to accommodate policy changes, new technologies, energy efficiency progress, and new shocks).[43] But they are useful in stimulating debate—not least over the underlying assumptions—and for informing policies in countries with endowments of the component fuels. Scenario-building also feeds into the investment decisions of companies which must commit billions of dollars in the expectation of profitable production over time horizons that span decades. To

[40] IEA (2022b: 10). The IEA also uses three scenarios: the *Stated Policies Scenario* which is the trajectory implied by today's policy settings; the *Announced Pledges Scenario* which assumes that all targets announced by governments are met on time and in full; and the *Net Zero Emissions by 2050 Scenario* (IEA 2022b; IEA 2022c). On the energy market as a whole, and its possible future, Yergin (2020) is an excellent guide.

[41] See BP (2022: annex data tables).

[42] IEA (2022c: 49 and 365).

[43] See Addison (2018) for further discussion of scenarios.

avoid nasty macro-economic surprises, governments are also well advised to make far greater use of scenarios than most currently do, to simulate the fiscal impact of shocks, and to maintain the necessary analytical capacity to do this. This can more than pay off in negotiating the terms and conditions of investments (and related agreements on taxation and revenue-sharing) with multinational companies (MNCs) (which have far more market knowledge than do small producing countries, especially new producers with limited experience).

2.3.3 The Asian energy century

It is a cliché to say that we live in the Asian century, but this is certainly true as far as energy, metals, and commodities generally are concerned.[44] The Asia-Pacific region is the big energy story, and the big climate story. China and India together already account for about one-third of global emissions from fuel combustion and this share seems certain to rise.[45]

All producing countries therefore need to keep a close eye on how policy is evolving across Asia. What happens in the ministries and boardrooms of Beijing and Delhi, in addition to Seoul and Tokyo, is critical to the market prospects of the DRC's cobalt, Mozambique's gas, and Uganda's oil: perhaps more so than in the capitals of Europe and North America. And aside from being a net importer, the Asian region is itself a big producer and exporter of oil, gas, and metals: coal, gas, and iron ore from Australia and Timor Leste; coal, copper, and nickel from Indonesia; most rare earths from China; and uranium from Kazakhstan (to give just a few examples).

There are at least five themes to the Asian energy future. The first is the current energy dominance of coal and how fast gas is likely to replace it. The second is the switch from coal and gas to renewables. The third is Asia's growing market for hydrogen. The fourth is how Asia might incentivize producers to supply more net-zero (or at least lower-emission) fuels and metals: if these countries are going to sustain fossil fuel use, can they at least work to lower emissions? The fifth is the impact on global metals demand from Asia's transition to net zero.

2.3.4 Energy transition in Asia

For the first and second of our Asian themes—the interplay between coal, gas, and renewables—a useful starting point is how Asia's policy-makers balance their often-competing energy objectives, all of which are important in their own right.

[44] On Asia's rise, see Nayyar (2019a, 2019b). Bridge and Le Billon (2017) discuss oil and the Asian regional market.

[45] www.iea.org/geco/data.

In a study for UNU-WIDER, Kathryn McPhail and Etienne Romsom identify eight key priorities that drive current energy policy in Asia: affordability; energy security; energy access, air quality; climate change impact; continuity of supply (managing intermittency); how to balance the grid; and diversity of use.[46] They assess how natural gas, oil, coal, and renewables rank against each of these eight priorities in China, India, and a block of countries in South East Asia (SEA).[47] Table 2.1 reveals considerable differences across the three blocks, and indicates how Asian policy-makers are playing their energy cards.

The top priority under China's 13th five-year plan (2015–2020) was *air quality* (see Table 2.1), with the best-matching energy sources for this being renewables, gas, hydro, and nuclear. The choice of gas versus coal depends on whether concerns about air quality trump *energy security* (China's second highest priority). The 14th five-year plan (2021–2025)—released in 2022 amid the turmoil in global gas markets—not surprisingly gives energy security a very high priority, and China has ramped up coal generation again to help deliver this.[48] China is still easily the world's biggest consumer of coal and its biggest producer: domestic coal output hit a new record in 2022, propelled by energy security worries.[49] Nevertheless, under the 14th plan, coal's share in the primary energy mix is expected to drop to 45 per cent by 2040 (from 60 per cent today), with the gas share rising from 9 to 12 per cent, and with wind, solar, hydro, and nuclear growing strongly alongside gas. The volumes of gas required are huge and so China is becoming an ever-bigger driver

Table 2.1 Energy transition priorities across Asia

Energy priorities ranking comparison	China	India	SEA
Affordability	3	8	8
Energy security	7	5	6
Energy access	1	7	5
Air quality	8	2	2
Climate change impact	2	4	1
Continuity of supply	5	6	7
Grid balancer	4	1	3
Diversity of use	6	3	4

Note: The table shows a comparative ranking; how each of the regions rank their priorities as evidenced in energy decision making (1 = low, 8 = high).
Source: Romson and McPhail (2020a).

[46] Romsom and McPhail (2020a). See also Romsom and McPhail (2020b) on the Asian gas market.
[47] SEA's combined population is almost 700 million.
[48] CREA (2020).
[49] Total global coal production is around 8,000 million tonnes per annum, with China producing about 3,500 million tonnes. India produces around 700 million tonnes and Indonesia 500 million tonnes annually.

of global gas markets: it overtook Japan and South Korea as Asia's largest LNG importer in 2021.[50]

Significantly, China has become the world's largest investor in renewable energy. Indeed, by 2017, China accounted for almost half of the world's investment in renewables, and today China is also a leader in manufacturing green energy technologies and EVs. Solar is already the cheapest alternative to coal in China (though still constrained by grid connection issues). China's renewable energy sector now accounts for around one-quarter of the world's total capacity; its capacity is more than double that of the US, and China is well ahead of Europe.[51] Significantly, all this investment implies a growing demand for metals.

India and SEA attach the highest priority to *affordability*, and India gives a high priority to *energy access*, while China attaches lower priorities to energy access (which is already good) and to affordability (Table 2.1). For India and Indonesia (the most populous nations in SEA), their high priorities of affordability and energy access have been pursued mainly through coal. India and Indonesia are the world's second and third biggest thermal coal producers, respectively, and their output hit new highs in 2022 (coal generated 38 per cent of Indonesia's energy in 2021). Indonesia is also the world's largest exporter of thermal coal. Both India and Indonesia have politically strong coal lobbies as large fortunes continue to be made in the industry and many poor communities depend on coal mining for work.

India is ambivalent about phasing out coal. Indeed, as recently as 2020 the government put out to tender 86 new coal mines to exploit India's huge estimated coal reserves of 300,000 million tonnes. While India is targeting an increase in renewables to 40 per cent of energy consumption by 2030, including more off-grid solar power for its large rural populations, fossil fuel subsidies are today at least seven times larger than those for renewables.[52] Although India has set a target of 2070 for net zero, its projected rate of energy demand is so large that the absolute consumption of coal will surely continue to grow. After COP27 in 2022 the power minister Mr R.J. Singh made it clear that: 'The phase-down (of coal) would happen in *percentage* terms, not in *absolute* terms' (our emphasis).[53]

It is clear from all this that Asia's energy transition urgently needs to accelerate, otherwise the region could on current trends fully consume the remaining global carbon budget (for the Paris 2°C scenario).[54] Will it accelerate? One driver is international action. In 2022 after COP27 the Group of Seven (G7) countries offered Vietnam a US$15.5 billion package to help its transition to renewables, following

[50] Japan took the top spot again in 2022 as China's economy slowed due to the continuation of the COVID-19 lockdown, but the trend still favours China to again exceed all other Asian LNG importers.

[51] www.iea.org/geco/data.

[52] https://mnre.gov.in/solar/current-status and www.iisd.org/publications/brief/background-note-fossil-fuel-subsidy-reform.

[53] 'Have Energy Needs, No Cut for Coal Phase-Down: Power Minister R.K. Singh'. *The Indian Express*, 27 November 2022.

[54] https://globalenergymonitor.org.

earlier similar support to Indonesia after COP26. Another driver is commercial, and stems from the application of carbon taxes (which constitute a powerful headwind for coal). In December 2022 the EU agreed a 'carbon border adjustment mechanism' (CBAM) to come into force in 2026 (a transitional phase began in October 2023).[55] CBAM targets carbon-intensive goods such as iron, steel, and aluminium. This will penalize emissions-intensive exporters such as India's steel industry that use large amounts of mainly coal-fired power. But it might also encourage them to lobby against the powerful coal incumbents, and push for a faster shift to renewables in India's energy mix. If CBAM does gain traction it will incentivize states elsewhere to move on carbon pricing, which would again accelerate the energy transition. China could eventually introduce its own carbon border tariffs, and raise the domestic carbon price, in response to the EU's CBAM and America's IRA. Competition in decarbonization between the EU, China, and the USA may also force the pace of energy transition across Asia, bringing coal to a quicker end.

Hydrogen is our third Asia theme. Asia's market for hydrogen is already growing fast and China is the largest green hydrogen producer and consumer, based on its renewable power capacity. Hydrogen is especially important in reducing the use of coking coal in producing steel. India's competitiveness will be threatened as GVCs turn green unless it closes the gap with China and others in using green hydrogen in industry and, as already noted, it will be vulnerable to CBAM and other carbon border tariffs. As also discussed earlier, Africa and Latin America could find a ready Asian market for liquified hydrogen produced by geothermal, solar, and hydro.

Our fourth Asia theme is the region's potential to encourage emission reductions both in its own continuing use of fossil fuels and among its suppliers. Since Asia constitutes at least 70 per cent of the global LNG market, it should have the market power to push down scope one and two emissions in the upstream global oil and gas industry and further encourage the use of carbon offsetting (a means to deal with scope three emissions, though an imperfect one).[56] The prospects of low-emissions gas, and perhaps even net-zero gas, then increase (and are given a further push by initiatives now underway for tighter verification of the standards). Again, the impetus for decarbonization arises from reaping the commercial gains from the greening of GVCs (not just in manufacturing but also in agriculture and services). Japanese and South Korean utilities have already started to pay a price premium for zero-carbon verified LNG cargoes in order to supply carbon-neutral gas to customers. Singapore, which was SEA's first country to introduce a carbon tax, is now positioning itself as a green LNG hub with a carbon trading scheme (building on its role as Asia's largest oil-trading hub).[57]

[55] https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en. The EU's trade partners claim that CBAM it is not compliant with World Trade Organization (WTO) rules.

[56] On the definition of scope one, two, and three emissions, see www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance.

[57] Romson and McPhail (2022: 20).

Such market developments provide incentives to cut emissions across the gas value-chain (especially methane). Tanzania's new (greenfield) LNG project, for example, could potentially have the lowest emissions footprint of any LNG project currently under development in the world.[58] And Tanzania is nicely positioned on the Indian Ocean to ship its LNG to Asia and earn a price premium. New producers have an advantage as it is far easier to build emissions reduction into oil and gas infrastructure at the development stage than to retrofit it later on.

Our fifth theme is that Asia's net-zero transition will significantly increase the demand for metals. China has been the big story in the metals market for nearly two decades, and its consumption took off after joining the WTO in 2001. Economic growth then averaged 9 per cent per annum for many years—much to the benefit of African mining.[59] In recent years China has accounted for over 70 per cent of global demand for iron ore, over 50 per cent for aluminium and nickel, and over 40 per cent for copper and lead. As a result, global metals production has grown at almost twice the rate of global GDP since 2000.[60] Countries endowed with the requisite metals can expect continued demand growth in the future from China, albeit at the expense of being tied to the Chinese business cycle: a risk that the country's long COVID-19 pandemic lockdown illustrated.[61] China has already secured long-term contracts for the supply of critical metals such as cobalt, lithium, and nickel, and Chinese companies have also become big investors in mining in the DRC and elsewhere.[62]

We next take a more detailed look at minerals, and the potential impact on producing countries of market trends.

2.4 Opportunities for the extractive industries of the developing world

2.4.1 The current dependence

Encouraging the diversification of developing economies and reducing their dependence on commodity exports is a long-standing goal of development policy. Yet, over the last two decades the dependence of many countries on the extractive

[58] Romson and McPhail (2022: 22).
[59] Addison et al. (2016, 2017).
[60] ICMM (2016: figure 2).
[61] See, for example, McKinsey Global Institute (2013: exhibit 5) and Addison et al. (2016).
[62] China is home to some of the most advanced cobalt processing companies and has considerable investments in DRC mining, for example the Tenke Fungurume mine. China's Belt and Road Initiative has been a driver (Economy and Levi 2014; Pigato and Tang 2015; Nedopil 2023). Nevertheless, China's control over African mining is less than often assumed: about 7 per cent of the value of total African mine production in 2018 (Ericsson et al. 2020). Bräutigam (2009) discusses China's broader engagement with Africa.

industries has *increased* significantly: this is a key finding from a UNU-WIDER study covering the period 1996 to 2016 (Roe and Dodd 2018).

Two further UNU-WIDER studies find that there were 43 LICs and LMICs where the extractive sector's share of total exports was 20 per cent or above in 2018 and in 24 of the 43 country cases extractives exceeded 50 per cent of total exports (Ericsson and Löf 2018, 2020).[63] A third UNU-WIDER study finds that for Africa's exports, the level of natural resource content (from all sources) nearly doubled between 1995 and 2015 for almost all countries (Osei-Owusu et al. 2022).

Oil, gas, and mining certainly provide useful economic opportunities but a high dependence also exposes economies to the risks inherent in commodity markets (especially price volatility), as well as to the more fundamental market adjustments to the net-zero transition: all discussed in the next chapter. These risks are especially significant for Africa, where more than half the countries are highly dependent on the extractive industries (30 countries out of 54), compared to 11 Asian countries and 1 Latin American (Bolivia).[64]

2.4.2 Metals: which countries benefit?

In a UNU-WIDER study, Ericsson and Löf (2020) identify the 13 critical minerals that are essential to building 10 technologies that underpin the net-zero future: wind turbines, solar photovoltaic, carbon-capture, nuclear energy, light-emitting diodes, EVs, energy storage, electric motors, hydrogen vehicles, and electronics. The 13 critical minerals are: chromium, cobalt, copper, graphite, lithium, manganese, molybdenum, nickel, niobium, palladium, platina, rare earths, and tantalum.[65] Some 40 developing countries are already producing (or have identified reserves of) these critical minerals.[66] The DRC, Indonesia, and Zambia have the highest production values, while Zimbabwe is also now producing seven out of 13 of the critical minerals. Overall, copper is the single most important: accounting for 55 per cent of the total critical mineral value for the group of 40 countries.

The next question is: in which countries will mining these critical minerals potentially have the most economic impact? To answer this question, Ericsson and Löf (2020) score each country using four indicators: the number of the 13 critical minerals for which the country has reserves; the number of these critical minerals already in production; the scale of new exploration activity relative to production;

[63] Among the 24 countries in which extractives account for more than 50 per cent of total exports, there are 15 countries in which minerals dominate. Five are mainly oil and gas exporters (Angola, Nigeria, Cameroon, Republic of the Congo, and Yemen), while the other four countries have a balance between mineral exports and oil and gas exports. Tanzania and Mozambique and others are set to join this group of 24 highly extractive-dependent economies.

[64] Roe and Dodd (2018).

[65] The study by Ericsson and Löf (2020) builds on work by the World Bank (2017: 75) and Vidal et al. (2013). See also Gloaguen et al. (2022); Herrington (2021). IEA (2022d) provides an overview of the role of critical minerals in the clean energy transition.

[66] See Ericsson and Löf (2020) for a full list of these countries and their critical minerals.

and the existence of a significant mining industry (defined as mine production greater than US$4 billion). Weighting the indicator scores generates a ranking of countries according to greatest *future potential*. At least *18* countries achieve impressively high scores, and Zimbabwe, Papua New Guinea (PNG), the DRC, Tanzania, and Zambia come top.[67] While not definitive, this study does indicate which economies could significantly benefit from the net-zero transition (Box 2.1 provides further insights).

Box 2.1 Potential beneficiaries from critical minerals

A mineral yields no revenue until it is extracted, processed, and transported to a market. This necessitates considerable investment, which is in turn determined by investors' perceptions of risk—including country risk (the regulatory and policy environment as well as political stability). A country's *potential* to benefit therefore consists of much more than favourable geology.

Ericsson and Löf (2020) assess this potential using three indicators, namely geology (number of critical minerals); investments (measured by announced project costs as a percentage of GDP); and country risk for investors (using the MineHutte index).[68]

Geology: The DRC scores highly because it accounts for 60 per cent of all global cobalt mined. The DRC is also a large copper producer as are PNG and Zambia, and PNG along with the Philippines and Indonesia produce both copper and nickel (metals which account for more than 70 per cent of the total production value of the 13 critical minerals). For lithium, Chile is the world's second largest producer after Australia. Bolivia has the world's largest lithium reserves but has failed to attract investment and its production remains negligible.

Investments: There is considerable variation in investment across countries. At the top end, announced projects in PNG are equivalent to 67 per cent of GDP, while in the DRC, Madagascar, and Zambia the figure is in the 10–15 per cent range, and at the bottom end, in Tanzania and Morocco, the ratio is 2.2 per cent and 0.1 per cent, respectively.

Country risk: Mining operations can span decades and stability is a key variable in determining whether investment occurs. Investment in Bolivia's

continued

[67] The countries with the greatest potential are, in order of their scores: Zimbabwe, Papua New Guinea, DRC, Tanzania, Zambia, Côte d'Ivoire, Philippines, Burkina Faso, Kyrgyzstan, Morocco, Madagascar, India, Mauritania, Uganda, Ghana, Mozambique, Bolivia, and Indonesia.

[68] The research consultancy MineHutte has developed an index or rating to estimate the investment risk in each country using indicators including: Legal (Mining Code); Governance (ease of doing

continued

lithium mining stalled as policy flip-flopped. Yet geology can sometimes trump a country's fragile politics. The DRC, for example, has a dysfunctional legal system and mining code, and a history of high-level corruption—and scores absolutely *worst* in the MineHutte comparison. Nevertheless, the country has large and long-standing mining operations and several more projects under development, notably in copper and cobalt.

2.5 Dilemmas

In sum, the global energy future will certainly be very different from what has gone before. Yet trying to anticipate how exactly this will play out, including in poorer countries potentially able to benefit, reveals many dilemmas over the role of the extractive industries. Here are just six examples.

2.5.1 Poverty reduction and nature

The first dilemma for resource-rich but poorer economies is how to end their poverty while protecting nature (the sub-title of our book). This was discussed earlier when we reasserted that *inclusive* growth is essential to reducing poverty.[69] For example, raising the productivity of Africa's farmers by substituting capital equipment and fertilizer and other inputs for their long hours of labour will not only improve household incomes, well-being, and food security but will also add to GDP and its growth. Investing a good portion of the tax revenue from the extractive sector into agricultural development will have a high return to poverty reduction *and* growth. At the same time, agricultural intensification will raise the sector's energy demands and emissions intensity especially *if* existing carbon-intensive technologies continue. It can also degrade nature unless appropriate conservation techniques are used. Hence the importance of innovation in agricultural technology as a global public good.

business, transparency); Social (political stability, conflict, population density); Fiscal (royalty rates, tax regime, economic growth); and Infrastructure (rails, roads, ports, energy security). See https://minehutte.com/methodology.

[69] Arguments for 'de-growth' have become fashionable, but stopping growth is unlikely to be either economically or politically feasible in the developing world, not least because population growth itself adds to GDP—unless every new labour force entrant is economically inactive, which is a recipe for starvation.

Later chapters have more to say about how the extractive sector can help achieve more inclusive and *sustainable* economic growth (as decarbonization increases).

2.5.2 Mining and environmental risk

A second dilemma is that the considerable new mining that is inescapable will add further to emissions and risks polluting nature unless well regulated.[70] While building a 'circular economy' to recycle and reuse more of the planet's resources will be a significant contributor to net zero, it is unrealistic to expect this will soon meet all the world's needs for materials. Today, less than one-third of 60 metals have an end-of-life recycling rate above 50 per cent, and for 34 elements recycling is less than 1 per cent.[71] Only about 20 per cent of cobalt and platinum is obtained from recycled sources in the EU.[72] The global recycling rate for lithium is below 1 per cent.[73] For at least the next decade, and probably longer, recycled metals will be insufficient to meet humanity's needs, including efforts to end energy poverty. A comprehensive World Bank study of the implications of the low-carbon transition for materials demand concludes that 'the technologies assumed to populate the clean energy shift—wind, solar, hydrogen, and electricity systems—are in fact significantly MORE material intensive in their composition than current traditional fossil-fuel-based energy supply systems.'[74]

As examples of this, the manufacture of wind turbines, batteries, and EVs, together with the construction of low-carbon buildings and low-emission mass-transport systems like trams and railways, require lots of steel produced from iron ore mined in places like Brazil's Minas Gerais. Aluminium smelters will use more bauxite from the mines of Australia, China, and Guinea. More copper will come from Chile and Zambia, nickel from Indonesia (the world's largest producer), manganese from South Africa, and tin from China, Indonesia, and Peru. A myriad of other metals with hard-to-pronounce names (like niobium and molybdenum) will also be needed.

Cobalt and lithium are especially crucial to the digital and net-zero economies. The batteries in EVs and those for the very large ('utility scale') storage of electricity produced by wind farms and solar PV need vastly more lithium and cobalt than

[70] On the environmental dimensions of mining, see Bell (2018) and Edwards et al. (2014), as well as further discussion in Chapter 8.
[71] UNEP (2011). See also UNEP (2019).
[72] Babbitt et al. (2021: 354).
[73] Haas et al. (2015: 773).
[74] World Bank (2017: xii); emphasis in the original. Addison (2018) discusses the issue further.

smartphones and laptops.[75] The average EV battery uses 14 kilograms of cobalt (about the weight of two large bowling balls), whereas the typical laptop battery use 28 grams (smartphones average 8 grams).[76]

The growth of EV adoption is therefore especially challenging for the supply of metals.[77] There were 16.5 million EVs on the world's roads in 2022, triple the 2018 number, and EVs were nearly 10 per cent of global car sales—with the largest market, China, accounting for half the growth.[78] Signatories to the Electric Vehicles Initiative are aiming for an EV market share of 30 per cent by 2030, which for China is a massive increase on the 2 per cent share in 2018.[79] If this target is met, then the demand for the cobalt used in the batteries of EVs will be 25 times greater in 2030 than its 2018 level.[80] Growing demand is stimulating large increases in the production of the materials essential to EVs, notably lithium, cobalt, manganese, nickel, copper, graphite, and rare earths: the DRC's production of cobalt rose by 400 per cent between 2009 and 2019, and the production of lithium in Argentina and Chile was up by 290 and 240 per cent, respectively, over the same period.[81] The infrastructure required to charge and service the EVs also adds substantially to materials demand.

As another example of this dilemma, a team of scientists has warned the UK Climate Change Committee that for EVs to replace the UK's 31.5 million (internal combustion engine) cars by 2050, almost twice the current annual *global* production of cobalt, an entire year of neodymium's global output, three-quarters of the world's lithium output, and 12 per cent of annual copper production will be required.[82]

These numbers are staggering. And the rate of demand growth will accelerate as the rest of the developing world follows China in using EVs. EVs in India, for example, still have a small share of the market (less than 1 per cent of new car sales) but this will surely grow as the government has ambitious targets.

But these expected trends in metal demands and so production need to be managed against the further increase in emissions and potential damage to nature that

[75] The growth rate of renewables implies huge investments in energy storage. By the mid-2020s the global energy storage market could be worth US$7–22 billion annually (Deloitte 2018: 3).

[76] Castelvecchi (2021) discusses EVs. See also 'The Cobalt Pipeline', *The Washington Post*, 30 September 2016.

[77] Jones (2020a); Jones et al. (2022).

[78] IEA (2022e: 4).

[79] IEA (2018b: 16).

[80] IEA (2018b: 13).

[81] Jones et al. (2022).

[82] 'Reaching Net Zero Emissions in the UK by 2050', open letter to the UK's Climate Change Committee, by Professor Richard Herrington and eight other scientists, 3 June 2019: www.nhm.ac.uk/press-office/press-releases/leading-scientists-set-out-resource-challenge-of-meeting-net-zer.html. They also estimate that the rate of EV growth in the UK will require a 20 per cent increase in electricity generation and, if provided by wind power, the additional materials required in the construction of wind turbines must also be added in. See also Herrington (2021).

could arise. So, another imperative is to shift the global mining sector rapidly towards net zero, minimize its environmental footprint, and maximize its social impact—tough challenges that we discuss in later chapters.

2.5.3 Demand and supply imbalances

The third dilemma is that it is unclear whether the supply of metals can keep up with the growth in demand even if there is a huge increase in investment. It takes at least a decade to bring a major mine into production. And minimizing the environmental footprint adds to the cost and length of time required in the mine's construction and development phase (as well as for related transport and power infrastructure). Refining must also be transformed by replacing emissions-intensive technologies with cleaner power sources and this too takes time, not least because refining itself needs new technical breakthroughs (and therefore considerable new investment). Price spikes during periods of excess demand seem inevitable. Demand pressure may encourage faster progress in finding cheaper substitute materials, which is already happening for batteries (as Chapter 3 discusses). But this too takes time and considerable investment. Therefore, price volatility and periodic shortages are likely until global metals markets settle into a new steady state, possibly around mid-century.

2.5.4 Fragile states and supply-chains

The fourth dilemma follows from the third, namely that much mining of critical minerals is undertaken in politically fragile states. These are beset by human rights abuses in supply-chains, haphazard regulation, frequent changes in corporate tax regimes, and political instability.[83] Notable examples are the DRC (which has over 60 per cent of the world's cobalt reserves and a turbulent history often centred around fighting for control of the nation's abundant natural resources) and Guinea (which produces a fifth of the world's bauxite, and where a coup in September 2021 jolted the market). Big mining companies increasingly realize that what they call 'tougher jurisdictions' offer some of the few realistic prospects for growing their portfolios of critical minerals. Not only will they have to risk billions of dollars in hard environments with deficient (or often non-existent) infrastructure, but in such environments they must also apply yet more effort to managing reputational risk. Consumers are increasingly sensitive to the ethics of supply-chains, ESG investors are a growing force, and the premier

[83] Such states are also more prone to attract rogue investors—most recently Russia's Wagner Group (and their successors) that offer protection and other services to local regimes in return for access to gold and other valuable mineral resources. Mali is an example (see Watling et al. 2024: 23).

industry body—the International Council on Mining and Metals (ICMM)—sets high standards for membership (see Chapter 8). All of this is guaranteed to bring numerous headaches to company boardrooms, which we explore in Chapter 8.

Relatedly, oil companies have historically been able to largely insulate themselves from the often-unsavoury politics of petro-states—by taking the public position that the use of revenue once transferred to the state is entirely a matter for the governments of sovereign nations to decide upon.[84] This position has become harder to sustain over the last decade, in part because of the work of EITI, civil society organizations, and others in shedding more light on the revenue flows (discussed in Chapter 6). Many petro-states do not have functioning democracies (i.e., their governments and leaderships are not truly accountable to their citizens, even if elections are held). Given the world's continued dependence on oil and gas for energy generation and transport until the energy transition takes a firm hold, a good portion of supply will likely continue to flow from regimes that do not serve their citizens well.[85]

2.5.5 Strategic dependence

The fifth dilemma centres on the geopolitics of accessing mineral resources and refined metals. This is an increasing worry for geostrategists given the deterioration in China's relations with the West and the broader 'deglobalization' which may now be upon us. China dominates global refining capacity: 90 per cent of rare earths processing (and 70 per cent of all world rare earths mining) and about half of the world's lithium-refining capacity.[86] Neodymium (crucial for magnets) and other rare earths from China, tantalum from Rwanda, and iridium from South Africa are just some of the 20 raw materials (later updated to 27) listed as critical to the European economy.[87] Reliable and unhindered access to supplies therefore depends not only on the geology and economics of mining but on the geopolitics as well—which we discuss in Chapter 3, as well as in our concluding chapter.[88]

[84] See, for instance, Coll (2013) on the history of ExxonMobil.

[85] See Wenar (2016).

[86] There are 17 rare earths, nearly all with unfamiliar names: lanthanum, praseodymium, dysprosium, neodymium, ytterbium, etc. They are endowed with unique magnetic and other properties that make them critical to many of today's modern technologies such as smartphones, liquid-crystal displays, broadband signalling, hybrid vehicles, laser devices, and missile guidance systems: for example, the supreme lightness of magnets made using neodymium.

[87] EC (2014). The Commission's list of critical raw materials is regularly updated: http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en.

[88] See, for instance, Global Commission on the Geopolitics of Energy Transformation (2019) and Goldthau et al. (2019).

2.5.6 Technological backwardness

Sticking with fossil fuels such as coal and gas for energy generation and petrol and diesel for transport can keep the developing world's growth going for a decade or two. However, countries making that choice—or having it imposed upon them by a lack of viable alternatives or finance to build net-zero pathways—will fall behind the rest of the world in technological progress and in their ability to take advantage of increasingly green GVCs. They could be left on a twentieth-century technology frontier while the rest of the world pushes forward to the twenty-first-century frontier. This is the sixth dilemma.

Continued dependency on fossil fuels may facilitate a rise in *absolute* standards of living in some poorer countries—and some reduction in poverty—but will be insufficient to achieve *convergence* with the living standards of those countries adopting the twenty-first-century technologies of clean energy and transport. Africa could be left in the paradoxical situation of exporting many of the metals critical to the material needs of the twenty-first century's net-zero transition, while being stuck with twentieth-century energy and transport systems, burning the fossil fuels that the rest of the world is giving up on. Africa will then be even further away from the technology frontier to which it rightly aspires, and the continent will be peripheral to green GVCs and the technological possibilities and economic opportunities that they increasingly offer.

We have provided the reader with six dilemmas to reflect upon, and there are more—including the dilemma of managing a resource boom—which we discuss in subsequent chapters.

2.6 Conclusions

This chapter has highlighted the opportunities for the developing world in the global net-zero transition: LICs and MICs are presently the main source of metals required for decarbonized infrastructure, energy generation, and transport (in addition to their use in a whole range of manufactures, not least those of digital infrastructure, a demand source that will continue to grow). Growing and sharing global prosperity will require a huge expansion of mining, as only a fraction of the demand growth can be met from recycling (despite efforts to increase recycling rates). Similarly, our analysis of the Asian energy transition highlights the likelihood that the world will require significantly more gas for at least a few more decades. Oil will still find a ready market as a source of transport fuels, even as the share of EVs grows, and petrochemicals will remain a growing market until we have better alternatives to plastics and other materials. A number of LICs and MICs are well placed to meet a substantial portion of this demand growth, which

promises greater revenue to fund their own development strategies, even as those strategies must adapt to climate change itself.

However, alongside these opportunities are many challenges. Foremost among these is the necessity to reduce the environmental footprint and emissions of mining as well as oil and gas. We have much to say about this later in this book, and the respective roles of governments and companies. Another is managing the risks and uncertainties which arise from resource wealth: that is the subject of the next chapter.

3
Recognizing the Risks

3.1 Introduction

Just over 100 years ago a book entitled *Risk, Uncertainty and Profit* by Professor Frank H. Knight of the University of Chicago was published.[1] This influential work drew a sharp distinction between risk (which can be assigned a probability) and uncertainty (which cannot). In the former we believe we have enough information about the likelihood of the outcome of an event; in the latter we do not. The hundred and more years since Professor Knight's book was published have seen shocks in abundance. Many were assigned too low a probability. Many were not anticipated at all.

Inherent to all economic-policy decisions is an assessment of risk, whether it is informal (making a judgement) or formal (deploying a model). These include investment decisions (whether to push the development of a promising sector) and borrowing decisions (whether to take on debt to finance the investment or the budget more generally). Successful economic development requires risks to be taken but the art of policy-making lies in balancing risk and reward.

When decisions must be made in the context of little (or conflicting) information, it might be better to admit to our uncertainty rather than try and assign some spurious probability to the event's likely occurrence. And then proceed with caution, especially when any downside is potentially large (from overborrowing, for example) and especially if it is irreversible (a particular concern when the damage is to nature). Therefore, while in this chapter we shall use risk as a shorthand term, the reader should be aware that policy-making often takes place amid what is actually acute uncertainty. This is certainly the case today amid a shaky recovery from the COVID-19 pandemic, war in Europe, and an unsteady trajectory for the energy transition.

Hubris is also prevalent. Often, we convince ourselves (and others) that we have a plan to manage and contain shocks. Yet there is a danger that we underestimate not only their likelihood but also the *scale* of impact. As the boxer Mike Tyson bluntly put it, 'everyone has a plan until they get punched in the face'.

Just as a boxer may never get off the canvas after a punch from Mr Tyson, so economies can struggle to find their footing after a major shock. Advanced economies have more strength and ability to recover than poorer economies: the

[1] Knight (1921).

Resources Matter. Tony Addison and Alan Roe, Oxford University Press. © United Nations University World Institute for Development Economics Research (UNU-WIDER) (2024). DOI: 10.1093/oso/9780192872197.003.0003

former have *more diversified economies* (so that a hit to one sector can be compensated by resilience elsewhere); their governments have *stronger capacities* to formulate and implement remedial action; and they have *more fiscal space* to offset the shock and initiate recovery. Poorer economies are deficient in all three, which is why development economists urge diversification, capacity-building in policy, and stronger public finances.

In this chapter we focus on two sources of risk (or uncertainty), distinguished by the potential for the typical producing country to anticipate them and to effectively respond. The first are *market risks*. Here we amplify Chapter 2's discussion of the climate and energy transition by highlighting the risks to resource economies from technological advance as well as geopolitics. Except for China, India, and some of the other large MICs, the typical small developing country has almost no power to influence technological change or geopolitical shifts (although their resource endowment may allow them to profit from one or both).

The second category of risks are distinguished from the first by the realistic chance that even a poor small country can anticipate them and respond effectively: these are the *economic, political, and environmental risks* that constitute the 'resource curse'. Our argument is that the resource curse is not a foregone conclusion, as is often assumed. We then use Mozambique as an example of a country that is in danger of the resource curse, but also one that could pull itself back given the right decisions. Mozambique also illustrates the risk posed by climate change to poorer countries—a risk to which it must adapt but one over which it has little direct influence given its tiny share of global emissions.

We then derive some policy principles for developing countries, emphasizing the need to reduce overall risk by bringing together all types of natural capital—both renewable and non-renewable—within a single policy framework, instead of leaving them in their respective policy silos as is largely done at present. The penultimate section argues that while there is scope for individual national action in managing risks, poorer countries will struggle without considerably more international assistance, both financial and technical. The chapter ends with a plea for more capacity-building in government to strengthen the evaluation of policy and investment decisions in the context of both risks and uncertainties—so that countries can take full advantage of the opportunities now emerging.

3.2 Market risks

When peering into the future, scenarios such as those of BP and the IEA summarized in Chapter 2 help us anticipate and prepare. The market for fossil fuels is robust for at least a decade (and longer in the case of gas) under most scenarios, even though the latest IEA scenarios expect the demand for oil, gas, and coal

to peak this decade.[2] From what we know about the materials intensity of EVs and renewable power infrastructure (and the necessary large-scale energy storage), together with all the other requirements of the modern economy (not least its digital foundation), metals markets appear buoyant to at least mid-century (but with the circular economy contributing an ever-larger share of supply). With fossil fuels still alive and kicking for some time, and metals and materials ramping up output, producing countries can certainly see the coming decades as a significant opportunity to use their resource endowments to tackle poverty (even though, in the case of fossil fuel producers, adding yet further to global emissions).

Nevertheless, life is full of surprises—and while scenarios are useful, overconfidence is a trap. What could lie in wait? What Knightian uncertainties might be out there? Inevitably there will be price shocks, reflecting the ups and downs of the global business cycle. Here we focus on bigger uncertainties arising from structural shifts in the markets. We begin with metals and materials, and then turn briefly to the fossil fuels. The reader should keep in mind that much of what we say is necessarily speculative.

Regarding metals and materials, sellers (producers) face less risk than buyers (commodity traders and ultimately manufacturers) over the long term if the scenarios already discussed are reasonably correct. Sellers can supply to many eager buyers, while the buyers could face rising prices and, of equal concern, supply shortages that put a brake on manufacturing and limit the market growth of EVs and wind turbines, for example. Manufacturers can and will seek new sources of supply but will also step up their research and development (R&D) to find cheaper materials with less risky supply-chains. If neither provides a solution, then the net-zero transition could slow or, *in extremis*, derail—a hit to the revenues of producing countries. In any event, producing countries should keep a close eye on the market's demand-side and its evolution.

Buyers have three (interacting) concerns: supply availability and price; their responsibilities as regards the quality of their supply-chains (especially the environmental and human rights impacts); and geopolitical risk (is the producing country subject to sanctions, for example?). And there is an added twist: 30 years ago, buyers were overwhelmingly the advanced economies of the Global North, but now they must compete with increasingly large Southern buyers, notably China since the millennium, and India (where the manufacture of EVs is also taking off). Furthermore, countries with large reserves of critical minerals such as Chile and notably Indonesia are intent on adding value to their resources by building a refining industry and then using the metals in new local manufacturing bases (including EVs) instead of exporting unprocessed ore.[3] Northern buyers

[2] IEA: www.iea.org/energy-system/fossil-fuels/oil. The Organization of the Petroleum Exporting Countries (OPEC), not surprisingly, disagrees: www.opec.org/opec_web/en/press_room/7217.htm.

[3] Bolivia, the DRC, and Zambia also share this ambition but need to overcome some fundamental obstacles (see Roe 2022a, 2022b).

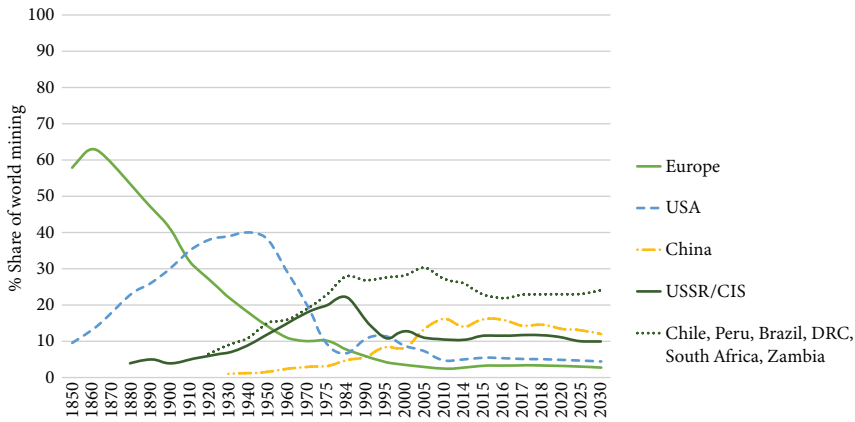

Figure 3.1 Value of mined production (excl. coal): share of world total

Source: Roe (2021).

therefore face more risk than previously in securing supplies of metals. The Global North's dilemma is accentuated by the decline of its own mining sector—mostly through choice in response to environmental campaigns—with mining becoming ever more concentrated in the Global South; see Figure 3.1.[4]

3.2.1 Nickel as one example

Nickel is an example of all three concerns. EV manufacturers worry about sufficiency of supply (the IEA expects nickel demand to rise 19-fold by 2040 under its net-zero scenario).[5] In July 2020 Tesla's Elon Musk said this to miners: 'Tesla will give you a giant contract for a long period of time if you mine nickel efficiently and in an environmentally sensitive way.'[6] Notable in Mr Musk's plea is the emphasis on environmental sustainability in addition to supply security and cost. Tesla and the vehicle industry need green materials given the environmental claims underpinning their own marketing. However, there is a hard-to-resolve tension with the sheer scale of their requirements for metals.

This has intensified with the geopolitical risk that now attends contracts for nickel (and other metals) supplied by Russia, which is the world's fourth largest nickel producer (supplying 20 per cent of the category one (high-purity) nickel required for batteries). While Russian metals are not yet sanctioned, entering a contract with Russian suppliers poses a distinct risk to Western manufacturers of

[4] Roe (2021) discusses the shift of mining out of the Global North.
[5] IEA (2022c).
[6] '"Please Mine More Nickel", Musk Urges as Tesla Boosts Production', *Reuters*, 23 July 2020.

supply disruption. It also risks their reputation: by in effect providing revenue that ultimately helps Russia fund its war on Ukraine.

Tesla has now turned to Indonesia, the world's biggest nickel miner (and a country that has also built a large refining industry). Tesla signed US$5 billion worth of deals with Indonesian companies in August 2022. This could be problematic as Indonesia's nickel mining has been beset by deep-sea water pollution from tailings run-off which has poisoned local fisheries.[7] Tesla has said that due diligence will be followed but critics worry that the EV industry will ultimately emphasize security of supply over environmental sustainability. Such tensions are intensifying more generally.

Clearly, EV companies need to convince investors with an ESG mandate as well as 'green consumers' of the battery's superiority over the internal combustion engine but must also press for environmental responsibility—not just emissions but also pollution—in the material supply-chain. Indonesia also faces difficult dilemmas on its development road. The government has provided considerable support to the nickel sector not only to build out refining but also to encourage the country's own nascent EV manufacturing capability (with investment incentives for both Chinese and Western companies).[8] However, coal accounts for 60 per cent of the country's electricity generation, and newly built coal plants power its nickel refining. Does Indonesia continue down these high-emissions (and high-pollution) pathways, with the risk that its nickel is placed at a competitive disadvantage relative to countries with cleaner mining and refining, or does it take the net-zero (and zero-pollution) pathway instead (thereby slowing its progress towards more nickel-based manufacturing but preserving its longer-term supply-chain reputation)? Powerful coal interests will lobby for the former, but big metals buyers like the EV industry will push for the latter. The winner is yet to be decided.

In sum, these trends give a competitive edge to countries that have reserves with a high metal yield (thereby requiring less energy in refining with fewer resulting emissions) but are also able to deploy renewable energy and other technologies to minimize emissions in both mining and refining, and strictly avoid local pollution. Some big investors have certainly taken note of this and so are looking for projects with such characteristics that were previously deemed to be too risky—because of their remote location together with a lack of transport and energy infrastructure and, sometimes, country risk.

The Kabanga project in remote north-west Tanzania is an example. Kabanga is the world's largest development-ready high-quality nickel deposit (with smaller amounts of cobalt and copper as well). It was discovered half a century ago and

[7] Nicola Niarchos, 'Making the Ocean Bleed Red: How the Race for Clean Power Is Poisoning Indonesia's Coastal Waters', *The Nation*, 6 March 2023.

[8] Indonesia is also restricting the export of unprocessed nickel. In November 2022, a WTO panel ruled against Indonesia's nickel export ban after an EU complaint. Indonesia has appealed the decision.

has passed through a succession of owners, none of whom could bring the project to fruition due to the site's lack of transport connectivity and power supplies but also country risk (Barrick and Glencore exited after being stripped of their licence in 2018 by Tanzania's President Magufuli).[9] Recent years have seen more stability in Tanzania's mining investment regime, a buoyant nickel price, and, critically, a hydrometallurgical technology developed by Lifezone metals to separate the metal from the rock: this water-based solution uses far less energy than traditional smelting processes (with an emissions footprint only 10 per cent of that of Indonesia's smelters). The project, a US$1.3 billion investment, is now underway and BHP, the world's biggest mining company, will eventually contribute millions of dollars to its financing.[10] This represents a turnaround for BHP which had previously exited African mining to concentrate on investments with minimum country risk. Now to meet its goal for 'future facing commodities' to provide half the company's revenues by 2030, BHP is willing to manage the risks of investing in countries which it labels 'tougher jurisdictions'.[11]

Countries like Indonesia that remain on a high-emissions pathway therefore face the risk of losing at least some investment and market share to countries like Tanzania willing and able to take the low-emissions route. And the material needs of the net-zero transition incentivize more companies to take on more country risk when the commercial logic, which is increasingly influenced by ESG concerns, warrants it. Ideally, countries with a high-risk investment profile should aim to lower it: a more stable tax and regulatory regime is a good place to begin. However, success often depends on first achieving greater political stability—a tough ask in the fragile states of the Global South, but one that yields immense benefits if successful.[12] A low-emissions pathway for mining and refining, investment in transport and communications infrastructure, and an improving country risk profile is a winning combination for future investors.

3.2.2 Uncertainty and the advance of science

Scientific discovery and technological innovation invariably lead to the substitution of cheaper materials for the more expensive. For the world economy, this is positive and highly desirable: it pushes forward the production 'frontier' by reducing production costs (and can result in entirely new products and services

[9] 'Kabenga Nickel Not Waiting to Compete Feasibility, Expects Surging Demand: CEO', *S&P Commodity Global Insights*, 6 May 2022.

[10] 'BHP Re-Enters Africa with Tanzania Nickel Investment', *Reuters*, 10 January 2022.

[11] 'BHP to Look to "Tougher Jurisdictions" in Hunt for Metals', *Financial Times*, 7 October 2021.

[12] Addison (2012) and Addison and Murshed (2005) discuss investment responses in fragile states, especially after the end of conflict.

becoming available). The impact is felt in commodity markets, improving the fortunes of economies with the resources now in higher demand (a positive shock). But it can upend the plans of those with metals or fuels which are now vulnerable to substitution (a negative shock). Science and technology are undoubtedly sources of Knightian uncertainty.

Innovation in renewable energy generation and storage as well as EV manufacturing is running at an ever-faster pace. This is propelled by the rising price of critical minerals such as cobalt and lithium, together with public action promoting green technologies (via subsidies, carbon pricing etc.), learning-by-doing among manufacturers, and a revolutionary shift in the science of energy materials through the adoption of artificial intelligence, machine learning, and robotic automation in research laboratories.[13] This promises faster rates of materials discovery than traditional combinatorial materials chemistry.[14] Venture capital is pouring into the new science of metamaterials, which are materials engineered to have properties not found in natural materials. Blending silicon with metamaterials engineered with special electromagnetic properties promises greater efficiency in solar power cells, for example. The price of silicon itself quadrupled over 2020–2021, which is a further incentive to this research.

Such progress is vital for achieving net zero's goals. It does, however, pose hard-to-gauge market risks for mining companies and for their host countries and the revenues they can expect. Scientists will eventually make the breakthroughs that reduce the intensity of use of critical materials—but the timing of these discoveries, and then the timescale to commercialization and widespread adoption, constitute major unknowns.

Graphite provides an illustration of the innovation induced by a tightening market. Graphite carbon used in the anode of a lithium-ion battery makes up half of a typical battery's materials (by weight). It is currently either mined (the top three producers are China, Mozambique, and Brazil) or synthesized from petroleum or coal (using considerable amounts of energy). The average EV uses 80 kilograms of graphite.[15] Just one company, Tesla, is on course to use some 94 per cent of the entire annual global supply of natural (mined) graphite, according to analysis by mining.com.[16] There has been little new investment in graphite mining outside of China (where Chinese EV manufacturers have tied up most supplies) because banks are reluctant to fund despite expectations of strong market growth (one exception is Mozambique's mine owned by Syrah Resources, a Tesla supplier,

[13] Just one example is the UK's Security of Supply of Mineral Resources (SoS MinErals) which is a multi-million-pound research programme. This one programme alone involves 50 industrial partners and over 20 universities and research organizations: www2.bgs.ac.uk/sosminerals/home.html.

[14] Ozin and Loh (2022: viii).

[15] www.bioeconomy.fi/making-sustainable-car-batteries-from-wood.

[16] www.mining.com/all-the-mines-tesla-needs-to-build-20-million-cars-a-year.

which is now set to raise output).[17] Western vehicle manufactures urgently need alternatives.

One innovation comes from the Nordic region. Northvolt, a Swedish batteries manufacturer which supplies Volvo, together with Stora Enso, a Finnish wood-products company, have researched into lignin, a natural polymer found in plant cell walls (lignin imparts stiffness to the plant and comprises 20–30 per cent of a tree: see Box 3.1).[18]

Box 3.1 Lignin: an example of innovation

Lignin from timber is now refined into hard carbon powder to replace graphite carbon in the anode of lithium-ion batteries. Relative to using graphite and synthetic carbon, lignin has a superior molecular structure (yielding more efficient batteries with shorter charging times), its GHG emissions in extraction (and across its life-cycle) can be as low as 3 per cent of those of graphite and synthetic carbon, it is non-toxic, and it is cheap (lignin accounts for around one-third of the organic carbon in the biosphere).[19] Lignin has considerable appeal as it replaces a fossil-fuel-based resource with a renewable one delivered through a responsible supply-chain (Finland's Stora Enso practises sustainable forestry). Given the considerable forest resources of the Global South, there could be a potential market for sustainably produced lignin, though it will probably take many years before it eats into the market share of graphite.

Graphite also illustrates the pressures coming from geopolitics. Chinese mines account for 65 per cent of natural graphite mining, and China has over half the world's graphite processing capacity.[20] Aside from concerns over China, as the world's biggest EV market, restricting supplies to foreign manufacturers, America's IRA does not permit tax credits for EVs manufactured using minerals extracted, processed, or recycled by a 'foreign entity of concern' (a designation aimed squarely at China).[21] For cobalt and lithium, China also accounts for 60 and 80 per cent, respectively, of global refining capacity. Consequently, Western EV manufacturers are scrambling to contract supplies of critical minerals, including graphite, from outside China. This is an added incentive to R&D into reducing the intensity of critical minerals such as lithium, cobalt, nickel, and graphite used in manufacturing. Neodymium and the other 16 rare earths of the periodic table present

[17] www.syrahresources.com.au/our-business/balama-graphite-operation.
[18] www.storaenso.com/en/products/lignin/lignode and www.ili-lignin.com/what-is-lignin.html.
[19] On lignin's emissions, see Obasa et al. (2022). For its other properties in lithium-ion batteries, see Espinoza-Acosta et al. (2018), Nirmale et al. (2017), and Wang et al. (2022).
[20] IEA (2022e: 7).
[21] CRS (2022: 3).

especially difficult issues as China accounts for about 85–90 per cent of the global supply of these.[22] There is now a substantial global response to this dilemma with intense efforts to find new sources of supply but also to understand how rare earths are formed, with test sites in Brazil, Madagascar, and other places.[23]

Graphite is also another illustration of the increasing pressure to build responsible supply-chains, particularly to take account of such human rights issues as forced labour. For example, the US has placed sanctions on some silica product manufacturers in Xinjiang (China) and this has contributed to a higher silicon price in recent years. For some metals we may see an increasing price premium for supplies that have certified supply-chains over those that do not. The London Metals Exchange is exploring ways to facilitate trading in such certified metals.

3.2.3 The stranding of fossil fuels

Chapter 2 has already identified some of the uncertainties in the future for fossil fuels, which arise from the timing of the eventual decline in global demand, leaving substantial reserves uncommercial to extract ('stranding') and generally cutting the taxable economic rents (and thus revenues to the state). Here we focus on the consequences that policy-makers need to keep in mind.

On the potential hit to revenues, any estimate is inevitably speculative given the uncertainties.[24] Jensen (2023) estimates that for a sample of 40 economies dependent on the extraction and export of fossil fuels, generating an average of one-third of their public revenues (and well over half in many cases), they will lose more than 60 per cent of their oil rents by 2040 if global net zero is achieved by 2050.[25] This uncertainty makes it even more urgent to diversify tax bases, as noted earlier (and discussed further in Chapter 7).

Yet a great deal can happen over the next quarter-century to raise or lower the eventual fiscal hit from stranding, not least continued innovation in the oil and gas sector to reduce production costs as well as emissions (see Chapter 8).[26] This may ease some of the headwinds for economic rents and therefore revenues from oil and gas. Additionally, fossil fuel producers must now keep a close eye on the metals markets: the availability and price of critical minerals affect the profitability of producing wind turbines, EVs, and so on, thereby acting as either a brake or an

[22] Neodymium when alloyed with iron makes the strongest permanent magnets, critical to wind turbines and electric motors.

[23] Sweden has a huge and as yet undeveloped deposit of rare earths.

[24] Mercure et al. (2018) discuss the macroeconomic impact of stranding.

[25] This amounts to some US$12–14 trillion in oil rents (on a net present value basis) under the IEA's net-zero 2050 scenario compared to IEA's 'business-as-usual' scenario (reflecting stated policies) (Jensen 2023: 6).

[26] Data science, including artificial intelligence, facilitates the discovery of new fields and increases the life of old ones, while robotics reduce production costs.

accelerator on the speed of the energy transition—and therefore on how quickly fossil fuels will strand. And a 'tail risk' for fossil fuel producers, but a definite positive for the planet, is an acceleration in climate action—especially much more finance for LICs to shift to renewables.

Manley et al. (2017) have also analysed the nature of this risk for developing economies with ample fossil fuel resources and therefore considerable exposure to revenue loss. Their key point is that IOCs can more easily diversify away from the risks of stranding (on average they hold 13 years of reserves on their balance sheets) than can *host countries* (which hold a median of 45 years of known reserves in the study's sample). The IOCs can ultimately shrink in size by returning capital to their shareholders and/or by diversifying into renewables—and most have already increased the share of renewables in their asset base (see Chapter 8). In contrast, countries must diversify by investing in renewable natural capital, human capital, and physical capital (increasingly in productive sectors unrelated to non-renewable resource extraction such as agriculture, manufacturing, and services). In sum, they must successfully transform their economies—and require assistance with finance and expertise to do so. This is, to say the least, a hugely difficult undertaking. Producers that fail could become 'stranded nations'.

Additionally, governments face political and economic pressures to remain on fossil fuel pathways for their own energy and transport needs: to do this they commonly subsidize fossil fuel use (especially transport fuels) often at a substantial fiscal cost (see Chapter 7). There is considerable policy inertia, especially given the large sunk costs of many years of existing investment, much of which has been undertaken by NOCs. NOCs are oil and gas champions within national political systems (see Chapter 8). Moreover, NOCs are partnering with IOCs in projects involving often complex financing arrangements entailing substantial debt obligations. There is a danger that less experienced NOCs in new producers (countries with no previous oil and gas extraction) such as Uganda take on too much of the project's risk, making them more vulnerable than their IOC partners to both market volatility and stranding (Chapter 5 discusses Uganda further).[27]

Countries in this situation risk over-investing in oil and gas—perhaps requiring time horizons for positive payoffs that are far longer than the realistic commercial lives of their resources—as well as in related industries (via local content policies, infrastructure, and skills), a topic we return to in Chapter 5. Yet given the uncertainties around the timing and pace of stranding, many governments will still see

[27] Volatility in the oil price (not least the COVID-19 price slump) has created uncertainties over the amount of revenue that the Government of Uganda can expect when (much delayed) production begins (Abigaba et al. 2021). Export of Uganda's oil can commence when construction of a pipeline to the Tanzanian coast is complete (the project is a partnership between the Uganda National Oil Company (UNOC), the Tanzania Petroleum Development Corporation (TPDC), TotalEnergies, and the China National Offshore Oil Corporation (CNOOC). Kayizzi-Mugerwa (2020) discusses Uganda's oil prospects.

merit in exploiting non-renewable resources: not only for the revenues but also for national energy needs—coal and gas for power, and petroleum for transport. In short, another clear tension between the poverty and climate imperatives.

Countries that have both metals and fossil fuels can partially hedge the risk to their revenues from a faster energy transition by encouraging more investment into mining critical minerals as one component of a *portfolio strategy* that dilutes the risk from any single resource. Additionally, they can invest in foreign mining ventures if they have funds. Saudi Arabia, which has deep pockets, is now using its sovereign wealth fund to invest in global mining ventures, and the resulting dividends will offer some compensation for the possible loss of revenues from the stranding of oil and gas resources. Finally, investment in renewable natural capital offers the prospect of revenues from the exciting new prospects of the new global bioeconomy (as our lignin example demonstrated) which is a further hedge against stranding, and another dimension of the portfolio strategy.

3.3 The resource curse risk

For economists, the term 'resource curse' and its main economic manifestation, 'Dutch Disease'—first coined by *The Economist* magazine to describe the pernicious economic effects of resource windfalls—are often at the forefront of the way we think about the extractive industries. It is not our intention here to summarize the voluminous literature on these topics.[28] Instead, the focus is on some key related concerns, to which we will return in later chapters.

Non-renewable natural resources have a finite life, which provides a window of opportunity that can accelerate economic development if the revenues they generate are invested well, and strong linkages are created from the extractive sector to the rest of the economy (see Chapter 5). This is, however, a *risky* window, in at least three all-too-familiar ways.

First, hydrocarbons and mining have often failed to make any significant inroads into poverty in many countries. For example, in the DRC, Nigeria, and Venezuela mismanagement has made the plight of the poor even worse. Instead of kick-starting structural transformation into higher value-added non-extractive sectors, resource wealth has often undermined local agriculture and industry through the currency becoming overvalued (a key contributor to Dutch Disease). Moreover, it has often encouraged significant corruption as well as the blatant theft of revenues (Chapter 6 discusses the issues at length). This is the first (*economic*) risk.

[28] Instead, the reader is referred to Addison and Roe (2018a); Auty (2001); Bebbington and Bury (2013); Collier (2010); Davis and Mihalyi (2021); Hendrix and Noland (2014); Lahn and Stevens (2018); Mohaddes et al. (2019); Mihalyi and Scurfield (2020); and Ross (2012). See also Cust and Mihalyi (2017a, 2017b) on the 'presource curse'.

The second is the *political* risk: petro-states as a group have a propensity to authoritarianism (e.g., Equatorial Guinea); to secession and conflict in oil-producing areas (e.g., Nigeria's Delta); and to civil war (e.g., Libya and South Sudan). Mineral-rich economies are also prone to unstable politics—Peru is a long-standing example—stemming from high inequality when elites capture the rents. Economic and political risk reinforce each other: economic crisis increases the chances of political and social breakdown, and political instability in its turn destabilizes economic policy and frightens investors away.[29]

The third risk is *environmental*, including the destruction of local biodiversity such as rainforests when cleared for mining and oil and gas extraction, together with pollution of water and soils when oil and mining operators are negligent. On a larger scale, countries producing fossil fuels cannot escape the droughts, floods, and cyclones associated with climate change—to which their own fossil fuels contribute when burnt. Many have large agricultural sectors, providing livelihoods for millions of their rural poor, which are at risk from an increasing frequency and severity of climate shocks.[30] The ocean's natural capital, such as coral reefs, is degrading at an unprecedented rate as global surface temperatures increase, undermining livelihoods in fisheries and tourism.[31] This third risk interconnects with the first two: local environmental destruction harms poverty reduction and growth, and adds to political instability (Nigeria's Niger Delta is again an example), and climate change will, if unchecked, add further peril to economies and societies (Figure 1.1 in Chapter 1 illustrates the linkages involved).

The good news is that countries can do much to reduce these three risks (and they could do a lot more if the international community was more generous with its support). Thus, *economic risk* can be reduced by strengthening the management of public finances and the conduct of macroeconomic policy: the fiscal methods for doing this are well documented.[32] In addition to fiscal policy (discussed in Chapter 7), the danger that Dutch Disease poses to the non-resource sectors like agriculture and industry can be mitigated by investing more in infrastructure—especially reliable (preferably renewable) power systems—to reduce production costs for farmers and manufacturers. Millions of people in the poorer world still earn their living from agriculture (especially as smallholders), forestry, and fisheries or in related livelihoods, especially in SSA—nearly 50 per cent of Africans still work in the sector.[33] Investing a portion of the resource revenue windfall in boosting their productivity via irrigation, power, and inputs boosts their incomes,

[29] Addison (2003, 2012); Collier (2009); Dietsche (2018a); Lei and Michaels (2011); and Ross (2012).
[30] Im et al. (2017).
[31] www.iucn.org/resources/issues-briefs/coral-reefs-and-climate-change.
[32] Addison and Roe (2004); Van der Ploeg and Venables (2018).
[33] FAO (2023: 6–7).

reduces the risks associated with rain-fed agriculture, improves food security, and spreads the benefits of resource wealth widely. Indonesia did this successfully in the 1970s using the revenue from its oil boom (whereas Nigeria let its 1970s oil boom undermine agricultural livelihoods).[34]

Debt accumulation can be better monitored than it often is, and a portion of the resource revenue used to cut borrowing (instead of accumulating more debt on the back of resource earnings).[35] Tax systems can be improved, not only with regard to resource taxation but also by strengthening tax administrations more generally, and their abilities to efficiently and fairly collect taxes on expenditures, incomes, and property—thereby widening the tax base and reducing the over-dependence on resource taxes that characterizes resource-rich countries (see Chapter 7).

Political risk can be reduced by containing elite capture of resource rents and their misuse for private gain and by building better institutions such as legislative oversight of the revenues and their allocation, together with debt accumulation (see Chapter 6). Reducing the extreme social inequality that characterizes resource-wealthy nations can also be politically stabilizing, especially when revenues are used to redress the grievances of communities, particularly indigenous peoples, who are frequently at the bottom of the social ladder (see Chapters 5 and 8). None of this is easy; it is politically difficult (even in strong democracies), it requires institutional investments that take time to build, and it entails close cooperation with operating companies (see Chapter 8). Although there is no single institutional template for these actions, they can provide significant development dividends if successful.[36]

Environmental risk arising from the extractive sector can be reduced by investing in improved regulatory oversight and adding teeth to its enforcement.[37] Satellite monitoring is now cheaper, with a level of detail that identifies forest loss, pollution, and other environmental harm at a reasonable cost (these technologies are already helping to reduce the huge and damaging methane emissions from the oil and gas industry: see Chapter 7). Colombia and Brazil, which have unique biodiversities, are identifying deforestation caused by illegal logging and mining in this way. Raising the value of natural capital also incentivizes its preservation (and encourages nature-based investing which is a rapidly growing sector globally).[38] Again, the difficulties should not be underestimated—and poorer countries need the requisite technical assistance and finance to help them adopt these new technical possibilities.

[34] Timmer (1988, 2019).
[35] On debt, see Addison and Lebdioui (2022), Fatás et al. (2019), and Van der Ploeg and Venables (2018).
[36] Andrews et al. (2017).
[37] However, see Aubynn (2018) for some of the practical difficulties seen from the viewpoint of a regulator.
[38] Lebdioui (2021, 2024).

3.4 Climate risk

Climate risk is, however, in a class of its own. The developing world as a whole now accounts for more than half of global carbon emissions, with China contributing 30.9 per cent of the total and India 7.3 per cent, followed by Brazil (1.32 per cent), Indonesia (1.67 per cent), South Africa (1.17 per cent), and Mexico (1.1 per cent).[39] The big emitters can make a significant impact on their own climate risk and that of other nations, with their extractive and energy sectors taking a lead in achieving their national determined contributions (NDCs) to cutting emissions (under the Paris Climate Accords). However, most developing countries individually account for less than 1 per cent of annual global emissions and together account for miniscule amounts of cumulative (historical) emissions. As signatories to the Paris agreement, they are committed to reducing their emissions, but they can do little individually to reduce the global total—yet they will still feel the full force of the climate crisis. For them this is a prime example of uncertainty rather than risk in Knightian terminology.

To take one example, Madagascar has a 0.15 per cent share of annual global carbon emissions.[40] Simultaneously, the island faces severe climate risk to which it has to adapt.[41] Madagascar is vulnerable not only to rising sea levels but also to cyclones and droughts: three years of drought resulted in a third of the population going hungry in 2022 (the UN declared this to be the world's first climate-change-induced famine).[42] Madagascar can at best adapt to, but not eliminate, the climate risks that it faces and even significant adaption (let alone major mitigation) is impossible without more international help given that the country's poverty is so extensive.

Ultimately, countries with oil and gas and coal have as much of a national interest in averting catastrophic climate change as countries without such resources. But this interest is not necessarily aligned with their developmental ambitions, and their political cycles, in which politicians compete with short time horizons. In using fossil fuels to build out their domestic energy and transport systems, countries risk not only contributing to an increasing frequency of climate disasters but also locking themselves into energy pathways that render their economies increasingly uncompetitive as global value chains turn green (re-emphasizing a point we made about the technological frontier in Chapter 2). Thus Mexico, for example, is hobbled by an energy policy that gives priority to, and subsidies for, the use of national oil and gas in electricity generation.

[39] https://ourworldindata.org/co2-emissions. Country shares of global carbon emissions are for 2021.

[40] https://ourworldindata.org/co2-emissions.

[41] https://unfccc.int/node/61105.

[42] David Pilling, 'Why Famine in Madagascar Is an Alarm Bell for the Planet', *Financial Times*, 3 August 2022.

In sum, countries can take steps to reduce the risks of their resource wealth turning into a resource curse. However, climate risk is of a very different kind, requiring a level of funding and technical expertise that the smaller and poorer countries struggle to find.

3.5 Mozambique illustrates the risks

Mozambique illustrates all three risks of the resource curse: economic, political, and environmental. This southern African country is becoming a major gas exporter: its first LNG was shipped in November 2022 (some gas will also be used in domestic power generation).[43] The gas is extracted from deposits in the Rovuma Basin off the north-east coast. Mozambique's location on the Indian Ocean gives it ready access to the gas-hungry markets of Asia.[44] The government is expecting a substantial revenue windfall (though its expectations may be inflated, and the timing of when the windfall peaks is some years away).

3.5.1 Economic risks

Once a country that found it hard to attract foreign direct investment (FDI), Mozambique is now one of SSA's largest recipients: net FDI was US$5.1 billion in 2021, equivalent to 32 per cent of GDP, much of it for mega-projects in the gas sector.[45] With nearly half the population still poor, large gas revenues (and the associated economic stimulus from the investments) offer the tantalizing prospect of Mozambique decisively breaking out of underdevelopment.[46] Neighbouring Tanzania is similarly excited about its own gas revenue potential.[47]

Mozambique clearly has a big opportunity. However, the nation risks getting it badly wrong—and in the process becoming another Angola or Nigeria, afflicted by the resource curse.

An early warning was the 'tuna bonds scandal', which dates to 2013, and involves US$2.2 billion of debt relating to the financing of fishery protection vessels. Some US$1.3 billion of the loans was concealed until revealed by media reports in 2016. Much of the debt was publicly guaranteed in breach of budget laws and without parliament's knowledge or approval, and at least US$500 million could not subsequently be located by investigative auditors. This is a tangled tale involving international banks, Gulf-based companies, high-level Mozambican officials and

[43] 'Mozambique's First LNG Exports to Europe Seen by Early November'. *Reuters*, 21 October 2022.
[44] See also Roe (2018).
[45] IMF (2022: 33).
[46] On poverty, see Government of Mozambique (2016).
[47] Romsom and McPhail (2020b).

politicians, and multiple court cases in Mozambique, South Africa, the UK, and the USA. Corrupt payments of US$150 million and more were made, according to a US Department of Justice (DoJ) investigation.[48] The banks involved (Credit Suisse International and VTB Capital) paid fines of over US$600 million (plus restitution payments to bond investors) after pleading guilty to charges of wire-fraud conspiracy and money laundering.[49] Some bank employees and Mozambican officials and others received prison sentences, but investigations and court cases remain ongoing.[50]

Mozambique's citizens bore a heavy cost for the folly and greed of those who ran the scheme. The concealed debt breached the conditions of an International Monetary Fund (IMF) programme, leading to the suspension of lending, aid donors cut their budget support, and a new IMF programme and debt restructuring involved severe public spending restraint for some years after 2016.[51] The cost of living spiked as the currency depreciated.[52] A reduction in fiscal space left the country weaker in responding to the onset of the COVID-19 pandemic in 2020. In September 2023 the UK Supreme Court ruled that Mozambique could proceed with its case against the boat supplier and Credit Suisse (now owned by UBS) seeking US$1.5 billion in damages (this claim includes US$1 billion for withdrawal of international financial support and US$260 million for higher debt costs as Mozambique's credit rating sank).[53]

The tuna bonds scandal occurred before even one dollar of gas from the big new fields had been shipped—although huge revenues had been widely anticipated in the press and official documents. Mozambique's debt is an example of the 'presource curse', rooted in the difficulties of managing expectations in the face of large revenue windfalls.[54]

The scandal does nevertheless offer Mozambique a salutary lesson on the risks of debt accumulation without full transparency and legislative oversight and, while painful, the debt crisis may perhaps help the country avoid the well-trodden

[48] www.justice.gov/opa/pr/credit-suisse-resolves-fraudulent-mozambique-loan-case-547-million-coordinated-global.

[49] www.justice.gov/opa/pr/credit-suisse-resolves-fraudulent-mozambique-loan-case-547-million-coordinated-global and www.credit-suisse.com/about-us-news/en/articles/media-releases/finma-mozambique-observation-202110.html.

[50] 'Mozambique "Tuna Bond" Scandal: Ex-President Guebuza's Son Jailed for 12 Years', *BBC News*, 7 December 2022. www.bbc.com/news/world-africa-63887329.

[51] IMF (2020: 9). For further discussion, see also Roe (2018). Mozambique defaulted on its debt in 2016, and by 2019 public debt was well over 100 per cent of GDP with arrears on external debt service reaching US$1.4 billion (including arrears on the Credit Suisse and VTB loans). This was a dramatic reversal after the Heavily Indebted Poor Countries (HIPC) Initiative had cut the debt level in the early 2000s (Addison et al. (2004) discuss the HIPC initiatives).

[52] See CIP/CMI (2021) and Mambo et al. (2018) on the severity of the 2015–2016 crisis and its impact on households.

[53] 'Mozambique to Seek $1.5bn in Damages over "Tuna Bond" Scandal', *Financial Times*, 20 September 2023.

[54] See Cust and Mihalyi (2017a, 2017b) and Collier (2017). Ghana is also an example; see Bawumia and Halland (2018).

path—of excessive borrowing—followed by Angola, Equatorial Guinea, and Nigeria as its gas revenues start to grow. By 2022, Mozambique was back to a position of debt sustainability, helped by a resumption of growth and stronger tax revenues.[55]

Mozambique is also creating a sovereign wealth fund (SWF) to save a portion of the expected annual gas revenue.[56] SWFs can be used as 'rainy day' funds to help stabilize public spending in the face of fluctuations in resource revenues (from shocks to commodity prices in particular) but also, sometimes, to transfer wealth from one generation to another (Mozambique's fund intends to pursue both objectives). The first goal, fiscal stabilization, is highly desirable: countries without significant public savings must resort to undesirable expenditure cuts or tax increases (as Nigeria did when the COVID-19 pandemic hit oil revenues in 2020).[57] Social spending is especially vulnerable at such times. A stabilization fund helps ease the fiscal pain. Whether poor countries like Mozambique should also use a SWF to benefit its future generations is a question we leave to Chapter 7.

3.5.2 Political risks

Social inequality is the point at which the economics of resource wealth collides with the politics. The creation of a small super-wealthy elite, while the majority remain impoverished, is a recipe for conflict—especially when living standards differ widely between regions. The location of the nation's resource wealth in an impoverished region is an especially combustible mix.

Such is the situation in Cabo Delgado, a neglected province of north-east Mozambique, the location of the base serving the offshore gas fields. Households living in Mozambique's northern provinces have the highest vulnerability to poverty and the least chance of escape as economic opportunities are so few.[58] In Cabo Delgado province, the poverty rate is well above the national average (itself close to 50 per cent) and the illiteracy rate is 52 per cent, with over half those of school age never having been to school.[59] A vicious insurrection was launched in 2017 by international jihadists recruiting young people aggrieved at the region's poverty and the paucity of local benefits from the gas investments (and from the region's mining as well).[60]

A military solution is unlikely to succeed unless the grievances of northern Mozambique are redressed. Education would be a good place to start given the

[55] IMF (2022: 13). A World Bank-supported technical assistance programme (*Gestão Económica para Desenvolvimento Inclusivo* (GEDI)) designed to strengthen all relevant aspects of the country's public investment management system has been established (Gebregziabher and Sala 2022).
[56] Bank of Mozambique (2020: 1).
[57] On Nigeria, see Addison et al. (2020).
[58] Salvucci and Tarp (2021: 1904). See also Government of Mozambique (2016).
[59] UNICEF (2022: 4).
[60] www.crisisgroup.org/africa/east-and-southern-africa/mozambique.

illiteracy rate, as would smallholder agriculture, and given the scale of the expected gas revenues there must surely be some fiscal space for the required spending. It will certainly be cheaper than combatting a never-ending insurgency if grievance continues to fester. Moreover, ending the conflict will have macroeconomic benefits as a good portion of planned investment into the gas fields and onshore infrastructure has been on hold (after Al-Shabaab attacks that impacted a US$15 billion Total Energies LNG project which was halted in 2021).

In sum, the risks arising from social inequality are among those that Mozambique has the potential to contain and reduce. So too is greater transparency around the management of the prospective gas revenues as well as foreign debt accumulation.

3.5.3 Climate risks

Climate risk, as for much of the developing world, is a different story, as noted earlier. Mozambique's NDC sets out the country's plan to cut its emissions.[61] Mozambique can play an especially valuable role given its excellent stock of renewable natural capital (carbon sinks such as forests and nature-based projects will be a good source of community income as well).[62] However, with its carbon emissions constituting only 0.22 per cent of the global (annual) total, Mozambique can make only a limited contribution to attaining the Paris goals.[63]

Nevertheless, Mozambique is very much *impacted* by climate change and will need to adapt. In 2019 the north was rocked by back-to-back cyclones. First, on 15 March 2019 tropical cyclone Idai landed on the coast of Mozambique, just north of the city of Beira, before heading inland and across Zimbabwe and Malawi, leaving at least 1,000 people dead and countless homes destroyed. Idai was the southern hemisphere's worst ever weather-related disaster, affecting 3 million people across the region, with recovery costs estimated to be at least US$2 billion.[64] Cyclone Kenneth followed soon after on 25 April, making landfall near Mozambique's border with Tanzania.

As the climate crisis intensifies, such extreme-weather events will increase in frequency and intensity, and rising sea levels will magnify the strength of all similar storm surges. Poorer countries and poorer people are highly vulnerable: the homes of the poor are fragile and incapable of withstanding storms; hunger and

[61] https://unfccc.int/NDCREG.

[62] Mozambique is one of the first recipients of funding under the World Bank's Forest Carbon Partnership Facility (FCPF).

[63] https://ourworldindata.org/co2-emissions. Mozambique's emissions will rise as gas production increases and it should endeavour to contain scope one and two emissions in the gas sector through minimizing gas flaring and venting, for example (see McPhail and Romsom 2021a, 2021b).

[64] www.worldbank.org/en/news/statement/2019/04/11/statement-on-high-level-meeting-on-humanitarian-and-recovery-efforts-following-cyclone-idai.

water-borne diseases quickly threaten when floods (and droughts) destroy crops and farmland; and humanitarian assistance is hindered by inadequate transport and communications infrastructure. Given the extent and depth of rural poverty in Mozambique (as in SSA generally), and the nature of smallholder agriculture (which remains predominantly rain-fed with little irrigation), it doesn't take much to tip thousands of households into disaster.

Even if the Paris 1.5°C goal is met, a portion of the current revenues (and the revenue savings in their SWFs) of oil and gas producers like Guyana, Mozambique, and Timor Leste must be set aside for *adaption* to climate change and to respond to the associated natural disasters. These funding requirements will escalate if the rise in global temperatures is not contained, with the economic costs of climate change—especially degraded agriculture and lost natural capital—eventually exceeding the monetary value of the revenues from fossil fuels. Tax bases will contract along with economies. And SWFs will be at risk from runaway climate change that eventually undermines the global economy, taking asset values down with it.[65] Such is the paradox at the heart of economies like Mozambique which extract fossil fuels in a world that continues to burn them.

Ultimately fossil fuels will be stranded, perhaps well before Mozambique has exhausted its gas (and very large coal) reserves. This is the fiscal risk arising from stranding, as discussed earlier. Additionally, if Dutch Disease entrenches itself, then Mozambique will be left with an undiversified economy—with high volatility in foreign exchange earnings—and a limited tax base, which will keep the country's debt ratings low and push its borrowing costs higher.

We have focused here on Mozambique as it encapsulates the risks and uncertainties that LICs with hydrocarbon resources face more generally.[66] Ghana too has over-accumulated debt on the back of its oil revenue (and suspended payments on its external debt in 2022). And there is much to learn from Angola and Nigeria which earlier went down the resource-curse road.

3.6 Managing natural capital

Creating an overall policy framework for natural capital, both renewable and non-renewable, is essential to reducing risk. In most countries, policy for natural capital is compartmentalized into different ministries (separate ministries of mining, energy and the environment). Typically, renewable natural capital (e.g., forests) is undervalued relative to non-renewables (e.g., hydrocarbons), thereby

[65] Estimates are inevitably speculative, but Dietz et al. (2016: 3) put the *expected* loss at US$2.5 trillion (of a global stock of non-bank financial assets of US$143.3 trillion in 2013) for the emissions path at the time they made their calculation (the loss could go as high as US$24.2 trillion or 17 per cent of the global stock of financial assets in 2013).

[66] Tanzania also faces the same risks; see Roe (2017).

implicitly incentivizing destruction of the former. Carbon pricing and regulatory tools can help level the field, as can the elimination of fossil fuel subsidies (politically difficult but essential: see Chapter 7). The developing world is the location of much of the world's carbon sinks, and their value can only rise as the net-zero transition accelerates.

A lesson from the world of finance helps here. Just as an investment portfolio ideally should contain a mix of assets with returns that have limited correlation, so an economy's natural capital consists of a portfolio of resources. Too much investment in hydrocarbons risks a big economic loss consequent on stranding (and continuing down a domestic energy path that limits participation in GVCs as the latter go increasingly green). Mining offers economic opportunities, especially from the net-zero green transition, but risks destruction of natural capital if pollution and land-use impact are not contained. Underinvesting in forests, reefs, and soils loses the opportunity of perpetual income—from sustainable forestry, tourism, and fishing—and destroying renewable natural capital constitutes a loss of national wealth (often irreversible). Our earlier lignin example illustrates the potential of scientific advance to create new markets for renewable natural capital: in the case of lignin, sustainably managed forests.

Moreover, renewable natural capital is a 'diffuse' resource that spreads its benefits widely by providing a livelihood for communities, and its management is a labour-intensive task which is good for employment generation. Non-renewables by contrast are 'point' resources: they are often enclaves with a low labour intensity. This employment advantage of renewable natural capital should give it a higher weight in the national resource portfolio.

Finally, just as the discount rate chosen by fund managers determines the net present value (NPV) of any investment portfolio they manage, so the discount rate applied to the portfolio of a nation's natural capital determines its NPV, but also favours some natural assets over others. Policy in most countries tends to operate implicitly with too high a discount rate. This reduces the value of the perpetual income yielded by renewable natural capital relative to non-renewables (the value of which can be extracted in coming decades), thereby tending to favour investment in the latter and destruction of the former. Short-termism exacerbated by the typical political cycle favours the present over the future and reflects not only political opportunism but also the basic fact that most people of the developing world are poorer on average and therefore inevitably favour consumption today over consumption tomorrow.

The good news is that international actors can influence how poorer countries manage their portfolio of natural capital; first, through the provision of expertise in the form of technical assistance; and second, through finance: for investment in renewable natural capital and its maintenance; for reducing emissions and pollution from oil, gas, and mining; for investment in wind, solar, and other renewable energy; and for easing the adjustment costs of phasing out fossil fuel subsidies. If

the Global North really does want the Global South to achieve net zero, and to cease the production, use, and export of fossil fuels, then it needs to provide both the technical expertise and generous investment finance necessary for the energy transition in poorer countries and to help them build more diversified economies with a stronger base of renewable natural capital.

3.7 International responses

Advanced economies have the finance, both public and private, to manage risks as well as the expertise to build greener economies and to reduce their climate risks. The Biden administration's massive green spending package (the IRA) is the prime example, which the EU is now trying to match with its own Green Deal.[67] Using their hydrocarbon earnings, the Gulf's wealthy economies are also stepping up their investments in renewables, hydrogen, and nuclear and are building more diversified economies to prepare themselves for the eventual stranding of their oil and gas reserves. And as we discussed in Chapter 2, China sees immense opportunities to green its own energy system and is taking full advantage of greener GVCs, while India could, with an extra push, catch up with China. Latin America's big economies (notably Mexico) also have the natural capital and capacity to go green, though some are too hesitant.

However, much of the developing world faces greater difficulties in these areas and is on a much slower path to net zero—some countries have barely begun. The LICs and LMICs as well as some of the smaller MICs lack both the finance and the expertise, and considerable external assistance is needed to build their capacities for effective risk (and uncertainty) management.

In economics, there is a well-known principle of 'the polluter pays'. But in the case of emissions, extracting the money out of the polluter is proving an exceptionally hard grind. In 2009 at COP15 in Copenhagen the Global North committed to providing US$100 billion annually by 2020 to the Global South for adaption and mitigation. Disbursements have fallen well short of that goal; in 2022 US$83.3 billion was provided, according to the Organisation for Economic Co-operation and Development (OECD).[68] Others such as Oxfam argue that the true figure is much smaller.[69] The annual goal of US$100 billion has in any case been badly eroded by subsequent inflation and, more fundamentally, was the result of negotiation that did not emerge from a comprehensive analysis of what is really required

[67] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en.

[68] OECD (2022a: 5). Colenbrander et al. (2022) estimate, using variables such as gross national income (GNI) and emissions, that in 2020 the US provided just 5 per cent of its 'fair share' of the climate finance pledge.

[69] Carty and Kowalzig (2022).

for both mitigation and adaption. Indeed, for adaption alone, the United Nations Environment Programme (UNEP) reckons that annual needs/costs will now be in the range of US$160–340 billion by 2030.[70] Based on an analysis of the investments and actions required for mitigation and adaption, the Independent High-Level Expert Group on Climate Finance estimates that more than US$1 trillion per annum of public and private money is needed by 2030.[71] UN climate officials are now citing figures of at least US$2.4 trillion per annum for developing countries, excluding China.[72]

Agreeing to establish a climate change loss and damage fund for developing countries was a major win for the 'G77+China' negotiating group of developing countries at COP27 at Sharm el-Sheikh in November 2022.[73] COP28 in Dubai in 2023 saw further negotiation on the fund and initial pledges (though less than a billion dollars in total by the end of 2023).[74] The Global North had resisted such a fund for years, and the tussle is far from over: the EU insists that China, Saudi Arabia, and the wealthy Gulf states should contribute to the fund—which would imply taking current emissions into account in determining contributions, not just historic emissions. The host of COP28, the United Arab Emirates (UAE), pledged US$100 million in 2023, but the Gulf will need to contribute much more for much longer (as the region, having some of the lowest production costs for oil and gas, is likely to be the last producer standing as stranding accelerates). Furthermore, many campaigners are insisting that the oil and gas industry also contribute to the fund, and the UN secretary-general, António Guterres, has called for windfall taxes on fossil fuel companies. The fund is a step forward but it is likely to fall far short of the demands of those campaigning for climate 'reparations'.

Although usually presented as a technical issue, climate finance is really a subset of geopolitics. And whereas the Paris accord of 2015 had a favourable tailwind, in that the leaders of China and the United States issued a joint statement in 2014 calling climate change one of the greatest threats to humanity and urging action, today China and the US are butting heads over fundamental issues of national security. Throw into this combustible mix the Russia–Ukraine war and the resulting shock to energy markets—as well as the Russian economy's own dependence on fossil fuels for both energy and revenue—and we have the least favourable international environment for cooperation since the Cold War. The landscape of responsibility is also changing: the debate over the loss and damage fund, for example, is increasingly becoming one between the historic emitters (the Global North) and

[70] UNEP (2022: xiv).
[71] Songwe et al. (2022).
[72] 'UN Climate Chief Urges COP29 Action to Close Financing Gap', *Financial Times*, 3 February 2024.
[73] The Group of Seventy-Seven (G77) countries now numbers 135.
[74] https://unfccc.int/loss-and-damage-fund-joint-interim-secretariat.

the new emitters (the big economies of the Global South) as well as the big oil and gas producers of the Middle East.

Space precludes us from addressing the broader sweep of development finance here. However, it is in essence highly unsatisfactory. The international debt architecture remains unfit for purpose, and for official aid many of the OECD's Development Assistance Committee (OECD-DAC) donors continue to fall short of the 0.7 per cent GNI target for ODA (and notably two aid stalwarts, the United Kingdom and now Sweden, have slid badly). Donors are shuffling money between ODA and climate finance funds, leading to double counting, together with a prioritization of MICs over LICs; the former are the biggest recipients of climate finance (partly because they are better risks as far as private funding is concerned). This deficiency and imbalance calls for more concessional financing (soft loans and grants) for the LICs, a bigger recapitalization of the multilateral development banks (MDBs), reform of their capital adequacy rules (to unlock more lending), and a reboot of the World Bank which has fallen behind other MDBs in its funding and technical assistance in the climate area.[75] Greater effort to de-risk private sector finance to get more into Africa (whose share is well below the developing country average) is also essential. There is no shortage of ideas and innovation in climate finance: debt for nature swaps; the new rainforest carbon trading alliance (launched by Brazil, the DRC, and Indonesia at COP27); and the Africa Carbon Markets Initiative (ACMI), to cite just three recent initiatives.[76] What is short is the funding, not only for climate action but for development and humanitarian aid more broadly.

For the poorer world, the Global North's stance reeks of hypocrisy: lecturing the South on the need to commit to an unprecedented energy transition while failing to provide adequate financial help, continuing to use vastly more fossil fuels per capita than the South (with subsidies that far exceed the amount of climate finance on offer), and cutting bilateral and multilateral technical assistance to improve the management and decarbonization of the extractive industries of the South (while simultaneously competing to buy the South's supplies of oil, gas, and coal as well as critical minerals). China is also on shaky moral ground. It cut funding to investments in coal-fired power plants in the Global South—following the pledge to do so by the Group of Twenty (G20) countries at COP26—but new construction of coal power capacity in China itself is six times larger than the rest of the world combined.[77]

[75] On MDB reform, see: Boosting MDBs' Investing Capacity (2022).
[76] www.seforall.org/ACMI.
[77] CREA (2023). In 2022, the Chinese authorities issued permits for new coal plants at an average rate of two per week.

3.8 Conclusions

In this chapter, we have deployed the distinction between risk and uncertainty. Institutions make decisions by assigning probabilities to events, sometimes implicitly and sometimes explicitly by using modelling to do so. The insurance industry, for example, could not function without taking a view on probabilities in order to price risk. Yet, institutions can become over-confident in their abilities. Thus, Value at Risk (VaR) models, used by financial institutions to measure and anticipate the risk of losses, appeared to work well, and profitably, until the 2007–2008 global financial crisis exposed their shortcomings, and banks went belly up. 'Knightian uncertainty' appeared with a vengeance.

That crisis, while dramatic at the time, appears quite straightforward in comparison to the complex and interconnected uncertainties with which we now live. The commodities markets shift by the second as participants, peering into the future, alter their views about the trajectory of the Russia–Ukraine war, the situation in the Middle East, the pace of China's recovery from the COVID-19 pandemic, the resurgence (or not) of inflation, the pace of the energy transition, and whether the era of globalization that has ruled for 30 years is really over. Except for the very largest developing countries, policy-makers in much of the developing world can do little to influence these megatrends. Yet, they do need to be aware of them, not only to identify and prepare for the threats but also to take advantage of the economic opportunities.

At the same time, there is a class of risks embodied in the oft-used phrase 'resource curse' that policy *can* tackle, and for which there are well-documented policy answers with a good chance of success if implemented well. Too often it is simply assumed that the resource curse is a fact of economic and political life. Yet countries can build the institutional capacities within government and public agencies to identify and manage the impact of resource wealth, through improving their investment decisions, spending allocations, and debt management—a point developed fully in Chapter 7. If they can also place day-to-day policy-making within a well-articulated vision for longer-term development—and sustain this amid the vicissitudes of the political cycle—then they stand a chance of success. In the second half of this book, we suggest ways in which the extractive industries can contribute more positively to the goals of development, poverty reduction, and the protection of nature, and how developing countries might position themselves to do well from the emerging opportunities.

Nothing is certain in this economic life. Yet, some risks are manageable. Poorer countries could assess and mitigate risk if they were provided with more external assistance to build much better analytical capacity, as well as more concessional finance, in all its forms, to manage shocks when they do strike. However, this still leaves countries facing the 'uncertainties', not least those of climate change and those relating to the timing and nature of the global transition to net zero.

4
Seizing the Opportunities

4.1 Introduction

This chapter takes stock of our argument so far and then focuses in on the opportunities that resource wealth can offer developing economies. It provides a short lead into subsequent chapters which discuss the three main transformations required—in economies, states, and companies—and the related *attitudes* and *policies* that are necessary to seize those opportunities while also managing the risks.

To recap the argument of Chapter 3, all countries face risks and uncertainties arising directly from the impact of climate change. If they are fossil fuel producers, they face risks and uncertainties over their revenues from the net-zero transition itself. The metals producers have opportunities, but they cannot take these for granted: technological breakthroughs can replace more expensive metals with cheaper ones—and materials from renewable sources—thereby altering markets in unexpected ways. Most developing countries have little influence over global technological trends (the exceptions being those with large scientific capacities such as China and India, which do now have considerable opportunity to shape twenty-first-century technology). More speculatively, as buyers increasingly seek clean supply-chains so countries mining and refining metals using power from high-emissions sources (and weak local pollution safeguards) also risk losing market share to competitors using renewable energy and deploying stricter pollution controls.

Inevitably there are many question marks. In addition to technological progress delivering surprises, geopolitical risks and uncertainties are now much greater than during the decades of globalization following the fall of the Berlin Wall: these increasingly impact the global economy, commodity markets, and the fortunes of the resource sectors and the economies (and companies) depending upon them. With the Russia–Ukraine war, renewed turmoil in the Middle East, and China–US tension, it is even harder to peer through the geopolitical fog and discern future economic trends.

Given these uncertainties, it is vital, as Chapter 3 emphasized, to devise economic strategies that reduce the impact of adverse shocks on public revenues and a country's broader prospects for growth and sustained poverty reduction. One way to do this, as Chapter 3 affirmed, is to focus on the nation's *entire portfolio* of natural resources—renewable as well as non-renewable—to reduce the risk posed by any one individual resource affected by a shock specific to its market.

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This is why protecting nature has, in addition to its strong intrinsic merit, a strong economic rationale, and indeed renewable natural capital could have a greater expected future value than most non-renewables—especially when the subsidies that favour fossil fuels and environmental harm are stripped out (see Chapter 7).

In sum, there is much that even the poorest countries can do to mitigate the chances of the resource curse taking hold. Chapters 5, 6, 7, and 8 are very much about meeting this national challenge, while at the same time urging far greater international assistance, before we return in Chapter 9 to the larger global picture to conclude our book. The rest of this chapter provides some of the flavour of the book's second half.

4.2 The opportunities

Decisively ending national poverty is a tantalizing prospect for poorer economies with large resource endowments. The next two to three decades offer unprecedented new opportunities for these countries to build stronger and more diversified economies *if* the resource revenues are invested wisely and *if* every opportunity is taken to cut emissions and protect nature.

What is the basis for even suggesting this? First, there is the *sheer scale* of mineral wealth in LICs and MICs, as detailed in Chapter 2. World Bank data tell us that Africa alone—with deep and pervasive poverty—is home to about 30 per cent of the world's mineral reserves, 10 per cent of the world's oil, and 8 per cent of the world's natural gas.[1] Many other LICs and MICs in Asia and Latin America are similarly rich in these resources. While some of these reserves of oil, gas, and coal will eventually strand, they are still finding a market and indeed that market continues to grow, albeit at (perhaps) a slower pace. Additionally there is all the non-renewable resource wealth, if protected and properly maintained.

A second reason is that we can expect *huge investments* into the resource sectors, perhaps matching or exceeding (in real terms) those of the first decade of this century when the extractive industries rode the Chinese-driven commodity boom.[2] For sure, the nature of this investment will undergo profound change, with metals mining accounting for a growing share, and coal and eventually oil and gas taking smaller shares, and with considerably more investment in cutting

[1] www.worldbank.org/en/topic/extractiveindustries/overview.

[2] Ten years ago, McKinsey Global Institute (2013) suggested, in its 'potential upside' case (which does not allow for any climate change adjustment), that at least US$3 trillion could be invested in LICs and LMICs cumulatively by 2030—triple the investment seen in the boom years after 1995. Even in McKinsey's lower, 'base case', scenario (that does allow for a climate change adjustment) the cumulative investment in these countries could be at an annual rate 50 per cent higher than the already high rates of the preceding 20 years. Ericsson and Löf (2020) as discussed in Chapter 2 confirm this positive prognosis and extend it out beyond 2030. On the contribution of China to recent commodity booms, see Erten and Ocampo (2013) and Francis (2007). On the impact of Chinese demand for commodities on African economies, see Addison et al. (2016, 2017). See also McKinsey Global Institute (2017, 2023) on Africa, including the impact of China.

emissions and minimizing other environmental impacts in response to regulation and investor pressures. Additionally, there will be more investment in renewable natural capital, perhaps increasingly offering better rates of return than in non-renewable resources (and not just as carbon sinks but as sources of new materials, as discussed in Chapter 3).

Third, as Chapter 5 will discuss, with appropriate policies the *direct* economic impacts on incomes and government revenues of such huge investments can be magnified by a wide range of *indirect* growth-boosting effects. Intensifying cooperation between public and private actors is central to this task. For example, the power, port, and transport infrastructure needed for mining and oil and gas projects can be more actively shared with agriculture, manufacturing, tourism, and renewable natural capital. Further opportunities arise from the public revenues generated by the extractive industries: these greatly exceed foreign aid flows for many countries.[3] These can fund investments in helping key sectors such as agriculture and manufacturing progress up GVCs, thereby mitigating some of the economy's dependence on volatile commodity prices. There may also be potential for investing in poles of growth in areas contiguous to the extractive activities: issues discussed in detail in Chapter 5.

In brief, the following chapters argue that developing countries have a new opportunity to reduce poverty, including energy poverty, through economic transformations based on building stronger linkages with their non-resource sectors—and which can also provide a larger tax base to fund social protection, health, and education. In doing so, these countries must obviously be careful to avoid locking their own societies into high-carbon pathways that will ultimately limit their participation in green GVCs and so eventually stall their economic transformation. They have an opportunity to shift onto low-carbon pathways by accelerating the adoption of renewable energy and phasing out fossil fuels in some areas such as transport and energy generation (especially *if* more climate finance is forthcoming to support the necessary large-scale infrastructure investments). At the same time, it is vital to preserve natural capital: to secure community livelihoods and to create new investment opportunities that can yield income long after oil, gas, and coal are stranded, and mineral resources are exhausted. In all, a promising—but very challenging—policy agenda.

4.3 Transformations

What about the practicalities of this undertaking? In a previous book for UNU-WIDER, with a large team of expert authors, we discussed in depth the multiple

[3] Mihalyi and Fleming (2017) note that US$1.2 trillion in revenue is raised even in those poorer countries having 'unsatisfactory' scores in the Resource Governance Index (RGI) produced regularly by the Natural Resource Governance Institute (NRGI) (on the RGI, see Chapter 6).

policy challenges facing both host governments and their external partners (private investors, international donors, NGOs, etc.); the challenges also facing mining and oil and gas companies; and also some practical solutions.[4] In the following four chapters, we draw on that work, together with insights from a second phase of UNU-WIDER's project on extractives, some additional literature, and some new angles linked above all to the net-zero agenda.[5] All four chapters share the theme of 'transformation'.[6]

Chapter 5, 'Transforming Economies', discuss *three* desirable shifts in attitudes towards the extractive industries, to stimulate a faster and broader-based economic transformation (by which we mean an overall shift of the economy towards sectors with increasing productivity and higher value added, thereby providing more remunerative livelihoods). These three are the need to: (i) discard the fatalistic enclave view of extractive industries; (ii) recognize the dangers of excessive reliance on the conventional approaches to local content and downstream processing, and (iii) embrace a broader multi-sectoral policy approach to the potential linkages to the extractive industries with greater policy support to local small and medium-sized enterprises (SMEs) and other businesses. Currently, there is a pervasive fatalism in the debate around the sector, with the resource curse being seen as almost inevitable. While not the case in all countries—Botswana is a notable exception, as are several rich economies with histories of resource dependence—this negative atmosphere has pervaded the debate for as long as we can remember.[7]

Chapters 6 and 7, 'Transforming States', focus on the main policies that governments could take to ensure a better and above all more sustainable developmental outcome from the large foreign investments now underway, or expected, in their resources sectors. Chapter 6 focuses on the transparency agenda, and the huge task of containing and reducing corruption, and ensuring that revenues are well accounted for. Chapter 7 focuses on building the capacities of the state to shape a strategy and effectively implement it: by improving national and local government capacities and coordination, and by reforming public finance management.

Chapter 8, 'Transforming Companies', deals with various aspects of the policies and standards maintained by oil, gas, and mining companies; the evolution of these over recent years; and ways in which these can be further improved to enhance their developmental impact. It also discusses corporate progress on emissions and the environment in their destination countries, and ways to accelerate this.

[4] Addison and Roe (2018a).

[5] Over 2020–2023 UNU-WIDER conducted a project called 'Extractives for Development (E4D): Risks and Opportunities' (www.wider.unu.edu/project/extractives-development-e4d-—risks-and-opportunities). This book is just one output from that project.

[6] 'Transformation' in all its forms was the over-arching theme of the 2020–2023 UNU-WIDER work programme (www.wider.unu.edu).

[7] On this history of debates around the resource sectors, see Auty (2001).

The following are brief summaries of each of these three transformations, to provide the reader with a route map through our main line of argument in the second part of this book.

4.4 Transforming economies

Oil and gas and minerals are depletable resources (even though the time horizon for depletion is sometimes considerable). So, it is a fundamental proposition that other productive activities eventually need to replace them if the stimulus to economic growth is to be sustained long term and, crucially, broadened in terms of its scope and impact. Consequently, whatever detailed policies are adopted towards the extractive industries, they must be guided by an over-arching and long-term vision for the economy and its transformation away from dependence on non-renewable resources.[8]

Chapter 5 suggests ways to build such strategies, which requires at the very least a shift in attitudes, specifically abandoning the fatalistic view that the extractive industries are unavoidably narrow enclaves that lack synergies with the broader economy. Today's wealthy countries such as Australia and Canada that have successfully pursued resource-based economic development clearly provide historical counters to such pessimism (noting, however, that countries today must pursue much greener pathways than did their predecessors). Second, encouraging more local downstream processing of minerals or adding more local content to the inputs used by the extractive industries can be a means to reduce the enclave nature of the extractive industries—*if* efficiently pursued. Experience has shown that over-dependence on these approaches can lead to unintended negative consequences and even value-reduction. Further, the constraints on such enterprise development are systemic and include: insufficient scale to achieve competitiveness; cumbersome regulatory processes; and, often the main constraint, inadequate energy and transport infrastructure. The promotion of local content and downstream processing will deliver little if these fundamental constraints are unresolved, especially unreliable energy systems.

Third, 'industrial policy' is necessary to drive diversification, but this does not just mean the promotion of manufacturing: *every* productive sector offers opportunities, especially the renewable resource sectors, which we define to include agriculture and ecosystem services when the country is rich in renewable resources such as soils, biodiversity, marine life, and nature more broadly. Services also offer considerable opportunities.[9] Sharing infrastructure and energy generation between the extractive industries and local economies can further reduce their

[8] This point is argued in much greater detail in Stevens (2018).

[9] On the expanded notions of industrial policy, see Lebdioui (2024), Newfarmer et al. (2018), and Noman and Stiglitz (2017).

enclave nature, not least in benefitting local communities (e.g., using local power generation in a mine to deliver reliable power to local farmers and small businesses).

These changes of approach taken together call for a considerably more ambitious agenda than the one usually seen in discussion of the extractive industries, which tends to overfocus on local content and downstream processing irrespective of efficiency or the cost to the public purse. Since the size of that purse is very limited in the poorer countries and must be stretched across many competing needs—not least those of health, education, and social protection—governments need to build excellence in project analysis to weed out the duds from those investments offering the best returns. Otherwise, public support to economic transformation risks failure, with high opportunity costs in terms of public money that could otherwise have been profitably spent in other areas of need. Such analysis is especially important if the projects are to be debt-financed as a significant rate of return is necessary to cover the cost of capital (which is especially high for poorer economies). Conversely, when resource wealth is generating exceptionally large revenues, substantial technical and financial project expertise is needed to avoid the tendency to try and fund everything, including the most marginal projects—also a route to investment failure.

Finally, governments must keep a close eye on the evolution of GVCs, especially as these are turning increasingly green (as discussed in earlier chapters). GVCs offer growing opportunities, particularly when renewable energy provides a rising share of the domestic power system and when safeguards are in place to prevent pollution and to protect nature. This is another reason why the traditional policy conversation around the extractive industries has been overly limited: it focuses too much on import substitution regarding local content, and too little on integrating into international GVCs and manufacturing for export markets. LICs and LMICs have mostly small domestic markets—making import substitution a limited driver of industrialization—consequently they need export markets to reap the increasing returns to scale that characterize successful experiences in economic diversification.[10]

4.5 Transforming states

Too many states and their institutions are characterized by a lack of transparency around their decisions and actions, which in turn feeds corruption with too many decisions being made benefitting private interests, not the public interest. While

[10] Much policy discussion around the extractive industries and economic transformation, and notably its focus on industrialization, has lagged behind the debate on this topic among development economists: see Addison (2014).

a lack of transparency and high levels of corruption can bedevil any society, resource-abundant nations seem to be especially vulnerable—with theft through multiple channels often on a grand scale. Millions and often billions of dollars are unaccounted for. The issue was introduced in Chapter 3 as a dimension of the 'resource curse', and in Chapter 6 we drill down into what can be done, and ask: how much progress has been made?

We find some effective innovations that have made real progress, notably the creation of the EITI, now in operation for two decades. EITI has catalysed civil society action at the national level, and so for many countries we now have a better handle on revenue flows: where they come from, and critically where they go. Nevertheless, civil society action has its weakness and is constrained in highly authoritarian societies. 'Governance'—the meaning of which we discuss in Chapter 6—remains too weak in too many countries, especially in such areas as licensing which has seen multiple abuses. This is not just a national problem, but an international one: commodity trading is especially vulnerable and yields some particularly egregious examples of the corruption of national officials. Increasingly large fines amounting to millions of dollars have been imposed on international companies, but these pale in significance when compared to the loss of public revenue and the damage to trust in public institutions. Outright theft, both small and large scale, is also all too frequent: the physical theft of crude oil and oil products is, in dollar terms, probably the biggest loss of revenue to host governments from all forms of malpractice.

Transforming states is not just about improving transparency and reducing corruption—as vital as they both are—it is also about improving the quality of economic management in its many dimensions. The latter is the focus of Chapter 7.

Chapter 7 argues that while markets and private investment, both domestic and foreign, are powerful drivers of economic growth, maximizing the development impact of natural resources requires public action, not least in achieving poverty reduction but also to protect the public interest by means of effective regulation underpinned by a coherent long-term vision of the transformed economy (including the protection of nature).[11] Development success requires an effective state, one capable of designing and implementing a development strategy. This requires close coordination between multiple ministries and agencies (including ministries of finance, energy, and mining as well as any NOC, the central bank, and the tax authority). Such an 'All-of-Government' approach is quite rare in practice, and in its absence public entities risk working at cross purposes. The consequence can be a confusing business environment which deters investment in both the resources sector and across the broader economy. Opportunities to maximize the benefits of a resource boom are then missed.

[11] On regulation of the extractive industries, see Addison and Roe (2018c).

Chapter 7 emphasizes the importance of strengthening the capacities of central government but also those of local government in areas that host extractive industries: this is essential to achieving better impacts for communities but also to achieving the fullest possible linkages to local enterprises (to help overcome the enclave tendency). Although the national government is the obvious custodian of any over-arching long-term development vision, it is advisable to avoid tight and highly centralized control of the process. In particular, some decentralization of revenues is desirable to reduce the tensions that bedevil local–central relations when local government is responsible for dealing with the multiple impacts of new mines and oil and gas infrastructure, but national government keeps back too much (or all) of any new revenue.

Chapter 7 then turns to issues of revenue mobilization and taxation. Our main message is that there is ample technical advice available for governments that balances the need to encourage investment—for without investment there is no public revenue—with the desire to maximize the revenue share. The latter approach can result in unstable fiscal regimes characterized by regular changes in tax policy—responding to political shifts—which then deter investment. At the same time, while investors expect tax holidays to recover their very large up-front investment costs, governments need to be wary of granting over-generous tax incentives. Moreover, governments need to develop revenue sources outside of the resources sector, since over-dependence on the latter can impart avoidable volatility to the public finances as commodity markets fluctuate. The chapter then moves onto climate change and the public finances, including the political difficulties of pursuing the very necessary reform of fossil fuel subsidies, and the role of fiscal policy in helping to achieve net zero—including encouraging the extractive industries to reduce their own emissions (with some success already seen in cutting methane emissions in the oil and gas sector). This will become an increasingly important, and thorny, issue for developing countries, as carbon taxes (including border taxes) increasingly shape the direction of the global economy.

The chapter concludes with a discussion of the importance of maintaining macroeconomic stability in the face of potentially large and destabilizing capital and revenue inflows.[12] It goes through five sets of decisions that governments face relating to spending, saving, and debt management. There are pitfalls in each. Saving for the purposes of stabilizing the public finances from the consequences of adverse shocks is desirable and fiscal rules for saving are often advocated, but country experiences demonstrate the difficulties in sticking to them. Fiscal boom and bust is much more common. Saving for the purposes of intergenerational wealth transfer should be considered when the resource windfall is exceptionally large in relation to the economy's size, but LICs with more modest windfalls, and a large percentage of desperately poor citizens, are better advised to invest in human

[12] Macroeconomic management is covered in more detail in Addison and Roe (2018a).

capital formation rather than financial savings. In general, the purposes of SWFs are often unclear, and some have been looted by the country's elites.

4.6 Transforming companies

Companies in the extractive industries vary in *size* (the huge IOCs versus the much smaller 'juniors'); in *ownership* (some very large NOCs and mining companies versus the many private businesses); in *function* (production companies versus some commodity trading companies as well as a large number of service companies); and *national* origin and corporate *culture* (with a very substantial presence now of Chinese, Russian, and increasingly Indian companies alongside the longer-established Western ones). Notwithstanding this variety, they face common challenges that could determine their fates over the coming years, namely the net-zero transition, ESG investing, and rising geopolitical uncertainties. These are market shapers, creating new opportunities but also new risks for companies and their shareholders.

This is a large agenda, and Chapter 6 deals with transparency and corruption in the context of corporate behaviour (and governance) and pressure from the ESG investor community for reform. The focus of Chapter 8 is therefore primarily on the community impact of company operations and the implications of the net-zero transition for corporate strategies (i.e., the social and environmental dimensions of the ESG agenda).

One of Chapter 8's main points is that what companies can achieve for local communities and for national development more broadly is very dependent on how inclusive and effective host governments are: the best combination is companies committed to a positive social and environment impact working closely with a government that wants to spread the development benefits widely (inclusive and especially pro-poor) and which is effective in delivery (i.e., which is building the state capacities discussed in Chapter 7). The worst combination is a company ('a rogue') operating with little concern for its social and environmental impact, together with a divisive government intent on maximizing elite gains and largely unconcerned about the welfare of the citizenry more broadly. Unfortunately, rogue companies and divisive governments are mutually attractive, not least because elites controlling the state are often linked to the companies (varying from financial payments to ownership stakes).

A second main point is that the best companies in the extractives sector have made significant improvements in recent years. Today, for example, there is a much greater awareness and action around social and environment impacts than 20–30 years ago, when the issues would have been seen as peripheral in corporate strategies. Although 'greenwashing' is still prevalent, the industry has a greater regard for community impact, labour practices, and human rights generally; and

more recently it is making greater efforts to reduce its emissions (not least because of the increasing commercial opportunities now evident in decarbonization). Mining in particular has had a hard time convincing ESG investors to commit their capital, but more mining is inevitable if net zero is to be achieved (highlighted in Chapter 2), much of the investment will occur in the developing world, and mining companies will have to ramp up their environmental and social impact if they are to sell their story to the investment community. Coal mining and oil and gas companies face a bigger challenge, and there is a danger that NOCs may stick with hydrocarbons much longer than IOCs—which poses risks to the public finances that governments need to wake up to.

Chapter 8's third main point is that notwithstanding the industry's progress, there must be greater ambition: achieving positive development impact at the national level, not just among communities. As discussed in Chapter 5, structural transformation is vital to higher standards of living, and to reducing the risks inherent in undiversified commodity economies (see Chapter 3), and companies could do much more to help governments shape and deliver realistic strategies and work in partnership to realize these (especially in the areas of transport and energy infrastructure).

4.7 Conclusions: values, knowledge, interests

Chapter 9, which concludes the book, is organized around the themes of values, knowledge, and interests. Ending poverty and protecting nature are widely shared *values*. Yet, historically ending poverty has come before protecting nature, evident in both the histories of the now wealthy countries, not least in their historical emissions, and more recently in the spectacular development success of East Asia, notably China. In principle, ending poverty while protecting nature should now be achievable given humanity's rapid technological advance (the theme of *knowledge*), but the poorer world continues to face unpalatable policy choices—due to a lack of expertise, institutional capacity, and above all finance. The extractive industries are centre stage in this dilemma. *Interests* also come into play: policy choices are not just the outcome of the rational calculation of costs and benefits but also reflect the clash of often competing interests both domestically and, increasingly, geopolitically. This is, to say the least, a difficult world to navigate and states, as well as companies, will need finesse—and not least luck—in doing so.

5
Transforming Economies

5.1 Introduction

In the advanced economies with significant extractive sectors—Australia, Canada, Norway, the United States, and others—multiple linkages have been created from mining and oil and gas production to the local and national economies. This has encouraged enterprise development and job creation outside of the extractive industries themselves, thereby helping to create the diversified economies characteristic of many wealthy countries. And given the technical and logistical challenges of finding and then extracting resources that lie far below the earth's surface, the mining and oil and gas industries have always been sources of scientific and technological advance—even more so today as information technologies, artificial intelligence (AI), and robotics are increasingly deployed. The extractive industries therefore potentially provide a source of productivity growth that spills over to the rest of the economy, creating a demand for the requisite skills.[1]

These economies set a high standard of achievement which might seem unattainable for poorer countries today. Their economies are undiversified, technical skills are in short supply, and enterprise development is very limited (most businesses are informal and generate only modest incomes). Hence, an extractive industry often ends up as an enclave, largely disconnected from the local (and national) economy.

Success in creating diversified economies with closer linkages to the extractive industries certainly cannot be accomplished overnight. Human capital, innovative businesses, and supporting infrastructure (energy, not least) all take time and money to build. Yet countries must set out on the journey and even slow progress is better than living with the risks inherent in undiversified and commodity-dependent economies. Eventually mineral resources will be depleted or (commercially) stranded, making it imperative to invest in agriculture, manufacturing, and services—as well as renewable natural capital—so that they become stronger sources of growth, livelihoods, and public revenues.[2]

[1] Fears of 'Dutch Disease' have periodically surfaced in Australia and Norway; see Garton (2008), for instance. Bjørnland and Thorsrud (2015) find positive impacts, via spillovers, from the resource sectors in Norway and Australia.

[2] See Stevens (2018).

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So how should this journey begin? Our suggestion is that governments must take a hard look at what has been possible in successful countries, abandon fatalism, and construct realistic national plans to build a greater economy-wide impact from the huge opportunities and investment that the extractive industries continue to offer. This can only be done by working together with companies in the sector—most would welcome such a government approach—and with communities who should be the ultimate beneficiaries. The extractive industries can then be turned into a positive force for economic development (with the caveat that the sector's emissions may continue to grow: the dilemma discussed in Chapters 2 and 3). The alternative risks ending up with communities disappointed by the limited local benefits, a citizenry unclear whether investment brings any benefit at all, and a government that views the sector merely as a generator of revenue (and is therefore inclined to maximize its tax squeeze on companies, often to the detriment of further investment and potential longer-term development benefits).

Accordingly, this chapter argues for abandoning the 'enclave mindset' that is otherwise pervasive. We discuss how closer linkages from the extractive industries to the rest of the economy require an active 'industrial policy'—meaning the promotion of *all* sectors of the economy, not just manufacturing. There are opportunities for more local content and downstream processing for sure, but these need to be promoted in the context of a broader programme of enterprise development that addresses explicitly the multiple constraints on the creation and survival of businesses. The chapter briefly provides examples of how this might be done at the local, regional, and national levels—thereby highlighting the role played by different mechanisms in coordinating private and public actions. Infrastructure is also a massive constraint to diversifying economies, and we discuss ways for sharing infrastructure between the extractive industries and other sectors. The chapter's central point is that there is a set of identifiable public and private actions that can deliver broader sustainable development. But these look somewhat different from those that are more commonly placed centre stage.

5.2 Ending the enclave mindset

There is a strong but understandable tendency to see mining and oil and gas as *enclaves* disconnected from the *national* economy, and with limited *local* economic impact. Policy is then largely confined to the question of how best to maximize and spend the windfall in public revenues. We call this the 'enclave mindset'.

Extractive industries unquestionably do have strong enclave characteristics. These include: a lack of significant linkages to the local economy; foreign-owned

capital often remitting abroad significant profits; a limited set of commodities mostly exported with limited local beneficiation; a dependence on highly specialized capital goods and inputs beyond the capacity of the typical LIC or LMIC economy to produce domestically; and high labour productivity resulting in only limited local employment (with foreign workers sometimes dominating technical and managerial positions, a tendency now accentuated by robotics and information technology). Disconnection from the national economy is exacerbated by the remoteness of many mines and oil and gas production sites from major economic centres. Mozambique's new offshore gas reserves are 2,000 kilometres from the capital, Maputo, for example. Mines are often similarly remote: Chile's large Antofagasta mines are 1,000 kilometres north of Santiago, and the Oyu Tolgoi mine complex is in Mongolia's South Gobi Desert. Yet while geographic isolation is an impediment, it is rarely the case that at least some linkages cannot be built—including to the local economy through, at minimum, the mine facility sharing its power generation capacity with local communities and businesses.

Once the enclave view embeds itself into policy-making, the focus narrows down to mobilizing revenue from the extractive sector and spending it; that is, *fiscal policy* dominates (discussed in Chapter 7). Opportunities to accelerate local enterprise development, job creation, and broader development in the producing area then risk neglect (evident in the missed opportunities attending Tanzania's gold mining boom in the 1990s, for instance).[3] Once the area's resources are depleted or commercially stranded, they are left with little economic activity to fall back on.

Market forces are powerful drivers of economic growth but left to themselves they do not always yield other desirable outcomes: resilience to economic shocks, respect for nature, and rapid poverty reduction. Market forces alone can result in development paths characterized by *social inequality* and its close relative, *regional inequality*, especially when the extractive industry constitutes an enclave.[4]

Market failures are pervasive in poorer countries, occurring on both the supply and demand sides, and public goods are undersupplied. The result is often distorted patterns of private investment with an emphasis on low-risk urban businesses over riskier, but higher-potential, investments elsewhere.[5] Offsetting public action is required, and this is especially the case for the extractive industries, with many ways in which public and private actions together can reduce these enclave characteristics. African leaders are among those recognizing the need to act (see Box 5.1).

[3] Roe (2016a, 2017) discusses Tanzania.
[4] Collier (2018) discusses market forces and spatial inequalities.
[5] On market failure, see Stiglitz (1989, 1994).

Box 5.1 African leaders on ditching the enclave mindset

Africa is the region where mining and oil and gas enclaves have been at their most extreme (often a legacy of unbalanced colonial development). In their *Africa Mining Vision* (AMV) of 2009, the region's heads of state set out an action agenda to address this, including these statements (African Union 2009):

- 'Africa should face up to the challenge of working for new directions founded on *not* taking the enclave nature of mining as an inevitable part of the continent's destiny but rather as a product of a particular phase of history; as something which can be overcome.' (p. 3)
- 'A central premise of the AMV is that mining in Africa must be constantly re-evaluated by its contribution to broad and long-term development goals. It insists that mineral operations need not—and should not—be activities of an enclave.' (p. 19)
- 'The restructuring of African mining from its enclave nature is *the* fundamental task of African policy-makers and those committed to having it play a transformative role.' (p. 151)

The challenge is how to deliver on this agenda—15 years on from the bold statements, progress remains disappointing.[6]

5.3 Strategies and sector choices

As the AMV recognizes, structural transformation should be at the core of the strategy for the extractive sector. Historically, successful economies have shifted over time into sectors with increasing value-added, higher labour productivity and skill intensity and therefore higher earnings. In those ways economic growth has yielded poverty reduction, and this is accentuated when governments choose to use their expanding tax bases to fund more education, health care, and social protection. Clearly, countries with resource wealth can enjoy rapid growth, and even a high GDP per capita for a while, until their resources are exhausted. However, without structural transformation they will not sustain economic growth or that higher standard of living—and risk going into reverse on poverty reduction. Furthermore, unless the state is very redistributive—providing large cash transfers, for example—then a high per-capita income is a misleading indicator: it can sit alongside deep and pervasive poverty and inequality. Equatorial Guinea, historically a large oil producer and a UMIC, is an unfortunate example: the population is only around 1.5 million, but three-quarters of Guineans are poor—its oil revenues having been largely captured and squandered by the country's elite.[7]

[6] See Hilson (2020).
[7] World Bank poverty definition: https://data.worldbank.org/indicator.

5.3.1 Opportunities in the renewable resource economy

Discussion of economic transformation typically focuses primarily on manufacturing. Instead, it is preferable to begin by emphasizing opportunities in the *renewable resource economy* when it comes to choosing investment priorities.

For most LICs, *agriculture* is the most important livelihood based on renewable resources, depending as it does on soils, waters, biodiversity, and the ecosystem in general. There are also livelihoods from fisheries, pastoralism, forestry, and, increasingly, the provision and maintenance of ecosystem services including carbon sinks.

Although the world is urbanizing, 44 per cent of people still live in rural areas.[8] The percentage is well above 50 per cent in most LICs and LMICs: 72 per cent in Kenya and 82 per cent in both Malawi and Rwanda, for example. Even in India, with its massive cities, 65 per cent of the population still live in rural areas. Most of the world's poor must find their livelihoods in the rural economy: as smallholder farmers using rudimentary technology (often without irrigation), as farm labourers, as pastoralists, and in the many small and informal enterprises that characterize the non-farm economies of villages and rural towns.[9] Agriculture and non-farm employment also offer an alternative to hazardous artisanal mining.

The survival of the poor therefore depends on a base of natural capital and on the quality of those natural assets, as does food security at both the household and national levels (including food security in the rapidly growing cities and towns of the developing world). For these reasons, the rural economy and especially agriculture is fundamental to ending poverty. For the developing world on average, and looking at a wide range of studies, a 1 per cent (annual) increase in agricultural growth potentially yields up to 2–3 per cent of income growth for the poor.[10] This is especially so for the 81 per cent of the world's poor who live in SSA and South Asia.[11] Many of the poorest female-headed households work in agriculture (in many African LICs women account for well over half the agricultural workforce).[12] Consequently, if better ways are found to connect the extractive industries to rural economic activity, then the benefits could be profound—and not least for society's very poorest and for gender equality.

While there are many success stories in rural development—and success is vital to achieving middle-income status—there remains much rural stagnation, especially in Africa where large parts of the rural economy are yet to see the productivity-enhancing technologies successfully adopted in Asia over the last half-century and more. Africa's agriculture requires a major transformation if it

[8] All population data are from https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS.

[9] On the rural economy, see www.ifpri.org.

[10] De Janvry and Sadoulet (2009: 6); World Bank (2007: 30). On African economic development, including agriculture, see Addison et al. (2015, 2019).

[11] https://pip.worldbank.org/home.

[12] FAO (2023: 7). For cross-country data, see https://databank.worldbank.org/metadataglossary/world-development-indicators/series/SP.HOU.FEMA.ZS.

is to provide higher incomes as well as more employment. Higher earnings are associated with higher productivity, which requires a shift from extensive to intensive land use, more irrigation, mechanization, improved seeds, and more fertilizer to boost yields. Investment by large and small enterprises to supply the rapidly growing cities, towns, and any new centres of growth arising from the extractive industries should pay off.[13] However, unless food production and marketing are transformed, then urbanization—and the manufacturing and services growth that accompanies it—will either stall or become ever more dependent on food imports (a source of vulnerability).

As a strategy, if the goal is to benefit the maximum number of livelihoods per dollar of investment, and especially poorer people, then the renewable resource economy should top the list—especially in countries blessed with good soils and water resources. The economic potential of these resources is often unrealized due to limited storage and transport infrastructure: food crops are lost because of inadequate storage—thereby exacerbating local food insecurities—and poor-quality roads make it costly to move food surpluses from high-yield areas to those which are food-deficit. Similarly, gaining the most from agricultural exports requires low-cost transport to ports. Investing in infrastructure that serves agriculture and other rural livelihoods can help offset the 'Dutch Disease' effects of non-renewable resource windfalls, which can otherwise be calamitous for agriculture.[14] Extractive companies can help by sharing some of their infrastructure, but this requires careful project preparation (which we discuss later).

Ecosystem services also offer increasing opportunities, especially in the context of carbon capture not only through forests but also other natural capital including soils.[15] Governments can encourage ecosystem services and the associated livelihoods by stepping up carbon pricing to help redress the imbalance in incentives which still under-value renewable natural capital in all its forms.

In sum, aside from its intrinsic worth, there is an imperative to protect nature given its importance to livelihoods, food security, and the elimination of poverty.[16] This is no easy task given the pressures of population growth and is made harder by climate change which is damaging the renewable resource base of many countries, with fossil fuels being a prime culprit. It is one of the paradoxes of poverty

[13] AGRA (2016); Reardon (2015); Richards et al. (2016); Timmer (1988).

[14] If badly managed, an oil or mineral revenue windfall can appreciate the real (and nominal) exchange rates, thereby cheapening the cost of imported versus domestically produced food. This creates a strong disincentive to domestic production (Nigeria in the first decades of its oil economy is a prime example). By lowering the unit costs of producers, infrastructure investment can offset some of the disincentive effect of currency appreciation for farmers selling to domestic as well as foreign markets.

[15] On the variety of ecosystem services, see Potschin et al. (2016). Note, however, that carbon capture is not a 'magic bullet' for the climate: Anderson and Peters (2016) provide a critique.

[16] Dasgupta (2021) discusses the economic role of nature, especially biodiversity. On nature's role in economic development from a historical perspective, see Barbier (2011). Collier (2010) discusses the damage to our planet.

that countries with some of the greatest agricultural potential and highest rates of rural poverty—Angola, Mozambique, and Nigeria, for example—also have large fossil fuel sectors which their governments are likely to grow further. This is a tough dilemma to manage, especially when climate finance remains so limited, as Chapters 2 and 3 highlighted. Yet one government—that of Colombia (where coal and oil account for around half of all exports)—has an ambitious strategy to reduce its fossil fuel dependence, and President Gustav Petro is adamant that 'the economy has potential aside from just oil: the development of a productive agriculture industry, tourism, taking advantage of the country's beauty, and the possible export of clean energies.'[17]

5.3.2 Opportunities in manufacturing and services

Manufacturing is often the centre-piece of strategies for economic transformation, influenced by the histories of the now advanced economies as well as East Asia's huge strides over the last half-century, beginning in South Korea and Taiwan, followed by Singapore and Thailand and then subsequently the spectacular rise of China and Vietnam.[18] Yet similar success has largely eluded SSA partly because its earlier industrialization strategies focused too much on substituting for imports (in small domestic markets) and too little on export manufacturing (where scale economies can be reaped and skills accumulated).[19] Exporting is a surer route for small LICs, with labour-intensive manufacturing providing only the first step. However, low labour costs are insufficient on their own to catalyse industrialization. Reliable power supplies, transport infrastructure, regulatory clarity, and accessible enterprise finance are all essential, and these are often deficient.

Manufacturing today involves engaging in a global race in which any early advantage of low labour costs dissipates—a sign of success as labour markets tighten and wages rise—so that matching the global leaders requires shifting to more capital- and skill-intensive industries. Ever-closer integration into GVCs facilitates the transfer of advanced technologies, knowledge, and skills from foreign investors. Successful economies like Vietnam have met this challenge, but not without investing public money into energy, training, and transport as well.[20]

[17] 'Colombia's Petro Woos Foreign Investors with Oil-Free "Potential"', *Financial Times*, 21 July 2023. Colombia is home to nearly 10 per cent of the Amazon rainforest.

[18] Nayyar (2019a, 2019b). Lin (2011) and Lin and Wang (2015) discuss the lessons from China's success for structural transformation in the rest of the developing world, including Africa.

[19] For example, Tanzania in 1964 anticipated an increase in the share of manufacturing and processing in GDP from 4 per cent to over 13 per cent by 1980 (Government of Tanzania 1964: table 111). But much of the industrial base collapsed in the 1980s. Most SSA countries have seen manufacturing's GDP share decline over the last 40 years (Newfarmer et al. 2018).

[20] On Vietnam, see Tarp (2017, 2019).

With hard work (and luck) a country can reach the global technological frontier, and then perhaps become a leader like China, South Korea, and Taiwan (China).

Although manufacturing can help boost economic development, it usually requires significant private investment, and a very judicious use of any public money that may be committed: unsuccessful industrial projects can end up draining, rather than filling, the public purse. Success in manufacturing does, however, increase and diversify the tax base, an important goal for economies that are overdependent on resource taxes.[21] Large manufacturing enterprises sit in the formal sector: they are registered for corporate taxes and value-added tax (VAT), their employees pay income tax, and both employer and employee pay into social security systems. This is not the case for smallholder farmers or for micro-enterprises and even some quite big enterprises operate informally, perhaps to avoid taxes and business regulation.

Setting up a factory is only the first step. Competitiveness must be sustained. Unlike a copper, cobalt, or nickel deposit, a manufacturing firm can shift countries if its initial host becomes unattractive. It is also unwise to hope that manufacturing will be a big generator of jobs. As Joseph Stiglitz points out, manufacturing has been the victim of its own success: productivity globally has grown faster than global demand and so manufacturing's share of total employment is declining in almost all countries.[22] New and successful export industries are now far less labour intensive than previously—even when located in low-wage Africa. That region should certainly promote manufacturing, but this will only ever absorb a small fraction of Africa's many jobseekers: the majority will resort to agricultural or informal employment—in which incomes will be low unless skills, productivity, and market access all improve.

There are also emerging opportunities in the services industries. LICs can draw four main advantages from any emphasis they may attach to services industries: (i) these will assuredly be growth industries globally; (ii) modern communication and information technologies (IT) open up significant new types of services with relatively low entry costs; (iii) many of the services are relatively easily tradeable internationally provided that the requisite IT infrastructure is in place; and (iv) the unit sizes of successful service companies can be quite small-scale. There are already impressive and notable successes, including from Africa.[23] The potential for high-value services, especially those integrated into GVCs, reinforces the case for investing a good portion of resource revenues into education and training.

[21] Chang and Lebdioui (2020).

[22] Stiglitz (2018: 1).

[23] Examples from Africa include: Sproxil (Ghana) which provides an IT-based anti-counterfeiting system; Chil Artificial Intelligence Lab (Uganda) which uses AI-guided e-oncology services to detect cervical and breast cancer; Jumia Ivory Coast, an online retail platform which according to *Forbes* magazine was the first African unicorn (a start-up valued at over US$1 billion); and The Isizwe Project which was one of South Africa's first mobile location-based service providers.

In summary, what is commonly referred to as 'industrial policy' no longer relates narrowly to manufacturing but to government strategies and actions to influence change in a wide range of activities also including agriculture, construction, finance, communication, and other services.[24] The transformation and modernizing ambitions that drive such a policy in *all sectors* need to ensure that the economy has the capacity to both learn and apply new ideas (from whatever sources)—it will then be equipped to innovate and create new activities and livelihoods.

These considerations apply to the prospects for manufacturing development in general, and very much to the two most common strategies for the extractive industries: *local content* and *downstream processing*. They also very much determine the prospects for adopting new and exciting technologies such as hydrogen.

5.3.3 Local content

Industrial policy in resource-dependent counties frequently focuses on increasing the share of local content, including manufactured inputs and services supplied to the resource sectors. There has been much success in local content—and we provide some examples later—but there are reasons to be cautious.

If local suppliers are not internationally competitive, their market will be confined narrowly to the local extractive industries, so it is important to assess the prospects for any local content supplier to become internationally competitive within a reasonable timescale. Mandated local content can encourage the over-reliance of supplier firms on the extractive industries, leaving them vulnerable to the same shocks as commodities (which increases the correlation of the domestic business cycle with the commodity cycle). If the local resources become commercially stranded, then any uncompetitive local manufacturer will also struggle.

Moreover, if local manufacturers remain internationally uncompetitive, then mandated local content targets will act as an implicit tax, raising the production costs of the extractive industry. If these additional costs are large, they will reduce the amount of taxable economic rent from the extractive industry and thereby the expected public revenue from the sector. They can also easily deter new investment.

Lobbying and rent-seeking are facts of political life, and policies such as mandated local content are vulnerable to such behaviours. A few well-connected local

[24] Industrial policy now has an extensive literature; see, in particular, Lebdioui (2024); Noman and Stiglitz (2017); Oqubay et al. (2020); Rodrik (2009); and Page and Tarp (2018). On the extractive industries and industrial policy, see Chang and Lebdioui (2020); Dietsche (2018b); and Dietsche et al. (2013). The UNU-WIDER website (www.wider.unu.edu) also has much material on industrial policy, especially in Africa.

companies can easily capture the market, impose high prices on buyers who have no alternative, and if those rent seekers subsequently struggle, they may capture public subsidies as well.

Two big global trends also affect the prospects for success of local content policies. First, local content policies swim against the strong tide of automation in a sector characterized by increasingly high levels of technology and skill intensities. Those MICs with a technological base might have enough expertise to enter these markets, perhaps through joint ventures with MNCs, as do the Gulf region's NOCs with their deep pockets and technical expertise. But LICs and LMICs could find themselves confined to supplying the least technologically advanced inputs at best. Second, and more positively, countries with clean energy systems are potentially better placed to create the green manufacturing of inputs and so step up local content by that means. This offers an opportunity given the impetus for companies to reduce their emissions (see Chapter 8). This is a strong reason to coordinate the national strategies for the extractive industries and energy supply.

Ultimately, success in achieving greater local content hinges on overcoming the numerous constraints that afflict enterprise creation and growth generally in poorer countries—an important point developed later.

5.3.4 Downstream processing

It is too often assumed that processing mined resources locally will invariably add more value to the economy than exporting an unprocessed or partially processed mineral. This may be so—and again there are success stories, but also many salutary examples of failure.[25] The risks need careful assessment before promoting any downstream processing. If there is no industrial base, then the inputs needed for processing must be imported—which constitutes an offset to any gain in local value-added. Consequently, processing margins may be small and even more volatile than the prices of unprocessed minerals. Furthermore, most LICs have only tiny domestic markets for processed metals, and therefore need to export the bulk of any produced. But export markets can be expensive to reach—especially when ports and railways are deficient—and just-in-time management systems may preclude distant suppliers. Competitive processors of metals, notably China, already enjoy huge economies of scale. Achieving cost competitiveness against this reality is difficult even for large miners of metals such as Chile with its ample copper deposits and well-developed industrial base. It is even more difficult for smaller suppliers and later entrants.

[25] Östensson and Löf (2018).

Metals refining requires large amounts of cheap energy, reliably supplied: many LICs lack this in comparison to China and other principal refining centres.[26] Therefore one first step must be to invest in a solid domestic energy system. But this is not enough—refineries using coal-fired power risk become commercially unviable, perhaps sooner than expected, as demand for 'green' metals grows. Renewable energy might give countries an edge in the growing global market for green metals, but this again requires large-scale investment (notably in geothermal, the best of all).

Indonesia, with its large investments in *nickel refining* (especially from China: see Chapter 3), provides a good example of the pros but also the cons of downstream processing. On the plus side, the market for the refined nickel seems secure—Indonesia's own nascent EV manufacturing industry (including joint ventures with Chinese companies) and exports to EV companies in China itself. On the negative side, the refining is heavily dependent on coal-fired power (using Indonesia's abundant reserves). This provides cheap reliable electricity but runs counter to positioning Indonesia in the growing market for green nickel. Indonesia has already burnt through considerable sums trying to establish a domestic bauxite processing industry.[27]

If a country cannot realistically meet the conditions necessary for competitive refining, and especially if it cannot realize the necessary scale economies, then its downstream investments will be *value-reducing*. The worst-case scenario is one that ends up with a domestically produced metal that is both uncompetitive in export markets and more expensive than imports, making it unattractive to domestic manufacturers as well. Governments then typically resort to high tariffs and import quotas to force domestic manufacturers to buy the more expensive domestic product. But this raises the domestic prices of any final product, and prices domestic manufacturers out of export markets. If the processing is subsidized, there is also a burden on the public purse and one which it is likely to endure for the lifetime of the project if international competitiveness is never achieved.

Infant industries *can* grow up, and achieve competitiveness, but to do so they need very careful preliminary analysis of their viability and their prospects for achieving international competitiveness on a reasonable timescale. There is also an opportunity cost: any public money committed might have been better deployed in other ways to reduce the enclave nature of the extractive industry (via infrastructure investment, for example). Hence, our general emphasis is on the need to build excellent analytical capacity in government, and to protect this from undue political influence and corporate lobbying.

[26] For example, in both Nigeria and South Africa electricity is not only expensive but the supply is also intermittent.

[27] Another example is India's iron-ore processing and steel industry. See Östensson and Löf (2018) on Indonesia and India.

The oil and gas sector has downstream traps of its own. Building more national refining capacity, including providing feedstock for a domestic petrochemical sector, is a popular strategy in the Middle East and North Africa (MENA) region's hydrocarbon-rich economies. This can make commercial sense (though not environmental sense). But the typical LIC has far less public money to invest in oil refining than the Gulf region, and so the opportunity cost of failure is much higher. Uganda is a case in point. Following major onshore oil discoveries in Uganda's Lake Albert Rift Basin in 2006, a plan developed to build a refinery. But this has been mired in controversy and years of delay over whether it will be commercially viable given the likely volumes, the necessary tariffs, and competition for the East African market from the more accessible capacity at Kenya's Mombasa port.[28]

The general message from this brief review is not to eschew either downstream processing or local content as policy options but to be alert to the possible downsides, and to recognize that they are only one part of the potential diffusing role of extractives. In particular, any commitment of public money, or other policies to promote/subsidize greater local content and downstream processing, must take full account of the challenging market realities that face local industries; must weigh up the possible risks and prospective fiscal costs; and must do that with a clear eye on possible alternative methods of promoting structural transformation.

5.4 The investment surge

Resource economies have received unprecedented inflows of foreign investment since the millennium, and these large flows seem set to continue and indeed accelerate for critical minerals. The past two decades have easily been the most successful for new investment in Africa, a continent which has often found it especially hard to attract FDI. Africa's resource economies have seen very large absolute and percentage increases in their FDI stocks since 2000 (see Table 5.1). The mining and oil and gas sectors dominate Africa's FDI, and probably will do so for at least another decade.

This is good news for poor countries which lack both capital and technology. The sums involved are truly huge relative to any other economic stimuli—such as foreign aid—that these countries have received and can realistically expect. For example, in June 2020 an agreement was signed for US$15 billion of financing for the French oil major TotalEnergies US$23 billion gas project in Mozambique's Cabo Delgado province—Africa's largest ever private investment.[29] Similarly, the construction costs in just one year of only one of Tanzania's offshore gas projects is

[28] Kayizzi-Mugerwa (2020) discusses Uganda. Hicks (2015) argues that in Uganda, Chad, and Niger the political priority given to refining has distracted, and seriously delayed, development of the more commercially assured export trades that the new oil makes possible.

[29] 'Total Mozambique LNG Completes Nearly $16 Billion Financing', *Bloomberg*, 16 July 2020.

Table 5.1 FDI stocks in selected African countries (US$ million) and export dependence (per cent)

Country	FDI stocks				Country	FDI stocks			
	2000	2010	2022	Extractive dependences 2018 (%)		2000	2010	2022	Extractive dependences 2018 (%)
Ghana	1,554	10080	42493	70.0	Ethiopia	941	4206	35281	12.9
Guinea	263	486	5252	83.8	Kenya	932	5449	11232	11.0
Guinea Bissau	38	63	315	4.7	Madagascar	141	4383	9092	38.1
Liberia	3247	10206	9002	60.7	Somalia	4	566	4923	0.5
Mali	132	1964	6272	68.0	Uganda	807	5575	18089	23.9
Mauritania	146	2372	12161	46.6	United Republic of Tanzania	2781	9712	18634	41.9
Niger	45	2251	8238	43.5	Angola	7977	32458	14719	99.8
Nigeria	23786	66797	88202	93.6	Botswana	1827	3351	5211	91.7
Cameroon	917	3099	6446	49.5	Lesotho	330	929	958	32.3
Central African Republic	104	511	715	***46.0***	Malawi	358	963	1605	3.0
Chad	576	3594	8372	90.3	Mozambique	1249	4331	54114	74.1
Congo	1893	9261	34026	79.0	Namibia	1276	3595	7848	***40.0***
Congo Democratic Republic	617	9368	30995	90.9	South Africa	43451	179565	173584	***43.0***
Equatorial Guinea	1060	9413	15892	***95.0***	Eswatini	536	929	4151	0.7
Gabon	-227	3287	16591	***72.0***	Zambia	3996	7433	15236	75.2
Rwanda	55	422	3327	56.9	Zimbabwe	1238	1814	6499	50.2
					Sub-total	69844	267269	383198	
Sub-total	34206	133174	288299		TOTAL	104050	400443	671497	

Note: Numbers in italics relate to 2014 rather than 2018.
Source: UNCTAD, World Investment Report, 2023.

US$5 billion: no less than *seven times* Tanzania's previously highest annual foreign investment inflow.

In Africa, FDI has surged into politically stable LMICs such as Ghana and Kenya but also into the 'fragile states' of the DRC, Guinea, South Sudan, and Zimbabwe (Table 5.1).[30] The mineral-rich DRC in particular continues to attract considerable investment in copper and cobalt mining despite its dysfunctional legal system and mining code (scoring absolutely *worst* in the MineHutte comparisons of investment risk: see Chapter 2).[31] Company behaviour in such fragile countries raises issues of its own, which we discuss in Chapter 8, but here we focus on the macroeconomic dimensions.

To do so, we note that the *injection of demand* into the domestic economy causes waves of increased spending on domestic goods and services as well as increased imports. Even in cases where the import *share* of the corporate spend is high, the *absolute* magnitudes of the remaining domestic spend can have major macroeconomic significance—depending on the scale of the project and the supply response of domestic producers. This can create a macroeconomic problem (Dutch Disease) but also an opportunity, if well handled, to transform the economy's structure. Specifically, the domestic supply response can be enhanced by appropriate supply-side policies and judicious public and private investments that build upon ('leverage') the demand impulse arising from the project itself.

5.4.1 Leveraging the potential of the investment surge

So, what are the potential linkage benefits of these large FDI flows and how do they arise? First, there are the *direct* expenditures by mining and oil and gas companies. These capital and operating expenditures (CAPEX and OPEX) invariably exceed government revenues from the extractive sector—three to four times greater in some mining projects, and some 50 per cent greater in oil and gas projects even before additional ('multiplier') effects are accounted for (see Figure 5.1).[32]

Local content policies often target these direct expenditures on local goods and services. All major mining companies now maintain supplier development programmes that provide support with technical guidance, finance, and so on. These undoubtedly help to produce substantial new capacity in agriculture, services, and sometimes manufacturing, and can be enhanced when integrated with broader public programmes and support from such bodies as chambers of commerce. This also extends their reach and longevity well beyond the narrower needs and lives

[30] On 'fragility', see Addison (2012).

[31] https://minehutte.com/methodology. More generally, there is no LIC classified as 'good' in the NRGI Governance Index: 39 of the 89 countries included in its 2017 assessment were rated as 'poor' or 'failing' (NRGI 2017a).

[32] As estimated by Östensson (2018a).

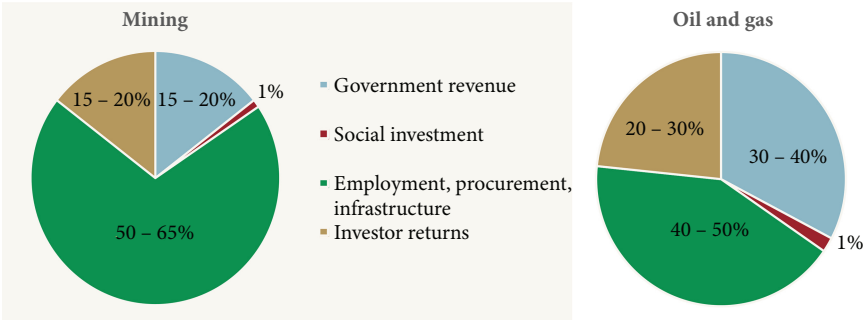

Figure 5.1 Typical share of total spending (direct) in the extractive industries

Source: Östensson (2018a).

of the mining or oil and gas sectors. Similarly, company provision of technical and other vocational training can be linked into broader government programmes to accumulate a significant base of *transferable skills* (e.g., of construction skills for housing development).

Leveraging effects can be further enlarged via *indirect* expenditures: enterprises supplying the extractive industries using their own additional revenues to purchase more goods and services from other enterprises, which then give rise to further rounds of spending—rippling right across the entire economy. Economy-wide programmes for enterprise and skill development can intensify these indirect expenditure effects, enabling domestic producers to competitively supply the market (relative to imports) not just for the extractive sector but for other sectors as well. Committing public money to such programme can have good returns.

Additional domestic demand also originates in households with members earning the relatively high wages available in the extractive industries: sometimes 5–10 times greater than other local wage rates.[33] The items involved in their expenditures may be individually quite small, but they are numerous (food items, clothing and footwear, household goods, personal services, transport services, etc.) and so *cumulatively* of benefit to many local enterprises.

5.4.2 The enterprise constraints

In sum, the investment surge arising from extractive industries represents a clear opportunity to build up an economy's supply-side: by strengthening existing sectors—including the renewable resource economy (agriculture, ecosystem services, etc.)—and by developing new activities in manufacturing and services.

[33] Roe and Round (2018) discuss such induced demand effects.

Success does, however, depend on overcoming the multiple constraints that hold enterprises back. The *responsiveness* of the economy's supply-side in poorer economies has been a central, and much-debated, question in development economics for decades as it determines the scale of public action required to compensate for deficient market forces.[34]

Entrepreneurship is rarely in short supply even in the poorest countries. Rather, most of the many millions of micro-enterprises, often home-based or street-based, remain *informal* (unregistered) with little capital. Such businesses need considerable help in adopting technologies, and above all a fixed property location and a proper registration that are more amenable to commercial scale operation: for most a seemingly daunting and risky step. Many SMEs, which are the next step up in size from micro-enterprises, also remain informal, and are therefore subject to a multitude of constraints in responding to additional demand when markets grow.[35]

Even those that do formalize (becoming registered businesses paying taxes) have difficulty developing beyond the SME stage. The many constraints are well documented across countries.[36] These typically include: a lack of capital; a lack of access to credit (with commercial banks unwilling to absorb much loan risk); unreliable/expensive power and water supplies; lack of transport infrastructure to ensure timely and reliable access to local and international markets; cumbersome procedures for registering business and over-zealous and complex regulation (a stimulant to corruption); and complex and onerous tax systems. Consequently, despite the many apparent opportunities, enterprises in poorer economies find it hard to supply the large volumes of goods and services required directly or indirectly by the extractive industries. In Mozambique, for example, only about 15 per cent of the upstream construction value-chain is produced domestically.[37] Much of the equipment and skilled labour used directly in the mining and oil and gas sectors is therefore imported.

Unless reduced, these constraints will conspire to limit the benefit of any investment surge for the broader economy: that is, the direct but also the indirect and induced multiplier impacts (that together can be five to six times the direct impacts). These realities can fuel deep scepticism about the benefits of extractive industries and many countries respond by *imposing* local content requirements rather than encouraging its competitive development.[38] This policy response is

[34] Economists can be placed on a spectrum from 'structuralism' to 'market liberalism', implying greater or lesser reliance on state action in driving development (see Addison 2014).

[35] The failure of these informal businesses to respond and expand turnover even in response to large demand increases is explained in part by the paradox noted by Banerjee and Duflo (2011). Specifically, they tend to achieve high *marginal* rates of return but on very small turnovers and consequently have abysmally low *total* returns.

[36] Fields et al. (2023).

[37] Cruz et al. (2020: 195) discuss Mozambique. Tanzania faces similar constraints (Kikwasi and Escalante 2020).

[38] These vary in ambition, ranging from requiring the purchase of local inputs and labour up to requirements on local ownership. See Lange and Kinyondo (2016).

not surprising, but it is often not sensible for the reasons already set out. If mandated, local content regulations will be unlikely to achieve the desired results when the fundamental constraints holding back enterprise development remain binding.

In sum, host governments hold the solutions in their own hands. They know clearly what the constraints are on enterprise development—there is ample research evidence, not least from interviews with entrepreneurs—they just need to take more decisive action.

5.4.3 Broadening linkages: local, regional, and national

Market forces can deliver some benefit for the broader economy from the investment surge in oil, gas, and mining as domestic firms seek opportunities to profitably supply the sector. But larger impacts invariably require *public action* including *new public goods and services* financed partly by the extra tax revenue generated from the sector itself. Market forces alone cannot do the job.

Although the national government must be the custodian of any overarching development vision—ideally via a well-articulated national plan—it should avoid tight and highly centralized control of the process. Rather, the government should build a good understanding of how the different actors can work together to leverage even further the various impacts of the large investments associated with the extractive sector itself. These actors include companies, financial institutions, private sector bodies (such as chambers of commerce), and government institutions (central, regional, and local).

To illustrate this theme, we now discuss three promising ways forward, moving from the local to the regional to the national levels, each illustrating the principle of coordination (with Chapters 7 and 8 providing further illustrations). The first is a company programme to stimulate increased local content with a local chamber of commerce (an example from South Africa). The second is a regional programme to increase local content via a regional federation of industries (an example from Brazil). The third relates to the benefit of building strong development finance institutions (examples from Brazil and Chile). Each of these offers a possible template for adaption to individual country circumstances. All involve institution-building to achieve the level of coordination necessary and each requires a public–private partnership to work.[39] Neither the market nor the state alone can achieve the desired outcome which is to reduce the enclave nature of the extractive industries by building stronger linkages—thereby stimulating more economic activity and livelihoods at the local, regional, and national levels.

[39] See Page and Tarp (2017) on Asian and African experiences.

5.4.4 The local level

All responsible oil, gas, and mining companies now operate supplier development programmes, combining technical, training, and financial support to existing or potential suppliers. Some have long histories and high rates of success such as the Anglo Zimele (AZ) scheme set up in 1989 by Anglo American in South Africa. Over 30 years it has supported over 2,000 local businesses and created some 50,000 jobs in South Africa.[40] This programme goes beyond the narrow need to increase local supplies to a mining company by also supporting enterprise development not directly linked to one particular mine, as well as offering community hubs that provide information and guidance on business practices and communication technologies more generally.[41] The Zimele approach to enterprise development could be a model for other countries.

Local chambers of industry and commerce can be ideal vehicles for coordinating a variety of different company stakeholders to contribute finance, training, and other support. Chambers of mines in some counties such as Brazil have achieved the same goal for a grouping of geographically clustered mines and have also helped to intermediate the often difficult issues that partnering between *competitive* entities, to achieve economies of scale, can involve. We return to the topic of how companies can help build livelihoods with communities in Chapter 8.

5.4.5 The regional level

A good example of the possibilities comes from the Brazilian state of *Pará* which attracted very large mining investments at the turn of the century and not least from Vale and Hydro.[42] The areas around their mines, despite being relatively underdeveloped, quickly succeeded in supplying inputs (also to non-mining businesses). By 2008 *Pará* state accounted for 25 per cent of Vale's own procurement, while a further 50 per cent was from other Brazilian states. Much of the credit for this goes to the *Pará* State Government's state-wide supplier development programme REDES, managed by *Pará*'s Federation of Industries (FIEPA).[43] REDES responded to the new opportunities offered by *Pará*'s large mining investments, aiming to increase the competitiveness of local companies in supplying large

[40] https://southafrica.angloamerican.com/our-difference/zimele. The AZ scheme offers support to: SMEs within the mining value-chain; to other businesses outside that value-chain; and to young entrepreneurs in starting their businesses (Anglo American and IFC 2008).

[41] In relation to some of its work, AZ delegates delivery to TechnoServe, a not-for-profit organization set up to harness the capabilities of South Africa's private sector.

[42] This 'new' mining area in the north of Brazil is characterized by below-average economic and social development and hosts part of the Amazon rainforest.

[43] *Redes de Desenvolvimento de Fornecedores do Pará* (Supplier Network Development Program of *Pará*). *Federação das Industrias do Pará* (Federation of Industries of *Pará*).

investors *from any sector*. REDES obtained its initial funding from 15 large companies that constitute FIEPA's 'funders', but significantly these were operating in various sectors including energy and food, as well as mining.

The general point illustrated by the REDES example is that partnerships coordinated by bodies other than government or any mining (or oil and gas) company can stimulate new economic activity in a region that had not seen much industrial development prior to the arrival of new investment. There is no need for national or local governments to envision local content as being limited to just those goods and services procured by a mining or an oil and gas company. Greater ambition can pay off.

5.4.6 The national level

In a functioning market economy, the coordinating role of governments is complemented and sometimes over-shadowed by the coordinating role played by banks and other financial institutions (OFIs). These financial institutions typically intermediate large amounts of investible funds between savers and investors, helping to shape the sectoral pattern of economic development. In LICs, this coordinating/intermediary role is present but limited because of the restricted development (and national coverage) of banks and OFIs and the narrow range of financial intermediation instruments (tiny stock markets, thin forward markets, etc.). Furthermore, the banks—invariably the largest financial institutions—typically focus on larger companies (often trading traditional export commodities) and they tend to buy safe government securities rather than lend to new enterprises, both characteristics limiting innovation and new development, especially among SMEs.[44]

Consequently, governments should consider promoting less conventional banking institutions such as development banks or development finance institutions (DFIs).[45] These institutions were popular in the 1960s and 1970s and they received much financial and technical support from donors, before falling out of fashion in the 1980s as many succumbed to politicization and poor management leading to large losses for the taxpayer.

However, DFIs are back in fashion and 20 per cent of those currently operating were established after the millennium, based on new and effective operating models—especially in Latin America. However, Africa and Asia also offer a wide

[44] A study on long-term development finance in Tanzania found that banks account for no less than 75 per cent of all the funds intermediated by the financial system. Moreover, the two next important types of financial institutions (pension funds and insurance companies) also deposit large percentages of their own investible funds in the commercial banks (OPM 2011).

[45] There are various labels for these publicly supported institutions. To keep matters simple, we use the DFI label throughout.

variety of DFI experiences.[46] DFIs have now become important facilitators of structural transformation and technical change. Latin America's DFIs successfully finance longer-term and riskier investments that are largely ignored by private capital markets which overwhelmingly prefer short-term and safer investments.[47] Brazil's national development bank, BNDES, has filled this gap in a country where, despite its MIC status, securities markets remain relatively shallow.[48] Its long experience, reinforced by the reform in 2017, enables BNDES to support private developers in building a pipeline of technically sound and bankable projects, and it either provides direct financial and technical support to projects or fosters new instruments to leverage additional resources from private banks and other institutional investors.[49] Similarly, the Start Up initiative of Chile's development bank, CORFO, has generated one 'unicorn' (a start-up now valued at over US$1 billion) and many other companies of smaller but growing size, a success that OECD (2016) concludes is comparable to Singapore (which is in the vanguard of private sector development).[50]

In sum, while DFIs differ in their mandates and *modus operandi*, they have a common characteristic: a commitment to address the market failures arising from traditional commercial banking, notably inadequate longer-term financing, avoidance of innovative but riskier investments, and underinvestment in SMEs. Well-managed DFIs can amplify the boost to the national economy arising from the large direct and indirect expenditures associated with the oil, gas, and mining industries. For example, a DFI with a mandate to promote SMEs can provide finance and project preparation support to suppliers of local content to extractives companies as well as those SMEs riding the tide of higher domestic demand.

Historically successful countries have pursued this strategy of close public–private partnership to diffuse the benefits of the resource sector's growth across the broader economy.[51] Yet success also depends on building and maintaining the infrastructure that boosts enterprise productivity, and which connects the local economy to the regional, and the regional economy to the national. It is therefore to infrastructure that we now turn.

[46] Africa has over 70 DFIs that are members of the Association of African Development Finance Institutions (AADFI), including: the Development Bank of Southern Africa (DBSA); the Industrial Development Corporation, also of South Africa (IDC); the Botswana Development Corporation (BDC); and the Development Bank of Namibia (DBN) (AADFI 2019). Asian examples include: *Bank Pembangunan Malaysia Berhad* (BPMB); SME Bank, also of Malaysia; *Bank Rakyat Indonesia* (BRI); and the large Chinese development banks.

[47] Griffith-Jones and Ocampo (2018).

[48] *Banco Nacional de Desenvolvimento Economico e Social* (BNDES), Brazilian Economic and Social Development Bank.

[49] Studart and Ramos (2018) discuss BNDES.

[50] Griffith-Jones et al. (2018) discuss CORFO (*Corporación de Fomento de la Producción* or Production Development Corporation).

[51] See Auty (1987, 1989) and Porter (1990).

5.5 Leveraging infrastructure investment

Mines and oil and gas installations are huge consumers of electricity and water; they need reliable telecoms and IT services (especially as automation accelerates); and the necessary road, rail, pipeline, and port infrastructure (which also transports the equipment and other inputs) entails large-scale construction. Resources have no market value unless transport infrastructure is in place. Thus, Bolivia has talked about becoming a lithium 'Saudi Arabia' for years (it has the world's largest estimated reserves) but its lithium-abundant deposits in Salar de Uyuni high in the Andes are remote from the nearest port in neighbouring Chile, and there is little in the way of the necessary power and transport infrastructure. Getting Uganda's oil to a port at Tanga on neighbouring Tanzania's coast involves the construction of a 1,440-kilometre pipeline. Offshore gas necessitates expensive LNG 'trains' (the liquification and purification facilities) to ship the gas to export markets, or pipelines connected to onshore gas-fired power stations.

Such infrastructure investment is very expensive. Construction must be undertaken well in advance of any revenues and much of it is debt-financed. Usually the financing is a mix of public and private (with the mine or oil and gas facility constituting the 'anchor project'), sometimes through public–private partnerships (PPPs), and often catalysed by MDBs providing the initial risk capital and funding for the appraisal and planning process (the African Development Bank (AfDB) has a programme for this).[52] This results in complex financial packages, requiring close coordination and a clear delineation of the financial and other responsibilities of each investor. Private investors will only commit when they are convinced that the project has a satisfactory rate of return and an acceptable level of risk, and MDBs must be satisfied that the project has a strong 'social' rate of return and does not pose an environmental risk (also now required by the best private investors: see Chapter 8). Governments must be careful not to overcommit public funds and take on too much fiscal risk.

Guinea illustrates the difficulties. The country has some of the world's richest bauxite and iron-ore deposits, but many potential mines are distant from the coast. Plans to invest more in the necessary railways and ports pre-date Guinea's independence from France in 1958 but it is only recently that real progress has been made. Guinea's Simandou project, which includes a 600-kilometre multi-use railway and port facilities, is Africa's largest greenfield integrated mine and infrastructure project (Simandou is the world's largest untapped iron-ore reserve). It is now proceeding after repeated delays caused by periods of low iron-ore prices, disputes between investors and the government, and political instability.[53]

[52] On PPPs, see www.ifc.org/en/what-we-do/sector-expertise/public-private-partnerships.

[53] Rio Tinto is the lead investor: www.riotinto.com/en/news/releases/2023/simandou-iron-ore-project-update.

In sum, getting large-scale infrastructure projects off the ground is a demanding task but one that has considerable economic benefits if successful. The construction phase is a good way to generate jobs including more at local level (especially if complemented by investments in skills training).[54] More ambitiously, infrastructure investment in the extractive sector can potentially serve other sectors, thereby leveraging the investment's benefits and diluting the tendency of the extractive sector towards enclavism.

Such leverage is especially important for Africa which has the biggest infrastructure deficit of any region, a deficiency which deters domestic investment and FDI into agriculture, manufacturing, services, and tourism—thereby limiting economic transformation and job creation.[55] Greater FDI would help integrate Africa more effectively into GVCs and encourage exporting firms which tend to pay more than firms just focused on the domestic market: the former operate at a larger scale, use more capital, and consequently require skilled workers who are more productive and therefore better paid.[56]

Africa's enterprises are much more likely to cite infrastructure deficiencies as an obstacle to investment than lack of finance or skills shortages (though those are important too).[57] Enterprises, large and small, suffer chronic power deficiencies when grid supplies are erratic. Nigeria and South Africa are notorious for their power shutdowns: firms stop working or resort to expensive diesel generators. Transport is especially deficient.[58] Trucks crawl along pot-holed roads, trains creep along colonial-era track, and exports and essential imports back up in choked ports. One study found that an increase in inland transit time by one day reduces African exports by 7 per cent on average, and that Africa's export volumes are about 16 per cent lower than the level predicted by the standard determinants of trade.[59]

Rural transport and energy infrastructure is especially important to raising yields in African agriculture—by increasing irrigation (which requires electric pumps for water management)—as well as by reducing the cost of delivering produce to local, urban, and global markets. In Asia, much of the success of the last 50 years in reducing rural poverty is down to infrastructure investment.[60] Getting Africa's infrastructure closer to international standards will raise its productivity in agriculture, and not just in manufacturing and services.

This is a big and expensive challenge. Identifying ways for farmers and local enterprises, large and small, to share in the railways, roads, ports, and energy infrastructure built for mining and oil and gas production can help to close the

[54] Estache et al. (2013).
[55] The cost of closing Africa's infrastructure is estimated to be at least US$150 billion per annum (Lakmeeharan et al. 2020).
[56] Eifert et al. (2008).
[57] Fox and Oviedo (2013).
[58] Page and Söderbom (2012: 16).
[59] Freund and Rocha (2011).
[60] Especially in Indonesia (Timmer 2019; Vos 2019).

infrastructure deficit. However, while the principle has widespread acceptance, the devil is in the detail of project design, financing, and regulation.[61] Rail transport, for example, requires sorting out the practicalities of how to share the track, maintenance and upgrade costs, rolling stock investment, and insurance. Given the reliance on project cash flow for debt repayment, the higher the complexity of the shared-use structure, the less bankable it is likely to be. In sum, sorting out multi-user demands on infrastructure can be complicated and demands a high level of project management skill: assistance from the MDBs is invaluable to achieving this.

There are some significant successes with sharing arrangements at the local level. One example is the subsidiary road projects linked to the Tenke Fungurume Mining project near the large copper mine site in Katanga DRC: its feeder roads benefitted community livelihoods by radically reducing transport times for farmers.[62] But many similar ideas never get implemented and companies and governments must work together to gather this 'low hanging fruit' for local community development (Chapter 8 returns to this issue).

Achieving greater impact beyond the local level, via *diffused* economic development and diversification at the regional and national levels, is a tougher task. Resource corridors are one tool of this more ambitious approach. The Maputo Development Corridor (MDC) linking Mozambique and South Africa is a well-known example, with the Mozal aluminium smelter near Maputo acting as the anchor investment, and with road and rail linkages to South Africa. MDC's impact has been positive (including encouraging further investment) despite some setbacks and deficiencies (it could have done more to open up opportunities for SMEs, for instance).[63] India, Malaysia, and Thailand also provide examples of successful economic corridors.[64]

Inevitably there have been failures as well, enthusiasm for resource corridors has waned somewhat, and there are still too few examples of successful greenfield multi-client/multi-user mining-related infrastructure PPPs in the world.[65] As is often the case with apparently simple concepts, implementation has proven trickier than expected. The root of the problem is often a lack of government capacity and experience in coordinating the actions of a wide range of stakeholders, both public and private, ranging in scale from community organizations and local authorities up to MNCs and MDBs (a constraint we return to in Chapter 7's discussion of the need for an 'all of government' approach). Overcoming this constraint requires engagement and leadership from the highest levels. A clear legal

[61] Collier and Ireland (2015); Östensson (2018a, 2020a).
[62] Östensson and Roe (2013: 46); OPM (2013).
[63] Baxter et al. (2017); Bowland and Otto (2012). Cruz et al. (2023) discuss the challenges of regional development in Mozambique.
[64] Hill and Menon (2020).
[65] Östensson (2018a) provides a review.

and regulatory framework is essential for attracting private investment finance, both to the anchor project and to ancillary projects, and PPPs need especially effective management with a clear delineation of the responsibilities to be borne by each stakeholder.

Resource corridors and other forms of large-scale infrastructure investment need to prioritize community engagement and environmental impact assessment from the appraisal stage onwards (with regular data collection to monitor impact, especially on community poverty and natural capital). The history of global development is unfortunately replete with projects that resulted in large-scale social and environmental damage, and aggrieved communities. The 'Law of Unintended Consequences' applies here: governments and companies are often surprised by outcomes that could have been avoided or mitigated by early community engagement. Moreover, people will inevitably migrate to the new growth poles and the job opportunities they offer, resulting in excess demand for housing and community infrastructure unless the necessary investment is stepped up.

5.5.1 Cross-border challenges

Resource-wealthy, but landlocked, countries face special difficulties in bringing their commodities to the global export market: distances to ports are long, and building and managing the transport infrastructure necessitates cooperation between neighbours—often complicating the project's risks. In Africa, 16 out of the region's 55 countries are landlocked (the highest percentage of any region). The costs of intra-African transport are exceedingly high in any case (because of the generally poor state of infrastructure). Improving transport infrastructure between countries has many benefits and cross-border integration in trade offers large and well-documented returns. Progress on cross-border infrastructure in Africa has, however, been painfully slow, and projects such as the MDC linking Mozambique and South Africa are still too few. Across Africa, road transport is still used to transport large amounts of ore from mines in the interior to ports when it should really go by rail.

There are now signs of renewed life in cross-border projects. Despite the ups and downs of metals prices—with slumps often leading to investments stalling—forecasts of strong long-term demand, especially for critical minerals, are encouraging renewed investor interest, as is competition between Western countries and China over access to Africa's mineral resources (leading the US government in particular to play a more active and supportive role). The 'Liberty Corridor', a multi-user infrastructure corridor to transport iron ore by rail from mines in Guinea (operated by a US mining company) to a new port facility in Liberia, is underway, after many false starts. The railway will also transport freight and agricultural products, and the project includes additional investments

in telecommunications and roads; hydro power will be supplied by Côte d'Ivoire. The Mbalam-Nabeba project to ship iron ore from a large deposit straddling the border between the Republic of Congo and Cameroon to an export terminal in Cameroon has also been signed off (with Chinese investment replacing Australian, leading to an investor dispute).

Most ambitious of all among the new mining infrastructure projects is the 'Lobito Corridor', a 1,300-kilometre railway connecting Zambian and DRC mines with an existing (to be upgraded) rail link to an Angolan port, with the aim of supplying cobalt and copper to EV battery manufacturers in the United States and the European Union. China earlier announced an investment to upgrade the Tazara railway between Zambia and Tanzania (which was originally built with Chinese aid in the 1970s) to ship copper and cobalt to its EV industry.

The organizational complexity of cross-border infrastructure investments in oil and gas, as well as the risks, is well illustrated by the East Africa Crude Oil Pipeline (EACOP) project. The pipeline will transport oil from Uganda's Lake Albert oil fields to an export terminal near Tanga Port in Tanzania.[66] The cost is estimated at more than US$3.5 billion, and is one of the world's largest ever pipeline projects.[67] The project is planned to improve the trade corridor between Uganda and Tanzania via better road and communications infrastructure investments which should benefit economic activity unrelated to the oil sector itself. An ambitious project for sure, but one that has been delayed by ruling out an alternative pipeline route to a Kenyan port, wrangling over tax issues and project financing, and the complexities of a project involving multiple regional and district authorities.[68] Community organizations and non-governmental organizations (NGOs) have highlighted deficiencies in compensation to communities for displacement and land acquisition (and related livelihood loss) and there is criticism over the scale of the project's environmental impact.[69] Ineffective community and environmental assessment has been associated with project failure in Africa (and globally). Chapter 8 discusses the problems that often arise in community–company relations in extractive projects, and large-scale projects that cross borders must be especially well managed.

In sum, there are many challenges in implementing cross-border infrastructure projects. However, governments and MDBs have given considerable thought and attention to resource corridors, PPPs, and other mechanisms in recent years; the strategy enjoys considerable political support and its underlying logic is basically

[66] https://eacop.com.

[67] On Uganda, see Abigaba et al. (2021); Kayizzi-Mugerwa (2020); Wolf and Potluri (2020).

[68] Tanzania's terrain was also more favourable than Kenya's. Security is also an issue as Kenya's Lamu port is closer to Somalia, making it a potential target for al-Shabaab militants.

[69] For instance, see the report by Human Rights Watch (2023). In May 2019 a coalition of African and international bodies wrote to leading banks to ask them to refrain from financing the project on the grounds of likely damage to both livelihoods and nature.

sound. Putting it into practice requires upgrading national capacities, not least better national planning systems to identify the investments with good prospects for growth and poverty reduction and to avoid white elephants, a topic we return to in Chapter 7.

5.6 Conclusions

This chapter has discussed various ways in which the enclave mindset within governments might be overcome, so that more linkages from the extractive industries to local, regional, and national economies can be created. This is a tough agenda, but it can be delivered. And as Joseph Stiglitz has pointed out: 'the fact that in the past such linkages appear to have been weak may only reflect the lack of effort in developing them.'[70]

There are considerable opportunities arising from the huge investment flows into the extractive sectors and their very large direct and indirect expenditures. These provide the prospect for catalysing enterprise development. However, realizing these opportunities requires proactive support for *all* enterprises—not just those directly connected to the extractive industries—and especially for SMEs trying to transition from informal to formal status. Strong cooperation between public and private players is necessary—neither can deliver success acting alone—and, on the state side, strong DFIs can help fill the large gaps in enterprise finance left unfilled by commercial banks which are less risk tolerant.

Greater local content and downstream processing is achievable, but narrowing policy down to just these approaches is risky. Local manufacturing can become over-exposed to the shocks that bedevil the markets for oil, gas, and metals as well as to the eventual exhaustion of the resources or their commercial stranding (an increasing danger with hydrocarbons). We advocate a broader approach in which the renewable resource sectors, and especially agriculture and husbanding natural capital, are central—certainly in generating better livelihoods for the poorest citizens. This calls for much greater attention to fostering the potential linkages than is normally seen.

Without better livelihoods, poverty reduction must rely on establishing comprehensive social protection and redistributive policies which, while highly desirable, is a tough ask for countries with limited state capacity, let alone limited public revenues. Moreover, unless the resource revenues are especially ample relative to the population size, they are rarely sufficient to fund transfers sizeable enough to move everyone above the poverty line. Further, such a redistributive approach to relieve poverty becomes unsustainable once the resources yielding the revenues

[70] Stiglitz (2018: 15).

are depleted. And social programmes are also vulnerable to revenue shocks, not least fluctuating commodity prices and their fiscal impact.

When policy has successfully reduced enclavism, the economic growth resulting from the extractive industry will diffuse more widely than in economies where oil, gas, or mining is seen merely as an enclave. Greater wage employment in manufacturing will result in workers remitting more income back to their extended families. Greater investment of resource rents into promoting the adoption of new crops and new farm technologies will result in rising yields, higher rural incomes, and more jobs in villages and rural towns. Greater support to the thousands of micro- and small businesses can release their energies to boost domestic output. Like throwing a stone into a pond to cause the largest ripple, policy should aim to generate the largest and widest gain in incomes across the nation. When enclavism prevails, the stone just sinks, barely disturbing the water.

6
Transforming States
Transparency and Corruption

6.1 Introduction

When Botswana achieved independence from Britain in 1968, the country had less than 150 kilometres of paved roads and an income per capita of barely US$100. Botswana was one of the ten poorest countries in the world. Today, it is an upper-middle-income country of 2.3 million people enjoying an average real income of around US$18,000 per annum: many times higher than in the 1960s, and some five times higher than the average in the rest of Africa.[1] All its main villages and towns can now be accessed via tarred roads, of which at independence it had less than 10 kilometres. Botswana's mining and other natural resources have been central to its success, and it is often cited as an exemplar of how to manage resource wealth for prosperity.[2] The capacity of the Botswana state has been central to that success. So too has Botswana's achievement in building a democracy—one of the earliest countries to do so in Africa.

Contrast Botswana with the DRC, where a predatory colonial state was replaced by a predatory post-independence state, one whose remit and authority after decades of conflict remain weak across much of the country. Whereas Botswana runs a fully transparent system for the sale of its diamonds, and one that protects the broader public interest, the revenue flows from the DRC's resource wealth—including the world's largest single source of cobalt—are often opaque and serve many private interests, with state actors enjoying lucrative connections to the mining industry. As a result, the DRC's per-capita income is a meagre US$1,337, placing it in the World Bank's category of LICs.[3]

Botswana and the DRC represent two extremes of the resource management spectrum. They illustrate how the nature and capability of the state determine whether resources can be used to achieve prosperity, or whether they will be squandered. Much ink has been spilled on debating whether the market or the

[1] https://data.worldbank.org/country/botswana. All per-capita income data are in 'purchasing power parity' terms for 2022.
[2] On Botswana's success, see Leith (2005).
[3] https://data.worldbank.org/indicator.

Resources Matter. Tony Addison and Alan Roe, Oxford University Press. © United Nations University World Institute for Development Economics Research (UNU-WIDER) (2024). DOI: 10.1093/oso/9780192872197.003.0006

state can best deliver sustainable development.[4] In practice, successful development is a far subtler process than this. Indeed, success invariably is the result of substantial private investments that take place within a system of property rights secured by the state, underpinned by its provision of public goods, together with an appropriate regulatory framework that encourages the private sector to take investment risks—while securing the public interest in its economic, social, and environmental dimensions. It is a dynamic relationship that each country must build for itself and one that is much influenced by its resource base and, not least, its history.

This chapter is the first of two exploring aspects of the state's role in relation to the extractive industries. In doing so it is easy to tilt towards extreme pessimism as there are too few countries like Botswana and too many resembling the DRC. This is especially so for this chapter's focus on *governance and corruption*. Consequently, we provide examples of what can be done to improve matters, while recognizing that these are deeply political issues with many obstacles to success.

6.2 Weak governance

The term 'weak governance' is often applied to resource-wealthy countries, but what does it actually mean? Social scientists debate the topic endlessly, but for our purposes we look to the NRGI's authoritative measure (the RGI). This nails down the concept using three sets of indicators and five performance bands from 'good' to 'failing' (Box 6.1).[5]

What does this show? In the 2017 RGI, not a single LIC was classified in the 'good' governance categories, and among the MICs only Chile was marked as good (Botswana is rated 'satisfactory'). However, the 2021 RGI does show some improvements in the intervening years (see Figure 6.2 in Box 6.1). Some MICs, ranging from LMICs to UMICs, are generally classified as 'satisfactory', including Brazil, Colombia, India, Indonesia, and Ghana. But overall, in 2017, 39 out of the 89 sectoral assessments were rated in the 'poor' or 'failing' bands. The 10 failing countries include, not surprisingly, the DRC, Equatorial Guinea, Eritrea, Libya, Mauritania, Myanmar, Sudan, and Zimbabwe—mostly African countries with high levels of political fragility.[6]

[4] Addison (2014) provides a review.

[5] https://resourcegovernanceindex.org/about/global-report.

[6] The RGI defines a 'failing' country as one that 'has almost no governance framework to ensure resource extraction benefits society. It is highly likely that benefits flow only to some companies and elites'.

The RGI ratings confirm that many countries have far to go in improving resource governance. The remainder of this chapter discusses what can be done and provides grounds for some (cautious) optimism.

Box 6.1 The NRGI RGI: selected countries

The RGI comprises three groups of indicators, measuring:

1. *Value Realization*: the governance of allocating extraction rights, exploration, production, environmental protection, revenue collection, and state-owned enterprises.
2. *Revenue Management*: national budgeting, subnational resource-revenue sharing, and SWFs.
3. The country's general enabling *Environment for Business*.

In the 2021 RGI, each of the 22 countries had an assessment of their mining and/or oil and gas sectors to grade them into one of *five* performance bands: good, satisfactory, weak, poor, or failing.

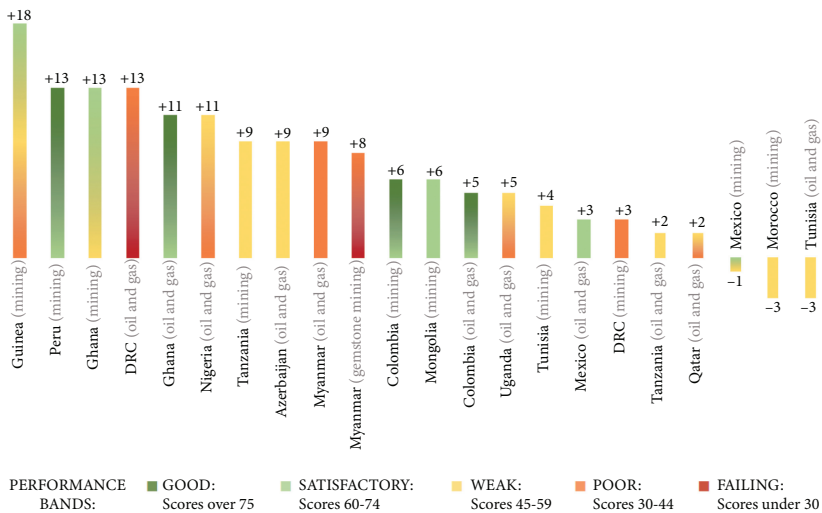

Figure 6.1 Score and performance band shifts between the 2017 and 2021 Resource Governance Indices

Source: NRGI (2017a, 2021).

continued

continued

A sound performance under all three indicators is necessary to obtain the full benefit of a country's resource wealth. Significantly, given our theme of economic transformation, component 3 (the enabling environment for business) enters alongside the more specific resource-related components (1 and 2) as a key element for success. A few countries that now perform tolerably well under components 1 and 2 perform much worse on component 3, notably Guinea and Nigeria. This hinders not only their extractive industries but also their prospects for economic transformation through the development of non-resource sectors.

Figure 6.1 shows the improvements achieved since 2017 but also the many weak, poor, and failing scores in countries whose economies are dominated by resource wealth. Governments with an unsatisfactory 2017 RGI score received an astounding US$1.2 trillion of public resource revenues (Mihalyi and Fleming 2017). The prospects for spending the revenue in ways that benefit all citizens, and not just the elite, remain limited until governance improves.

6.3 Tackling corruption and theft

Corrupt practices will always be with us, but none of the parties to bribery welcome more light.[7] Their incidence and damage can in principle be reduced by building the technical capacities of the national institutions responsible for regulating and managing natural resources. The World Bank, AfDB and other regional development banks, bilateral aid agencies such as Norway's NORAD, and the UN agencies all provide significant assistance.[8] Progress has been achieved under the UK's DFID (now FCDO) FOSTER project in Nigeria, for example.[9] Moreover, the NRGI, EITI, and Transparency International (TI) all promote improved governance and their data-gathering greatly helps civil society's advocacy for reform.[10] We return to the assistance provided to civil society organizations (CSOs) later.

[7] Noting that the concept of 'corruption' is not straightforward: what is legal in one country can be illegal in others, and there is a grey area involving 'lobbying' which is pervasive across all societies (see Kaufmann and Vicente 2005). On corruption specifically in the natural resource sectors, see Williams and Le Billon (2017).

[8] The World Bank's Extractives Global Programmatic Support (EGPS) Multi-Donor Trust Fund assists countries to improve the governance of their oil, gas, and mineral resources in such areas as transparency, legal and regulatory reform, local economic diversification, institutional strengthening, and social and environmental sustainability: www.worldbank.org/en/programs/egps.

[9] On FOSTER, see Buckley et al. (2018) and Lopez Lucia et al. (2019).

[10] The term 'civil society' embraces NGOs, local community groups, faith groups, trade unions, the press, and social media.

However, any institutional restraints on corruption face an uphill task if not backed by the top layer of government.[11] The worst cases involve *state capture* in which political leaders place family members, allies, and other politically exposed persons (PEPs) into high-level positions in NOCs, ministries of energy, and SWFs. Private companies linked to PEPs are also created to win contracts via opaque public procurement processes. Oil economies are especially vulnerable as large fortunes can quickly be made: one study estimates that for petro-states with autocratic rulers around 15 per cent of a typical oil boom is deposited in accounts in tax havens.[12]

These political dynamics mute the effectiveness of any technical assistance. These situations are much harder to resolve than those in which the main problem is deficient technical capacity but where accountability in the political system exists (legislatures can then hold the executive to account) and where the media and civil society are reasonably free. No country is irredeemably bad, but they do vary enormously in the amount of progress needed, seen, or yet to be achieved.

The World Bank's Worldwide Governance Indicators (WGI) are one way to track progress.[13] Nigeria has deep governance problems but nevertheless shows progress in some areas with both its WGI and RGI scores improving, for example (see Box 6.1 on the RGI). South Africa pulled itself back from the abyss after the state capture that characterized the Zuma presidency (2009–2018). South Africa's democratic institutions, civil society, and media provided some defence, although the damage was substantial and is still under repair.

Progress can never be taken for granted and is always in danger of reversal, as Myanmar demonstrates. Myanmar joined the EITI in 2014 following the start of its democratic transition and its RGI score in oil and gas improved (see Box 6.1).[14] But achieving transparency in mining and commodity trading has been much harder as the military retains its extensive business interests in jade, gemstones, and timber. The 2021 coup has protected the military's commercial ventures and provided further scope for their expansion. EITI has now delisted Myanmar.

In sum, resource wealth remains an open temptation to weak governance, corruption, and theft. However, rather than throwing up our hands in horror and concluding that this is inevitable, let us now dig deeper into what can be done to make progress.

[11] There is a large literature on institution building and development, especially in the context of fragile states and violent conflict. A sample includes Andrews et al. (2017), Pritchett (2013), Pritchett et al. (2017), and Werker and Sen (2021). Addison (2003) discusses the issues in the context of Africa's conflicts and 'post-conflict' recoveries. Much depends on whether an 'elite bargain'—an agreement to pursue long-term development—emerges (Dercon 2022).

[12] Andersen et al. (2017). On corruption in the oil industry, see Gillies (2019a).

[13] Since 1996 the World Bank has been quantifying 'Control of Corruption' as one of the six indicators included in its WGI database: https://info.worldbank.org/governance/wgi. This indicator reflects 'perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests'.

[14] EITI (2019).

6.3.1 Actions by richer countries: the US Foreign Corrupt Practices Act

Despite their stronger rule of law, the rich world is complicit in corruption in the developing world: their companies pay bribes, their banks launder money, and they host the wealth of many corrupt officials and politicians. These points are often made, but they bear repeating. Not so long ago many OECD countries allowed tax deductibility for business expenses relating to payments to secure contracts abroad: it only ended for Swiss companies making payments to private individuals in 2022 (and for payments to public officials in 2001). A catalyst for national action was the OECD's initiatives on bribery, including its convention on combatting bribery of foreign officials (which was adopted in 1997 and came into force in 1999).[15] This has been adopted by all 36 OECD member countries and by 8 non-OECD states.

How much progress has there been? The US Foreign Corrupt Practices Act (FCPA) of 1977 was a major step forward and is still the most widely enforced anti-corruption law. The FCPA was the first to introduce corporate liability responsibility for third parties and extra-territoriality for corruption offences, whereby companies and persons can be held criminally and civilly responsible for corruption offences committed abroad. Nevertheless, and despite the FCPA getting off to a good start, the number of enforcement actions was only one or two per year in the Act's first three decades, a limiting factor being the lack of cooperation from other countries. This started to change around the millennium, notably when the OECD adopted and promoted its anti-bribery convention in the late 1990s.[16] This resulted in more international cooperation on investigations and prosecutions. Around 2005–2007, the US DoJ and Securities and Exchange Commission (SEC), the FCPA's dual enforcers, stepped up prosecutions and this continued under the Biden administration.[17]

The FCPA matters hugely for companies in the oil, gas, and mining industries, as well as the commodity traders and banks: the sector has seen some of the largest cases, with the imposition of large fines. For example, in 2020 Eni entered into an agreement with the SEC to pay US$24.5 million in resolution of a case brought under the FCPA, concerning improper payments of

[15] See www.oecd.org/corruption/oecdantibriberyconvention.htm. Work under the Convention is supported by a variety of guidance documents such as OECD (2009, 2011).

[16] See Transparency International (2020) on enforcement.

[17] The SEC intends to implement a policy requiring more companies and individuals to admit wrongdoing when they settle civil enforcement actions; previously the SEC had allowed most companies and individuals to settle on a 'neither admit nor deny' basis. This will make it easier to bring private litigation against companies and provide more potential for DoJ criminal prosecutions. At present companies can settle and move on, essentially transferring the cost of the fines to their shareholders, thereby limiting the reputational damage.

€198 million (around US$200 million) by an Eni subsidiary, Saipem, to Algerian government officials (Eni neither admitted nor denied the SEC's findings).[18] In 2021, Credit Suisse agreed to pay US$475 million to US and UK authorities for violating the FCPA with regard to Mozambique and in connection with two bond offerings and a syndicated loan (the 'tuna bonds scandal', discussed in Chapter 3), while a London-based subsidiary of the Russian VTB bank also settled with the SEC for US$6.4 million in relation to the second bond offering.[19] Such successes represent hard-won progress, but as Chapter 3 highlighted, corruption's damage to the economies and societies of poorer countries can be truly enormous.

Another advance was the US Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010; Section 1502 requires companies reporting to the SEC to report their use of designated 'conflict minerals'. A parallel set of standards comprising the Kimberley Process was adopted in 2002 by a coalition of 37 nations to try and prevent conflict diamonds from entering legal supply-chains.[20]

In sum, progress is evident. Yet there is still much that is opaque, including companies protecting the identities of their shareholders, financial statements that hide corrupt payments, the use of tax havens to hide the payment of bribes, and the laundering of the gains.[21]

6.4 Transparency and the power of civil society

Transparency is centre stage in the international struggle of the past two to three decades to improve accountability in licensing, tax agreements, and payments. There is a strong link between weaknesses in transparency on the one hand and the incidence of corruption, tax evasion, and illicit financial flows (IFFs) on the other.[22]

The turn of the century saw a step change in international action when advocacy by Global Witness, the Open Society Foundations, and others rallied under the banner of Publish What You Pay (PWYP).[23] This culminated in an international conference convened in London by the UK's DFID in June 2003, which agreed a Statement of 12 Principles to increase transparency of payments and

[18] www.sec.gov/enforce/34-88679-s. See also Transparency International (2020: 73).

[19] www.sec.gov/enforce/sec-enforcement-actions-fcpa-cases.

[20] www.kimberleyprocess.com. See Bieri (2010); Smillie (2010, 2014); Östensson (2020b).

[21] www.transparency.org/topic/detail/oil_and_gas. Blas and Farchy (2021) provide insight into the activities of the large international companies trading oil and gas.

[22] Additionally, and as noted by Östensson (2020b), weak transparency results in serious allocative inefficiencies that reduce economic growth. On the methods used in IFFs, see the Financial Action Task Force (FATF), an intergovernmental body charged with combatting money laundering: www.fatf-gafi.org.

[23] On the history of PWYP, see van Oranje and Parham (2009). The UN Global Compact, established in 1999, was another catalyst.

revenues in the extractive industries. EITI was founded to give effect to these principles.[24] The take-up of EITI has been impressive and over 50 countries now implement the EITI standard (see Figure 6.2).[25] In its 20-year life EITI has helped clarify the revenue picture of its members, including in Africa which accounts for over half of EITI's membership.[26] EITI also provides an important platform for dialogue among stakeholders, including civil society and companies in addition to governments, especially in countries where this might otherwise be absent.

Nevertheless, there is a long way to go. EITI would be greatly strengthened if more big resource economies signed up: Brazil, Russia, and South Africa remain outside, and Iraq is the lone member in the MENA region. The US withdrew during the Trump administration, leaving Germany and the UK as the only Group of Seven (G7) members (France is surprisingly absent).[27] Countries that withdrew or were suspended due to a lack of progress in implementing the standard are Afghanistan, Azerbaijan, Equatorial Guinea (which applied to re-join, but has made insufficient progress), Solomon Islands, and Yemen—and Myanmar was delisted in 2024 due to its political regression, including its crackdown on civil society.[28] Given the increased role of Chinese and Indian companies, it would greatly boost EITI's reach if their governments were to join.

Zimbabwe illustrates the struggle around revenue transparency. There is a long-standing illicit trade in gold, which is bought by politically connected traders who smuggle it through South Africa and Mozambique and then onward to the Gulf. One government minister has said that no less than US$100 million of gold leaves Zimbabwe illegally every month, which represents a massive loss of revenue for the state.[29] Zimbabwe is not yet an EITI member: reformers within government are in favour, others denounce it as 'another Western plot'. The politics of extractives interact intimately, as in every country, with the broader agenda of democratic accountability.[30] EITI membership offers no magic bullet, but the chair of the Zimbabwe Environmental Law Association (ZELA), Tumai Murombo, is surely right in concluding that: 'While the EITI may not prevent the corruption and

[24] The Dodd-Frank initiative as it applies to the extractives sector (Section 1504) is a parallel initiative with similar objectives. If enforced (a matter that remains in doubt), it would require the disaggregated reporting of payments by 90 per cent of the world's largest IOCs, as well as 8 of the world's 10 largest mining companies.

[25] https://eiti.org/countries.

[26] See Cust (2018) and van Alstine (2017) for reviews of EITI's effectiveness.

[27] Western Europe's biggest oil and gas producer, Norway, is implementing EITI. In addition, 68 companies support EITI.

[28] https://eiti.org/news/myanmar-delisted-eiti-due-political-instability.

[29] GITOC (2021: 11). At least 50 per cent of Zimbabwe's artisanal gold is estimated to be smuggled. Gold smuggling is a global problem; see UNU-WIDER studies of Kenya and Peru by Smith et al. (2023) and of Bolivia (Brugger et al. 2022).

[30] Robinson (2021). Zimbabwe once had one of the most promising futures in southern Africa (see Addison and Laakso 2003).

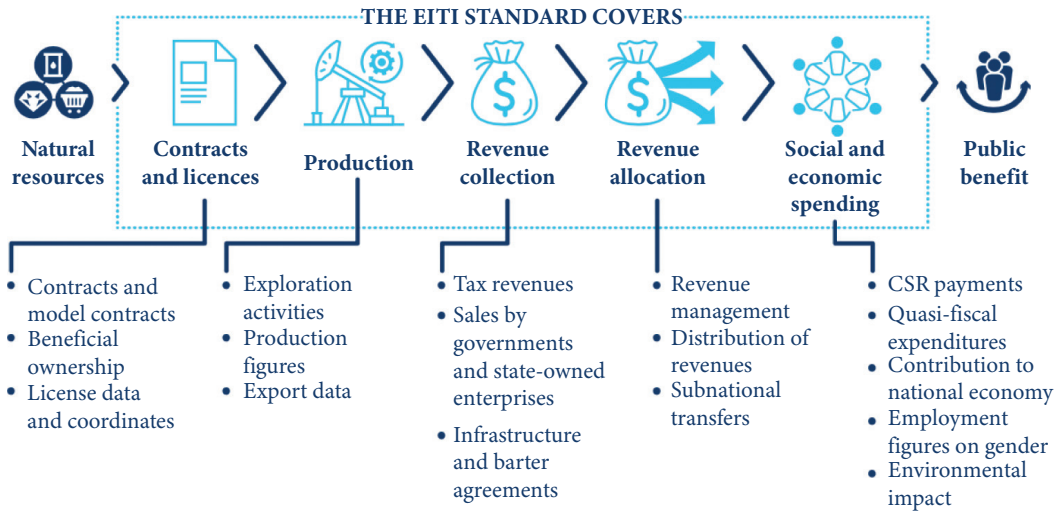

Figure 6.2 Data disclosed under the EITI standard

Source: Extractive Industries Transparency Initiative (EITI); eiti.org. Reproduced here in line with terms and conditions for reproducing content from the EITI website.

plundering of a country's extractive resources, it will be a step towards building trust and a culture of transparency and accountability.'[31]

Chad is another illustration of EITI's potential—along with many of its difficulties. In 2006, the government broke an agreement with the World Bank over revenue transparency, including saving 10 per cent of Chad's oil revenues into a Future Generation Fund which was supposed to remain untouchable. This led to the Bank's withdrawal from the project. However, elements within the leadership wanted to maintain good relations with Chad's aid donors.[32] Moreover, drawing on an earlier national PWYP network, Chad's civil society mobilized strongly in support of joining EITI.[33] By 2010 Chad had signed up, and was fully compliant with EITI principles by 2014, becoming something of a laboratory for the practice of revenue transparency.[34] But progress has been far from smooth and off-budget expenditures to service resource-backed loans remain of particular concern.[35] Moreover, the Sahel region's insecurity still impacts on the country's politics, and thereby on the prospects for progress on transparency.

Ghanaian civil society has expertise ranging from community development to fiscal governance, and was therefore well placed both to encourage Ghana to join EITI and to help create the Public Interest Accountability Committee (PIAC) which oversees the use of the nation's petroleum revenues.[36] In the Shama district in Ghana's Western Region, the Ghanaian NGO Friends of the Nation (FON) has worked with the district assembly on participatory budgeting and public oversight of spending funded from oil revenues.[37] There is also progress in Peru where, despite weak formal accountability (local governments and companies often ignore the law), CSOs have successfully identified discrepancies in revenue transfers and project execution.[38]

Nigeria's FOSTER project, supported by the UK's DFID (and now FCDO), is one of the most impressive examples of civil society's influence. Aid projects can be rigid in design and execution, usually being implemented through an organization chosen by the donor and the host government. Instead, FOSTER was designed to work flexibly with any counterpart agency or group (some outside the government entirely) that promoted and supported reform, with the choice being vested

[31] Murombo (2021: 21). www.zela.org.

[32] Not least because Chad was going through the HIPC debt relief process. Addison et al. (2004) discuss HIPC.

[33] Hoinathy and Jánszky (2017).

[34] Hicks (2015: 39).

[35] https://eiti.org/countries/chad. EITI (2022: 6). Resource-backed loans, where oil is used as collateral, are a feature of China's lending (Horn et al. 2019: 23).

[36] www.piacghana.org. This was one component of the 2011 Petroleum Revenue Management Act. See Slack (2018). EITI (2018) discusses EITI's engagement with Ghana's oil and gas trading.

[37] In 2013, Ghana's CSOs organized a successful campaign, 'Oil for Agriculture', which convinced the government to commit 15 per cent of its oil revenue to small-scale agriculture (Offenheiser 2014).

[38] Slack (2018). These achievements are especially important given the finding of the 2021 RGI assessment that the *governance of local impacts*—the environmental and social aspects of extraction—often showed worsening performance in the five years after 2017 (NRGI 2021: 14).

in the local Nigerian team. FOSTER also adapted its modalities as political circumstances changed. The FOSTER team provided evidence-based information about the oil sector, which was used by a wide range of CSOs and other partners to enhance public debate. Notably, this helped strengthen Nigeria's EITI and support Nigeria's National Assembly in preparing new legislation for the oil and gas sector. It was also a critical player in the development of Nigeria's pioneering Gas Flare Tracker that has resulted in significant reductions in methane emissions from production facilities (a topic we return to in Chapter 7).

From these examples, three lessons emerge on strengthening the hand of CSOs. First, build their resources and technical capacity so that they can more effectively contribute to EITI and other transparency initiatives.[39] High-quality, accurate, and up-to-date information is the vital raw material for civil society to do its job effectively. Second, put more resources into improving awareness among citizens of the value of revenue transparency and what 'good governance performance' can and should look like. Third, any donor-funded technical assistance to CSOs must try to ensure genuine local ownership: Nigeria's FOSTER is a good model.[40]

In sum, CSOs can be a powerful force for monitoring state behaviour, exposing corruption, and pushing the transparency agenda, especially when national organizations combine through international initiatives like EITI and other mobilizers of technical assistance and financial support. At the same time, we must recognize civil society's limitations—CSOs can be institutionally fragile, not all are progressive (authoritarian politicians create their own to exercise influence and spread disinformation), and they must operate in difficult and sometimes highly dangerous environments.[41] Their chance of success is therefore much influenced by the national and local political environment. Progressive governments recognize the support that a well-functioning civil society can provide in shaping the resources debate, monitoring the effectiveness of regulation, and giving voice to marginalized communities. Truly democratic politicians and responsible companies might not like criticism, but they listen with respect.

6.5 Tightening up licensing

The award of licences to explore and to operate (produce) is an area of high-corruption risk.[42] Licensing is the starting point of the life cycle of all mining and oil and gas projects after successful exploration and is therefore critical to

[39] This section draws on Slack (2018).

[40] 'FOSTER's Abuja team was Nigerian led from the start, and by 2015 was entirely Nigerian' (Lopez Lucia et al. 2019: 1).

[41] There is a long history of persecuting the CSOs created by indigenous peoples in Latin America, including the murder of community leaders and activists.

[42] The award of contracts to firms providing services to the mining and oil and gas industries is also open to abuse.

the anti-corruption battle. NRGI's 2021 RGI states that, 'Governance of licensing was the lowest-scoring dimension of resource governance … This was primarily due to poor scores on laws regarding beneficial ownership transparency and asset disclosures by public officials.'[43]

For oil and gas, a study for UNU-WIDER by Marcolongo and Zambiasi finds that the incorporation of offshore shell companies in tax havens increases around the time that exploration licences are awarded (with the association being stronger during oil booms).[44] This suggests corruption involving PEPs with influence over the award of licences and the active use of shell companies (controlled by people with links to the country in which the licensing is underway), established with intent to hide illicit payments. The study limits itself to companies created before (or in the aftermath of) the award of licences, in a six-month window.

Corruption in licensing also occurs in mining. Recognizing this reality, TI has a Mining Awards Corruption Risk Assessment Tool enabling governments and other stakeholders to identify and assess the underlying causes of corruption in mining sector awards. The tool has been used to assess the risks in 23 mining jurisdictions, identifying more than 80 common corruption risks.[45]

The NRGI's Benchmarking Framework, which uses The Natural Resources Charter to frame its building blocks, also enables governments and civil society to evaluate licensing arrangements against good practice (see Figure 6.3).[46] Specifically, the benchmarking for licensing (precept no. 3) is organized under three sets of questions: (i) *planning* that precedes allocation; (ii) *screening* processes for allocation to ensure that all licensees are of good standing and can offer value for money; and (iii) *monitoring* processes once the licences are issued. Under the second of these headings NRGI's Framework also offers detailed advice about *licence disclosure* (of information relevant to the licence) both before and after the licence is issued. The Framework has been applied in over 15 countries and helps in interpreting EITI results when these indicate possible deviations from the rules.[47] Relatedly, NRGI has also developed 'Twelve Red Flags' to help spot licence abuses (see Box 6.2).

[43] NRGI (2021: 12).

[44] Marcolongo and Zambiasi (2022). The study covers 119 countries over the period 1990–2014 and uses data from the Offshore Leaks Database constructed by the International Consortium of Investigative Journalists (ICIJ).

[45] Transparency International (2017). Furthermore, contracts supported by finance or technical assistance from the World Bank and the AfDB are subject to stringent external audit. Specifically, these development banks can debar companies that are guilty of dubious practices and also 'cross debar' them from accessing contracts from other agencies.

[46] NRGI (2017b) and www.resourcegovernance.org/approach/benchmarking-framework.

[47] On using EITI disclosures for an anti-corruption investigation, see Sahla et al. (2021).

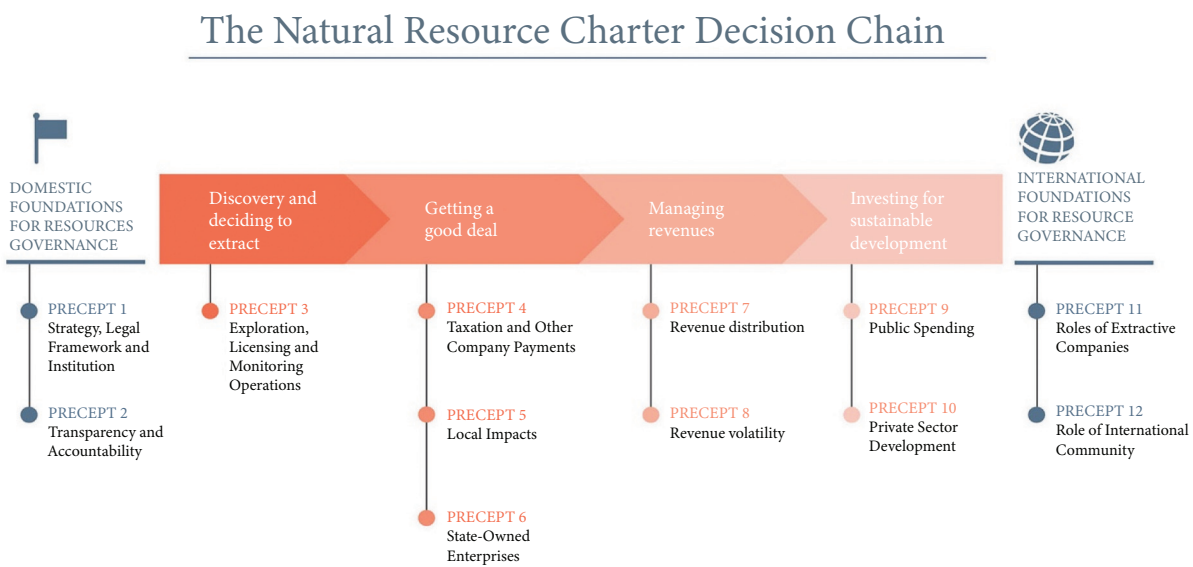

Figure 6.3 The natural resource charter decision chain

Source: NRGI (2014).

Box 6.2 Red flags for corruption

NRGI's red flags provide a useful lens for investigating corruption as they are based on an analysis of common patterns of corrupt behaviour. This covers the award of exploration and production licences, service contracts, and commodity trading contracts. The presence of an individual flag does not necessarily indicate corruption, but as the number of red flags increases, so does the corruption *risk*. We reproduce here the red flags from Sayne et al. (2017: 2):

1. The government allows a seemingly unqualified company to compete for, or win, an award.
2. A company or individual with a history of controversy or criminal behaviour competes for, or wins, an award.
3. A competing or winning company has a shareholder or other business relationship with a PEP or a company with a PEP interest.
4. A competing or winning company shows signs of having a PEP as a hidden beneficial owner.
5. An official intervenes in the award process, resulting in benefit to a particular company.
6. A company provides payments, gifts or favours to a PEP with influence over the selection process.
7. An official with influence over the selection process has a conflict of interest.
8. Competition is deliberately constrained in the award process.
9. A company uses a third-party intermediary to gain an advantage in the award.
10. A payment made by the winning company is diverted away from the appropriate government account.
11. The agreed terms of the award deviate significantly from industry norms.
12. The winning company or its owners sell out for a large profit without having done substantial work.

There are many examples of where licensing has gone wrong, resulting in complex and often protracted legal cases. One especially tangled tale is that of Nigeria's 'Oil Prospecting License 245' (OPL 245) which began in 1998 when General Sani Abacha, the country's head of state (after seizing power in 1993), awarded OPL 245—a potentially rich offshore asset—to a local company which counted the then oil minister as one of its shareholders. Over the following years, Eni and Shell acquired stakes in OPL 245, leading to accusations of corrupt payments. Eni and

Shell denied any wrongdoing and stated that they acquired the licence through legitimate agreements with the Government of Nigeria.[48] There then followed protracted litigation in both national and international courts. In March 2021, and after a three-year trial, an Italian court acquitted Eni, Shell, and other defendants of all charges.[49] Nevertheless, Nigeria's Economic and Financial Crimes Commission (EFCC) is still pursuing the case. A quarter of a century after the concession was first awarded, OPL 245 still casts a dark shadow over oil and gas licensing in Nigeria and has undoubtedly impacted investment into the sector.

More generally, such cases illustrate the risks to companies' reputations in dealing with authoritarian governments, and for countries the need to avoid highly personalized allocations of licences rather than fully transparent processes that protect the public interest. A declaration of public officials' assets is vital to avoiding conflicts of interest in the award of licences, whether in oil and gas or mining (NRGI's red flag no. 3 in Box 6.2). Many countries have worked hard to reform the legal frameworks around their extractive industries, but enforcement can lag far behind, a result of limited administrative capacities and sometimes political interference.[50] In sum, licensing can be a complex business, huge sums are involved, and there is a need for much more transparency using the tools developed by TI, NRGI, and others.

6.6 Cleaning up commodity trading

Commodity trading is big business: it made a record US$115 billion in gross profits in 2022.[51] There are the big international commodity trading companies such as Gunvor, Trafigura, and Vitol which remain private partnerships, while

[48] 'Timeline: Nigeria's OPL 245 Oilfield Licence Bribery Cases', *Reuters*, 17 March 2021.

[49] A subsequent appeal failed in 2022 but Nigeria may appeal to the Italian Supreme Court. In June 2022, a UK commercial court also ruled against Nigeria in a related case involving the transfer of payments by JP Morgan Bank on behalf of Eni and Shell. Also in 2022, the Netherlands public prosecutor dropped an investigation into Shell regarding OPL 245. For Eni's statements on the case, see www.eni.com/en-IT/media/opl245-case-process-nigeria.html. Shell's statement is here: www.shell.com/media/news-and-media-releases/2021/shell-comments-on-the-verdict-from-the-milan-tribunal-over-opl-245.html. See also Global Witness (2018a).

[50] Thus, for example, Senegal has made significant progress in closing the implementation gap but there is still much to be done, especially regarding beneficial ownership (Diene and Woodroffe 2021). In 2019, a BBC programme, *Panorama and Africa Eye*, investigated the 2017 award of offshore gas blocks in Senegal: www.bbc.com/news/av/world-africa-48475068. A statement by the Timis corporation, denying the allegations made in the programme, is here: www.bbc.com/news/world-africa-48483250. BP also denies any improprieties: www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/what-we-do/worldwide/bbc-panorama-response-english.pdf. The deal triggers at least 7 of NRGI's 12 red flags (Gillies 2019b). In 2019 Global Witness called for US and UK authorities to investigate further: www.globalwitness.org/en/press-releases/global-witness-calls-on-uk-and-us-to-investigate-bp-and-city-bad-boy-frank-timis. The Organized Crime and Corruption Reporting Project (OCCRP) has also looked into the case: www.occrp.org/en/investigations/senegals-offshore-oil-reserves-a-pricey-pawn-in-covert-deal.

[51] 'Global Commodity Trading Earnings Reach Record $115bn', *Financial Times*, 5 March 2023.

Glencore eventually became so large as it diversified into mining that it went public in 2011. The energy majors have highly profitable trading arms, notably Shell, as do some international banks and hedge funds. Some of the IOCs are still vertically integrated (producing, refining, and selling to the consumer) but many commodities pass through a chain of multiple sales, involving a variety of intermediaries and markets before they reach their final destinations: smelters, refineries, power-plants, and factories. Tracking these intermediate trades is complex, as the commodities can and often do move through many jurisdictions. And there are numerous independent registered traders along the way, as well as large and illicit trading networks.

Traders are spread across the world, with China and the Gulf region of special and growing importance. However, many of the older trading companies are still headquartered in Switzerland, the world's leading commodity trading hub, with some 500 companies active in trading, shipping, transaction financing, inspection services, and product testing. They account for 3.5 per cent of Swiss GDP and 15–25 per cent of the global trade in commodities.[52]

Founded as private companies, the big trading houses have a chequered history of malpractice including bribery, sanctions evasion, mis-invoicing, tax evasion, and the evasion of financial regulations.[53] Because of the substantial size of many of the trades, the costs of such malpractices are potentially huge.

Swiss-based companies have been under sustained pressure to become more transparent, not least because of the damage to Switzerland's reputation itself. In 2011 prominent Swiss NGOs came together around the 2011 Berne Declaration which pulls no punches when it states: 'Trading houses that often operate on the legal and political fringes are dangerous for Switzerland … After the fall of Swiss bank secrecy, they are the country's next exposed flank.'[54] The Federal Council of the Swiss Government has been increasingly alert to these concerns with new tax and other legislation among the instruments designed to achieve improvement.

Today all the bigger and more familiar names in the business claim to be squeaky clean (and some have signed up to EITI as supporters, notably Glencore). Yet any casual perusal of the business press over the last five years still yields many cases that have been successfully prosecuted or settled before going to court, as well as ongoing trials, continuing investigations, and a host of allegations (many involving company and state actor behaviour that raises multiple red flags).

A sample of cases, and just in relation to oil trading, include Vitol, the world's largest independent oil trader, which in 2020 settled for US$164 million in a deferred prosecution agreement with the DoJ after admitting to bribery in Brazil,

[52] Berne Declaration (2011).
[53] Blas and Farchy (2021) is the best single source for the history of the opaque world of commodity trading.
[54] Berne Declaration (2011). See Carbonnier and Zweynert de Cadena (2015) on the history.

Ecuador, and Mexico.[55] In 2019, oil trader Gunvor agreed to pay US$95 million in settlement of a Swiss investigation into the bribery of officials in Côte d'Ivoire and the Republic of the Congo.[56] In 2021, a former agent for Gunvor pleaded guilty to bribing officials of Petroecuador, the country's NOC, following a DoJ investigation, and in its 2022 accounts Gunvor took a US$200 million provision relating to the case.[57] In 2022, a London court ordered Glencore to pay over US$200 million in penalties after the company pleaded guilty to charges relating to bribery in Cameroon, Côte d'Ivoire, Equatorial Guinea, Nigeria, and South Sudan to secure access to oil on preferential terms.[58] In 2023 a New York court ordered Glencore to pay US$700 million relating to bribery in Brazil, the DRC, Nigeria, and Venezuela.[59] These are just the recent cases reported in the media; a complete list covering decades of commodities trading would fill an entire book.[60] Moreover, the dealings of Chinese and Russian companies remain opaque, to say the least.

Many of the cases just cited involve the use of agents acting for bigger traders. Many agents are honest businesses and, given their knowledge of sellers and buyers, such intermediaries improve market efficiency by reducing transactions costs. But a minority offer a convenient cover for bribery, enabling the bigger players to deny culpability. Nigeria has seen exceptionally large amounts of oil sold through intermediaries in this way. Until the 2016 reforms, Nigeria's 'briefcase companies' (so-called because of their method of transporting cash for payments) bought oil from the Nigerian National Petroleum Corporation (NNPC) and then rapidly resold it, skimming a margin in the process.[61] One allegedly operated on behalf of a minister of petroleum. Accordingly, intermediaries are often the starting point for investigations by law enforcement agencies, and their presence constitutes a red flag for corruption risk.[62]

As a result of successful law enforcement, but also investor pressure, big commodity traders are now reducing their use of intermediaries. Trafigura ceased to do so in 2019, and was one of the first trading houses to join EITI as a supporting

[55] 'Vitol Pays $164 mln to Resolve US Allegations of Oil Bribes in Latin America', *Reuters*, 3 December 2020.

[56] 'Gunvor Pays Almost $100m to Settle Africa Corruption Case', *Financial Times*, 19 October 2019.

[57] 'Ex-Gunvor Employee Pleads Guilty to Foreign Bribery Scheme', *Bloomberg*, 6 April 2021. The employee became an agent for Gunvor in 2018, but the case also related to bribery before that date, with some US$22 million being paid to officials between 2012 and 2020.

[58] 'Judge Orders Glencore to Pay £276 mn over African Bribery', *Financial Times*, 4 November 2022. Investigations by the UK's Serious Fraud Office revealed that Glencore employees transported US$800,000 in cash by private jet to South Sudan to pay bribes.

[59] 'Glencore Sentenced to Pay $700 Million in US after Bribery Guilty Plea', *Reuters*, 28 February 2023. At the time of the decision, the company said it expected to eventually pay US$1.5 billion to settle bribery and market manipulation accusations.

[60] While the fines are substantial, the sums are minor relative to the profits. In 2022, Gunvor's net income was US$2.36 billion and Glencore's was US$17.3 billion. 'Energy Trader Gunvor Posts Record $2.36 bln Net Profit in 2022', *Reuters*, 5 April 2023; 'Global Commodity Trading Earnings Reach Record $115bn', *Financial Times*, 5 March 2023.

[61] Sayne et al. (2015).

[62] Sayne et al. (2017).

company (later followed by Glencore and Gunvor).[63] EITI-supporting companies are expected to uphold the EITI standard by reporting in EITI-implementing countries in which they operate.[64] As such, EITI membership is a signal of credibility for companies that care about reputational risk, and it also increases the ability of analysts to verify trades by such entities as NOCs in EITI-implementing countries.

In summary, much attention is rightly focused on transparency in the 'first trade', especially oil sales by NOCs which have featured in multiple corruption cases. Tests of whether a trade is a source of illicit gain include the following. First, has the sale been efficiently conducted, and what were the terms on which the sale was made: specifically, does the sale price reflect prevailing market conditions/prices or has it been under-priced for the benefit of a particular buyer? Is there a relationship between the officials in charge of the sale and the buyers? What happens to the money once the sale goes through? Does all of it appear in the accounts of the government? Large amounts of timely data are needed to verify the facts, but also analysts skilled in understanding the market and industry are still in short supply.

Corruption is fundamentally theft: taking money for private gain from the public purse—and ultimately away from the public goods it could otherwise fund. A dollar stolen is a dollar lost to basic health care, primary schooling, or developmental infrastructure. Corruption on a grand scale ultimately degrades the state and social trust, and makes societies more inclined to settle their differences by resorting to violence. Given the scale of the losses, which are not just financial, the penalties should be commensurate, and not just fines on the companies—which are then largely paid for by the shareholders—but serious penalties, including jail time, for those not just directly engaged in the payment and receipt of bribes but also facilitating them right up to the highest levels. Given the damage from corruption in all its forms—not only in commodity trading but also in licensing and so on—it is surely time to seriously consider the creation of an International Anti-Corruption Court, as championed by the UK's Lord (Peter) Hain.[65]

6.7 Theft and state fragility

A related but equally difficult challenge is the theft of the resource itself, after its extraction, at some point along the global value-chain. Again, we return to the

[63] https://eiti.org/commodity-traders. Trafigura (2021: 19).
[64] https://eiti.org/documents/expectations-eiti-supporting-companies.
[65] A proposal not yet endorsed by the British government. See the 6 July 2023 House of Lords debate, including Lord Hain's robust summary of the issues and the merits of an International Anti-Corruption Court: https://hansard.parliament.uk/Lords/2023-07-06/debates/DB0613A7-1D77-482D-A180-20745447DD92/InternationalAnti-CorruptionCourt.

case of oil since it is the largest stolen resource globally—a staggering US$133 billion is lost annually—while fuel is the most smuggled natural resource.[66] Oil theft varies in scale, from tapping pipelines (a longstanding practice in Nigeria's Delta region and in Mexico) to maritime piracy and large ship-to-ship transfers at sea beyond national jurisdictions (especially off the coasts of Bangladesh, Indonesia, Somalia, and West Africa). Oil may be sold on, often across borders, or used as fuel (in Colombia the low-grade fuel *pategrillo* is used in cocaine refining). The costs go beyond lost revenues (borne by companies and governments) to include disruption to international trade (e.g., piracy in the Gulf of Guinea has led to port shutdowns) and challenges to the very security of the state.

One way forward is to use a chemical marker (such as an isotope) to 'fingerprint' oil products and construct a database—blockchain has potential—to enable companies and law enforcement agencies to track the commodity from its source through the value-chain to any final sale. In Ghana, a full-scale Petroleum Product Marking Scheme (PPMS) was implemented, after a pilot in 2013, for officially imported fuels. Fuel stations selling unmarked fuels are now penalized and the incidence of fuel adulteration has dropped markedly. Success was achieved in Uganda after fuel marking regulations were introduced in 2009. And a PPMS commenced in 2019 to counter lost tax revenues from fuel smuggling amounting to US$7.1 billion over 2010–2019.[67]

A very different market to oil is that for gemstones. Here the issue to be highlighted is illegal control over mining itself and subsequent trading. Gemstones are of special concern as they are easily smuggled, often from conflict zones via rebel and terrorist groups, and can then swiftly pass through opaque global trading networks, with their origin readily concealed.[68] Following the publicity around West Africa's blood diamonds, Botswana became so concerned about consumers turning away from the stones that it launched a highly transparent and regulated diamond auction process in 2013.[69] The government-owned Okavango Diamond Company auctions diamonds from De Beers (in which the Government of Botswana is a shareholder). Every prospective buyer must undergo pre-auction verification checks of their legitimacy. And details of all transactions, and the final price, are posted online. In sum, it is a highly regulated online auction of gemstones where the buyer is assured of the integrity of the seller—the auction is run by a body operating under government licence—and the seller undertakes thorough checks on the probity of the buyers, and as such it is an innovation to be

[66] This section draws on UNU-WIDER studies by Romsom (2022a, 2022b).

[67] However, this is harder for crude oil once multiple crude types are blended together in a pipeline; in storage or upon loading, any forensic information on any one component and its ultimate source can be lost in the mix.

[68] Siegel (2009) discusses the 'trust networks' that characterize diamond trading.

[69] www.odc.co.bw.

recommended. This differentiates Botswana's legitimately sourced diamonds from illegitimate stones, which means that they can command a premium among ethical buyers in the luxury jewellery business as well as final purchasers.

Another corrective innovation is to use online databases and blockchain technologies to track gemstones from source to buyer. A blockchain number is etched microscopically into the stone and then entered into a blockchain record, which cannot, by virtue of the technology, be tampered with. Several jewellery houses have already trialled this technology with promising results. Their incentive is partly commercial: ethical consumers increasingly demand assurance of the cleanliness of the supply-chain.[70] It also helps in the increasing competition between mined diamonds and lab-grown diamonds for market share.

Clamping down on the extraction and trading of gemstones, precious metals (gold and silver but also rare and valuable industrial metals such as coltan), ornamental minerals (e.g., amber and jade), crude oil and fuels, sand, and stone (e.g., rare marble) by armed non-state actors (sometimes in collusion with state actors such as the military) remains one of the biggest challenges.[71] These items are readily shipped through illicit networks and often traded alongside drugs (heroin and cocaine in particular), rare timber species, ivory, endangered wildlife, weapons, and even people with the respective trades financing each other (drugs gangs in Colombia and Mexico will also tap oil pipelines, for example, while in Myanmar the mining and trading of amber and jade interconnects with the country's heroin and crystal meth industries).[72] Aside from organized crime, such activities have funded wars in Angola, the DRC, Liberia, and Sierra Leone, as well as insurgencies by Al Qaeda and Islamic State in the Middle East. Islamic State 'franchises' continue to finance themselves with gold mining and trading operations across the Sahel region. Much of the mining of gemstones, precious metals, and ornamental minerals is undertaken by informal artisanal labour in local communities. Child labour and even forced labour is often used in unsafe mines, and refugees and migrants can be used in transportation and smuggling.

These activities are a major source of IFFs with the money commonly laundered via investments in property and businesses—thereby transferring the wealth far from its originating source. The resulting funds, together with informal 'taxation', create a substantial financial base for armed militias which ally with, or more often

[70] Note, however, that Botswana's diamonds are mined industrially from kimberlites which prevents 'leakage' and then enter a tightly controlled supply-chain. West Africa's diamonds originate mainly from artisanal mining in alluvial fields and therefore need to be effectively regulated at source before beginning their movement through the supply-chain. Botswana and Sierra Leone make for an interesting comparison as regards the development outcomes from diamonds as both gained independence with approximately the same (low) per-capita income, but then followed strikingly different trajectories. These may be attributable to institutional differences but also to the nature of the diamonds sector in each country (kimberlite versus alluvial).

[71] FATF (2013); FATF and APG (2015).

[72] On Myanmar, see Global Witness (2018b).

challenge, the incumbent state. When building their local political base, rebels may sometimes spend more of the revenue in ways that benefit communities—possibly more so than if the revenue (taxes, licensing fees, etc.) had gone into the national exchequer—thereby creating a local 'social contract' to challenge the legitimacy of the established state. Nonetheless, the loss of revenue to the government reduces its ability to fund social and development spending in a conventional manner.

State actors as they compete for control of a country's resources can easily turn routine political competition into violent conflict. One example is gold mining and trading by the Rapid Support Forces (RSF), the paramilitary force implicated in massacres during the Sudan's 2018–2019 political transition (originating in the Janjaweed deployed in massacres in Darfur) and Sudan's subsequent descent into civil war in 2023.

None of these matters lend themselves to easy technical solutions. They involve deep and complex issues of state authority, resolving the causes of fragility in fractured and conflictual societies, and coordinated international action. The latter must involve not only international organizations and governments but also the companies that are engaged in the extractive sector (Chapter 8 returns to this issue).

6.8 Trade and illicit financial flows

Much attention has been paid by campaigners to allegations of false documentation in the declaration of traded commodities (often referred to as trade mispricing).[73] Although such allegations implicate the commodity traders, their target is also the large producing companies. Analysis has yielded some very large estimates; for example, UNCTAD (2020) concludes that Africa alone loses some US$30–52 billion annually through trade mis-invoicing.

However, while trade mis-invoicing undoubtedly occurs, measuring the scale of lost revenues is very difficult to get right: some of the standard measurement approaches suffer from well-documented difficulties. Examples are the use of residuals in balance-of-payments statistics as a measure of capital flight and the use of so-called 'mirror-trade analysis' as a way to measure trade mis-invoicing.[74] For example, much of UNCTAD's estimate for Africa derives from trade data on South Africa's gold exports, and the size of that estimate appears to result from the

[73] Mispricing takes one of two basic forms: *transfer mispricing*, when a price different from the 'normal' market price is applied between related companies, and *mis-invoicing*, where the transaction takes place between unrelated companies but the prices for the seller and buyer are different, with an intermediary appropriating the difference.

[74] Earlier trade mis-invoicing studies that have received a great deal of attention are those by the NGO Global Financial Integrity whose studies conclude that up to 80 per cent of illicit outflows could be accounted for by mis-invoicing (GFI 2014, 2019).

way that South Africa records its gold exports and not from any large-scale misappropriation of the gold itself. Indeed, the South African Revenue Service (SARS) issued a refutation of an earlier UNCTAD (2016) study on this same issue.[75]

6.9 Conclusions

Corruption, illicit payments, and non-transparency are endemic in the extractive sectors and are regrettably embedded in many producing countries. Yet pessimism must be tempered as there are some impressive initiatives to at least contain the problems, if not resolve them. Our examples indicate how this is already being done and how it could be further improved.

First, advanced countries that had previously been quite passive in acting against malpractices by their own companies have tightened up significantly. Following the early lead of the US FCPA, we have had the Kimberley Process, the OECD's Anti-Bribery Convention, and initiatives such as Switzerland's Berne Declaration. The chapter has given examples of high-profile prosecutions, some of which have been successful. Yet more needs to be done, as the large fines handed out by the SEC and others to commodity trading companies and officials are still small compared to the millions earned by employees tempted to cross the borders of legality. Those at the very top of companies need to take responsibility and to face jail time if they do not.

Second, since the turn of the millennium some large companies and many governments have been increasingly willing to disclose more about revenues, contracts, licensing awards, and so on. Transparency has dampened some corrupt practices. Transparency alone is no panacea, but as our examples show, it is the foundation of anti-corruption practice.

Third, and related to the second trend, the broad-based transparency agendas led by EITI, TI, and others have received valuable support from the enactment of a growing set of agreed (and often mandated) standards of good corporate practice. The tone for this was set by the Sustainability Framework of the International Finance Corporation (IFC), an arm of the World Bank, and later the ICMM standards for its own mining company members. We have much more to say about these initiatives in Chapter 8. NRGI's Natural Resources Charter and its NRGI Governance index which systematically documents actual governance practices are invaluable, as are the World Bank's governance indicators. From the 1990s onwards, Global Witness led the way through its in-depth investigations of illicit

[75] SARS Media Statement on UNCTAD Report: www.tralac.org/images/docs/10,208/sars-media-statement-on-unctad-report-29-july-2016.pdf (29 July 2016). Eunomix (2017) provides an evaluation of the UNCTAD methodology. See Östensson (2018b, 2020b) and Forstater (2016, 2018) for extensive discussion of the methodological difficulties.

payments in the resources sector and this has inspired newer initiatives, notably by the ICIJ.

Finally, but not least, organized civil society is demonstrating a powerful monitoring and restraining influence in domestic politics and on the extractive industries themselves, facilitated by social media and rapid communication. The record of achievement is of course uneven across countries—autocratic regimes have become more sophisticated in countering civil society—but in many countries civil society is a force to be reckoned with, especially through EITI membership and support from EITI Oslo, as well as other international agencies.

7

Transforming States

Economic Management

7.1 Introduction

The previous chapter focused on the *governance* of resource wealth, concluding that, not surprisingly, transparency is the bedrock of successful inclusive development. Now we turn to the equally important topic of economic *management* where the issues, though technocratic and administrative, are no less political. We pose some key questions, explore the dilemmas, and examine lessons from experience rather than proposing formulaic solutions.[1]

To kickstart our discussion, we pose the question: why does the management of the extractive industries so often go wrong? There are at least two reasons.

First, governments often assume that managing a resource can be delegated to a specialist ministry (of mining or petroleum), supported perhaps by a NOC and by the finance ministry (on debt and expenditure control) and the tax administration. But this risks missing the potential of the resource discovery to help *diversify* the economy for when it is eventually depleted or becomes uncommercial (stranded) as discussed in Chapters 3 and 5.[2] Pursuing this long-term strategy requires a broader set of ministries and agencies to engage with resources policy, not least the environment ministry to preserve renewable natural capital, and for deeper cooperation between all of these. And building the capabilities of local, not just central, government is critical to achieving the right kind of developmental impact.

Second, governments frequently take too short term a view of the sector, often linked to the country's electoral cycle (four to five years), which is incompatible with managing and regulating resources that can have decades of life. Moreover, it can take a decade or more after the resource's discovery before significant revenues arrive in the exchequer. There is then a risk of a 'presource curse'—excessive public spending and debt accumulation in advance of any revenue—which Chapter 3 highlighted.[3]

We now discuss the first problem and possible solutions, then turn to the second problem, and finally discuss how to build greater macroeconomic stability

[1] See Addison and Roe (2018a) for much more on economic management.
[2] See also Lahn and Stevens (2018).
[3] On the 'presource' curse, see Cust and Mihalyi (2017a, 2017b).

Resources Matter. Tony Addison and Alan Roe, Oxford University Press. © United Nations University World Institute for Development Economics Research (UNU-WIDER) (2024). DOI: 10.1093/oso/9780192872197.003.0007

around resource revenue flows (including issues of taxation, the fiscal implications of climate policy, and the choice of saving or spending the windfall).

7.2 An 'all of government' approach

To effectively manage mineral resources, the African Union's *Africa Mining Vision* (AMV) calls for an integrated approach across government: what Kathryn McPhail terms an 'all of government' approach.[4] This contrasts with the more common approach of assigning responsibility to a few ministries and public institutions: the ones most obviously connected to the resource itself—which stems from the 'enclave mindset' discussed in earlier chapters. In moving to an 'all of government' approach, mechanisms must also be built for effective collaboration around a shared common vision. Otherwise, there is a danger that each state institution pursues its own agenda to the detriment of both effective implementation and cooperation with companies, civil society, and aid agencies.[5] Weakness in government capacity is a familiar development problem and requires hard work to construct the necessary institutions.[6] For the resources sector (both non-renewables and renewables) and building on the work of McPhail (2018), we suggest the following approach.

First, joined-up government is more likely if the president, prime minister, and cabinet can articulate and focus on a long-term development vision, preferably set out (and costed) in a detailed national plan (Botswana is a good example). Asian success in structural transformation provides many examples of effective and longer-term national planning.[7]

Second, that vision must be informed by a regularly refreshed base of evidence about the current situation in the resources sector together with *credible* scenarios for its future evolution as well as a risk assessment. Cooperation between stakeholders (not only within government but also with companies and civil society) in constructing such a vision and evidence base should increase the prospects for effective cooperation in its implementation.

Forward-looking projected data (often extending out for three or more decades) are needed to guide scenario-building and ultimately sound policies—especially decisions over 'saving versus spending' discussed later. Otherwise, decision making is vulnerable to ill-informed and over-optimistic assumptions—on revenues especially—a sure route to disaster as Chapter 3 discussed. Risks can then be

[4] African Union (2009); McPhail (2018).

[5] Lack of coordination has been a problem in Tanzania where there are at least *12* major government institutions involved with minerals and hydrocarbons policy in addition to the Ministry of Energy and Minerals (Roe 2016a).

[6] Addison (2003, 2012, 2014).

[7] Nayyar (2019a).

minimized and managed, increasing the chances of seizing the opportunities as discussed in Chapter 4. Regrettably, as an AfDB study shows, good-quality medium-term modelling/projection capacity is all too rare.[8]

Third, international initiatives exist to build trust between stakeholders (including across government). McPhail advocates regular multi-stakeholder workshops organized around solid bases of objective fact: an approach pioneered by the Mining Partnerships for Development Initiative (MPD) developed by ICMM.[9]

7.3 Local versus national: reducing the tensions

To work effectively, an 'all of government' approach requires a better relationship between central and subnational (regional and local) government, as this is rarely satisfactory and in the worst cases it is beset by ethnic and religious division. The locality-specific nature of mines and oil and gas sites can exacerbate tensions if local power brokers try to take control of the revenue streams (and may seek secession to do so). Tensions can also arise when central government redistributes too little revenue back to the regions. This governance challenge is much debated but rarely solved.[10] Here we restrict ourselves to some key observations.

Problems arises in part because the direct footprints of extractive projects are spatially concentrated—often in locations remote from the main economic centres—and can be huge relative to the local host economies. Examples include Chile's copper mining in the remote Atacama Desert region and Brazil's iron-ore mining in the remote north-west of *Pará* state.

The concept of an *inverted pyramid* of mining's share of direct impacts, developed from ICCM case studies, provides a simplified description of this problem (Figure 7.1). Specifically, while the direct economic benefits can be very large relative to GDP, most benefits at the top of the inverted pyramid (including government revenues) are typically highly centralized: flowing to the national government and the capital city.[11] By contrast, the direct benefits (especially jobs) of most concern to the locality hosting the mine are at the base and so *relatively* much smaller. Moreover, these local areas bear the brunt of disruptions resulting from extractive investments, including: loss of cultivable land to mine and oil and gas facilities; population displacement (sometimes by force rather than consent); inward migration as migrants compete with local people for the new jobs; localized 'Dutch Disease' effects as house and land prices are bid up; water shortages (when the requisite infrastructure is not developed

[8] AfDB (2017).
[9] ICMM (2010a). The MPD was tested by case studies in Brazil, Ghana, Laos, Peru, Tanzania, and Zambia.
[10] Boadway and Shah (2012) provide a thorough review.
[11] ICMM (2014: 6).

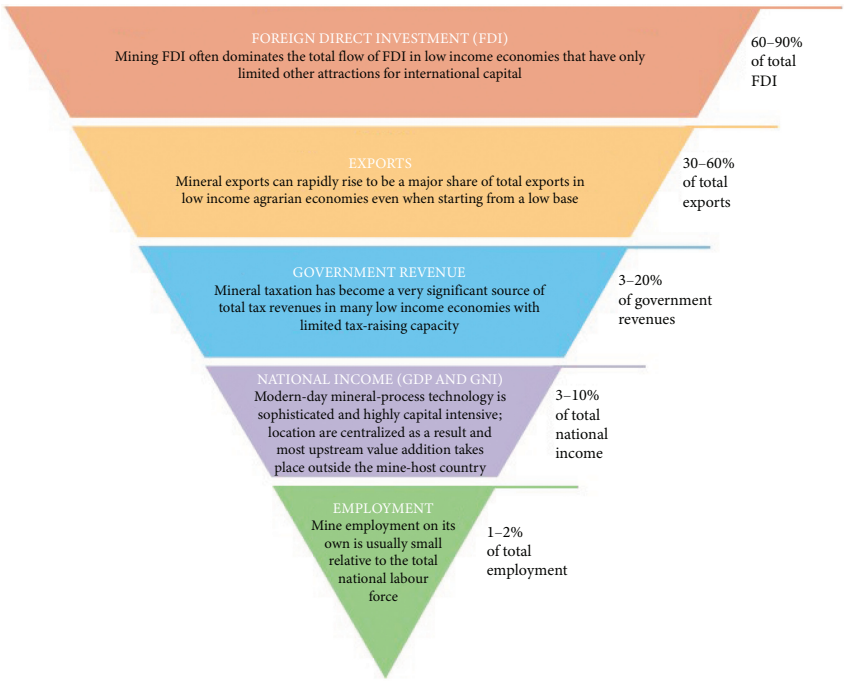

Figure 7.1 Mining: typical contributions in developing economies

Note: The percentages are not additive but indicate the range of stand-alone contribution in each segment.
Source: ICMM (2016). Reproduced here with permission.

to meet increased demand); air, soil, and water pollution (when environmental standards are not enforced); and new social problems such as crime and alcoholism. Not surprisingly, this generates resentment if communities expect to share in a large bonanza but are disappointed (which is exacerbated when politicians and companies talk up the benefits without delivering tangible results: see Chapter 8).

Devolving political and economic power to subnational authorities, including a share of the resource revenue previously flowing to central government, can in principle reduce these tensions. However, such revenues are volatile (and finite for non-renewable resources) which poses a risk to subnational government finances.[12] Diversifying the local revenue base by granting local authorities' independent tax-raising powers (e.g., over property taxes) will help but can disappoint in poor and remote localities where the tax base is small. Central government needs to widen and deepen the non-resource revenue base at national level, and

[12] Morgandi (2008).

build fiscal buffers, thereby absorbing revenue risks and maintaining stability in subnational government funding.[13]

Fiscal decentralization will fail if accountability in subnational public expenditure management is weak (a common problem in Africa).[14] Revenues can also be squandered on white elephant projects (e.g., the Canon Minera in Peru) and are often financially unsustainable as well. Project failures occur when local authorities have limited project planning and preparation capacities.[15] Politicians inevitably lobby for their own constituencies, and this can dominate project selection irrespective of merit. In the worst cases, revenues are captured by local criminal mafias (e.g., some oil revenues in Colombia).

Sometimes the central government takes the position that areas with resource wealth are sufficiently well-off relative to the national average, and therefore do not need fiscal transfers from the centre (a tendency in Tanzania). Or it is assumed that while subnational administrations are technically and financially weak, companies can step in to provide public goods and services (notably health care), acting as *quasi* government agencies. Such was the case in Zambia in the years after mining was nationalized and before privatization began in the 1990s.[16] In sum, localities in which mining and oil and gas extraction is sited can be left with the worst of all worlds: local governments with increased expenditure obligations but little additional revenue, and negligible benefits for local communities (while local elites gain).

Local limitations in revenue and expenditure management are fixable. Indeed, if they are not fixed, then little *inclusive* development can occur—whether the country has resource wealth or not. The starting point must be a thorough assessment of the technical and financial competencies of local and regional administrations. This is the basis for building the capacity to deliver high-return projects and services of real value to the local communities. Existing local competencies are often chronically deficient, and the non-resource sources of local revenue are commonly inadequate relative to the large new local demands arising from resource investments. Governments need to ask: what are the expenditure responsibilities already assigned to local or regional administrations and are these complete given the new situation in which large private sector investments are taking place? Additionally, what independent tax-raising powers does the local government already have? Should they have more?

[13] Formula-based approaches for allocating revenues (e.g., royalties) can have unintended consequences. In Brazil the sharing of the CFEM (*Compensação Financeira pela Exploração de Recursos Minerais*) royalty between municipalities and the state administration in *Pará* state resulted in some municipalities acquiring huge wealth and public assets while doing little to enhance the spending powers of the much larger state authorities (ICMM 2013).

[14] Auditing practices are often deficient (NRGI 2021: 15).

[15] ICMM (2006).

[16] Mwaba and Kayizzi-Mugerwa (2021).

Ideally this assessment should take place within the framework of a regional development strategy, which in its turn is integrated into the national plan. There are many promising possibilities. Examples include development corridors based on leveraging the transport and power infrastructure constructed for the mine or oil and gas facility (see Chapter 5); stronger incentives for new smaller-scale private investments; and supporting public investments for local renewable energy generation and telecoms systems. But these all depend on the available financial envelope. And so finally, a financial plan is necessary, realistically costed with a strategy for mobilizing funding from both local and national sources, public and private, as well as donor support. None of this is easy, but it is an essential part of any coherent long-term approach.

While localities with mines and oil and gas infrastructure have special needs—notably in minimizing adverse social and environmental impacts—their challenges are embedded in the wider politics and economics of regional policy. Every region cries out for more assistance, whether it has resource wealth or not. When resource revenues are especially large, there is an opportunity to craft and fund a new regional policy, including a radical rethink of existing arrangements for fiscal decentralization.[17] Unfortunately, policy inertia rather than policy reform is all too common in countries experiencing a revenue windfall. Fiscal transfer arrangements often continue much as before with local demands for improvements falling on deaf ears.

Spending resource revenues effectively—whether at the local or national levels—is one major fiscal challenge for an extractive sector programme. An equally important fiscal challenge is that of raising these revenues as efficiently as possible, and it is to this fundamental issue that we now turn.

7.4 Reforming taxation

7.4.1 Issues and controversies

Revenues are often the first item on the agenda when discussing the extractive industries with politicians and government officials who are invariably keen to grow the public purse.[18] This priority is often accompanied by deep suspicions that companies, not least the MNCs, are evading their tax obligations. The domestic media is often quick to reinforce any suggestion that foreigners are taking an 'unfair' cut of national wealth. The commodity cycle stirs up additional passions: in boom times governments complain that their share of the windfall is too low,

[17] Our recommendations are similar to those of the NRGI Benchmarking Framework (NRGI 2017b).

[18] McNabb (2023) discusses fiscal dependence on resource revenues.

and in slumps companies complain that taxes are too high. Tax disputes are regular occurrences. Rio Tinto and the Government of Mongolia argued for years over the Oyu Tolgoi mine, one of the world's largest copper (and gold) assets, and the country's biggest foreign investment.[19] Governments are prone to alter tax legislation in their favour, especially for the mining of metals that have highly cyclical markets such as copper (Zambia, a big copper producer, changed its mining tax regime 10 times over 2002–2017, making three changes in one year alone).[20] New governments are especially keen to show some muscle, and talking tough on mining goes down well with electorates. *Perú Libre*, for example, won power in 2021 on a pledge to take 80 per cent of mining profits to fund its promise of 'no more poor people in a rich country'. *In extremis*, the sector can be nationalized in an assertion of sovereignty: every 18 March, Mexico celebrates the oil industry's 1938 nationalization.

Whether such approaches (including full state ownership) can enhance the government's revenue take is open to debate. State-owned mining and oil and gas companies do not necessarily have the best expertise, technology, or finance to deliver projects on time at a cost that is competitive with the best MNCs which have long-standing expertise: this is especially so in newly producing countries with little or no experience (an issue we return to in Chapter 8). In extreme cases public revenues collapse, disastrously so in the later years of public ownership in Zambia.[21] That said, there are some NOCs, notably Saudi Aramco (now partly privatized), that are highly effective project managers (see Chapter 8).

Nevertheless, MNCs certainly do have distinct advantages in limiting their tax burdens. They can field teams of international lawyers and tax experts that host countries rarely match, especially when the countries are new producers and lack experience with the industry. And, as Chapter 6 discussed, illicit payments are known to have secured some concessions on very favourable terms.

Aside from striking a hard bargain in the initial negotiations, including tax holidays and other concessions, common corporate strategies to reduce tax bills revolve around shifting profits to lower- or zero-tax jurisdictions through, for example, borrowing from a subsidiary of the multinational located in a tax haven (often a Caribbean jurisdiction). Intra-group purchases of equipment and services (transfer pricing) also shift profits and can be difficult for tax authorities to monitor and assess.[22] Another tactic is to realize any capital gains outside the host

[19] 'Rio Tinto and Mongolia Settle Feud over Oyu Tolgoi Copper Mine'. *Reuters*, 25 January 2022. Delays in starting a project to expand mining at Oyu Tolgoi led to the postponement of royalty and tax payments. Rio Tinto eventually wrote off the US$2.3 billion that the Mongolian government borrowed from the company to cover its share of the development costs, and the government will now receive revenue (in the form of dividends) at a much earlier date.

[20] Manley (2017); Lundstøl and Isaksen (2018).

[21] Adam et al. (2014).

[22] Viola et al. (2023) discuss transfer pricing in mining.

country, and in a more favourable tax jurisdiction. More generally, the line separating evasion from avoidance can be a fine one and provides plenty of work for tax lawyers.

Inevitably the evidence on profit shifting is patchy since concealment is at its heart. However, profit shifting is proportionately larger for LICs and MICs than for advanced economies: measures of profit shifting are inversely related to per-capita income (Johannesen et al. 2020). Two pieces of IMF research provide further evidence. First, using a sample of 74 countries over 2000–2018, Beer and Devlin (2021) find that a 1 per cent increase in the host countries' corporate tax rate reduces the reported profits of mining and oil and gas companies by more than 3 per cent. And the effect is stronger for mining companies than those in oil and gas, a sector which has more joint ventures and production sharing (which provides national authorities with greater clarity on revenue flows and costs). Second, and building on the first IMF study, Albertin et al. (2021), using EITI data, calculate that SSA losses from multinational tax avoidance in mining are between US$470 million and US$730 million per year. A UNU-WIDER study using data from the Ugandan Revenue Authority, and covering both resource and non-resource MNCs, finds that multinationals pay lower effective tax rates, and are more likely to report losses than domestic firms: partly due to favourable tax treaties but also profit shifting—the lower the tax rate in the country in which the multinational is registered, the lower the reported profit of its Uganda subsidiary (Koivisto et al. 2021). Indian multinationals in the extractive industries are also adept at using foreign subsidiaries, especially those in offshore financial centres, to lower their tax bills, according to two UNU-WIDER studies (Das 2022a, 2022b).

What can be done to reduce these losses to the exchequer? The most important step is for governments to strengthen the capabilities of their own tax administrations. Many have made progress on this front in recent years, especially via establishing special departments competent in dealing with large taxpayers such as MNCs. International action and close cooperation across national jurisdictions are also necessary to share information, not least on transfer pricing risks.

In whatever they may do, government will always face the difficult task of balancing their desire for revenue with the need for investment. Extracting additional dollars of tax revenue can come at the cost of losing some future investment, not only in natural resources but right across the economy if foreign investors take fright. One example among many is the bitter tax dispute between the UK company Cairn Energy and the Government of India. Cairn eventually received a reimbursement of over US$1.2 billion in 2020.[23] The dispute did extensive damage to both India's international investment standing and Cairn's shareholder value.

Complete harmony in company–government relations is unlikely given the high stakes involved. Yet one country, Botswana, does seem to offer a model of good

[23] 'Scots Oil Firm Wins £1bn Payout from Indian Government', BBC, 23 December 2020.

relations. Botswana's diamonds are mined and traded in a 50–50 joint venture with De Beers (an Anglo-American subsidiary) with the government owning a stake in De Beers itself. The government then receives a dividend. Zambia could move towards the Botswana model to end the country's seemingly endless cycle of fiscal renegotiation.[24] Ghana has gone down the route of limited joint ownership and receives significant mining revenues from state participation dividends.[25] Company–government relations tend to be better in oil and gas than in mining. This is probably because production sharing arrangements (PSAs) characterize hydrocarbons, and this provides the host authorities with more insight into the finances of its commercial partners. PSAs are much rarer in mining, though there is now an uptick in their use, possibly in response to the difficulties of taxing MNCs.

7.4.2 Some technical choices

In sum, resource revenue policies are often highly conflictual and are always very political. But they are also very technical, which is why countries would be wise to draw upon as much international expertise as is available. Space precludes us going into the finer details, but there are at least four sets of technical choices to be made around revenue policy.[26]

First, should the fiscal terms be set out in detailed legislation or negotiated on a project-by-project basis? The former provides for greater rigour in aligning the fiscal terms for investors with national development policy; the latter is more flexible: it might encourage more investment and a quicker path to production and revenue. General tax legislation offers transparency, while project-by-project negotiations are often clouded in secrecy. The former will require more initial institutional investment in setting an appropriate fiscal framework; the latter requires substantial national negotiating skills. In recent years the balance of these arguments has led to a greater *relative* use of general tax legislation.

The second set of decisions revolves around choosing the mix of taxes on: (i) *income* (corporate income tax, economic rent, withholding taxes, etc.), (ii) *production* (mainly royalties), and (iii) *trade* (excises and customs duties on imports of capital equipment, inputs, etc., as well as export taxes).[27] These choices, once made, become embedded into tax administrations and into company behaviour. So new producing countries are advised to spend the time on getting it right at the

[24] On applying the Botswana model to Zambia, see Mwaba and Kayizzi-Mugerwa (2021).
[25] Albertin et al. (2021: 8).
[26] For reviews, see Daniel et al. (2010, 2017); Nakhle (2012); Otto (2018a); and Readhead (2018).
[27] On the concept of economic rent for taxation purposes, with an application to the global diamonds industry, see the UNU-WIDER study by Löf et al. (2021).

outset. This reduces the danger of persistent and expensive tax inefficiencies, as well as an unstable/uncertain tax policy which will invariably deter investment.

Third, should mining or oil and gas companies receive more favourable tax treatments than other corporates? Given the unusually long gestation period for extractive projects, there is certainly a case for tax holidays to enable investors to recover their very large up-front investment costs—this is quite common: companies invariably expect it in project negotiations. Yet tax holidays can lead to political difficulties for governments as they may receive little if any revenue for several years after production commences, an outcome later perceived as unfair despite earlier agreement (and one that is ripe for opposition parties to exploit at election time). On this very thorny question governments need to ask themselves whether any particular investment would have been forthcoming *without* these tax incentives. This requires a good understanding of global market conditions, and the attractiveness of their own mineral deposits relative to the alternatives. Countries with large deposits extractable at low cost are in the best position, especially when these are critical minerals in high demand by the technologies of the net-zero transition. Little if any tax incentive may then be required for companies to sign up and invest.[28]

Fourth, how can countries best achieve acceptable levels of revenue-capture over time while encouraging long-term investment? One way to reassure investors is to employ tax stability clauses in agreements to ensure an unchanging fiscal regime for a specified number of years. In practice, such agreements can encounter intense political pressure when prices boom as governments eye the extra revenue. This was evident during the 'super cycle' of commodity prices from the early 2000s through to about 2014. The optimistic future for metals markets at that time encouraged another round of tax increases: for example, Chile and Peru both raised their royalty rates on copper. Underlying this debate is a broad principle: taxation needs to be flexible and progressive. In short, the government's tax take should increase when prices rise, and adjust downward when prices fall in order to preserve investment. The former is of course politically easier to achieve than the latter.

Fifth, there is the matter discussed earlier: how should the taxes collected from the sector be shared between the national and subnational tiers of government? Should subnational tiers be permitted to impose additional local taxes on companies? This would increase tax complexity and, if badly coordinated, deter investment. Yet, it could also enable poorer regions to be more proactive in financing desirable local public goods, helping them reduce local company–community tensions (discussed in Chapter 8). Much will depend on local institutional capacities and the politics of fiscal decentralization—both of which are very country-specific.

[28] Readhead (2018) reviews tax incentives in mining.

In sum, policy-makers are faced with complex technical choices in the context of market dynamics that in turn can alter the value of resources in unpredictable ways. Investment in the national capacities necessary to formulate tax policy in these challenging circumstances should more than pay off, as policy decisions made early in the project cycle will have ramifications for revenues and development often lasting decades.[29]

7.4.3 Policy advice and the non-resource sectors

To help them with these specific technical problems and with the less familiar taxation challenges associated with critical minerals and the net-zero agenda generally (on which more later), advice is available from several sources. These include the IMF's fiscal affairs department, which models oil and gas revenue management across countries, supporting countries to benchmark against best practice.[30] Also notable is the research and technical advice provided by the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) which has, for example, a very comprehensive database on mining tax incentives as well as a model to estimate the impact of tax incentives in mining.[31] The OECD has many initiatives on tax policy and natural resource management.[32] The UN Department for Economic and Social Affairs (UN-DESA) *Handbook of Extractives Taxation* (now in its second edition) is an invaluable guide to the finer details.[33] UNU-WIDER has undertaken a large amount of research on the extractive industries, as well as on tax policy more broadly (including ways to create a broader non-resource tax base).[34] The Columbia Center on Sustainable Development (CCSI) and the NRGI are also invaluable sources of advice and country experience.[35]

As emphasized in Chapter 5, the *non-resource sectors*, and their key role in economic diversification—including revenue diversification—are also vital to a

[29] A further complicating factor is the Global Minimum Tax (GMT), agreed by more than 130 countries in 2021, to ensure that MNCs with revenues above a given threshold are subject to a 15 per cent effective minimum tax rate wherever they operate. Implementation of the GMT's so-called 'second pillar' is underway (as of 2024), but progress on the 'first pillar' is stuck in the US Congress for the moment. It is unclear how much developing countries will benefit.

[30] The IMF's Fiscal Analysis of Resource Industries (FARI) framework: www.imf.org/en/Topics/fiscal-policies/fiscal-analysis-of-resource-industries.

[31] www.igfmining.org/beps/current-topics/tax-incentives (an output of an IGF/OECD project). See also Readhead (2018) and Readhead et al. (2023).

[32] See in particular OECD (2019) and the policy dialogues led by the OECD's Development Centre: www.oecd.org/dev/natural-resources.

[33] UN-DESA (2022) and www.un.org/development/desa/financing/what-we-do/ECOSOC/tax-committee/thematic-areas/extractive-industries-taxation.

[34] The UNU-WIDER Domestic Resource Mobilization programme: www.wider.unu.edu/about/domestic-revenue-mobilization-programme.

[35] https://ccsi.columbia.edu/content/resources-publications and https://resourcegovernance.org.

long-term strategy for countries intending to break with the enclave mindset. Successful policies for these sectors can diversify a country's revenue risks, and so render the public finances less vulnerable to the vicissitudes of the commodity cycle.[36] Unfortunately, and with but a few exceptions, resource-wealthy countries are notorious for their limited tax take outside the resource sectors: just one manifestation of the 'resource curse' phenomenon. This is something to be improved as part of the broader development strategy which we advocate.

There are two dimensions to this. First, the governments of many resource-wealthy economies have had limited success, and sometimes limited interest, in turning their finite *below-ground* assets into *above-ground* assets such as human capital, infrastructure, and effective institutions to deliver taxable growth *in the non-resource sectors*. Hence the tax base outside the extractives sectors remains smaller than its potential, with much activity being informal and therefore outside the tax system. Second, tax administrations being often weak, the effective rates of indirect and direct taxes are low on average: but particularly so in the hydrocarbon economies. An influential IMF study finds that for a sample of 30 oil and gas economies, a 1 per cent increase in hydrocarbon revenue (relative to GDP) is associated with a reduction of 0.2 per cent in non-hydrocarbon revenues.[37] Why mobilize revenues from other sources when resource revenues suffice (at least to meet the needs of the country's elite)? Or why risk a potential challenge to existing authoritarianism if developing non-resource revenues—especially income, property, and indirect taxation—leads citizens to demand democratic accountability and transparency in how the money is spent?[38]

This poor tax performance of the resource-wealthy group contrasts with much progress (on average) across the developing world in tax reform: LICs have increased their tax-to-GDP ratios from 10 per cent in 2000 to around 14 per cent today (with VAT making a big contribution).[39] But tax reform in hydrocarbon economies has been mostly disappointing. To take one example, Angola's revenues from non-resource sources have been 7.5 per cent of GDP, and from oil and mining 33 per cent of GDP, since 2000. Repeated attempts to improve the tax system (VAT, income taxes, and property taxes) have largely stalled.[40] This left Angola vulnerable to the 2020 oil price shock which hit its oil revenues hard, resulting in much-reduced fiscal space to deal with the COVID-19 pandemic. The

[36] For discussion of commodity trends, cycles, and shocks, see www.wider.unu.edu/project/extractives-development-e4d-—risks-and-opportunities and Addison and Ghoshray (2023). Jones (2020b) discusses revenue forecasting in mining.

[37] Bornhorst et al. (2009).

[38] The answer to these questions lies in the nature of the country's 'political settlement'; see Masi et al. (2024) for further discussion and empirical evidence.

[39] Mullins et al. (2020).

[40] Angola did manage to create a single revenue administration agency (IMF 2017b: 26). But Angola's other tax reforms stalled (Fjeldstad et al. 2020).

good news is that there are some obvious opportunities to improve tax systems—if governments are politically willing.[41]

7.5 Climate change and the public finances

7.5.1 Fossil fuel subsidies

In sum, there is no shortage of advice on taxation policy which is well supported by research. But the political difficulties are acute and are intensified today by the new fiscal challenges posed by the global net-zero agenda, to which we now turn. The daunting problem of fossil fuel (consumption) subsidies, which reached an all-time high of US$1.1 trillion in 2022, illustrates the hard politics.[42] These subsidies are especially common in hydrocarbon-abundant countries.[43]

Aside from driving up emissions, fossil fuel subsidies are fiscally ruinous. Yet they are hard to cut. As an example, in mid-2021 the Government of Nigeria announced the phase out of its fuel subsidies which have taken billions from the public purse since the 1970s (sometimes reaching 20 per cent of the public budget, more than the shares of education and health combined).[44] Previous attempts had failed and it was no surprise when, in 2022, the reform was pushed back until after the February 2023 presidential elections. In the event, the new administration bit the bullet and removed the subsidy in June 2023. Fuel prices tripled (and jumped in neighbouring countries which had enjoyed cheap smuggled petrol). Transport and food prices followed, as did electricity costs (many Nigerians depend on diesel generators).

Governments risk civil disorder when fuel prices increase: 41 countries experienced fuel riots between 2005 and 2018.[45] Food security, especially in remote areas with high transport costs, is put at risk. Increasing targeted cash transfers *before* the subsidy's reform can mitigate the impact on the poor. But when social protection is inadequate, the poor are left badly exposed to price shocks (Nigeria's government announced a cash transfer but then paused amid fierce criticism that the cost-of-living shock has not been effectively mitigated for the poor). The middle class may also join the demonstrations as they spend a lot on fuel (the petrol

[41] Chachu (2021).

[42] IEA (2023a); www.oecd.org/fossil-fuels. Together implicit and explicit fossil fuels subsidies amounted to US$7 trillion in 2022 (equivalent to 7.1 per cent of global GDP) according to an IMF study (Black et al. 2023: 3). Far more is spent on fossil fuel subsidies as well as other practices that harm nature than on conserving, protecting, and restoring nature itself (about US$200 billion in 2022) (UNEP 2023: xii).

[43] See McCulloch (2023).

[44] Siddig et al. (2015: 4). The World Bank estimated the cost at US$2.1 billion in just the first nine months of 2021: www.reuters.com/markets/commodities/nigeria-should-end-fuel-subsidy-speed-reforms-boost-growth-world-bank-says-2021-11-23.

[45] McCulloch et al. (2021).

subsidy benefitted non-poor Nigerians some three to four times more than poorer citizens). Overall, fuel subsidy reform is a risky political step for any government (and in Nigeria there are signs that subsidies are creeping back in).

As the global energy transition accelerates, markets for fossil fuels will become more thinly traded and almost certainly more volatile, putting pressure on governments to maintain subsidies or reintroduce them. Whereas EVs will eventually prevail in the Global North, the internal combustion engine will be around for much longer in the poorer Global South. Driving an EV down Africa's roads remains a distant prospect (not least because of terrible roads and erratic power supplies). The political constituency to retain fuel subsidies will therefore remain strong. Governments do, however, need to act as there are much better uses for public money than fuel subsidies. They are often fiscally unsustainable (Nigeria's lesson), and they lock countries into energy and transport pathways that are now well behind the technological frontier—to the detriment, ultimately, of a country's global competitiveness.

7.5.2 Greening fiscal policy

Cutting fossil fuel subsidies is just one item on the growing agenda of reforms necessary for the public finances to meet the net-zero challenge. Other green fiscal instruments include carbon taxes and well-crafted subsidies for renewables (the public finances permitting), especially solar for poorer communities and ecoservices to preserve natural capital.[46]

While in principle governments recognize the green fiscal agenda's importance, not least in meeting their obligations under the Paris Climate Agreement, finance ministries in poorer countries are usually in the desperate business of finding enough revenue to fund even this year's budget and debt service. So, climate and the environment invariably get pushed down the priority list. This is exacerbated by a lack of analytical capacity within government to address what are complex and novel policy problems, for example the distributional impact of introducing carbon taxes, an understanding of which is critical to mitigating the poverty impact, as well as dampening political trouble. Consequently, promising policy ideas often stall early on and opportunities to raise more revenue, save public money, or reduce social inequality are easily missed.

One example of a policy that can raise revenue while cutting emissions is taxing or fining the flaring and venting of gas by oil and gas facilities—a large source of methane emissions. This is facilitated by timely satellite data, which are becoming ever cheaper: Nigeria has demonstrated success (see Box 7.1).

[46] IMF (2019b); OECD (2022b).

Such an approach, and carbon taxes more broadly, can incentivize oil, gas, and mining companies to cut their *scope one* emissions: those that arise or are controlled by the producing company and its affiliates.[47] More countries are now legislating to require companies to track and report publicly their emissions that are either categorized as scope one or *scope two* (the latter include emissions from the energy used to power the production process, transport, refining, etc.). Major investors are also putting pressure on companies to do this voluntarily even if they are not yet legally obliged.[48] Some oil and gas companies have announced targets to reduce scope one and two emissions (although only a fraction of these targets match up to the IEA net-zero scenario).[49] In sum, fiscal policy and investor pressure on companies can encourage a reduction in scope one and two emissions from oil and gas (which account for about 15 per cent of total energy-related emissions).[50] Similar opportunities exist in mining.

Box 7.1 Cutting flaring and venting in the oil and gas industry

Some 7.5 per cent of all gas extracted is flared or vented. Both contribute hugely to the atmospheric emissions originating in the upstream oil and gas industry (methane is an especially potent greenhouse gas) and cutting flaring and venting will help oil- and gas-producing countries in the developing world meet their NDCs under the Paris Climate Agreement. Particulate matter and chemicals from flaring and venting are also harmful to human health, especially in communities close to producing sites. UNU-WIDER studies by McPhail and Romsom (2021a, 2021b) find that reducing these emissions could provide an additional natural gas sales value globally of at least US$36 billion annually and would therefore add considerably to energy generation.[51]

continued

[47] On scope one, two, and three emissions, see https://ghgprotocol.org. Another approach is to hike royalties, since a royalty acts as an implicit carbon tax: 'A royalty of 10% on a barrel of oil that sells for US$100 is equivalent for instance, to a carbon tax on its content of about US$20, tonne' (Keen 2023: 87).

[48] For example, UK requirements apply to all companies listed on the London, other European, or US stock markets; large unquoted companies producing an annual Directors Report; and also large limited liability partnerships. Pressure also comes from emerging international arrangements such as the International Sustainability Accounting Standards Board (ISSB) established by the International Financial Reporting Standards (IFRS) Foundation: www.ifrs.org/news-and-events/news/2021/11/ifrs-foundation-announces-issb-consolidation-with-cdsb-vrf-publication-of-prototypes.

[49] IEA (2023b: 6).

[50] IEA (2023c: 4).

[51] McPhail and Romsom (2021a). Based on an assumed average gas price (US$4/MMBtu), and if 75 per cent of the global upstream gas flared and vented is instead captured.

continued

Affordable technologies to capture and use the gas are now available but are not necessarily used by producers when these would reduce their commercial returns.[52] Flaring and venting is sometimes necessary for safety reasons, but much is excessive, and can be reduced by regulation and by appropriate taxation. To do so, however, requires timely data on the location and volume of the gas flares and vents. Fortunately, remote imaging technologies using satellites can now be used accurately to monitor individual flares, and so provide the data necessary to design appropriate taxes. Regulators no longer need to depend on companies to self-report.

Nigeria—a pioneer in this policy area—now measures flares across its upstream oil and gas sector, and reports these in a 'Gas Flare Tracker', an open-source database which civil society can also actively and freely monitor.[53] Penalties are applied and already provide significant revenues for the government: US$120 million in 2019 and US$270 million in 2020. Nigeria has gone from being the world's second largest gas-flaring nation to being the seventh.

The scope for replicating the Nigerian example in other producing counties is huge. In particular, the VIIRS Nightfire satellite-based algorithm has registered and measured no fewer than 10,820 individual flares globally, in more than 100 countries—many in the developing world.[54] It is also increasingly possible to obtain fine detail on the composition of each flare: to show, for example, the dominant amount of methane that they contain. Satellite data are especially useful in identifying 'super-emitters': 61 per cent of all gas flared globally originates from just 6.6 per cent of flares. It is vital to make these satellite data on flares and vents freely available as a global public good, so that every country can identify the specific sources, the amounts, and the responsible companies.

In summary, flaring and venting can be reduced, and the gas that would otherwise be wasted can be monetized, including via small-scale energy generation for neighbouring communities (which despite their proximity to the energy source often lack adequate energy access). Furthermore, improved air quality leads to significant health benefits and, not least, the new fiscal measures can yield additional revenues for governments—as Nigeria successfully demonstrates.[55]

[52] McPhail and Romsom (2021c).

[53] See https://nosdra.gasflaretracker.ng. Advisory work for the tracker was conducted by Oxford Policy Management (OPM) under a DFID-funded project: www.opml.co.uk/projects/facility-oil-sector-transformation-foster-2. Subsequent work is described in McPhail and Romsom (2021b), Roe, McPhail, and Romsom (2021), and Romsom and McPhail (2023).

[54] The algorithm uses the Visible Infrared Imaging Radiometer Suite (VIIRS): data collected nightly by the Suomi National Polar Partnership spacecraft: https://ncc.nesdis.noaa.gov/VIIRS.

[55] See also Lorenzato et al. (2022).

This represents progress but it still leaves unanswered questions about scope *three* emissions, which occur from activities outside the control of the producer. Such emissions arise from the combustion of hydrocarbon products for energy generation and transport; from the use of hydrocarbons as a feedstock in manufacturing petrochemicals; and from the smelting of metals and their subsequent use in manufacturing consumer and capital goods. Scope three emissions account for between 80 and 95 per cent of the emissions of the global oil and gas industry; that is, mostly in midstream and downstream.[56] Scope three emissions also account for the bulk of mining emissions, notably from coal, but also from metals refining, much of which still relies on energy from burning coal and gas. Consequently, reducing emissions *throughout* the value-chain, and not just in the upstream, will require new actions including carbon taxes at increasing rates.

This gives rise to a thorny and unresolved policy dilemma, and one that will increasingly dominate both the climate and development debates. Consider the global oil and gas value-chain. A carbon tax can be levied at any point in the value-chain but levying it on the upstream companies is administratively easier as their number is much smaller than the vast number of companies and consumers further down the value-chain. A hydrocarbon producer with a small domestic energy market—the typical African country—will export much of what it extracts, and so most scope three emissions will occur abroad, often thousands of miles away. The governments producing hydrocarbons will be reluctant to levy a full carbon tax on their oil and gas—covering all emissions irrespective of where they occur—as they quite reasonably fear a loss of investment that ultimately cuts into revenues from royalties, corporate taxes, and dividends. This reluctance will be even greater if their competitors fail to levy full carbon taxes (and if importing countries also fail to levy carbon taxes on their energy consumers).

Consequently, while the 'polluter should pay' is a well-established principle in environmental taxation, in practice we foresee a complex game between sovereign nations over exactly where in the value-chain the taxes should be levied and who is responsible. Much better would be a global emissions control system established and enforced comprehensively as an agreed global 'public good'.[57] This, however, remains a distant prospect—especially in the current state of geopolitics.

How all this will all play out is therefore highly uncertain. What is likely, however, is that the taxable economic rents from fossil fuels will eventually be squeezed, putting fiscal pressure on producing countries (see Chapter 3).[58]

[56] Wood Mackenzie (2022).

[57] Dietsche (2020: 5) succinctly spells out the implications: 'a truly effective global emissions control system would need to cover all excess emissions without exceptions and … would need to do so across the boundaries of sovereign nation states; and would need to apply equally to all carbon consumers, leaving no room for free riders'.

[58] Jensen (2023) estimates the loss from stranding.

Consequently, they are well advised to redouble their efforts to diversify the revenue base away from over-dependence on fossil fuels in ways suggested earlier. And they need to look also to their renewable natural capital as a revenue source, when sustainably managed (as discussed in Chapters 3 and 5). Public revenues from mining metals should be more resilient. However, someone in the value-chain must bear the costs of cutting emissions (and other environmental pollution) and so poorer countries might not get quite the revenue bonanza they expect from critical minerals. The richer countries could share some of their own carbon tax revenue with the Global South, via increased climate finance and more bilateral and multilateral aid (and there is certainly a strong ethical case given the Global North's historic and current emissions). But the poorer world cannot bank on such 'generosity'.

7.6 Building macroeconomic stability

7.6.1 Managing the public finances

As Chapters 3 and 4 emphasized, economic transformation is made harder when macroeconomic policy fails to respond effectively to 'Dutch Disease' and economic incentives become distorted. Fiscal policy—the management of public expenditures, public revenues, and public debt—plays a central role in reducing the risk of Dutch Disease and mitigating the business cycle.[59] Public finance management (PFM) and the necessary expertise and institutions are at the heart of successful development and the maintenance of macroeconomic stability.

Most countries now deploy standard budgetary mechanisms for both revenue-raising and expenditure management, which are usually overseen by the finance ministry. There is also much experience on good PFM practice.[60] Once again the NRGI Benchmarking Framework provides a set of valuable suggestions.[61] This is yet another area of economic management where the technical tools required are extremely well defined. Yet their *application* is often weak, the result of not only limited technical capacity within some governments but also the politics of spending, taxing, and debt, together with the shocks that make it hard to keep poorer economies on a steady growth path (see Chapter 3).

Fiscal policy choices must start with the *exploration phase* for minerals and oil and gas, since the investments involved in exploration invariably generate

[59] Monetary policy in both LICs and LMICs has only a supporting role given the thinness of their financial markets. Addison and Roe (2004), Henstridge and Roe (2018), and Magud and Sosa (2010) provide a fuller discussion.

[60] See IMF (2007); Kristensen et al (2019); ODI (2011); and OPM (2000).

[61] NRGI (2017b).

significant public revenue (e.g., from exploration fees) regardless of whether the venture is successful. Later, if a project's commercial viability is confirmed, expectations of wealth grow—often unrealistically. But further project development will still be needed before a final investment decision is taken and large-scale investment starts in constructing the mine or oil and gas production facility together with the necessary power, transport, and other infrastructure. At this stage, given the expected volumes of production and export, the prospects for public revenues can be evaluated—based on realistic assumptions (and scenarios) about future prices and the likely magnitude and timing of the completion of the investment phase, the start of production, and the arrival of revenue flows into the exchequer.[62] This is also the time to conduct the risk analysis discussed in Chapter 3.

In principle, the policy agenda around the revenues comprises five sets of decisions which can be categorized as follows:[63]

- Decision 1: Should the government borrow in advance of the arrival of the resource revenues, to allow earlier spending on its development priorities?[64] Or, if public debt is already high, should the government signal an intention to pay down debt once the revenues arrive in order to borrow in future on more favourable terms?
- Decision 2: Once the revenues arrive, should the government spend most of it (after debt service) or save some portion and, if saving, how much and for what purpose (fiscal stabilization or intergenerational wealth transfer being the most common goals)?
- Decisions 3: For the portion of revenues to be spent, should it be spent on 'consumption' (e.g., the civil service wage bill or social protection) or 'investment' (e.g., physical infrastructure such as roads and bridges or human capital investment via education and health)?[65]
- Decision 4: Should saving be undertaken on a regular (annual) basis, according to a well-defined 'fiscal rule'?[66]

[62] In practice, commercial operators normally work with a range of different scenarios, each associated with specific assumptions about uncertain parameters—especially prices. Any revenue projections should take full account of: (i) engineering timelines for the construction of production and export facilities; (ii) price assumptions; and (iii) an assessment of geological, engineering, and other non-technical risks.

[63] This categorization follows Henstridge and Roe (2018) and AfDB (2015).

[64] Depending on the project's complexity and its scale, many years may elapse between the start of construction work on the mine or oil and gas facility and the start of production. There can then be a further delay in the arrival of significant revenues into the exchequer depending on the specifics of the tax agreement with the company (in particular, the nature of the agreed investment tax breaks).

[65] On public spending choices in resource economies, see Mosley (2017) and Witter and Jakobsen (2018).

[66] A fiscal rule acts as a 'constraint on fiscal policy through numerical limits on budgetary aggregates' (Lledó et al. 2017: 8). Rules may be based on targets for expenditures, revenues, or the budget balance.

- Decision 5: For the savings, what should be the allocation of assets? Should the savings be accumulated in the foreign currency reserves of the nation's central bank, or deposited in a SWF? If the latter, what mix of foreign and domestic assets should the fund be mandated to hold, and of what duration? (Decisions that in turn depend on the purpose of the fund.)

The complexity involved in making these decisions is discussed in our earlier work.[67] Suffice it to say that serious errors can arise in any one of these sets of decisions. Mozambique, discussed in Chapter 3, illustrates the consequences of early over-borrowing, as do Nigeria and Venezuela over the decades (decision 1). Ghana's experience after the discovery of its large Jubilee oil field in the late 1990s illustrates the same danger of over-borrowing but also that of committing too large a portion of additional revenue to current expenditures (in particular, civil service wages) (decisions 3 and 4).[68] Nigeria's immense oil and gas revenues could have been saved over the decades to build a very large SWF but were instead mostly spent (decision 2) and too little of its spending has been allocated to social protection, education, and health (decision 3). Equatorial Guinea has spent too much of its oil revenue, and in ways that benefit the elite rather than most of its citizens (decisions 2 and 3). Angola, Chad, Libya, and Malaysia have all experienced serious mismanagement of their SWFs (decision 5).

Failures are more evident than successes, but among the few successes two stand out: Botswana and Chile. Botswana has accumulated substantial savings for future generations in a well-managed SWF (the Pula Fund).[69] Chile is one of the few countries that have stuck to a fiscal rule through the commodity cycle for copper. Public expenditures there are budgeted based on the long-term copper price, rather than the current market price (which can be as much as three times greater than the long-run price during boom times).[70] The savings are then deposited in a stabilization fund and a pension fund. Chile's fiscal rule contained over-spending as copper entered a super-cycle from 2000 onward, despite the political pressures to do so, and eased the adjustment to the sharp drop in the copper price caused by the global financial crisis of 2008–2009.[71] The merits of fiscal rules are many and numerous countries have tried them out—only to reverse course later. We are reminded of Saint Augustine's plea: 'Please God, make me virtuous, but not just yet.'

[67] Addison and Lebdioui (2022); Addison and Roe (2004); Henstridge and Roe (2018). See also Van der Ploeg and Venables (2018) on the theory.
[68] Bawumia and Halland (2018) discuss Ghana.
[69] www.bankofbotswana.bw/content/pula-fund. While the stated objective of the Pula Fund is intergenerational wealth transfer, it has in practice also been used as a stabilization fund (Sebudubudu 2021: 82).
[70] Céspedes and Velasco (2014).
[71] Solimano and Calderón Guajardo (2018); Villafuerte et al. (2010).

7.6.2 Sovereign wealth funds

Countries with new resource discoveries are often urged to establish a SWF to signal policy credibility.[72] This is intended to reassure domestic and foreign investors that macroeconomic stability is taken seriously as a goal.

Additionally, it is often argued that resource revenues should be saved until such time as the effective institutions necessary for spending the money wisely can be built. This is a strong argument and nobody can doubt the value of effective institutions, but they are not cheap to build, especially in countries that lack a broad base of the requisite skills and expertise. Constructing robust institutions can itself absorb a good portion of the new revenues: for example, building a comprehensive and effective public health system, or a primary school system that delivers quality education right across the nation, or a well-managed tax system (which is especially important in diversifying the revenue base away from an over-reliance on resource revenues).

Technocrats, such as government economists, tend to favour SWFs as a way of resisting politicians keen to overspend on the back of resource booms. This is especially so in countries that have undergone debt crises, like Mozambique (see Chapter 3). There it is hoped that an SWF will provide an institutional lock on the resource treasure chest. However, it is a lock that is not unbreakable. Numerous SWFs have been looted by political leaders together with their families and friends.[73] One prime example is Malaysia's state investment fund, known as 1MDB (*1Malaysia Development Berhad*): some US$4.5 billion was stolen from the fund according to Malaysian and US investigators, with more than US$1 billion going to accounts linked to the former prime minister Najib Razak (who was subsequently jailed for 12 years).[74] We again come back to a theme of this book that any mechanism to ensure probity is only really as good as the political context in which it operates, and the quality of the checks and balances in place to restrain elites from putting their personal interests ahead of the public interest.

More fundamentally, many governments are insufficiently clear about the purposes of public saving.[75] Funds intended to transfer wealth to future generations often end up being raided to shore up the public finances in times of macroeconomic stress. In such cases, it would have been better to create a fund for the *explicit* purpose of fiscal stabilization with its assets in mainly liquid short-term instruments (such as US Treasuries of short maturity) rather than in the illiquid

[72] Roe (2016b, 2018) discusses Mozambique and Tanzania. SWFs take a variety of forms: see Cumming et al. (2017).

[73] Angola's SWF is alleged to have greatly benefitted the family and friends of former President dos Santos. One of the worst cases is Libya, involving Africa's largest SWF. See Addison and Lebdioui (2022).

[74] 'Jailed Malaysian Ex-PM Najib Loses Final Bid to Review Graft Conviction'. *Reuters*, 31 March 2023. See Wright and Hope (2018).

[75] Addison and Lebdioui (2022); Van der Ploeg and Venables (2018).

assets characteristic of funds intended to maximize long-term investment returns. Likewise, SWFs created for the purpose of intergenerational wealth transfer or fiscal stabilization may end up investing in domestic enterprises—which can have the potential to become profitable but are risky assets. It is better to establish a fund specifically for domestic investment or to capitalize a national development bank (as discussed in Chapter 5).

Finally, the purpose of funds that save for future generations needs closer examination (see Box 7.2). Rich countries can afford to give more weight to their future generations, but much of the population in poor countries is desperately poor: they need better livelihoods, more social protection, and quality health and education *now*. When infant mortality is so high, it is hard to see why saving a dollar for those not yet born is preferable to spending that dollar on saving a child's life today—after all, children *are* a nation's future. Health is vital, and so is education. Current spending on education improves the lives of the current generation but also those of future generations as more of today's children become the teachers of the next generation and so on—building, over time, society's stock of human capital. In this way educational investment using the revenues from oil, gas, and mining constitutes an ideal way of converting natural resources with finite lives into one that is in effect renewable (human capital). In sum, countries with resource revenues need to be clear why they are saving.

Box 7.2 Sovereign wealth funds: intergenerational wealth transfer

Building up a SWF to help maintain essential public spending for when shocks strike is desirable, but what about using a SWF to transfer some of today's resource wealth to future generations? Many SWFs have this objective, often alongside fiscal stabilization.

Norway's SWF (a pension fund) fed by the country's oil and gas revenues is among the largest and best known.[76] This makes sense for Norway which was already a prosperous country with good infrastructure and insignificant poverty when North Sea oil and gas came into production in the 1970s. However, it took at least seven or eight years before any revenues could be placed in this fund and a couple of decades at least before the magic of compounding could enable Norway's oil fund to reach the impressive size and power that it now commands.

continued

[76] www.nbim.no.

continued

Intergenerational wealth transfer makes sense for developing countries with small populations, and large hydrocarbon or mineral endowments, the revenues from which unambiguously exceed the ability of their economies to spend it productively. Guyana, with a population of only 820,000, has recently established a SWF to save a portion of its rapidly growing and potentially immense oil revenues. Botswana (population 2.6 million), which is now an upper-middle-income country, also saves a portion of the diamond revenues for future generations via its Pula Fund.

However, in cases of LICs with large but not massive revenue expectations, intergenerational saving is a more doubtful goal. Compare, for example, Mozambique (population 32 million) with Norway (population 5.5 million). A prosperous Norwegian can be generous as far as the future generation is concerned, but nearly half of Mozambique's population are extremely poor.[77] Today's Norwegian babies will live to a comfortable old age: the infant mortality rate (IMR) is one of the world's lowest at just under 2 per 1,000 live births, whereas Mozambique's IMR is one of the world's highest at around 70.[78] A Mozambican might well conclude that the best help for the future generation would be to spend more today on health care, especially child and maternal health care, so that more babies survive into adulthood. And the returns to human capital investments via well-designed education and health spending in poor societies are far higher than the expected returns on the financial assets comprising a SWF.[79]

In addition, many rural people in Mozambique (and much of Africa) are especially poor and have limited access to power and transport infrastructure.[80] There are higher rates of return on well-designed anti-poverty projects and infrastructure which could deliver real benefits for the economy and poor people. This adds to the case for spending the gas revenues quite early—provided that any projects are well planned. This in turn intensifies the case for investment in the necessary analytical capacity within local and national government, and tight project execution. None of this is easy, but unless this institutional capacity is built, which itself requires spending a good portion of the revenue, then the prospects for better livelihoods and a more diversified economy will be limited.

[77] Government of Mozambique (2016).
[78] https://data.unicef.org.
[79] This point is discussed further in Addison and Lebdioui (2022).
[80] Cruz et al. (2023).

7.7 Conclusions

'Transforming the state' in the various ways discussed in this chapter (improved management), and Chapter 6 (greater transparency), may strike the reader as an over-ambitious set of goals, given the politics of poorer countries. Many have long histories of initiating change only to fall far short or fail entirely. State capacities are often in short supply, especially at the local government level. There is rarely enough funding. Grand theories of institutional change have run up repeatedly against these realities. Progress depends on dealing with a complex web of interconnected problems, few of which lend themselves to simple or formulaic solutions.

Resource booms, such as the one in critical minerals now driven by the net-zero transition, provide countries with a window of opportunity to catalyse change, even if progress is then iterative rather than rapid. Our view is that this requires an 'all of government' approach involving close collaboration between the different ministries and public institutions, preferably coalescing around a well-thought-out longer-term national vision and plan. These must be based on a realistic assessment of possible market scenarios rather than wishful thinking—and with the backing of the highest levels of political leadership.

The relationships between the different layers of government also require sorting out as they are rarely satisfactory. Local grievances over the social and environmental impacts of mining or oil and gas extraction and over the apportionment of the revenues between national and local government are the result. This chapter suggests greater revenue sharing between local and central government to fund increased local development spending, including at the community level, but with the proviso that *local capacity* in public expenditure management as well as project planning and execution must also be built. None of this will be easy, and each country needs to work out its own solutions.

Whatever institutional improvements are settled on, they do need to be funded. Governments and companies are never going to have a completely harmonious relationship—both have strong interests to protect—but they do need to reach a stable modus operandi. Governments need to reinforce their tax administrations and greater international cooperation on tax evasion is essential. Frequent and politically driven changes in tax legislation create an unstable investment climate and ultimately reduce public revenues. Nationalization is no panacea: NOCs, for instance, can be efficient and effective, but they can also become bloated and costly, thereby reducing the revenue take for the treasury (NOCs are discussed again in Chapter 8).

Net zero will increasingly come to dominate the debate around fiscal policy in developing countries as both their economies and populations grow. If they remain on their current fossil fuel pathways, then their share of global emissions will inevitably rise, especially as the advanced economies move ever closer to

achieving net zero. It is not inconceivable that populous developing nations such as Nigeria will, on current trajectories, have bigger emissions than the whole of Europe by 2050.

Achieving the necessary institutional changes, which are difficult in themselves, is made even harder when macroeconomic instability prevails. Shocks are an unavoidable fact of economic life, as Chapter 3 emphasized, and developing countries have little of the fiscal space available to wealthy advanced economies to absorb these. Yet there are still steps they can take to reduce the risk and give themselves more room for manoeuvre should bad times strike. One is to diversify the economy in ways discussed in earlier chapters as this lessens the impact of sectoral shocks and diversifies the revenue base as well. Limiting foreign borrowing is also prudent, as is building up a fiscal stabilization fund by saving a portion of any additional revenue (ideally guided by a fiscal rule) to maintain essential expenditures if a shock hits revenues (a frequent event in commodity-dependent economies). Governments do, however, need to rethink whether they should save into an intergenerational SWF unless the resource revenue inflow is exceptionally large relative to the economy's absorption capacity, and they are confident that they can commit enough funding to the current budgets of priority social expenditures and development infrastructure.

8
Transforming Companies

8.1 Introduction

The role of companies in the extractive industries is multi-faceted. Companies bring together the skills in finance, marketing, and technology necessary to develop resources that until extracted are otherwise valueless. A multitude of companies run the value-chains. They locate and assess deposits; provide or borrow the necessary finance; build the necessary plant and other infrastructure; extract the oil, gas, or ore and then process and transport it to refineries; and finally market, sell, and transport the output in expectation of a profit. All this must be done safely without environmental and social damage and then, at the end of the project's life-cycle, sites must be cleaned up and subsequently monitored for pollution risk. These are complex and demanding processes, involving many types of companies, each with their own special skills, that must be sustained over timeframes often spanning many decades and involving significant risks—a great deal can go wrong.

Additionally, companies are now expected to make a bigger contribution to both the development agenda of host countries (especially at the local level) and the climate agenda, both national and global. Some companies have made large strides, but others lag. This chapter assesses some aspects of this agenda and links it the newer corporate approaches of recent times.

We begin by briefly mapping the industry's landscape. Some 25,000 companies are engaged in the global mining industry and there are several thousands more companies in the oil and gas industry.[1] They differ by nationality, size, ownership, function, and strategy, and the reader needs to keep this in mind as our discussion turns to how companies (ranging from 'good' to 'ugly') interact with governments (whose development performance ranges from 'effective and inclusive' to 'ineffective and exclusive'). The chapter then turns to how corporate approaches have recently evolved, which sets the scene for some ideas about how companies might integrate better with host economies to deliver greater benefits for local communities and national economies. The chapter concludes with how companies might evolve further, including in the context of the net-zero and environmental challenges.

[1] Hodge et al. (2022: 1).

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8.2 The extractive industries

Mining, oil, and gas are the epitome of global industries. Although the national origin of companies is one obvious differentiating factor, many multinationals are listed on several exchanges and operate subsidiaries or branches in multiple national jurisdictions. A second differentiator is ownership. There are some huge NOCs: the value of the biggest, the partly privatized Saudi Aramco, exceeds those of IOCs such as Exxon Mobil, Shell, and Total. Other NOCs include China's National Petroleum Corporation (China's largest oil company) as well as Angola's Sonangol, Brazil's Petrobas, and Malaysia's Petronas.[2] In mining, state companies (wholly or majority state-owned) were common by the early 1980s—following a wave of nationalizations after independence—when they accounted for almost 50 per cent of global mine production and prior to the privatization wave of the 1990s which reduced their share to around 27 per cent today.[3] Botswana's Debswana, Bolivia's COMIBOL, Chile's CODELCO, and Zimbabwe's ZMDC remain partly or wholly state-owned.[4] Non-Chinese state-owned enterprises (SOEs) account for a relatively stable 10 per cent share of total world mining production.[5]

The giant Western IOCs and the big listed Western mining companies, notably Anglo American, Glencore, and Rio Tinto, face increasing competition from the newer Chinese players. China Shenhua Energy (the third largest mining company in the world) and Jiangxi Copper (China's largest copper producer) grew rapidly after 2000 along with China's consumption of metals. China's Ganfeng Lithium and Tianqi Lithium are increasingly dominant miners and processors of this key battery metal. Russia for its part boasts Gazprom (one of the world's largest oil companies), Rosneft (another top 10 global oil producer), and Norilsk Nickel (the world's biggest producer of palladium and nickel). These companies morphed out of the old SOEs. Other large companies from the emerging economies include Brazil's Vale formerly state-owned but now private, as well as India's Vedanta Resources and Hindalco Industries: all have extensive international footprints.

The privately owned commodity trading houses, including Gunvor, Trafigura, Mercuria Energy, and Vitol, were discussed in Chapter 6. Glencore listed in 2011 and expanded into mining, becoming the world's largest mining multinational and one of the world's most valuable companies.

The giants of the industry, with assets running into the billions, inevitably dominate the headlines, but there is a myriad of more specialized companies as well.[6]

[2] *Sociedade Nacional de Combustíveis de Angola, E.P.* (Sonangol); *Petróleo Brasileiro S.A.* (Petrobas); *Petroliam Nasional Berhad* (Petronas).

[3] Hodge et al. (2022).

[4] *Corporación Minera de Bolivia* (COMIBOL); *Corporación Nacional del Cobre de Chile* (CODELCO); and Zimbabwe Mining Development Corporation (ZMDC).

[5] Ericsson et al. (2020).

[6] Hodge et al. (2022) categorize mining companies as follows: 50 global giants (0.2 per cent of all mining companies); 250 seniors (1 per cent); 3,200 intermediates (13 per cent); 10,500 production

The medium-sized companies are sometimes owned by multinationals but will typically focus on smaller deposits in one country or region, and on a narrow group of minerals. 'Juniors', which lead a high-risk life, typically sell their interests to larger companies with deeper pockets once discoveries are made ('farm-outs'). Below these is an ecosystem of contract miners; maintenance/technical support companies; financial service providers; consultancies in business administration, law, geology, engineering, and marketing; energy providers; construction companies; and equipment suppliers. Finally, artisanal mining provides a full-time or part-time livelihood for millions of people who interact, for good or bad, with large numbers of informal metals buyers and small trading companies, often Chinese in origin. Artisanal miners frequently operate in proximity to large commercial miners, which is another source of company–community tension.[7]

8.3 The good, the bad, and the ugly

'Good', 'bad', and 'ugly' companies lie along a spectrum involving many different shades of performance. Here we use the three terms only in a relative sense. Good (enlightened / responsible) companies integrate environmental and social goals into the core of their operations, taking their 'social licence to operate' seriously, while for bad companies this is mostly about public relations: they do the minimum and bend the rules whenever possible (including 'greenwashing'). Downright ugly companies disregard their environmental and social responsibilities, engage in outright corruption, and can resort to violence (merging, at the extreme, into organized crime and warlordism).

Our earlier work set out a simple taxonomy showing the range of possible interactions between states and companies.[8] The best developmental (and environmental) outcomes invariably require partnership between good companies (here labelled 'enlightened') and effective and inclusive host governments: denoted by Zone B in Figure 8.1.[9] By 'effective and inclusive', we mean a government capable of formulating and delivering a coherent development strategy—with a clear vision of how the extractive sectors fit in (as discussed in earlier chapters).[10]

juniors (42 per cent); 8,500 exploration juniors (34 per cent); and 2,500 investment juniors (10 per cent).

[7] Artisanal mining is a large topic, and one that we cannot do justice to in this book. See instead O'Faircheallaigh (2023).

[8] Addison and Roe (2018b: 16).

[9] On the interdependency of companies and governments in determining outcomes, Hodge et al. (2022: 10) conclude that: 'A significant complicating factor in addressing change across the full global industry is that across governments, there is a vast variation in interest, capacity, and strategic approach to effectively manage change in pursuit of enhanced social and environmental performance for the common good.'

[10] Hickey et al. (2015) discuss the meaning and role of 'inclusion' in development. The nature of the 'political settlement' determines in large part whether a country's development is inclusive: see Bebbington et al. (2018).

There is then a reasonable chance that mining and oil and gas can be used to improve everyone's living standard, not just that of the elites. Companies and the state will still engage in hard bargaining, but the rule of law will prevail—encouraging more investment and good corporate behaviour.

By contrast, an ineffective/divisive state lacks a clear development strategy, its implementation capacity is weak, and its public finances are usually managed badly. A good (enlightened / responsible) company can still help local communities, but the benefits will likely fall well short of community expectations, as synergies between companies and public institutions will be weak (Zone D in Figure 8.1). Opportunities to jointly finance infrastructure and other development projects will then be missed, and communities will often vent their frustrations on companies even if the government is at fault.

When the state is *exclusive* in orientation—benefitting a narrow elite—based perhaps on ethnicity or a narrow group of supporters to the exclusion of the citizenry at large, then even the best efforts of companies can fail to achieve local development benefits and meet community expectations (Zone D). Exclusive governments also attract (or themselves create) ugly companies, to facilitate their illicit wealth accumulation: personal interests rather than national interests then determine who gets the license to operate. Ugly companies (labelled rogue in Figure 8.1)

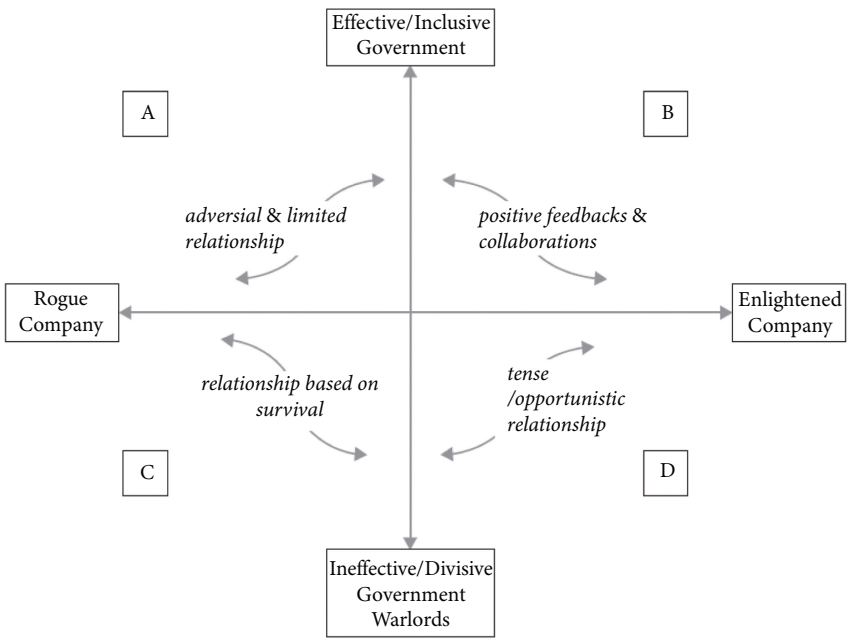

Figure 8.1 Four alternative interactions: companies and governments

Source: Addison and Roe (2018b: 16).

seek to achieve the greatest possible return irrespective of the resulting environmental and social damage, and in fragile states they are after quick profits before any more politically favoured competitor moves in. Exclusion and ineffectiveness characterize 'fragile states', that category of mainly LICs with a high propensity to violent conflict.[11] Civil society and the independent media will be harassed when they report abuse, and pressure for better outcomes from external agencies such as EITI will struggle. Ugly (Rogue) companies combined with ineffective and exclusionary government is the worst scenario (Zone C in Figure 8.1).

In sum, extractive companies are heterogenous. Their ability to deliver beneficial outcomes depends not just on their own efforts but also on the motivations and capacities of host governments.

8.4 Evolving corporate approaches

The past three decades have seen the spread of international norms for better business practices. Many companies have aligned their policies and practices with the UN's *Guiding Principles on Business and Human Rights* (approved in 2011), especially around community relations.[12] More broadly, the SDGs, launched in 2015, have visibly affected corporate attitudes. Investors with ESG mandates increasingly exert pressure on companies.[13] Even the most conservative of chief executives now find it hard to ignore the financial advantages of aligning with ESG criteria, including broadening the investor base and cheapening the cost of capital. Swarms of ESG analysts together with a multitude of advocacy organizations have turned a bright spotlight onto the social and environmental practices of the largest publicly traded companies (and some of the mid-tier companies as well). Today's social media world also makes it harder to hide malfeasance—at least in open societies.

The extractive industries are part of this broader progressive trend. One of the biggest sector-specific initiatives was the foundation of EITI in 2003.[14] EITI now has 69 supporting (larger) companies that are committed to the initiative's core principles of transparency and reporting, particularly the disclosure of taxes and other payments to governments.[15]

New standards from the IFC, an arm of the World Bank, have also been highly influential in the extractive industry. Around the millennium the World Bank

[11] Social exclusion is a catalyst for conflict; see Addison (2009); Addison and Brück (2009); Addison and Murshed (2005); and Stewart (2009).

[12] UN-OCHR (2011).

[13] See, for instance, the Transition Pathway Initiative (TPI): www.unpri.org/sustainability-issues/climate-change/the-transition-pathway-initiative-tpi and TPI (2021).

[14] On the numerous initiatives, see Cust (2018); Hodge (2018). Bell (2018) focuses on the environmental dimensions and the relationship of these initiatives to corporate social and environmental responsibilities (CSER).

[15] See https://eiti.org/supporters/companies.

was persuaded, as civil society pressure mounted, to take a hard look at its own performance. One outcome of its *Extractive Industries Review*, conducted over 2002/03, was the IFC's Performance Standards, introduced in 2006.[16] This was ground-breaking, not only in establishing a comprehensive set of environmental and social standards but also in setting out tangible steps to guide companies in managing their environmental and social risks and impacts.[17] Today the IFC Standards arguably have had the most impact of all the international standards; they are widely referred to in company practice (and have indeed been adopted by many projects that are not IFC financed). They provided the model for the 'Equator Principles' applied by major financial institutions to their project financing and complement industry initiatives—notably those of ICMM.[18] These initiatives also influenced the 2014 standard issued by China's industrial organization (CCCMC) which represents 6,000 companies: the vast majority of China's mineral industry operating abroad.[19]

Within mining, ICMM's creation in 2001 was a big step forward, and one led by the chief executives of large mining companies in response to intense NGO criticism as well as pressure for change from within the industry itself.[20] ICMM has since helped to improve the practices of its 28 company members, which are subject to stringent membership criteria, involving a rigorous admissions process followed by regular subsequent monitoring: every member company must adhere to 10 Principles and 8 Position Statements (which are regularly updated).[21] In 2019 ICMM was one of the leaders in responding to the Mariana tailings disaster in Brazil, resulting in the first international standard for the safe management of tailings storage facilities. In 2020 ICMM introduced its new Mining Principles which include improved ESG practices for its own members.[22] ICMM members are now expected to reduce water consumption (a big concern in water-deficient areas), end biodiversity loss, commit to net zero by 2050, and contribute to attainment of the SDGs.

Other corporate initiatives include The Copper Mark, created as an independent agency by the International Copper Association in 2019 with input from companies and NGOs, which aims to encourage responsible production practices

[16] World Bank (2003); IFC (2012). Addison and Roe (2018b) discuss this further.

[17] www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards.

[18] See https://equator-principles.com/about.

[19] The China Chamber of Commerce of Metals and Minerals and Chemicals Importers and Exporters (CCCMC) (https://en.cccmc.org.cn/about/introduction.html). On China's companies, see Dolega and Schüler (2018).

[20] See www.icmm.com/en-gb/about-us/our-organisation/annual-reviews/our-history.

[21] ICMM's 10 principles: www.icmm.com/en-gb/our-principles. Some of these have been adopted by mining companies that are not ICMM members, including Chinese companies.

[22] These cover biodiversity, gender, human rights due diligence, labour rights, local content, mine closure (and the management of post-closure liabilities), pollution, resettlement, and waste. Hodge and Brehaut (2022) discuss closure and post-closure issues.

and the green transition among copper miners.[23] Such industry initiatives are complemented by collective efforts in organizations such as the Responsible Mining Foundation (RMF) and the Global Reporting Initiative (GRI). The first of these promotes the responsible sourcing of minerals along many of the world's most significant supply-chains. RMF's periodic report, *The Responsible Mining Index* (RMI), based on field surveys of ESG practices in a large number of mine sites (253 in the 2022 report) across all continents, is an invaluable guide to the strengths, weaknesses, and progress of companies.[24] GRI, established in 1997, maintains a set of standards for the reporting of company impacts in their host locations.[25] In sum, at least part of the mining industry now has a more coherent approach to sustainable development. Companies now must deliver on it—and are more accountable if they fail.

The situation among the Western IOCs points in a similar direction—albeit at a much slower pace than in mining and with less industry coordination. Although the oil industry has its own association, IPIECA (founded in 1974), its mandate is less ambitious than ICMM's and, unlike ICMM, it is not led by company chief executives.[26] For much of their history, the international oil and gas companies have taken the view that they should focus on their core commercial business, comply with local laws (while lobbying to reduce regulation), pay their taxes (while manoeuvring to minimize them), and provide some basic ad hoc benefits to local communities.[27]

This started to change in the late 1990s when BP and Royal Dutch Shell in particular shifted to a more rigorous approach, following allegations of company complicity in human rights abuses as well as environmental damage (revealed in investigations by Greenpeace, Human Rights Watch, and Oxfam, among others).[28] Encouraged by new chief executives and board chairs, BP and Shell introduced more robust internal corporate codes of conduct and established corporate functions dedicated to 'social performance' issues. More significantly, BP and Shell worked with the UK and US governments and various human rights NGOs to establish, in 2000, the *Voluntary Principles on Security and Human Rights*

[23] See https://coppermark.org.

[24] RMI (2022). See also RMI (2018, 2019).

[25] www.globalreporting.org.

[26] International Petroleum Industry Environmental Conservation Association (IPIECA). See www.ipieca.org.

[27] Tomlinson (2018) provides a substantial review of the evolution of oil and gas companies on social and environmental issues.

[28] BP was alleged to have been complicit in human rights abuses in the late 1990s in Colombia and Sudan (which it denied). Shell experienced serious reputational damage from the execution in 1995 of Ken Saro-Wira and nine other environmental activists by the then Nigerian military dictatorship (see Doron and Falola 2016). Human Rights Watch (www.hrw.org) has undertaken in-depth investigations of these cases. Oxfam has investigated corporate practices in relation to communities (Slack 2018).

(VPs), one of today's key standards for the industry—31 major IOCs (and mining companies), including some of the biggest, are now signatories.[29] Regrettably, however, these companies do not include, with the exception of Norway's Equinor, many of the world's largest NOCs like Saudi Aramco, or the Russian companies such as Gazprom and Rosneft.[30] These non-members produce around *half* the world's oil and gas. Nor do they include most of the less visible smaller companies. The oil and gas industry has made progress—but still has a long way to go.

In short, many IOCs as well as mining MNCs are now more alert to the need to manage their reputational risk in the face of increased media attention and civil society's ability to investigate and publicize malfeasance. Voluntary standards provide a means for civil society and governments to hold responsible companies to account. And the composition of the corporate workforce also pushes in the same direction. More younger managers and engineers want careers that benefit society and the environment, and the industry is now keen to attract more female talent. The responsible portion of the industry recognizes that reputational damage harms recruitment and the bottom line. The *RMI 2022 Report* notes that formal ESG commitments are becoming the norm among the companies surveyed, with evidence of some very good practice.[31]

However, the *2022 RMI Report* also finds significant gaps remaining in most companies as between: (i) commitments and actions and then (ii) actions and effectiveness. The *2022 RMI Report* has uncovered systematically weak results in areas such as the disclosure of financial surety arrangements for both closure-related liabilities and the financial assurances needed for disaster management and recovery.[32]

Disasters can therefore still happen. In addition to Vale's negligence leading to the Minhas Gerais tailings disaster in Brazil in 2015, Rio Tinto destroyed a 46,000-year-old Aboriginal heritage site in western Australia in 2020, and also in 2020 a spill from a Norlisk Norsk Nickel storage facility in Russia caused massive environmental damage to a Siberian river. These are just three examples, and we could cite more.

There is no single answer to why these disasters and broader failures in ESG areas still occur, but explanations range from: compliance controls that degenerate into box-ticking; the often long distances between field operations and company headquarters; the low status within companies of field staff undertaking

[29] See www.voluntaryprinciples.org.
[30] www.voluntaryprinciples.org/the-initiative.
[31] RMI (2022).
[32] Hodge et al. (2022) and Hodge and Brehaut (2022) note that only in the late 1990s did issues of closure and management of post-closure liabilities begin to find their way into corporate and government decision making in the mining industry: they still remain deficient in many cases.

community and environmental assessment; and periodic cost-cutting that impacts disproportionally on environmental and social work streams.[33] Regulatory oversight by local and national governments certainly needs to be tightened, and punishments must go beyond chief executives simply losing their well-paid jobs.

8.5 Delivering greater development impact

By development impact we mean the achievement of higher living standards—especially for poorer citizens—while at the same time protecting nature (via action on pollution, deforestation, and harmful emissions). Earlier chapters have already discussed such impact, but here we expand further on the role of companies—and argue for greater *ambition*.

8.5.1 Addressing community needs

Community impact is a hot topic, with a proliferation of media reports, NGO and community-organized activism, and some high-profile court cases.[34] Responsible companies recognize that delivering more benefit is a tangible way to build trust with host countries and diffuse any tensions that otherwise might threaten their social licence to operate.

Guidance for companies is now abundant.[35] ICMM's *Community Development Toolkit* (CDT) has five sets of tools for good practice in community relations: relationship building; management; planning; assessment; and monitoring/evaluation.[36] To be effective, any corporate approach must have explicit requirements to: respect human rights and local customs; adequately compensate resettled populations; ensure emergency response arrangements; provide health and safety monitoring and training; assess and mitigate environmental damage and risk; and consult with local communities to support their development aspirations.

[33] Hodge et al. (2022) link such shortcomings to the corporate culture in mining which is a source of inertia and resists change.

[34] Organizations representing communities have brought cases against companies to European courts. For example, in 2021 a Dutch court ordered Shell to pay compensation for oil spills to two villages in the Niger Delta region. Ecuador is an especially interesting case of indigenous peoples and the 'right to nature' (enshrined in Ecuador's constitution; see Eisenstadt and West 2019).

[35] The earliest was ILO's *Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy* adopted in 1977, but successively amended, most recently in 2022 (www.ilo.org/empent/areas/mne-declaration/lang—en/index.htm). Africa Mining Vision has a rather broader focus (www.africaminingvision.org).

[36] ICMM (2012). Catherine Macdonald, a principal author of the toolkit, discusses its evolution in Macdonald (2018a). See also Filgueiras et al. (2018) on approaches applied by Vale S.A.

One comprehensive model is Anglo American's *Socio-Economic Assessment Toolbox* (SEAT) which has detailed guidance for collecting and analysing community information.[37] SEAT has many practical suggestions on how to work with communities, including: resettlement (in South Africa); security and human rights (Colombia); leveraging funds (the Anglo American Khula Mining Fund in South Africa); enhancing local skills (Brazil); revenue transparency (Colombia); basic infrastructure provision (water in South Africa); and health and HIV/AIDS (South Africa).

Health is another promising area for company impact. Government can work with the companies to ensure that their CSER projects (especially on education and health) are well aligned—even synergistic—with the governments' own programmes. Ghana provides an example of a company, AngloGold Ashanti, successfully creating a robust malaria programme well aligned with national efforts, and indeed one that helped catalyse a bigger donor-supported nationwide effort (see Box 8.1).[38]

Box 8.1 Ghana: AngloGold Ashanti and malaria control

Ghana suffers from one of the world's worst health burdens from malaria. In the locality of the Obuasi mine run by AngloGold Ashanti (AGA), malaria accounted for nearly half of all cases at health facilities as well as 22 per cent of all deaths by the early 2000s.[39] AGA estimated that malaria among its employees was causing the loss of working time equivalent to nearly one-third of its 8,000-strong workforce.

The response was an effective partnership between AGA, the health ministry, and local communities to deliver a programme of prevention and treatment—known as the 'Obuasi model'—that was initiated in 2006.[40] The programme led to a 75 per cent drop in malaria cases in the Obuasi mine area in eight years, well above the 50 per cent target set at the programme's inception, benefitting pregnant women and young children especially (with school attendance among older children improving as well).[41] AGA has also benefitted: by 2012

continued

[37] Anglo American (2014).
[38] On other initiatives, see ICMM (2010b).
[39] AfDB (2016: 9).
[40] https://bhr-navigator.unglobalcompact.org/case_studies/private-public-partnership-to-address-malaria-in-the-workforce-and.
[41] AfDB (2016: 11).

continued

its monthly spending on malaria treatments was only US$510 compared to US$55,500 previously.

AGA has invested approximately US$1.5 million annually in the programme. The impact was such that the programme eventually attracted funding of US$138 million from the Global Fund to Fight Aids, Tuberculosis and Malaria which enabled a substantial scaling up as well as expansion, led and managed by the Global Fund, to 40 districts in Ghana, including those where malaria's incidence is even worse than in Obuasi.

The Obuasi model was a significant component of what has proven to be a large-scale national anti-malaria programme. Ghana has gone on to greater success, and malaria vaccination across Ghana from 2019 onwards has cut the prevalence of the malaria parasite in children under five, including in Obuasi.[42]

Yet for the extractive industries generally, communities are all too frequently disappointed, especially over jobs, pollution, and displacement by mining infrastructure.[43] An evidence base of impacts, often harmful, has accumulated. The NRGI's authoritative *2021 Resource Governance Index* report states, for example, that: 'Local impacts of the extraction of oil, gas and minerals have long been a major area of contention between companies, affected populations and governments. On average, all practice and disclosure-related indicators in the index's local impact subcomponent demonstrated poor or failing levels of governance' (NRGI 2021: 14).

Complaints about companies in this area have three main themes: (i) gaps between statements of intent, often impressively presented in glossy publications and websites, and actual delivered outcomes; (ii) the lack of any legal force behind many of the voluntary obligations that companies make (Brazil being an important exception); and (iii) the absence of independent and rigorous monitoring and evaluation of performance, and an over-reliance on company self-reporting.

What goes wrong? First, as we noted earlier, corporate culture is often the root cause of failure. The problems can begin right at the start of the mining or oil and gas investment. Social impact assessments (SIAs) are now used by most IOCs and mining companies but will degenerate into box-ticking if top management is not fully committed.[44]

[42] www.afro.who.int/countries/ghana/news/malaria-vaccine-plays-critical-role-turning-tide-malaria-ghana.

[43] Tomlinson (2018).

[44] On SIA, see Becker and Vanclay (2003) and the International Association for Impact Assessment: www.iaia.org.

Box 8.2 Legislating for community development

Should countries move to a *mandatory* approach to community development, instead of relying on voluntary action by companies, not all of whom are good corporate citizens?

Legislation that governs company–community relations avoids treating companies individually on an ad hoc basis which can result in inconsistent practices (and lobbying to reduce responsibilities). Compared to a voluntary approach, the responsibilities of all parties in a mandated approach should be clearer (reinforcing the tripartite approach), and companies will know the minimum level of development funding expected of them. Formal consultation, grievance, and dispute resolution approaches can also be established, giving communities (hopefully) greater certainty about benefits.

Building institutional capacity is essential for a mandatory approach to work. Otherwise, a large administrative burden will be added to often over-stretched regulatory agencies.[45] Donors should support capacity-building with funding and technical assistance.

At least 43 countries have mining legislation requiring CDAs.[46] Many of these are linked to a World Bank initiative to create model CDA regulations and guidelines.[47] The widespread use of CDA legislation is a relatively new phenomenon and so its efficacy is still open to debate. However, if the CDA legislation is robust, as in the model legislation, it can provide a roadmap for mandatory approvals, monitoring, and enforcement, all of which voluntary approaches can lack. Moreover, hybrid approaches combining mandated elements and voluntary activities can also work quite well, as Brazil demonstrates.

Second, companies may have CSERs but if the specifics are not clear with government (local and national) and communities (i.e., a *tripartite approach*), then confusion and continuous bargaining results. Trouble often starts when government sees CSER as a substitute for meeting its own responsibilities.

Third, if local governments with weak capacities do not share in the increased revenues from a project, then they are less able and likely to deliver on their responsibilities (see Chapter 7). Corporate action works best with good-quality local government (and mandated community development agreements (CDAs) in some cases; see Box 8.2).

[45] Aubynn (2018).
[46] Otto (2018b). Note that not all of these comply fully with the standard CDA definition.
[47] World Bank (2012). The framework addresses various challenges to implementation such as: who should be a party to a legislated agreement; how might the negotiating capacity of a local community be enhanced; and which types of operations are amenable to coverage using a CDA?

Finally, CSOs and NGOs can act as trusted brokers between the three parties. But this should not be assumed. These organizations are heterogenous, and their different mandates do not necessarily fit well with what the three parties are trying to achieve. Some are service providers while others concentrate narrowly on advocacy, and many have expertise in only a single area (e.g., the environment or human rights).[48]

Zambia illustrates all these difficulties but also some promising initiatives. Mining communities are frustrated about livelihoods, pollution, housing, and health care.[49] Companies maintain that they meet their responsibilities. The government's regulatory powers are weak—relying on self-reporting by companies—and independent verification is limited. Fundamentally, the respective responsibilities of the government and the companies are unclear. Prior to privatization in the 1990s, the dominant state mining company Zambia Consolidated Copper Mines (ZCCM) provided a wide range of services including health care. This social model collapsed along with copper prices in the 1980s, leaving a gap in local provisions. After privatization the state was expected to take over these functions, funding them via the higher tax revenues from a reinvigorated mining industry. In the event, delivery along those lines has been bedevilled by generally weak public services and fierce tax disputes.[50] A Zambian analyst of long-standing experience, Angel Mondoloka, writes that the resulting gap between community expectations and companies' delivery is 'worsened by the government's continuing failure to undertake the necessary development projects and deliver corresponding social services in mining communities'.[51]

Despite these problems, there are now several Zambian examples of community-driven approaches to catalyse dialogue and partnership between mines, local authorities, CSOs, and traditional community leaders. Efforts are underway to strengthen community organizations and build the capacity of CSOs to act as effective, trusted brokers. One local NGO, for example, has collaborated with EITI to develop its negotiating skills to achieve an increased commitment by the municipal council, out of its mining tax revenues, for communities that have suffered from environmental damage, livelihood disruption, and displacement due to mining activities.[52]

A final point is that the increased collection of information on living standards, both quantitative and qualitative, to monitor and evaluate progress against SDG benchmarks now offers companies a much-improved opportunity to rigorously

[48] Slack (2018) examines the political dynamics around CSOs and NGOs in relation to the extractive industries. Bebbington et al. (2008) discuss the development role and effectiveness of NGOs.

[49] NGOs have assisted Zambian communities to pursue a number of class-action lawsuits against mining companies in recent years.

[50] Lundstøl and Isaksen (2018); Manley (2017); Mwaba and Kayizzi-Mugerwa (2021).

[51] Mondoloka (2018: 621).

[52] See Mondoloka (2018) for a detailed analysis of these projects including the significant Lumwana Community Development Forum (LCDF).

understand the *impact* of their own investments, especially the multiplier effects resulting from increased economic activity, and their impact on poverty metrics (e.g., through the use of panel data).[53] There is also now an extensive literature on impact evaluation that uses various different techniques to understand the effects of policy and projects on households (including the gender dimensions: SDG 5).[54]

8.5.2 Maximizing national development impact

Responsible companies now recognize their obligations to localities and communities. The situation is more ambiguous at the national level. Certainly, responsible companies will comply with their legal tax obligations. But do they see any national role much beyond that?

We argue that companies can contribute significantly more to national development goals. Figure 8.2 shows a sample of four intersections between corporate and government functions, where collaboration could be mutually beneficial, and which we discuss briefly here. In addition to these, companies can play a much bigger role in helping their host countries meet their nationally NDCs under the Paris agreement, as well as other environmental goals, as discussed later.

Revenue: While companies are keen to minimize their tax bills—and the worst will evade their legal tax obligations—many are large contributors to the exchequer (indeed, sometimes the very largest). Therefore, in principle they have an interest in the effective management of both public revenues and the resulting public spending. Weaknesses in the latter exacerbate company–community relations as discussed earlier. Additionally, weak management of the public finances ultimately leads to macroeconomic distress which is a risk to company operations and profitability (ranging from production shutdowns to governments seeking a higher tax take or, *in extremis*, nationalizing the company). Although companies obviously have no mandate to engage directly with fiscal policy, their technical input could be helpful, not least in helping government economists avoid outcomes such as the resource curse. For example, a frank and regular sharing of price and longer-term production forecasts should help national treasuries improve their fiscal forecasts and projections for debt-servicing.

Infrastructure: Companies make large investments in roads, rail, water, power, and even ports, which offer opportunities to boost the local non-resource economy, especially in ill-served remote and poorer localities (see Chapter 5). Such investments can complement publicly financed infrastructure, or even extend

[53] Qualitative information is as important as quantitative information because this can capture perceptions around impacts that household surveys of income and expenditure do not. Addison et al. (2009) discuss 'Qual-Quant' approaches to poverty dynamics.

[54] Cochrane (2017) provides an example of the use of anthropology in understanding the impact of mining projects. MacDonald (2018b) discusses the gender dimension of the extractive industries.

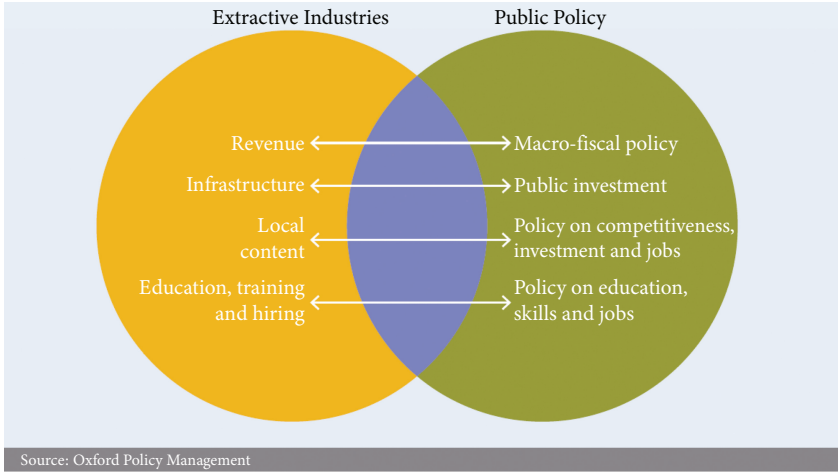

Figure 8.2 The intersection of shared interests between companies and government policy

Source: Dietsche et al. (2013: figure 5); reproduced here with permission.

their access at low marginal cost to provide both local and national benefits, for example feeder roads from main roads for rural communities to reduce marketing costs and improve food security.[55] For this to work, governments—both national and regional—need a good strategy to leverage private investment and coordinate it with public investment. As discussed in Chapter 5, this should be driven by a well-articulated national development plan. Consulting with companies in its preparation, including the various links to the energy transition and the net-zero agenda more generally, would be helpful in identifying opportunities for private–public partnership.

Local content: This is commonly presented as an obligation imposed on companies rather than as an opportunity for active cooperation. Experience tells us that local content policies work best when company programmes to provide finance, training, and mentoring are coordinated actively with government programmes. Companies can also help governments identify constraints on enterprise development, especially for SMEs. The Anglo Zimele programme run by Anglo American in South Africa is an example of SME support via financing and advisory services (see Chapter 5). Another is Brazil's Vale which links its supplier development programmes with those of government, local chambers of commerce, and others.

Education, training, and hiring: All companies need significant and qualified labour forces, and skill requirements continue to grow as mines and oil

[55] One example is the road programmes of Tenke Fungurume Mining in Katanga, DRC (OPM 2013).

and gas facilities automate even further. Public–private partnerships to build training programmes, and to align these with wider national and local policies on education, skills development, and employment-generation, should be beneficial, especially when the skills are transferable to other sectors (especially in information technology and financial management).[56]

These four examples of possible collaboration fit quite comfortably with established company practices. And there are many other ways to construct cooperative partnerships, including increasing opportunities linked to climate targets.[57] Many companies have already incorporated at least some of the SDGs into their own operations. Significantly, SDG 17 refers to partnerships for sustainable development.[58]

Companies today should recognize that they are more than marginal players in LICs and MICs, and that the scale of their *macroeconomic* impact is invariably significant. This being the case, companies have an obligation to develop a clear understanding of where their own activities fit into the broader macroeconomic framework of a country and its ambitions for economic transformation and poverty reduction. Companies disinterested in such national matters forgo an important opportunity to enhance both longer-term profits and image. In a lacuna situation where host governments also fail to see the full scope of the possible corporate impacts, both actors will miss important opportunities for synergies.

The ideal situation is one where companies with a broad understanding of their own societal impacts collaborate with inclusive governments that have a holistic vision of the long-term benefits of extractive industries—benefits not just confined to the revenue stream. This type of shared mindset can be a rich breeding ground for many positive initiatives. The regrettably more common situation is one where national governments and companies meet only infrequently and then only to argue about taxation.

8.6 The climate dimensions of corporate action

8.6.1 Mining

For mining companies, the growth in the material requirements of the net-zero economy is a growing market driver but one that will require them to ride the

[56] The African Mineral Skills Initiative (AMSI) is one innovative approach.

[57] ICMM (2011) provides a partnerships toolkit which has been applied in at least 10 country case studies (including Ghana, Peru, Tanzania, Lao PDR, Zambia, and Brazil) with governments and companies working closely together to establish a sound basis of facts and ideas about actual and possible new partnerships and synergies.

[58] WEF (2016) provides a guide for mining companies to map their activities to the SDGs (from exploration through operations to mine closure). Analysis and advice are available from the IGF (www.igfmining.org) as well. See also McPhail (2018).

new vicissitudes of global markets. While this trend is mostly their friend, mining companies face uncertainty over the source of critical minerals and are now investing more in countries they previously avoided (see Chapter 3). This is good news for poorer countries, not only in boosting their revenues but also in building infrastructure that could have broader economy-wide benefits (see Chapter 7). New and closer relationships are also evolving between manufacturers of EVs, refiners, and mining companies to secure future supplies, including cross-investments, off-take deals, and, most ambitiously, the outright purchase of mining companies to achieve vertical integration.[59] More controversial is the prospect of seabed mining, with its uncertain environmental impacts.[60]

Some miners—mostly publicly traded Western companies—are positioning to attract ESG investors by measuring and cutting their scope one and two emissions, making plans to cut their scope three emissions, and aligning themselves with the guidelines of the Financial Stability Board's Task Force on Climate-Related Financial Disclosures (TCFD).[61] Chief executives increasingly like the resulting upside for the company's share price (and their own remuneration) and chief financial officers like the cheaper cost of capital. Mining companies which moved early to reduce emissions have market valuations some 20 per cent higher on average than their tardier peers.[62] Some mining companies are also successfully placing 'green bonds' and 'transition bonds' (a new class of financing for companies that offer investors a convincing plan to go green). ICMM member companies now publicly support carbon pricing.

Mines are huge consumers of power: sometimes a country's biggest. Shifting to renewable energy not only reduces their emissions but also shows leadership by demonstrating to companies in other sectors what is possible.[63] Chile has taken a lead in green mining, boosted by a national strategy to use more of its wind and solar resources: all of Antofagasta's copper production is now run on renewable energy.[64] Anglo American has now achieved 100 per cent renewables for all its power requirements in Brazil, Chile, and Peru.[65] Gold Fields has made substantial financial savings by increasing the share of renewable energy in its operations in Chile, Ghana, Peru, and South Africa.[66] Greater use of hydro power is also a possibility for some mining, and hydrogen use is also set to grow, especially in

[59] UNCTAD (2023). A prominent example is China's Ganfeng Lithium—a top global producer of the battery metal—with its acquisitions of lithium deposits in Australia, Argentina, and Canada, among others.

[60] Marine mining is the focus of the UNU-WIDER study by Löf et al. (2022).

[61] www.fsb.org. McKinsey Sustainability (2020) provides a guide for companies intent on decarbonization.

[62] Bour et al. (2020: 3).

[63] Alova (2018).

[64] https://copperalliance.org/resource/antofagastas-copper-production-powered-by-100-percent-renewable-energy.

[65] www.angloamerican.com/media/press-releases/2021/15-04-2021.

[66] Gold Fields (2023).

transport. In short, mining companies with their huge investments can be a source of significant change in relation to a host country's energy transition.

Nevertheless, despite this progress, mining companies have not transitioned to clean energy at the speed or on the scale needed.[67] Progress has been held back by the intermittency of supply if wind or solar is used on site (and if hydro is not available): mines have huge power requirements and grid supplies are often from coal-fired power. Ill-advised regulation also holds companies back. In South Africa, mining companies—the country's biggest buyers of electricity—were, until 2020, blocked from generating their own electricity. This protected their biggest power supplier, Eskom, the unreliable and heavily indebted state utility which needed a captive market, and coal dominates Eskom's generation capacity.[68]

Some 4–7 per cent of global emissions are generated by the operations of mining companies (and are therefore under their own direct control).[69] But once scope three emissions are factored in, the share is a great deal higher because of the dominant effect of emissions from burning coal, and coal's continuing high share of energy (where the latter accounts for 75 per cent of global emissions).[70] Scope three emissions therefore remain a daunting challenge for miners (and refiners), as discussed in the next section. Some companies have committed to net zero, including scope three emissions. Many merely publish targets for this to apply only at some far distant date. One leader is Gold Fields.[71] Others are largely silent on the issue.

8.6.2 The coal dilemma

Coal accounts for roughly one third of the fuel mix in global electricity generation.[72] Coal-fired plants are still being built, with the developing world accounting for around 90 per cent of those expected over the coming years, notably in China, India, and Indonesia where coal still accounts for around 60 per cent of electricity generation (even as renewables increase their shares). In much of the developing world coal is still seen as the cheapest and easiest route to ending energy poverty, despite accounting for one-fifth of global emissions (the biggest single source).[73]

Shutting coal plants down in the developing world is a monumental task. Many are highly indebted, and their early closure poses a risk to domestic financial systems (especially in China), closure will cause job losses in both power generation and mining (a big concern in South Africa), and they supply much of the power

[67] World Bank (2020).
[68] Harvey (2018: 171–173).
[69] www.globaldata.com/data-insights/mining.
[70] Mitchell (2019). See also Evans (2020).
[71] Gold Fields (2023: 16).
[72] IEA (2023c: 11).
[73] Birol and Malpass (2021). Coal combustion also releases such toxic pollutants as nitrogen oxides, sulphur dioxide, heavy metals, and particulate matter.

to the new industries under development (paradoxically, including Indonesia's EV manufacturing). Moreover, whereas coal plants in the richer world are mostly near the end of their effective lives, those in the Global South, being much newer, can expect decades of life: Asia's new coal plants have a lifespan of 40–50 years.[74] Yet as Chapter 3 emphasized, the continuation of coal in the energy systems of developing countries will be an increasing headwind for their successful participation in GVCs as these turn green. This risk might eventually catalyse a reversal of attitudes to coal in the Global South, but the coal industry remains profitable, it is politically influential (especially in India and Indonesia), and wealthy and powerful lobbies support it.[75] The industry is also a big employer, and local communities will also resist closures if they are offered few alternative sources of livelihood.

Coal is therefore far from dead, at least in the developing world which is now the largest market. So, does this mean business as usual for coal mining and its companies? The answer is not yet clear. The financing of coal investments has become harder. Banks and financial institutions made landmark commitments at COP26 in 2021 to end the funding of coal: they included major international lenders like HSBC and Fidelity.[76] Insuring coal mines (and coal-fired plants) is also more expensive.[77] Coal assets have weighed down the share prices of mining companies. Some Western mining companies have disposed of their coal assets or are planning to do so, not least to focus their efforts on the critical minerals demanded by the net-zero transition (and thereby making themselves more attractive to investors). Rio Tinto sold all its coal assets in 2018, and in 2021 Anglo American hived off its South African thermal coal into a separate listed company, Thungela Resources.[78]

Yet Glencore, one of the world's biggest miners of thermal coal for export, which in 2020 committed to run down its coal assets (already in Colombia and next in South Africa), acquired more in 2023 when it bought a stake in the (coking) coal business of Canadian miner Teck Resources but with a plan to spin off the coal assets into a separate company. Glencore's ambition is still to become a pure play miner of metals, but the time-scale for this goal remains uncertain.[79]

[74] The average age of an existing coal power plant is 11 years in South-East Asia, 13 years in both China and India, 34 years in Europe, and 41 years in the United States: www.iea.org/data-and-statistics/charts/average-age-of-existing-coal-power-plants-in-selected-regions-in-2020.

[75] Newer coal plants deploy scrubbers and other technologies to reduce the emission of toxic pollutants, making them 'cleaner' than older power plants. This is encouraged by tighter regulation in India and China, among others. Reducing the huge CO_2 emissions from coal plants poses much bigger technical and economic challenges, and carbon capture and storage (CCS) has had limited adoption to date. Achieving 100 per cent carbon capture is very expensive and is unlikely to happen without a high carbon price.

[76] Loan spreads for coal mines rose by 54 per cent over 2007–2020 (Zhou et al. 2021).

[77] Insurers are well aware of climate risks and in 2018 the industry leaders pledged to stop insuring or reinsuring projects that had significant thermal coal exposure.

[78] www.thungela.com. Anglo American has retained its coking coal assets.

[79] 'Digging Deep: Will Glencore Ever Say Goodbye to Coal?', *The Sunday Times*, 3 December 2023.

More fundamentally, when mining companies divest their coal assets, the emissions do not disappear. Like pushing on one end of a balloon that shifts the air to another part, the emissions are merely transferred to another commercial entity—becoming the responsibility of the new company and its shareholders. That company may actually expand its coal mining operations (Thungela Resources subsequently intensified its search for new coal assets).

As the big Western companies divest their coal assets, so the buyers of coal mines come increasingly from the developing world. Thus, the Indian conglomerate Adani Group now controls mines in many overseas locations including in Australia and Indonesia. And the new buyers may be privately owned, in which case they are not subject to the same ESG pressures as publicly traded companies. Unless governments push for regulation and carbon pricing to encourage the switch from coal to cleaner power generation, then thermal coal mining will remain profitable. The market for metallurgical (coking) coal will also remain robust until new technologies of steel production are more widely adopted.

When the coal industry does begin to downsize, comprehensive public programmes to aid affected communities via retraining, investment promotion of new activities, and environmental clean-up are vital. Yet delivering a 'just transition' is far from straightforward and is certainly not cheap. This is another reason why governments may alternatively seek new companies to continue coal production—especially when it remains a major export earner as well as a key source of domestic energy generation.

8.6.3 Oil and gas: the sunset years

Global climate action including the increased take-up of renewable energy and EVs will eventually strand fossil fuels—but at rates differentiated by country. The timings are uncertain, but companies must now regularly update their strategies for this emerging future amid rapid technological change. Oil and gas companies must decide how far to incorporate renewable energy, energy storage, and carbon capture and sequestration into their business portfolios.

They are already cutting their scope one and two emissions, encouraged by tighter regulations, carbon taxes, and fines, as well as intensifying pressure from investors and, especially, environmental campaigners. Companies are fixing fugitive emissions from corroded pipelines, reducing venting and flaring (see Chapter 7).[80] Methane has been a special area of concern. In 2021

[80] Emissions from global upstream oil and gas consist of two-thirds carbon dioxide and one-third methane (a more potent GHG).

more than 100 countries signed the Global Methane Pledge at COP26, a collective commitment to cut global methane emissions by at least 30 per cent by 2030.[81]

This is a promising start but some 80 to 95 per cent of the emissions of the global oil and gas industry are categorized as scope three and, according to industry watcher Wood Mackenzie, only 10 large companies have committed to net-zero scope three, most with a target date well into the future (commonly 2050).[82] The reason for this tardiness is not hard to see: achieving net-zero emissions requires a fundamental recasting of business models. Only one big oil and gas company has shifted entirely into renewable energy: Denmark's DONG Energy (now Ørsted).[83] Much of the IOCs' strategy for net zero consists of continuing to extract oil and gas while engaging in carbon offsetting and CCS (the latter with an eye on using old and empty oil and gas wells to sell CCS to high emitters such as steel and concrete producers).[84] Most of the IOCs now have portfolios of renewable assets, with TotalEnergies being the most ambitious. But BP and Shell have flip-flopped over their commitment to renewables and have shifted back to prioritizing increased dividends and share buybacks.[85] The industry's investment in low-emissions energy sources averages less than 5 per cent of its upstream, according to the IEA.

The biggest IOCs control around 14 per cent of global gas reserves and 12 per cent of global oil reserves.[86] The IOCs operate right across the developing world, and how they position themselves on the energy transition impacts especially on the newer producers such as Guyana and Mozambique—where they are the sector's principal investors—as well as in SSA more generally. During the pandemic, when oil prices collapsed, they pulled back on new investments in older and high-cost fields such as those in Angola but reengaged after 2021 as the West sought to replace Russian oil and gas.

However, while the biggest IOCs command most media attention, it is the NOCs which control the bulk of global oil and gas assets, over US$3 trillion. Their businesses focus mostly on assets in their home countries (though some,

[81] www.globalmethanepledge.org.
[82] Wood Mackenzie (2022).
[83] https://orsted.com.
[84] Norway is a CCS pioneer, encouraged by licensing requirements and emissions taxes. CCS has not progressed much in the developing world beyond a few projects in China, Malaysia, and North Africa. Perhaps encouraged by carbon pricing and regulation, empty reservoirs could one day become more valuable than those still full of (stranded) oil and gas, with CCS becoming the core business of companies in the sector. By facilitating greener manufacturing, especially in such high-emissions industries as aluminium, concrete, and steel, CCS encourages deeper linkages from the oil and gas industry to the wider economy. However, numerous technological challenges remain, not least those of geology. One of the largest CCS projects, Chevron's Gorgon LNG project in Australia has yet to meet its target of 80 per cent CO_2 capture.
[85] Shell has invested in India's renewable power company Husk Power Systems.
[86] IEA (2020: 20–21). In addition to the biggest IOCs (often referred to as 'Majors'), the 'Independents' control 22 per cent of global oil reserves according to the IEA.

notably Malaysia's Petronas, have grown their overseas operations).[87] The NOCs vary considerably in their scale and technical capacities (see Box 8.3). They also vary in their strategies for net zero (if they have one). The largest, Saudi Aramco, is investing billions in renewables, especially solar and hydrogen (with plans to produce green hydrogen using solar energy), though this is exceeded by its vast oil and gas operations. Further down the scale, Colombia's Ecopetrol is also moving into renewables, encouraged by the government's diversification strategy (see Chapter 5). So is Malaysia's Petronas. These larger NOCs have the managerial and engineering experience to execute very large renewable energy projects at scale, but whether renewables will ever come to dominate their asset portfolios is debatable—as it is for the IOCs. Certainly, some NOCs have become as adept as the IOCs in using modest investments in renewables together with well-crafted net-zero messaging (greenwashing) to manage public relations—as COP28 in Dubai demonstrated yet again.

Box 8.3 National oil companies

NOCs vary considerably in scope: some directly run most of the operations to extract oil and gas (though often collaborating with private companies or buying in their services), while many of the smaller ones oversee, and collect revenues from, private companies that undertake the bulk of the operations. Moreover, governments have often looked to NOCs for delivery in other areas as well, notably infrastructure construction and sometimes health care.

NOCs receive mixed reviews. From a government perspective, they seem to represent an ideal institution for optimizing the revenue flow from oil and gas for the nation: one that is directly answerable to the state. And in countries with mostly weak government institutions and limited skills, they may be one of the few that can reliably implement projects. However, in running production operations, and when compared to private companies, NOCs can be less efficient, less technologically advanced than IOCs, and less disciplined in their capital expenditures. They are prone to over-staffing and sometimes corruption: all resulting in less, not more, revenue for the exchequer. Examples of NOCs suffering from all or some of these faults include Angola's Sonangol, Mexico's Pemex, and Venezuela's PDVSA.

The NOCs usually cited as more successful include Malaysia's Petronas, Saudi Aramco, and Norway's Equinor. They have maintained vigorous exploration programmes, delivered strong returns on their investments, cut reliance on costly private partners, and encouraged a technocratic class of engineers and

continued

[87] On NOCs, see Heller (2018) and Manley et al. (2019).

continued

managers. Brazil's Petrobras would, until the 'car wash' corruption scandal, have been placed in the 'successful' category, but it now illustrates how NOCs can too easily be derailed by patronage and corruption. NOCs are vulnerable given their positioning at the intersection of public policy, commercial ambition, massive economic rents, and networks of established elites.[88] This is exacerbated by a tendency to non-transparency: only a minority publish full information about their finances and operations.[89]

In sum, NOCs can and do play a valuable economic role. But they need strong oversight and accountability, not least to ensure that they contribute to, and do not impede, swifter energy transitions.

As champions of fossil fuels, NOCs can end up dominating the national energy strategy of their countries by virtue of their market knowledge, technical capabilities, and political influence—hydrocarbons are often the largest single source of public revenue.[90] This risk is increased when the government lacks a clearly defined national plan and when responsibilities for energy and environmental issues are spread across weak public institutions which fail to coordinate (see Chapter 7 on the need for an 'all of government' approach). The dangers include more, not less, fossil fuel investment, under-investment in renewable energy, and a neglect of nature (and the associated economic opportunities this offers, including carbon sinks). Countries that fail to respond to these dangers will then continue down energy and development pathways that risk leaving them increasingly outside a greener global economy.

As global climate action accelerates, the industry faces the challenges posed by the eventual stranding of proven reserves as markets contract and earnings fall below production costs. Simulations by Cambridge Econometrics for IEA and IRENA suggest that the rapid adoption of renewable and energy-saving technologies could strand some US$1 trillion of fossil fuel assets by 2040.[91] This suggests that companies will need to respond by scaling back production, by closing wells, and by either diversifying into renewables and carbon capture or shrinking (perhaps returning capital to their shareholders).

Yet today, the industry continues to invest in oil and gas despite the IEA's warning that this will cause the 1.5°C climate target to be exceeded.[92] Companies do

[88] In Myanmar, for instance (Heller and Delesgues 2016).

[89] Some 62 per cent of the NOCs reviewed by Heller and Mihalyi (2019: 5) had 'weak', 'poor', or 'failing' performance on public transparency. See NRGI's database on NOCs: https://resourcegovernance.org/publications/national-oil-company-database.

[90] Jensen (2023). See also Heller and Mihalyi (2019) and Heller and Manley (2019).

[91] IEA and IRENA (2017).

[92] IEA (2021, 2023d).

so based on scenarios in which demand growth remains robust (as discussed in Chapter 2). Nonetheless, the industry's oil and gas investments face an increased stranding risk if revenue streams do not match expectations.

In principle, private capital markets shoulder the risks of private investments, but financial regulators are increasingly concerned about the impact of stranding on financial stability (and by implication the public finances if lenders need to be bailed out). As global operators, the IOCs can reduce risks by shedding assets (those with the highest production costs but also assets with the highest scope one and two emissions, which are vulnerable to tighter carbon pricing).

By contrast, the NOCs face bigger risks from stranding as they have a much more concentrated asset base than the IOCs. NOCs such as Mexico's Pemex and Venezuela's PDVSA are highly indebted, with their bonds trading at hefty discounts.[93] Pemex has US$110 billion in debt, and the Mexican government is expected to set aside US$8.2 billion to help it meet US$11.2 billion repayments in 2024.[94] The potential for default by highly indebted NOCs (in the event of earlier than expected stranding leading to revenue disappointments) poses a risk to domestic financial systems and a fiscal risk if the domestic and foreign borrowing is government guaranteed (either explicitly or implicitly, as is likely given that many NOCs are deemed 'too big to fail').

As the global net-zero transition accelerates, the producers to be 'the last left standing' are likely to be in the Gulf region, by virtue of their massive reserves and low production costs—'to drill every last molecule', as Saudi Arabia's energy minister bluntly stated.[95] The Kingdom is promoting the (as yet) untested idea of a 'circular carbon economy' (sequestration, offsetting, etc.). Governments with smaller reserves and much higher production costs (and higher per-barrel emissions) may conclude that they should start winding down production sooner rather than later. Rather than allowing their NOCs to retain revenue to fund new oil and gas investments, using the funds elsewhere—for example, to invest in the nation's renewable resource base—may become a better strategy for governments.[96] However, most NOCs will be inclined to defend their existing business models which focus on oil and gas. They have considerable political capital (built up over decades), and many governments will be reluctant to shrink what has traditionally been a reliable cash cow for the exchequer—all factors which work against taking determined and early action to change course.

[93] *Petroleos Mexicanos* and *Petróleos de Venezuela, S.A.*

[94] 'Mexico's $8bn Backing for Pemex Leaves Problems Unresolved, Say Bondholders', *Financial Times*, 12 September 2023.

[95] Prince Abdulaziz bin Salman quoted in Javier Blas, 'The Saudi Prince of Oil Prices Vows to Drill "Every Last Molecule"', *Bloomberg*, 22 July 2021. Aside from its low production costs, Saudi Aramco's pitch to investors, when it was partly privatized in 2019, emphasized its low emissions (scope one and two) per barrel compared to other producing nations and companies.

[96] Manley and Heller (2021).

8.7 Conclusions

Running a company—whether in private or public ownership—no longer amounts to just finding the oil, gas, or mineral, extracting it as efficiently as possible, and then selling it at the best price. There are now multiple environmental and social standards that must also be met. Additionally, all companies must position themselves on the energy transition with clear actions to drive down their own emissions (scope one), those of their suppliers (scope two), and, the very hardest part, those of their customers (scope three). It is certainly much harder now for companies, whether public or private, to act in a vacuum separated from the national development and climate strategy. The best companies have increasingly aligned with these national goals and the UN's SDGs, at least in their public statements. This chapter has highlighted ways for them to deliver more, especially by working in partnership with government to deliver the structural transformation of economies.

The evidence on what companies have actually achieved thus far is mixed. It certainly reveals some positive initiatives by companies—and we have highlighted a few—but there remain many question marks. In part these gaps in our knowledge arise from the huge diversity of companies themselves, and the concentration of much of the available evidence on a small number of the larger and therefore more visible companies among them. Responsible companies would do themselves a favour, at a modest cost, if they worked more actively with governments, civil society, and researchers to build a solid evidence base on their development impact, both at local and national levels. This approach would also appeal to ESG investors in helping them differentiate the good companies from the bad.

That said, the toughest countries for companies are the ones in which host governments are ineffective and divisive: in those situations, any positive development impact may at best be confined to local, small-scale community projects. Unfortunately, divisive and ineffective governments also attract the very worst companies—either foreign or established by state actors themselves. But in poorer countries in which the political leadership is committed to inclusive development, there are good prospects for companies to contribute more, and as state capacities deepen it then becomes possible to partner with national and local governments to deliver much greater impact.

At the start of 2020, ESG and climate looked set to dominate the attention of chief executives and boards in the decade ahead. And then COVID-19 struck, upending the global economy and commodities markets. An unsteady post-pandemic recovery (still ongoing in China, the principal market for many commodities), with central banks struggling with a resurgence in global inflation, then took a further knock from Russia's attack on Ukraine in early 2022. This has accelerated a reconfiguration of global trade and investment flows, which was already evident in a deterioration in the West's relations with China and Western

alarm at China's growing presence in critical minerals extraction and refining. We have entered a new era in geopolitics which looks set to reverse at least partially the globalization of business that has driven corporate strategy over the last three decades. How chief executives and boards deal with such shocks, and simultaneously reposition themselves for a global net-zero economy, will determine whether their companies thrive, or indeed survive, in the years ahead.

9
Values, Knowledge, and Interests

9.1 Introduction

Books of this kind often argue for some grand plan for global action. One common proposal is to allocate the world's remaining carbon budget to the LICs, including to their extractive industries, allowing them to continue using fossil fuels for their own energy needs, including ending energy poverty, as well as a revenue source to fund their SDG commitments. We have avoided offering the reader such grand plans. Others are better placed to make the case than we are. Specifically, there already exist processes, notably the annual UN COPs, at which these issues are exhaustively discussed. They constitute an appropriate way to agree upon global action to end poverty while protecting nature—the theme of our book.

Instead, this book provides a set of pragmatic recommendations, grounded in a variety of real-country experiences, that can lessen (but certainly not eliminate) the tensions between the imperatives to end poverty and protect nature. In doing so, we have tried to place ourselves in the position of leaders in the Global South as they juggle many competing objectives often in the context of very limited fiscal space; often with limited technical capacity; often disappointing international assistance; and invariably with limited financial support. Moreover, we have tried to take the perspective of those chief executives and boards of companies who wish to act responsibly in helping country partners achieve their development goals, as well as the net-zero transition, both nationally and globally. Our approach therefore recognizes explicitly the constraints under which Southern governments operate, as well as the potential to better harness corporate and public action together.

Our recommendations constitute suggestions to be considered by decision-makers, and not general prescriptions: every country must work those out for itself, as each has a unique history and potential trajectory towards greater prosperity. Nor is it possible to cover all the component policy issues in a short book such as this. So, the emphasis is placed on a sub-set of issues that seem to us to be the most important, or where we feel able to offer a somewhat different perspective to that found elsewhere.

To end our book, we now organize the over-arching issues under three headings, namely *values*, *knowledge*, and *interests*, and discuss each briefly in turn with the aim of providing the reader with some final food for thought.

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9.2 Values

Whichever way we define poverty, we can surely all agree that ending poverty must be a central goal of national and international action. Indeed, its primacy as a global goal is signified by 'No Poverty' being the first of the 17 SDGs (which succeeded the Millennium Development Goals (MDGs) in which 'eradicating extreme poverty and hunger' was the first of 8 goals). Ending poverty has long been an agreed moral value.

Protecting nature is, however, more contentious as a value. Do we see nature as *instrumental* to human well-being—as a source of livelihoods—implying that we value nature insofar as it contributes to the creation of more prosperous societies (and thus damage to nature endangers human well-being), or does nature have an *intrinsic* value, irrespective of whether it contributes to human well-being? For example, do we value the oceans primarily as a source of livelihood, food, and perhaps critical minerals—or do we value the oceans as a habitat for their wonderful diversity of creatures and habitats, irrespective of their utility for humanity?

Responses to the question we pose about nature will vary depending on each individual's moral values and beliefs but will undoubtedly be influenced by where they sit in the hierarchy of global prosperity. Those who face a daily struggle for survival might be expected to adopt a more instrumental view of nature, especially when starvation threatens. Near at hand forests are more likely to be seen as good sources of firewood than as valuable carbon sinks. Yet equally, many of the world's poorest people with close connections to the local natural world—and stretching back generations—often husband those resources sustainably; not only because they constitute a source of long-term livelihoods but also because the communities have deep cultural and even spiritual connections to the natural world around them. Those who are wealthier can undoubtedly afford to take a view of nature that values it more for its intrinsic than its instrumental worth. But this is not always the case. Indeed, wealthier societies continue to inflict the most damage on nature: they are the largest per-capita polluters with the largest per-capita emissions.

Development policy over the last 70 or so years, and especially in its early decades, tended to take an instrumental view of nature: resources are there to be used to increase prosperity—local environmental damage (let alone emissions) were of secondary concern. Nature was undervalued, as it mostly still is. This bias against nature and its renewable resources is evident in the long-standing subsidies and incentives which are still provided for the extraction and use of non-renewable resources. Ending poverty came well ahead of protecting nature in the values that framed development thinking from the 1950s onwards—and still does in many policy circles.

For some commentators, given the destruction of the natural world (which becomes existential if climate change goes unchecked), the inevitable conclusion is to downgrade economic growth as a policy objective—perhaps even to pursue

'degrowth'—and to try and achieve the end of global poverty by some other means. Often this entails proposing a wholesale redistribution of wealth and income from the Global North to the Global South, or some such grand plan. Reverting to a pre-industrial style of life is another utopian favourite.

We take a somewhat different view. While we strongly agree that development must be about much more than merely increasing per-capita income—human development has many dimensions not captured by GDP—we also hold the view that economic growth is an essential dimension of development. This is not least because it yields an enlarged tax base that can be used to advance the fight against poverty by paying for more education, health care, and other public services that enhance human development. Utopian degrowth can never provide this.

Moreover, it is the *quality* of growth that matters. Building more diversified and resilient economies helps improve livelihoods and, if done in the right way, adds to the opportunities available to society's poorest (for example, by improving their productivity). There is, for example, surely much merit in helping a smallholder farmer increase their output and their family's food security—all outcomes that add to measurable economic growth. It is hard, and for many people unacceptable, to be anti-growth in societies with millions of citizens who need an income merely to get them above the poverty line, let alone to enjoy the wealthy world's level of prosperity.

For these reasons, we have never met a policy-maker in the developing world who holds a no-growth position. Neither do most believe that transfers from the Global North alone can ever substitute for their nation's own efforts to increase the prosperity of its citizens. Moreover, aid 'fatigue' together with evident tardiness on climate finance (not least the shortfall on the US$100 billion per annum promised as far back as 2009) add to their wariness regarding yet more promises that lack real credibility.

Consequently, for many of the South's political leaders, ending poverty still ranks above protecting nature in their value systems. If they have coal, oil, and gas, then there is a strong argument—from their viewpoint—to use these to end energy poverty (while increasing the share of renewable energy if funds allow). And why not also export them to earn valuable foreign exchange and obtain tax revenue—to a world still hungry for such resources (especially gas)? Given the scale of national poverty in so many countries, it is understandable why their leaderships prioritize poverty, including energy poverty, ahead of the climate. For the smaller countries this is reinforced by their small shares of current emissions. As Uganda's President Museveni said bluntly just before COP26: 'Africa can't sacrifice its future prosperity for Western climate goals.'[1]

[1] Yoweri K. Museveni, 'Solar and Wind Force Poverty on Africa', *Wall Street Journal*, 25 October 2021.

As this book has documented, the energy transition must be fed by increasing supplies of minerals and metals, much of which cannot be supplied from recycling and reuse. This represents a significant new opportunity for poorer countries, and we have focused on increasing connections to the rest of the economy. The developing world is now the main home for much of the world's mining, given the Global North's general reluctance to invest in any new mining at all. This is already leading to unprecedented levels of investment in the Global South, and especially to more companies willing to invest in LICs which otherwise receive little investor interest. Again, Southern governments are less cautious about the risk to polluting nature given their concern for prosperity (noting, as we have discussed in this book, that 'green mining' is feasible, thereby reducing the risks).

In sum, the poverty of the Global South often leads to values and so choices that put prosperity before nature—especially when funds are tight. Yet, as Chapter 3 emphasized, there are risks in continuing down a fossil fuel pathway for domestic energy generation. Many African policy-makers are still betting on an East Asian development-energy model—underpinned by fossil fuel energy, especially coal—which yielded unprecedented growth over the last 50 years, notably in China and South Korea. Behind this strategy is a hope that the advanced economies ('The West' and increasingly China) will achieve net zero on target, leaving enough of the remaining global carbon budget for the late developers. But such a route puts Africa at a disadvantage in participating in GVCs that are turning increasingly green (and of which East Asia is now taking full advantage). These green GVCs are not just in manufacturing but also in agriculture and services. The fully decarbonized economies (the 'green leaders') will be increasingly averse to importing from the less decarbonized but poorer economies (the 'green laggards').

Countries that derive significant foreign exchange earnings and public revenues from the export of fossil fuels are vulnerable to the eventual stranding of those assets, with smaller and higher-cost producers likely to be stranded first. This poses a special risk to NOCs, as discussed in Chapter 8, and additionally to industrialization strategies that over-rely on downstream processing (as discussed in Chapter 5). These risks are very hard, perhaps impossible, to gauge (see Chapter 3's distinction between risk and uncertainty). Such countries are essentially banking on the hope that there will be enough of an international market for their fossil fuels—and at a price sufficient to cover the cost of production—to maintain their revenue flows (and within a contracting global carbon budget, with perhaps the wealthier nations accelerating their own shift out of exporting fossil fuels to leave enough room for the poorer exporters). The risk is greatest for the exporters with the highest costs of production and the smallest volumes (and those with the highest scope one and two emissions are most vulnerable to carbon border taxes, as discussed in Chapter 7).

To mitigate the risk we recommended, in Chapter 3, adopting a *portfolio approach*: one that supports diversification and gives as much emphasis to renewable as non-renewable natural capital, in order to reduce the overall economic impact of a shock to any single resource's prospects. Of course, the impact of all risks and uncertainties, and not just stranding, would be considerably reduced by guaranteeing ample concessional finance for poorer countries in the event of adverse shocks.

In sum, we should not be surprised if many governments in the Global South continue to follow the well-worn fossil-fuelled development pathways—as producers, users, and exporters of fossil fuels—first pioneered by the wealthier world. Yet if the planet does break through 2°C (we are increasingly unlikely to contain warming to 1.5°C above pre-industrial levels, the target that guided much of the formulation of the Paris climate agreement), greater prosperity—including attempts to end poverty—will be undermined by weather shocks of increasing magnitude and severity. Not least, increasingly any revenue saved by countries will need reallocating towards infrastructure for mitigating climate's impact (e.g., flood control) and to disaster relief dealing with the damage to communities and infrastructure from drought and storms.

Fundamentally, the Global North together with China and the wealthier Middle East need to provide the poorer Global South with the finance and technical support necessary for them to achieve rising prosperity based on a very different development model to that successfully pursued by the advanced economies (including the East Asia region more recently). This new model must be based on renewable energy, green mining, and investment in non-renewable resources alongside an eventual—but preferably early—phasing out of fossil fuels in both production and use as the remaining global carbon budget shrinks.

Without such support, the poorer countries are faced with too narrow a range of choices and their governments will be under pressure to put ending poverty ahead of nature—one value trumps the other. This is not only bad for the Global South—the destruction of nature eventually destroys valuable livelihoods—but also for the world as a whole: losing valuable species, biodiversity, and carbon sinks as well as the continued growth of emissions. Nevertheless, as bad as it is, this does enable political leaders to offer some hope to poorer citizens. They can vote, whereas the yet-to-be born cannot—and it is the latter who will bear the full brunt of a warming world.

Political leaders in the Global South are as aware of these political facts as are their peers in the wealthy Global North. The difference between the former and the latter is that Northern politicians can call on a bigger tax base and therefore have less need, in principle, to subordinate nature to prosperity in domestic policy. But Northern politicians and voters need to be aware that given the growth in material demands of the poorer Southern nations (see Chapter 2) and their difficulties in transitioning to net zero, it is the poorer world that will increasingly eat into the

remaining global carbon budget. The older wealthier world—and now China and the Gulf region—therefore has a self-interest (let alone a moral one) in helping the poorer world achieve the energy transition and put an end to poverty.

9.3 Knowledge

The knowledge base underpinning resource policy is now substantial. For the extractive industries, a strong prescription emerged by the millennium, namely that the main task was to maximize transparency over the generation of economic rents, tax those rents efficiently without curtailing investment, and then spend the resulting revenue on public services and infrastructure with the most benefit for growth and poverty reduction. This agenda was motivated in large part by the anxiety to limit tax evasion by companies, but also the misuse of available revenues by some governments. The hard-won institutional innovation of EITI and other transparency mechanisms was the result, as discussed in Chapter 6. This was also well aligned with the increased emphasis in development policy, and among donor organizations (both official and philanthropic) and civil society (both national and international), to build more effective, better-governed development states that would be accountable to citizens and capable of delivering on the goals of the MDGs, and subsequently the SDGs (discussed in Chapter 7).

These policy prescriptions remain highly relevant, and the numerous initiatives to help achieve them continue to grow. The transparency agenda itself has had some success, although it has sometimes resulted in one step forward and two back when hard-won reforms are reversed—an outcome all too evident in fragile states. Nevertheless, there now exists a much-improved stock of knowledge about the institutions and mechanisms available to improve the transparency and management of resources. In parallel with this there is a similarly strong body of knowledge and experience about the methods needed to manage the macroeconomic dimensions of resource revenues and thereby reduce the risks of the downsides (such as 'Dutch Disease' discussed in Chapters 3 and 7). In particular, governments can now draw upon considerable international expertise from such bodies as the IMF and the IGF, albeit with some countries still needing further support to build their own analytical capacities.

Moreover, we now have decades of experience—of both success and failure—about what it takes to build more diversified economies (see Chapter 5), an essential ingredient of any successful resource-led development strategy. While the lessons of experience must be adapted to each country's circumstances, and also a constantly evolving global economy, policy-makers have available to them a rich fund of knowledge about what works in enterprise development, investment promotion, skill formation, and other related matters (Chapter 5 offers numerous examples).

Another key area for the effective use of resource revenues relates to investment decisions. In particular, poorer countries would benefit in many cases from a deepening of their capacities in project evaluation, in both local and national governments, in order to weed out the risky low-return or even white elephant projects in favour of those that can generate high returns and positive outcomes for development goals. Again, there is now a large and accessible knowledge base on project appraisal in the public sector on which to draw. Applying such knowledge and building the necessary institutional capacity can reduce the risks of development failure (discussed in Chapters 3 and 7 in particular).

These measures can together enhance the prospects for more successful public–private partnerships (another theme of Chapters 5 and 8). This book has argued that successful resource-led development is more likely when there is a solid base to public institutions, with which companies can work to achieve greater development impact and improve their own social licence to operate (as discussed in Chapter 8). The very large and diversified global population of mining and oil and gas companies now includes an increasing number that are seriously committed to social and environmental responsibility in their host economies as a core corporate value. Commercial and social objectives generally are increasingly aligned because of shareholder and investor pressures. Again, this book has shown that both governments and companies can now draw upon a large body of practical country experiences and much in-house expertise and knowledge on what works created by industry organizations such as the ICMM and described in Chapter 8.

Yet there are more ways that companies can increase their own positive development footprint, as Chapter 8 also emphasized. There is still a big knowledge gap that companies can fill, to increase their ability and that of other stakeholders such as community organizations, to deliver greater development impact. Especially useful would be more and better comprehensive/rigorous assessments of the development impact of projects in the extractive industries, including their wider *indirect* impacts on the local and national economy (impacts which, as Chapter 7 highlighted, can well exceed the *direct* effects of the investments themselves). This implies a more systematic collection of data on living standards at a project's inception, to provide a good quality baseline, followed by regular (panel data) surveys during any project's lifespan to understand its social and environmental effects. Companies could greatly help themselves by contributing to funding such work and to independent data collection and its analysis. We already have some good country examples and decades of experience on how to rigorously undertake both quantitative and qualitative poverty studies. So much of the disputation arising between communities, governments, and companies would be reduced if there was a solid and objective base of facts around which to organize an informed discussion and resolve any disagreements—thereby helping create a consensus on an effective way forward.

In sum, there has been considerable progress in recent decades in our knowledge, from a social science base, about the development role of the extractive industries, though there is still much to do. But the extractive industries are just one component, albeit a very important *non-renewable* component of the resources economy. The resources economy as a whole also includes significant *renewable* resources which (as we have emphasized in Chapter 3) offer considerable opportunities to create new materials and energy sources that can have substantially lower environmental footprints than those we use today. Materials science is central to the twenty-first-century resource economy, and its pace of discovery offers us some much-needed hope for reducing the tension between ensuring prosperity for all of humanity and the demands on the world's resource base that this implies (the tension between ending poverty and protecting nature being the core topic of Chapter 2).

New scientific and technological knowledge also offers us the prospect of reducing the environmental footprint of the extractive industries. This includes the emissions associated with current technologies for turning ore into metal. Such progress could finally deliver the green metals (especially steel and aluminium) which are cost competitive with the already installed industrial base. Those countries blessed with energy resources such as geothermal and hydropower, or with the ability to install large-scale wind and solar systems, can then benefit through the creation of new industrial clusters—from refining to manufacturing—enabling them to better integrate into the global green economy. And cheaper and more effective technologies to monitor pollution and emissions are becoming widespread. The use of satellite data to locate and measure emissions from individual gas flares and vents from oil and gas infrastructure (discussed in Chapter 7) offers immediate opportunities for the sector to contribute to the Global Methane Pledge announced at COP28.

Yet technological advance needs to be recognized for what it is: a two-edged sword. Technology can, for example, drive down the cost of oil and gas discovery and exploitation, allowing new wells to be opened even if prices do weaken, and making possible the extraction of more oil and gas from older wells which would previously have been capped as uneconomic—thereby delaying the onset of stranding and the deceleration of emissions growth. Carbon pricing and regulation on emissions (embracing scope three emissions and not just one and two) is necessary to tilt the balance further towards technological development that favours renewables (and especially to incentivize cheaper technologies to store energy from wind and solar generation).

Furthermore, scientific advance can upend the fortunes of countries by shifting the markets for individual minerals when cheaper alternative materials are invented (Chapter 3 discussed the uncertainties and risks). Those with reserves of critical minerals in high demand but whose supply is limited can become complacent: their revenues can be vulnerable to new scientific breakthroughs that

offer cheaper materials substitutes which are less expensive to extract and refine and less polluting (with the better alternatives created from renewable rather than non-renewable sources: the point of our lignin example in Chapter 3).

Technological advance also risks driving a further wedge between the Global North and the poorer Global South unless the latter is enabled through much-improved funding and technical assistance to accelerate its *adoption* (and to eventually participate more fully in its *creation*). As Chapter 2 outlined, Africa in particular is using too little of its wind power and other renewable energy resources. And as Chapter 7 discussed, the adoption of EVs has barely begun on the African continent. So, there is a real danger of Africa being left on what was the twentieth-century technological frontier, with fossil fuels continuing to dominate its energy generation and transport—while simultaneously the continent provides ever-more of the minerals required by the twenty-first century's clean energy and transport technologies. Today's wealthy world, together with the most dynamic emerging economies, will then be on the twenty-first-century technological frontier, with all of its benefits for prosperity, while Africa languishes well behind, unable to completely end poverty, not least by generating better livelihoods through participation in the new global green economy.

9.4 Interests

The relationship of societies to the natural world is shaped not just by our values and advances in knowledge but also by our *interests*. Simply put, different groups differ in their preferences over how society and the economy should be organized—including over the resource sector (both renewables and non-renewables). Change will be either promoted or opposed by those with much to gain, or much to lose, including over their access, control, or ownership of natural capital in all its forms. This can lead to conflict which in peaceful societies is channelled into long-standing and carefully nurtured processes and institutions for debate and perhaps eventual resolution. In fragile states, defined by weak institutions, dispute is often instead settled at the point of a gun—resulting in the violent transfer of ownership of resources from the weaker group to the more powerful. The history of humanity's relationship to resources has been repeatedly characterized by such conflict, sometimes violent, and invariably driven by the value of those resources to livelihoods, wealth accumulation, and ultimately political power.

Transformation—of economies, states, and companies—has been a thread running through this book. As economists, we see the merit of such change (via the 'reform' of policies and institutions) whenever logic or evidence tells us that it is for the social good. But we do so knowing that whether reform is initiated and then sustained very much comes down to the balance of competing interests

in society, and how these inform and influence the power structures that determine whether desirable change occurs or not (and indeed whether policies and institutions instead change for the worse).

There may be considerable but neglected opportunities for revenue, foreign exchange, and—with judicious, well-planned investments—economic diversification that the investments and resource revenues can potentially catalyse. But these opportunities may be blocked by strong interests, and moving ahead often depends on assembling a more powerful political coalition for change. Therefore, each country, as this book has emphasized, must work out its own route to success—and while countries can certainly learn from each other, applying the lessons is as much a political art as a technocratic endeavour. This is particularly true of the thorny questions of transparency, corruption, and theft discussed in Chapter 6. Something similar, it may be said, applies to the transformation of companies, discussed in Chapter 8, for each has a unique history which is embedded into corporate practices—and which can then be highly resistant to change.

Nations also have interests, which are in part the result of the balance of power within their distinct societies—and therefore tend to change as power shifts domestically. When nations share fundamental interests, cooperation comes more easily—but conflict, sometimes violent, is always possible between those that do not. The resulting geopolitics in turn reshapes the global economy when it alters the flows of trade, investment, and finance—and those flows will adjust when the relationships between nations change. For more than 30 years the most powerful theme for discussing how to organize the world has been *globalization*. Globalization itself was predicated on the reconfiguration of relationships between states emerging out of the end of the Cold War which had severely limited economic interactions between states in competing blocs. This led to intense competition between the Western and Soviet blocs to control access to the natural resources of the Global South while trying to deny access to the competing bloc.

Have we entered a new geopolitical era, as many commentators claim, in which globalization as we have known it is dying—or is at least severely damaged—and one in which the most powerful states, which had for decades achieved closer economic cooperation, now have increasingly divergent interests and whose relationships are increasingly conflictual? Certainly geopolitical (now often termed 'geoeconomic') considerations have returned to the deliberations of company boardrooms, as they think through their long-term strategies for mining, oil, and gas investments and the likely direction of market trends. Policy-makers in the smaller countries of the Global South have a difficult balancing act to perform as they position themselves relative to the competing blocs: do they, for example, favour investments in their extractive sectors from one bloc over the others, and if so, what risks do they face if caught up in a trade war (or sanctions)? Indonesia is, for example, anxious to balance its investments from China in nickel mining, refining, and EVs with its continued desire to export to the US market, while

African nations could be affected by the backwash from any new Western sanctions on trade in Russian gemstones and metals. Finally, the cooperation required to achieve progress at the annual UN climate summits is under considerable stress. This too has implications for the energy transition and therefore for the timing and pace of the stranding of fossil fuels, as well as for the scenarios for future growth in the markets for metals and materials.

9.5 Conclusions

This book has taken its reader across a large amount of terrain, both underground (mines and oil and gas facilities) and overground (meetings of policy-makers, company boardrooms, and poor communities). Their actions and decisions shape our material world as much as the technologies of extraction, with the latter both constraining choices and opening new possibilities when technological breakthroughs occur. The decades ahead will show whether the Global South can reap the full benefits of these and other greener technologies and converge with the wealthier world.

To conclude: we hope that this book has convinced the reader that resources *do* matter. Whether we can end poverty while also protecting nature is *the* central question of our time, and one that must be resolved if humanity is to achieve greater prosperity for all without irrevocably damaging our planet.

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