Asia-Pacific landscape transformations

Solutions for sustainability

Edited by Henry Scheyvens and Binaya Raj Shivakoti

IGES

Asia-Pacific Landscape Transformations

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Editors

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Asia-Pacific Landscape Transformations: Solutions for Sustainability

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IGES is an international research institute conducting practical and innovative research for realising sustainable development in the Asia-Pacific region.

Recommended citation: Scheyvens, Henry and Binaya Raj Shivakoti (eds). 2019. Asia-Pacific Landscape Transformations − Solutions for Sustainability. Hayama, Japan: Institute for Global Environmental Strategies.

ISBN: 978-4-88788-210-2

Cover design: Henry Scheyvens and Binaya Raj Shivakoti. Photos: www.pexels.com

Printed in Japan

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Foreword

The Asia-Pacific region is seeing rapid economic development associated with urbanisation, lifestyle changes and rapid transformations in land use, which is often at the expense of biodiversity and ecosystem services. There is also an accompanying upsurge in resource consumption, placing further stresses on land and natural ecosystems.

This report takes up the issue of unsustainable land use and land-use transformations in the Asia-Pacific region. Land and natural resources have been used in an expendable manner to support economic growth, but this pattern of development is exposing the region to increasing risk and is contrary to the spirit of the Sustainable Development Goals. It is associated with an alarming loss of biodiversity and through the release of GHGs is contributing to climate change. If the region does not move quickly to a sustainable development pathway, it faces a future of much greater climate threats and less resilience because of biodiversity loss, land degradation and resource depletion.

This report provides an overview and case studies of the major landscape transformations taking place. Across the region biodiversity rich forests and other natural ecosystems that provide a wide array of ecosystem services are being converted to plantations, intensive agriculture and urban settlements. Low intensity agroecosystems are being replaced by resource-intensive farming systems, which are degrading soil fertility and ecosystem services. Over two billion hectares of land are now considered degraded. Living conditions in some urban areas have become harsher because of the loss of green spaces, congestion and environmental pollution, while many rural areas around cities are experiencing open dumping of ever-increasing volumes of urban waste and unplanned urban sprawl.

In pointing to solutions, this report highlights the shortcomings of existing sectoral and administrative frameworks for land and natural resource management, and calls for a sustainability transition and inclusive governance arrangements that link stakeholders both vertically and horizontally. It argues that initiatives are needed to both create an enabling environment for sustainable land management and provide direct support to land managers.

It is critical for the Asia-Pacific region to work towards the realisation of decarbonised, sustainable and just societies. Without applying a holistic perspective to land use this will not be possible. I believe that this report will help readers better understand the challenges facing land and natural resource management in the Asia-Pacific region and to think about ways to effectively address these challenges.

Prof. Kazuhiko Takeuchi

President

Institute for Global Environmental Strategies

Acknowledgements

The editors and authors are grateful to the many people who contributed to the publication of this report. We are especially appreciative of the efforts made by external reviewers to provide ideas on how drafts of the chapters could be improved. The external reviewers were Dr. Alice Beban, Massey University (Chapter 2); Prof J.K. Ladha, UC Davis (Chapter 3); Mr. Peter Dam, Forest Management and Product Certification Service (FORCERT) (Chapter 4); Dr. Satoru Okubo, Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organisation (Chapter 5); Dr. Daisuke Terauchi, Toyo University (Chapter 6); Dr. Md. Humayun Kabir, University of Dhaka (Chapter 7); Dr. Tim Cadman, Griffith University and University of Southern Queensland (Chapter 8); and Dr. Tek Maraseni, University of Southern Queensland (Chapter 9). We are also very grateful to Dr. Peter King and Dr. Mark Elder at IGES for painstakingly going through each chapter, pointing out areas where further thinking was necessary and providing ideas for improvement. We thank Ms. Emma Fushimi for the many hours she spent proofreading this report, as well as Dr. Mark Elder and Mr. Matthew Hengesbaug for strengthening some parts of the writing. Ms. Saeko Kadoshima and Ms. Eiko Kitamura provided invaluable administrative support. Finally, we would like to express our appreciation to IGES President Kazuhiko Takeuchi and Executive Director Hideyuki Mori for making resources available for this report and for their continuous encouragement.

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Abbreviations and Acronyms

AFOLU	agriculture, forestry and other land use
APL	other use area "*areal penggunaan lain*" (Indonesia)
ASEAN	Association for Southeast Asian Nations
ATIGA	ASEAN Trade in Goods Agreement
BC	before Christ
BCM	billion cubic metres
BRWA	customary area registration body "*Badan Registrasi Wilayah Adat*" (Indonesia)
CBD	Convention on Biological Diversity
CCDA	Climate Change Development Authority
CCGT	Combined Cycle Gas Turbine
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CF	Carbon Fund (World Bank)
CLUP	comprehensive land-use plan
CO2e	carbon dioxide equivalent
COI	Commission of Inquiry
COP	Conference of the Parties
CP	document prepared for the Conference of the Parties
CRPD	Convention on the Rights of Persons with Disabilities
CSA	climate-smart agriculture
DAL	Department of Agriculture and Livestock
Desakota	peri-urban area ("desa" = village and "kota" = city) (Indonesia)
DIE	German Development Institute
DLPP	Department of Lands and Physical Planning
DoNRE	Department of Natural Resources and Environment
DPI	Department of Planning and Investment
DRR	disaster risk reduction
EIA	environmental impact assessment
EKC	environmental Kuznets curve
ER-PIN	emission reductions program idea note
EU	the European Union
FAO	Food and Agriculture Organisation of the United Nations
FAOSTAT	FAO database of food and agriculture statistics
FCA	forest clearance authority
FCPF	Forest Carbon Partnership Facility
FORCERT	Forest Management and Product Certification Service
FREL	forest reference emission level
FSC	Forest Stewardship Council
FWI	Forest Watch Indonesia

GCF	Green Climate Fund
GDP	gross domestic product
GEO5	Fifth Global Environmental Outlook
GEO6-APRA	Sixth Global Environmental Outlook - Asia-Pacific Regional Assessment
GFW	Global Forest Watch
GHG	greenhouse gas
GIS	geographic information system
GIZ	German Development Agency (Deutsche Gesellschaft für Internationale Zusammenarbeit)
GN-RHL/Gerhan	National Movement of Forest and Land Rehabilitation
GWh	gigawatt hours
GWP	Global Water Partnership
ha	hectares
HA	customary forest "*hutan adat*" (Indonesia)
HCV	high conservation value
HCVF	high conservation value forest
HD	village forest "*hutan desa*" (Indonesia)
HEC-HMS	Hydrologic Engineering Centre's Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Centre's River Analysis System
HKM	community forest "*hutan kemasyarakatan*" (Indonesia)
HL	protection forest "*hutan lindung*" (Indonesia)
HP	permanent production forest "*hutan produksi tetap*" (Indonesia)
HPK	convertible production forest "*hutan produksi yang dapat konversi*" (Indonesia)
HPT	limited production forest "*hutan produksi terbatas*" (Indonesia)
HR	people's forest "*hutan rakyat*" (Indonesia)
HTR	community plantation forest "*hutan tanaman rakyat*" (Indonesia)
IFPRI	International Food Policy Research Institute
IGES	Institute for Global Environmental Strategies
IKAP	Indigenous Knowledge and Peoples' Foundation
ILG	incorporated land group
InVEST	Integrated Valuation of Ecosystem Services and Trade-offs
IPBES-AP	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services for Asia and the Pacific
IPCC AR5	Fifth Assessment Report of the Intergovernmental Panel on Climate Change
IPGCL	Indraprastha Power Generation Co Ltd
IPSI	International Partnership for the Satoyama Initiative
IRENA	International Renewable Energy Agency
ISPO	Indonesian Sustainable Palm Oil
IUCN	International Union for Conservation of Nature
IWRM	integrated water resources management

K	Kina (unit of Papua New Guinea currency)
KH	forest area "*kawasan hutan*" (Indonesia)
KK	partnership forestry "*kemitraan kehutanan*" (Indonesia)
km2	square kilometre
KPA	nature conservation forest area "*kawasan hutan pelestarian alam*" (Indonesia)
KSA	nature reserve forest area "*kawasan hutan suaka alam*" (Indonesia)
Lao PDR	Lao People's Democratic Republic
LCCAP	local climate change action plan
LDCs	least developed countries
LDN	land degradation neutrality
LLDA	Laguna Lake Development Authority
LLDCs	landlocked developing countries
LOCs	landowner companies
LSS	land settlement scheme
m3	cubic metre
MBT	mechanical biological treatment
MDF	medium-density fibreboard
MDGs	Millennium Development Goals
Mha	million hectares
MK	constitutional court
MMBtu	million British Thermal Units
MoEF	Ministry of Environment and Forestry
MOEFCC	Ministry of Environment, Forest and Climate Change
MOEJ	Ministry of the Environment, Japan
MWh	megawatt hour
NARAP	Revised National REDD+ Action Plan
NARBO	Network of Asian River Basin Organisations
NBS	nature-based solutions
NCP	nature's contributions to people
NDC	nationally determined contribution
NFMS	national forest monitoring system
NGO	non-governmental organisation
NPM	new public management
NPV	net present value
NTFPs	non-timber forest products
OFID	OPEC Fund for International Development
OPEC	Organisation of the Petroleum Exporting Countries
PC	principle component
PCA	principle component analysis
PHES	payment for hydrological ecosystem services

PIAPS	indicative map of social forestry area "*Peta Indikatif Areal Perhutanan Sosia*" (Indonesia)
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forestry Authority
PNRPS	Philippines National REDD+ Strategy
PPP	purchasing power parity
PRAP	provincial REDD+ action plan
PRPTE	rejuvenation, rehabilitation and expansion of export crops "*Peremajaan Rehabilitasi dan Perluasan Tanaman Ekspor*" (Indonesia)
PRTF	provincial REDD+ task force
RAJUK	Capital Development Authority (in Dhaka, Bangladesh)
RDF	refuse-derived fuel
REDD+	reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
RF	rotational farming
Rio+20	United Nations Conference on Sustainable Development, Rio de Janeiro, Brazil, 2012
RPJMN	national mid-term development "*Rencana Pembangunan Jangka Menengah Nasional*" (Indonesia)
RSPO	Roundtable of Sustainable Palm Oil
RURBAN	Partnership for Sustainable Urban-Rural Development
SABL	special agricultural and business lease
SAMOA	SIDS Accelerated Modalities of Action
SDGs	Sustainable Development Goals
SDM	Satoyama Development Mechanism
SE4All	Sustainable Energy for All (SE4All)
SEI	Stockholm Environment Institute
SEPLS	socio-ecological production landscapes and seascapes
SES	social-ecological system
SIDS	small island developing states
SIS	safeguards information system
SRAP	East Kalimantan's provincial REDD+ action plan
SRWMC	Santa Rosa Watershed Management Council
Taka	unit of Bangladesh currency
TB	hunting park "*taman buru*" (Indonesia)
TCSSP	Tree Crop Smallholder Sector Project
TDR	transfer development rights
TFP	total factor productivity
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development

UNDP	United Nations Development Programme
UNEA	United Nations Environmental Assembly
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commission for Refugees
UPLB	University of the Philippines Los Baños
US	United States
USD	United States dollar
VOP	village oil palm
WBCSD	World Business Council for Sustainable Development
WEFN	water-energy-food nexus
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund

Executive Summary

Unsustainable land use threatening regional prosperity and security

The Asia-Pacific region faces a fundamental dilemma. Over recent decades the region has achieved tremendous economic growth that has lifted millions of its people out of poverty and raised living standards, but in many places the way land is being used to generate this growth is unsustainable. Land has been exploited – growing economies regardless of the costs to biodiversity and ecosystem services. For biodiversity, the impacts are alarming – almost 25% of the region's endemic species are at risk – and threats are growing. For ecosystem services, the impacts are no less severe: over 2,500 million ha of land are degraded, four fifths of rivers are polluted and the region is quickly losing its major terrestrial sinks and stores of greenhouse gases, namely its forests and peat lands. If the causes of unsustainable land use are not addressed with a greater sense of urgency, the consequences will become increasingly severe. Unsustainable land use is driving climate change, and simultaneously increasing the region's vulnerability by decreasing options for adaptation.

This report – "Asia-Pacific landscape transformations – Solutions for sustainability" – was motivated by the stark and rapid changes in landscapes that can be observed across the region and their consequences. It was also motivated by a lack of appropriate visions of sustainable landscapes in policy and decision-making, and the need for better understanding of integrative approaches that can help realise these visions. It argues that a vision of sustainable landscapes can guide policymaking and administration towards more effective cross-boundary management of interdependent ecosystems.

For the reader to have both a regional perspective and an understanding of what can make land-use change a complex and difficult issue to manage, this report includes chapters that provide regional overviews and chapters that provide in-depth case studies. It is directed at a wide audience including policy makers, administrators, funding agencies and land managers and users (government, private sector, communities, households, individuals) whose decisions affect land use and land quality. For governments it provides ideas on how they can include land-use management in their roadmaps for the sustainable development goals. This report will also be of value to students of land-use change, natural resource management, agronomy, urban planning and development studies.

Major types of regional landscape transformations

Of the various major types of landscape transformation that can be observed in the region the conversion of natural ecosystems to other land uses for economic gain is striking. Vast areas of primary forest, mangroves, wetlands and grasslands have been converted, mostly for agriculture, though also for urban, infrastructural and industrial developments. Many of the remaining natural ecosystems have been heavily degraded by unsustainable resource extraction.

Agriculture features heavily in the region's landscape transformations. The expansion of agriculture into areas once occupied by natural ecosystems is one of the most pervasive land-use changes in the region. Most sub-regions experienced a large increase in agricultural area over the past five decades (31% - 59% in Southeast Asia, East Asia and West Asia). In addition to the expansion of

agricultural land, use of existing agricultural land has intensified, especially on fertile floodplains and deltas. Through agricultural intensification, rural landscapes across the region have been transformed from diverse farming systems to much greater uniformity in land use characterised by monocropping, mechanisation, modern irrigation systems and the heavy application of pesticides, herbicides and fertilisers. Agricultural intensification can also be observed in upland areas where traditional shifting agriculture characterised by high crop diversity has given way to intensive monocropping.

With half of its population now living in cities, the Asia-Pacific region can no longer be characterised as rural. A "greying" of landscapes can be widely observed around cities and major transportation links, with the concrete and steel of built-up areas replacing farms, wetlands and coastal ecosystems. Rapid land-use change is occurring around the megacities, where landscapes that were once predominantly rural are now characterised by a mosaic of urban and rural uses.

There are some land-use changes that run counter to the general tendency in the region to transform landscapes for immediate economic gain. These include "greening" of cities and of rural landscapes, where governments have invested in national afforestation/reforestation programmes to rehabilitate land degraded by poor management or unsustainable land cover conversion. Afforestation/reforestation programmes can be found across the region and range from community-based forestry schemes to massive tree planting projects covering millions of hectares in critical watersheds and desert areas. Greening programmes can also be found in cities such as Singapore, Melbourne and Beijing.

Trade-offs of landscape transformations

The transforming of landscapes has underpinned the region's economic growth, but is associated with trade-offs that are often not considered in decision-making and have serious consequences. The harvesting of renewable resources such as tropical timber has contributed to economic growth, but resources have been left depleted and landscapes heavily degraded across millions of hectares due to lack of environmental controls. Expansion in the area under agriculture and agricultural intensification have enabled the region to meet its food needs, but the way in which land is being used in many areas is not sustainable or has high environmental costs. Heavy use of chemicals and irrigation are harming water, soil and biodiversity. Poor land management is leading to land degradation and in some cases land abandonment. Traditional agrobiodiversity, and the rich biocultural diversity that goes with it, is also in decline. Urbanisation and industrialisation have contributed to greater labour productivity, but at the expense of biodiversity and natural ecosystems. The region's rapid urban growth has largely been inefficient and unplanned. Urban sprawl has led to the loss of fertile agricultural land and biodiversity, while urban infilling has reduced biodiversity and ecosystem services in city cores. Through their growing demand for water, food, energy and materials, cities are indirectly contributing to resource depletion and the destruction of natural ecosystems in far-off places. Urban growth is associated with increased consumption of high-protein and energy-dense foods, which raises levels of resource use and intensifies pressure on rural land. Land and water bodies are also being degraded by the region's massive and growing volumes of urban waste, most of which continues to be disposed using open dumping and uncontrolled landfilling. In the short-term, the over-exploitation of resources and the unsustainable use of land have been key factors in the region's prosperity. However, if these practices continue the region risks transgressing the boundaries of a "safe operating space" and eroding the resilience of major components of Earth-system functioning.

Drivers of regional landscape transformations

Landscape change is complex. A wide range of interconnected economic, demographic, technological, institutional and cultural drivers from local to global scales interact over time to shape land-use trajectories. Acknowledging and understanding the complexity and interplay of land change drivers is essential for setting out solutions for sustainable land management.

In the Asia-Pacific region, the underlying drivers of landscape transformation include economic growth, market failure, technological advances, development policies, weak governance, demographic factors (population growth and migration), urbanisation, poverty, insecure tenure and lifestyle changes. Resource depletion and land degradation are the combined effects of these drivers.

In recent decades economic integration and policies encouraging foreign direct investment have made land and resources available to international capital. In the absence of holistic land planning frameworks and strong environmental controls, agribusinesses have emerged as major agents of deforestation.

Urban expansion is another outcome of economic restructuring. Institutional reforms creating opportunities for domestic and foreign private capital, combined with the creation of industrial estates, export processing zones, container ports and other infrastructure facilities, have accelerated urban growth. There are also a set of push factors behind urbanisation. These include extreme weather events, land degradation, a decrease in rural livelihood opportunities due to consolidation of landholdings, and lack of services and educational opportunities in rural areas.

Underlying drivers for planned land conversion to agriculture and agricultural intensification include population growth, national agricultural and land policies, economic growth and transformation, urbanisation, growing private sector investment in agriculture and technological advances. A different set of drivers explains the unplanned encroachment of agriculture into natural ecosystems, which can also be widely observed. These include natural population growth, inward migration, lack of secure land tenure, poverty and lack of alternative livelihood options.

Case studies of rapid landscape transformations

The United Nation's Environmental Programme's *GEO5* highlights monitoring and studying how social and biophysical drivers interact, and the diversity of social, economic and environmental consequences they generate, as an important step to address the growing demands on land. This report aims to contribute to a better regional understanding of these interactions and their consequences through locational studies of several of the key types of landscape transformations observed in the region. The case studies are of areas where IGES has conducted research over several years or more, which helps contribute to understanding the local complexities surrounding land-use change.

1. Conversion of forests to oil palm plantations, Pomio district, Papua New Guinea

In Pomio district of East New Britain province in Papua New Guinea, over 30,000 ha of mostly forested land was made available for conversion to oil palm plantations. This land development is expected to generate local and national economic benefits, but also has serious economic, social and environmental trade-offs. The drivers for conversion include a strong international market for palm oil, policies favouring large-scale land developments, weak governance at all stages and levels of land permitting, weaknesses in community institutions, and lack of support for land-use

alternatives. The solutions lie in a suite of policies that address these drivers. They include development of international markets for sustainable agricultural commodities, reform and proper resourcing of land development processes, strengthening of community institutions, and the provision of extension services that enable local communities to explore land-use options suited to their capacities and institutions.

2. Conversion of Karen traditional rotational farming areas to input intensive monocrop agriculture in northern Thailand

In northern Thailand, Karen farmers are converting areas of land under rotational farming to monocropping of azuki bean and maize. The drivers for this agricultural intensification include the need and desire of Karen households for greater cash income, lack of support to Karen communities for livelihood development and national agricultural policies aiming to increase commercial crop yields. The increasing conversion of Karen rotational farming areas to intensive agriculture has serious trade-offs for biodiversity, terrestrial carbon stocks and other ecosystem services. The loss of Karen rotational farming systems could also impact food security, as they preserve a large number of indigenous cultivars. The solutions lie in providing support to Karen farmers to maintain the multi-functionality of their landscapes. Support can be provided for the development of local businesses promoting the unique products and values of Karen landscapes. The government can also consider collaborative land governance, with the Karen as a key partner.

3. Rural land-use trajectories in East Kalimantan, Indonesia

In East Kalimantan, forestry was the focus of land and natural resource development in the 1970s, but the forests were left degraded due largely to poor monitoring and law enforcement. Efforts turned towards converting land to fast-growing tree and oil palm plantations. Plantations have contributed most to local development when local people have established the plantations themselves, and least when their land has been expropriated for plantation development by companies. In the former case, communities can maintain a variety of land uses, which contributes to their economic security. The provincial government is now promoting REDD+, which means implementing activities that protect or enhance forest carbon stocks. Appropriate REDD+ activities could include support to smallholders for planting and harvesting of rubber and cacao, as well as village forestry and other forms of social forestry.

4. Rapidly urbanising areas: Dhaka city, Bangladesh and the Santa Rosa Watershed, the Philippines

The underlying drivers for Dhaka's rapid expansion include population growth, which is mainly a consequence of inward migration, economic growth and transformation, weak governance and policy bias. The rapid and largely uncontrolled expansion of built-up areas in the Santa Rosa Watershed is associated with its proximity to Manila. Urban growth has contributed to economic development in both case study areas, but it is largely unplanned and has adversely affected the hydrological cycle in both areas. In Dhaka, the draining of wetlands for urban development is threatening the city's water supply. In the Santa Rosa Watershed, the expansion of impervious areas has increased the risk of flooding. The solutions include integration of urban and regional planning strategies, mechanisms to coordinate land-use planning at the watershed or landscape scale, and collaborative processes that engage stakeholders in urban planning.

From degraded to sustainable, multi-functional landscapes: Key messages

- ***Enabling environment for sustainable land management***

Creating sustainable landscapes requires simultaneous efforts to address the underlying drivers of unsustainable land use and support land managers. National population policies must be framed by a long-term perspective. Rapid population growth provides an economic dividend by increasing the working population and reducing the dependency ratio, but increasingly Asia-Pacific countries will experience an aging population. Both rapid population growth and population aging pose challenges to sustainable land use. Fundamental economic reforms are also required to ensure land managers receive signals encouraging sustainable land use, such as better market access and higher prices for sustainable agricultural products. Institutional reforms will be necessary to ensure rigorous environmental assessments and control. Policies in non-land sectors, including investment, banking and finance, need to be strengthened to ensure sustainable land development. Regional and global integration processes have an important role to play, as they are responsible for exposing land and natural resources to larger market forces. They can develop standards, targets and other tools to assist countries in addressing the economic drivers of unsustainable land use.

- ***SDGs as a holistic and transformative framework for land management***

As an organising principle for meeting all human development goals, the UN Sustainable Development Goals (SDGs) provide a holistic frame of reference for making decisions on land-use. The SDGs framework can be employed to identify and assess potential trade-offs and synergies associated with alternative land uses and management practices. For example, the SDGs framework could facilitate discussion of how conversion of a natural forest to agriculture might contribute to food security (SDG 2 – Zero Hunger) but increase exposure and sensitivity to extreme weather events (SDG 13 – Climate Action) and reduce biodiversity (SDG 15 – Life on Land). The SDGs can also be used as an "umbrella" to ensure other international agreements relevant to land – Convention to Combat Desertification, Sendai Framework for Disaster Risk Reduction, Paris Agreement, Aichi Biodiversity Targets, New Urban Agenda (Habitat III), UN Declaration on the Rights of Indigenous Peoples, etc. – are reflected in land-use decisions. National governments can use the SDGs to supplement proven tools like strategic environmental assessment or regulatory impact assessment to ensure land use-policies are aligned towards sustainability. Local governments can use the SDGs as a broad framework to ensure their visions for sustainability are comprehensive and that their land-use plans are aligned with these visions.

- ***Governance for sustainable land use***

Simple technical fixes and sectoral approaches are unable to address the region's complex land issues. Land planners and administrators are unable to cope with the scale, speed and consequences of the land changes taking place. To meet these challenges, governance needs to be adaptive, inclusive/collaborative, multilevel and multi-scalar. Strengthening governance is a long-term process that requires considerable sensitivity to local contexts. With this in mind, multilateral, regional and bilateral development agencies should ensure that land governance is a core area of their work, especially in countries where policy implementation has been consistently weak.

- ***Integration***

Land must be governed in an integrated manner to avoid environmental harm and suboptimal outcomes. This requires horizontal coordination across sectors and administrations, vertical coordination across the different tiers of government and effective engagement of stakeholders.

Previous attempts at integration have often failed to deliver on their promises. Obstacles include vested interests in the status quo of public administration, lack of incentives for integration and lack of understanding on how to implement integrative concepts. The establishment of high-level steering mechanisms with the authority and resources to ensure policy alignment and coordinated planning may help overcome these obstacles. Capacity needs for implementing integrative approaches should be identified and addressed, and the possibility of providing incentives for coordination can be explored.

- ***Sustainable and inclusive cities***

As centres of high productivity and innovation, cities can be sources of solutions for sustainable land management. National urban policies with a vision of sustainable and inclusive cities can guide city development towards these solutions. With Asia-Pacific cities sharing similar challenges and trying out various solutions, city-to-city cooperation can be an effective way to bring new ideas to city governments on how they can work towards such a vision.

Examples in the region show that the protection of urban biodiversity, the creation of green spaces and ecosystem-based solutions can all be included in city master plans and designs. Cities can consist of compact forms with mixed-use areas, pedestrian friendly environments and well-developed public transportation infrastructure. These design elements help avoid the low-density sprawl that results from car-dependent development, while also making cities liveable. Metropolitan spatial strategies can ensure that sensitive areas, the best agricultural lands and natural assets are protected from urban sprawl. Physical improvements to water, drainage and sanitation, and support for waste recycling with health and safety standards in place, can improve the health of slum dwellers, provide new livelihoods, and reduce the environmental impact of slums on their surrounds. Cities can reduce their material and environmental footprints through waste reduction, recycling, efficient transport infrastructure and services, the use of renewable energy, green building codes and other initiatives that reduce greenhouse gas emissions.

For cities to be sustainable, urban expansion must be brought under formal planning processes. In many Asia-Pacific cities this necessitates investments in urban governance and management. Strong urban governance involves multilevel consultation mechanisms among different tiers of government and among adjacent local governments, as well as partnering with communities, civil society and the private sector. Capacity building and resourcing of local governments for spatial planning and stakeholder engagement are also priorities. Where formal planning is difficult, city governments can employ action-planning processes, focusing on critical problems and demonstrable benefits.

- ***Sustainable rural landscapes***

National agricultural policies should be reviewed to ensure they promote sustainable agriculture and not just focus on annual crop production targets. Keys to sustainable agriculture in the region include crop production technologies that promote efficient water use, renewable energy and smart rather than blanket subsidies. Rural extension and financial services may need to be reviewed, adjusted and strengthened to ensure that farmers have the support they need to adopt sustainable agricultural practices. Transformational changes in agricultural production systems will ultimately be

required. An “agroecosystems” approach that combines traditional and local knowledge with new ideas and techniques for sustainable farming can be promoted.

Global and regional responses are needed to create an enabling environment for actions by governments and land managers towards sustainable land management. Various avenues for promoting responsible trade can be explored, including procurement policies, regulatory measures and voluntary certification. To be effective, these initiatives need to target all major commodities with high environmental risks and engage as many countries and companies as possible to ensure they do not merely shift the flow of commodities from discerning to less discerning buyers/markets.

- ***Urban-rural linkages***

Many families in the region are no longer purely urban or rural and economies certainly are not. Proper management of interdependencies and stronger coordination between urban and rural areas can contribute to sustainable land management and spatially balanced economic development. Synergies among urban areas and their peri-urban and rural surroundings can be realised by integrating city and regional plans to ensure coherence between urban and rural development policies. Interactions between urban and rural areas that support sustainable land use can also be promoted. These can include farmers’ markets and urban and peri-urban agriculture. Eco-labelling can also be used to encourage responsible urban consumption of food sourced from sustainable agriculture.

- ***Regional landscape monitoring***

Rapid, complex and profound landscape transformations continue to take place across the Asia-Pacific region. The trade-offs associated with these are enormous, especially for biodiversity and ecosystem services, exposing the region to risks and reducing future development and adaptation options. A regional “observatory” on landscape transformations could make an important contribution to sustainable land management by monitoring and analysing these transformations in terms of their major features, drivers and impacts, and extracting and sharing lessons from initiatives to strengthen land governance.

CHAPTER 1

Introduction

Henry Scheyvens and Tomoko Takeda

Key messages

- *The transformation of landscapes is a key feature of the Asia-Pacific region's great economic transformation. Massive land-use changes have underpinned economic growth, but at the expense of biodiversity and ecosystem services. Unsustainable land use is contributing to global climate change, which is compounding the risks of biodiversity and ecosystem services loss.*
- *Governance arrangements that integrate the interests of different sectors, link planning and decision-making both vertically and horizontally, and provide opportunities and build capacities for stakeholder participation will be needed to promote inclusive economic development without degrading the land and its resources.*
- *A vision of sustainable landscapes can guide policymaking and administration towards more effective management of interdependent ecosystems.*
- *Land change needs to be understood in terms of the generic qualities of the drivers and the place-based, human-environment conditions that shape land change.*

1.1 Introduction

The Asia-Pacific region faces a fundamental dilemma.[1] Economic growth has lifted millions of its people out of poverty and raised living standards, but its economic development patterns are exposing the region to a future of risk and uncertainty. Economic growth has been achieved through resource-intensive development patterns that are destroying biodiversity and ecosystem services, which are fundamental to human wellbeing and human security. Technological advances and engineering feats may be able to compensate for some of this environmental harm, but when the damage is as great as global climate change and when the region could lose 45% of its biodiversity by 2050 (IPBES 2018), the sustainability of its entire economic enterprise is called into question.

Across the region, economic growth has been pursued at great expense to the environment; the approach has been one of grow first, clean up later. To some extent, this is understandable. By the end of the Second Word War, many Asia-Pacific countries found themselves in ruins and even today 400 million of the region's 4.5 billion population continue to live in extreme poverty

[1] This report is concerned with land changes across the Asia-Pacific region, which is comprised of the sub regions of Western Asia, South Asia, Southeast Asia, Northeast Asia and Oceania. It particularly focuses on the concerns of developing countries and takes many of its examples from Southeast Asia, South Asia and the Pacific, where much of the research of the Institute for Global Environmental Strategies (IGES) has concentrated.

(UNESCAP 2017a). However, the idea of grow first, clean up later fails because the resultant loss of biodiversity, ecosystems services and ecosystems resilience all mean greater vulnerability, especially in the context of global climate change.

Land change is the main cause of biodiversity and ecosystem services loss, regionally and globally. Changes in land-use type and intensity have been an explicit objective of governments and can be found embedded in their rural, urban and industrial plans, though in many areas they are also the result of unplanned, disorganised actions. These changes affect millions of hectares of land across the region, from the Himalayan ice fields to the Pacific island atolls.

This report uses the expression “landscape transformations” to capture the scale and profoundness of the transformations in land use and land cover that are taking place. A landscape can be defined as a “geographically bounded area where ecological, social and economic processes interact to produce a distinct mosaic of ecosystems, with its boundaries defined by management objectives” (Scheyvens et al. 2017). This definition underscores the notion that changes in the physical landscape are intimately connected with changes in society and economy. Land, society and economy are transforming together across the Asia-Pacific region. Writing on the experiences in Southeast Asia, Drahmoune (2013, 114) describes the countryside as having been “subjected to dramatic transformations that have swept over or, at times, trickled into, every domain of rural life, and left agrarian societies profoundly altered in their political, social, economic and ecological configurations.” This observation applies equally to other rural parts of the region as well as to urban areas.

From an environmental standpoint, some of the changes in land use and land cover that can be observed are good, e.g. when native vegetation has been planted to rehabilitate degraded areas and agricultural productivity has been increased through improved land management, but many are not. Areas of high conservation value have been lost as a result of the territorial expansion of agricultural land and urban sprawl, millions of hectares of land are degraded because of the intensified use of soils, rivers, lakes and terrestrial ecosystems are heavily polluted, having served as dumping grounds for ever increasing volumes of waste, and renewable resources such as forests and fisheries have been exploited well beyond sustainable rates. At the same time as land is degrading, demands on it are increasing. The United Nations Secretary-General’s High-Level Panel on Global Sustainability warned that 50% more food, 45% more energy and 30% more water will be required by the world’s burgeoning population by 2030 (UNESCAP 2015).

Land degradation has been defined in various ways, leading to large discrepancies in estimates of the scale of the problem. This report broadly adheres to the following definition, which embraces the biophysical factor of land capability as well as socio-economic considerations: “Land degradation is the reduction in the capability of the land to produce benefits from a particular land use under a specified form of land management” (Blaikie and Brookfield 1987).

This report was motivated by a lack of appropriate visions of sustainable landscapes in policy and decision-making, and the need for better understanding of integrative approaches that can help realise these visions. It argues that a vision of sustainable landscapes can guide policymaking and administration towards more effective cross-boundary management of interdependent ecosystems.

Recent regional and global environmental reports recognise unsustainable land-use change as a profound and complex issue and see integrative approaches as a key part of the solution. The *Regional and Subregional Assessment of Biodiversity and Ecosystem services for Asia and the Pacific* published by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem

Services (IPBES) points out that misfits exist between institutions and governance systems and the biophysical dynamics underpinning biodiversity and ecosystem services (IPBES 2018). Institutional jurisdictions are either too small or large for effective management of ecosystems or linked ecosystem services domain. The IPBES regional assessment stresses the importance of integrated ecosystem management approaches that span jurisdictional boundaries for achieving biodiversity conservation alongside other developmental goals such as food security (IPBES 2018). The United Nations Environment Programme's (UNEP) *GEO6 Regional Assessment for Asia and the Pacific* calls for integrative mechanisms that employ new concepts such as green economy and ecosystem-based approaches (UNEP 2016). GEO6 also argues for a collective and inclusive approach to major environmental issues, acknowledging that governance research has pointed out the importance of greater stakeholder engagement, enhanced coordination and integration between different policy areas, and stronger monitoring and accountability mechanisms.

This report highlights the importance of "getting governance right". It discusses how landscape and nexus approaches aim for better inclusiveness and coordination in environmental governance. This report breaks down the landscape approach into its constituents, identifies the challenges it faces and discusses ways of moving from concept to practice. The water-energy-food nexus approach, which helps to build an enabling environment for integrated land management, is dissected in the same manner. In contrast to other studies that view integrated landscape management as an approach just for rural areas, it promotes a landscape approach within regional/territorial planning frameworks that link urban and rural development.

The aims of the report are twofold. First, the report aims to contribute to a deeper understanding of the drivers and impacts of major landscape transformations in the region. The United Nation's Environmental Programme's *GEO5* highlights monitoring and studying how social and biophysical drivers interact, and the diversity of social, economic and environmental consequences they generate, as an important step to address the growing demands on land (UNEP 2012a). This report aims to contribute to a better understanding of these interactions and their consequences through locational studies of several of the key types of landscape transformations observed in the region.

Second, the report aims to identify how land governance can be strengthened in areas where pressures on the land are increasing and where competition between sectors for land and resources are intensifying. Governance arrangements that integrate the interests of different sectors, link planning and decision-making both vertically and horizontally, and provide opportunities and build capacities for stakeholder participation will be needed to promote inclusive economic development without degrading the land and its resources.

The remainder of this introductory chapter introduces the major types of landscape transformations that are taking place in the Asia-Pacific region and discusses their implications for human wellbeing and human security, explains the conceptual framework used in this report, and outlines the content and findings of the subsequent chapters.

1.2 Landscape transformations in the Asia-Pacific region and their implications for human wellbeing and human security

The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) described Asia at the end of the Second World War as "a wasted continent – plundered by colonialism, ravaged by wars of conquest and resistance, depleted by famines, spoiled by millennial systems of injustice, characterised by inequality between men and men, and men and women, and

damaged by the systematic denial of all that makes human existence truly human" (UNESCAP 2014, 11). Though poverty and inequality remain significant issues, the region has transformed itself into the world's engine of economic growth (IMF 2017), leading some to call the 21st Century the "Asian Century" (Rood and Cole 2015). The region's gross domestic product (GDP) per capita more than doubled between 1990 and 2014 (UNESCAP 2017a) and it can boast that millions of its people have crossed the poverty line in recent decades. From 1990 to 2013 the proportion of people living in extreme poverty, i.e. on less than USD 1.90 a day, dropped from 29.7% to 10.3%, and those living in a "vulnerable situation", i.e. on less than USD 3.10 a day, fell from 58% to 32% (UNESCAP 2017a, 18, 19).

The transformation of landscapes is a key feature of this "great transformation". Since the end of the Second World War millions of hectares of forests, wetlands, mangroves and grasslands have been converted through processes associated with urban, industrial and agricultural development. A "greying" of landscapes can be observed where mega-urban areas have sprung up and expanded outwards, replacing farms, wetlands and coastal ecosystems with the cement and steel of mostly unplanned urban development. Industrial and manufacturing industries and other urban activities have replaced agricultural land in the surrounds of the megacities, and the linking of megacities has created mega-urban regions with intermingled land uses that cannot be easily managed by municipal or rural administrations. Elsewhere, new areas have been brought under agriculture by smallholders and investors through the clearance of native vegetation, and land drainage and irrigation. Many rural areas have shifted from farming systems based on traditional practices and indigenous cultivars to more uniform landscapes of chemical-intensive monocropping of a few commercial high-yielding crop varieties. Another predominant landscape transformation is the "greening" of landscapes associated with national forestation programmes aimed at restoring watershed and other ecosystem services in degraded lands.

While the transformation of landscapes is stark in many areas, in others it is subtle, yet no less significant. Subtle transformations can occur when the broad categorisation of land use or land cover employed by planners remains the same, but when there are significant changes in ecosystems associated with land management. An example is the selective logging of primary forests under concessions, as well as the replacement of natural forests with planted "fast wood" tree plantations, both of which can be observed widely across Southeast Asia.

Landscape transformations have underpinned the region's economic growth, but in many cases at the cost of biodiversity and ecosystem services. Expansion in the area under agriculture and agricultural intensification have enabled the region to meet its food needs, but food security is being threatened by the very nature of this land use. Intensified land use is generating greater yields, but in many areas is harming water, soil and biodiversity due to poor land management (UNESCAP 2009). Over 2,500 million ha of land in the region are now degraded and the total area of arable land is declining (Gibbs and Salmon 2015).

Urbanisation and industrialisation have contributed to greater labour productivity, economic surpluses, new employment opportunities and rising incomes and living standards, but at the expense of biodiversity and ecosystems, not just in urban areas and their surrounds, but also in far-off places that provide cities with their energy, water and raw materials. Water bodies and uninhabited land have become the dumping grounds for growing volumes of consumer and industrial waste. Four fifths of the region's rivers are polluted or compromised (ADB and Asia Pacific Water Forum 2011) and of the world's ten rivers carrying the largest volumes of plastic waste, eight are in Asia (IPBES 2018).

The loss of biodiversity brought about by land-use and land cover change is also a threat to the region's prosperity and security. Unsustainable land use is responsible for habitat loss, fragmentation and degradation, which are the greatest threats to genetic and species diversity in the region (IPBES 2018). Rapid biodiversity loss exposes the region to risk as, at a certain point, it leads to degradation of the essential processes that sustain ecosystems. Growing threats to biodiversity from land-use, land management and land cover change are found across the region: almost 25% of endemic species are threatened; bird extinctions on some Pacific islands range from 15.4% to 87.5%; and the damage of alien invasive species are estimated to cost Southeast Asia USD 33.5 billion (ibid.). Traditional agrobiodiversity, and the rich biocultual diversity that goes with it, is also in decline, due to chemical-intensive monocroping moving into upland areas. This shift to high-yield agriculture poses a risk to the large crop genetic diversity preserved in socio-ecological landscapes, which is especially important for food security in the context of climate change. Figure 1.1 shows that plant and animal biodiversity are facing threats across the Asia-Pacific region.

Unsustainable land use in the Asia-Pacific region is contributing to global climate change, which compounds the effects of biodiversity and ecosystem services loss on human wellbeing and human security. Agriculture, forestry and other land use (AFOLU) accounts for a large proportion of greenhouse (GHG) emissions in many of the region's developing countries. Between 2001 and 2011, Asia was responsible for 44% of global emissions from agriculture and had the largest average annual agricultural emissions growth rate of 2.3% (Tubiello et al. 2014). For the period 2001 to 2010, Asia was responsible for 22% of global emissions from forestry and other land use (ibid.). The regional impacts of climate change on biodiversity can already be observed, including changes in species distribution, population sizes and the timing of reproduction or migration, as well as pest and disease outbreaks (IPBES 2018). Climate change will reduce food supplies in many countries in Asia and will generally have a negative impact on crop production (Barros et al. 2014).

There is an equity dimension to unsustainable land use. Environmental degradation affects low-income households, particularly in rural areas, disproportionality more than other groups. Their wellbeing often depends on access to unpolluted natural water supplies as well as fuelwood, materials, animals and plants from nature. In India, the contribution of ecosystem services to the economic value accruing to households who depend on small farming, animal husbandry, forestry and fisheries, which account for about 480 million people, is about 57%, compared with the estimated contribution to the whole economy of 7.3% (UN and ADB 2012). Climate change will exacerbate the impacts of biodiversity and ecosystem services loss for indigenous and vulnerable communities in particular (IPBES 2018). Unsustainable land use thus needs to be considered in terms of its broader implications for equity and sustainable poverty reduction.

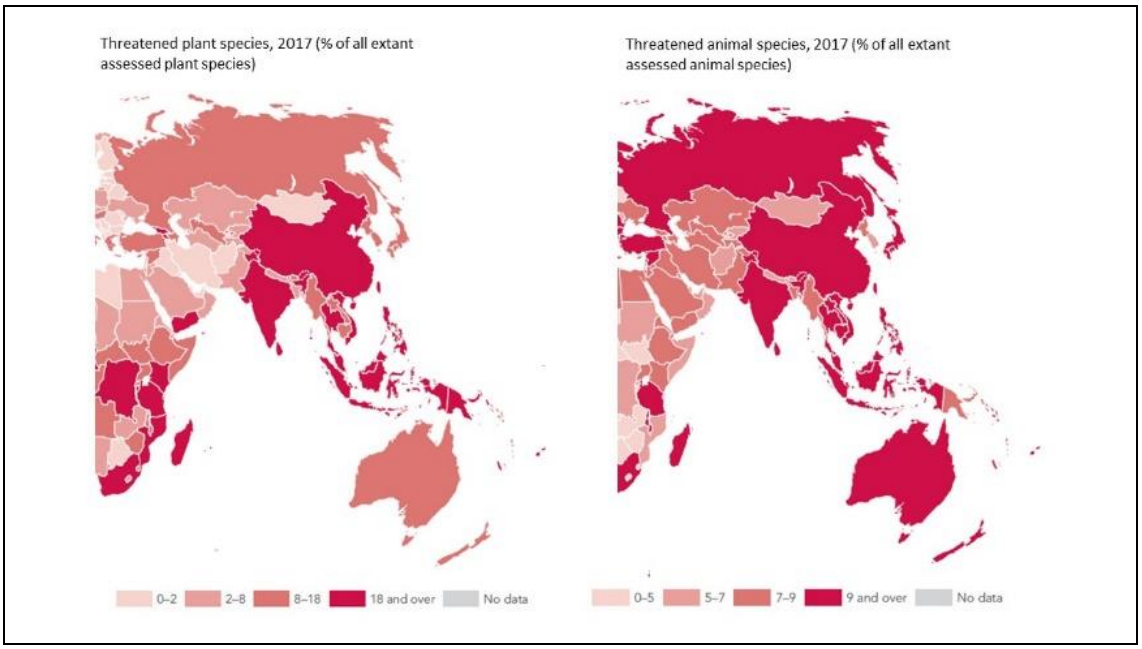

Figure 1.1 Percentage of threatened extant plant and animal species, 2017

Source: World Bank (2018)

1.2.1 Positive signals and opportunities

While the task of moving land use towards sustainability is formidable, positive experiences and developments in the region provide reason for hope. In Asia-Pacific developing countries, land and natural resource management institutions have undergone major reforms that incorporate environmental values, though enforcement remains a major problem. Decentralisation and democratisation processes are opening spaces for stakeholders to influence institutions for land management. Efforts are underway to reform markets with the aim of reducing environmental externalities in production processes. The Asia-Pacific region has a rapidly growing middle-class freed of the concerns of surviving from one day to the next and starting to pay attention to environmental issues. The region is one of "people on the move, better educated, with more purchasing power, enjoying improved quality of life and access to information and communications technology that has allowed the spread of new opportunities, social connections and ideas" (UNESCAP et al. 2016, 3). These movements and trends can be harnessed to help the region move away from environmental harm and towards more sustainable and equitable land management.

1.3 Conceptual framework

The conceptual framework used in this report is concerned with connecting the solution to the problem. Many efforts to improve land and natural resource management have failed because of misconceptions and a shallow understanding of the factors that drive land change. The conceptual framework acknowledges this complexity. It identifies the major types of drivers behind land change and recognises that drivers evolve in complex ways over time and space due to changing circumstances and to feedback effects from their impacts. With respect to solutions, the conceptual framework draws attention to the importance of "getting governance right". Land is arguably the

most important physical resource a country has. It can be a source of great wealth and power for some, but for others a cause for discontent and conflict, all depending on how it is governed.

In this report, land is taken to include the Earth's surface, i.e. the physical land, as well as its resources, including forests, fisheries and water. Land change is used as shorthand for changes in the purpose assigned to land use, land management practices and land cover.

1.3.1 Understanding unsustainable land change as a "wicked" problem

Landscape transformation can be considered unsustainable when it adversely affects human wellbeing and human security. Landscape transformations that occur without efforts made to mitigate impacts on biodiversity and ecosystem services that underpin human wellbeing and security are ultimately unsustainable.

Unsustainable land change can be characterised as a "wicked problem". Here, "wicked" does not mean that the problem is awful; rather "wicked" refers to a problem that is complex, multidimensional and both hard to define and hard to solve (Howes and Wyrwoll 2012). In the case of land change, the drivers and their impacts, and attempted solutions and their impacts all interact in complex ways.

Defining the problem of unsustainable land use is not always straightforward. This is because it is perceived differently by different groups, and also because the complexities surrounding the drivers make it difficult to understand the full nature of the problem. At any one location, land change is usually driven by multiple drivers that reflect the interplay of biophysical and social patterns and processes on different spatial scales. These interactions change over time because of feedback processes. The impacts are also complex. They vary over space and time, have economic, social and environmental dimensions, and have different meaning for different stakeholders.

Unsustainable land change is also a wicked problem because it usually involves many interest groups with different worldviews and potentially conflicting interests in the land. One group may profit in the short term from unsustainable land use at the expense of another. Adding complexity to the problem and its possible solution is the fact that interest groups range from people living on or in the immediate vicinity of the affected land to people in far-off places who may invest in the land, consume its products or occasionally visit it.

It is not an easy task to identify solutions that are informed by a comprehensive understanding of complex sets of interrelated drivers and their feedbacks, and that also balance the interest of stakeholders. The complexities and unique nature of wicked problems means that conventional methodologies cannot simply be recycled; they "defy simplistic, pre-packaged solutions" (Howes and Wyrwoll 2012).

1.3.2 Analysing drivers and factors influencing land change

The root causes of land change are often assumed rather than carefully investigated. Lambin et al. (2001) argue that myths about the causes for land change have been propagated through simplification in line with prevalent worldviews. Olson et al. (2004) agree that the socio-economic dimensions of land-use change are often analysed in simplistic ways that fail to capture the causal processes behind changing land management and land-use practices. The analysis of land

degradation often focuses on simplified single-factor causes, and misses the fact that land degradation is usually the result of multiple drivers (Scholes et al. 2018).

As an example of one myth about land cover change, Lambin et al. (2001) found the belief that tropical deforestation is mostly driven by population and poverty, which leads to the "invasion of forests" along roads, to be prevalent in the literature. More careful analysis from site-specific case studies suggests that globally population is neither the sole or even main cause behind deforestation; rather, deforestation is often linked to new economic opportunities which themselves are linked to social, political, and infrastructural changes (Lambin et al. 2001). Piers Blaikie identified another land change myth when he traced back land degradation in Africa to colonial policies of land appropriation, which contrasted with the popular view that placed the blame for degradation at the feet of African farmers (Blaikie and Brookfield 1987).

The number of locational studies applying multidisciplinary, multi-scalar approaches to the study of land change are increasing and improving understanding of land issues. These have identified a wide range of interconnected economic, demographic, technological, institutional and cultural drivers from local to global scales that interact over time to shape land-use trajectories (Olson et al. 2004). They have identified feedback mechanisms between the drivers and shown how land changes can also have feedback effects on the drivers.

Various theoretical positions and concepts can and have been applied to studies of land change drivers, and as they have quite different starting points they can lead to quite different conclusions. They differ in the emphasis they place on the role ascribed to actors versus the wider socio-economic context (agency versus structure), the importance of demographic and technological factors versus policy or other factors, and how differential power affects access to resources (Olson et al. 2004). No universally accepted theory of land change has emerged.

The approach employed in this report to understand drivers is influenced by political ecology, which combines the concerns of ecology and political economy to examine the tensions that exist between ecological and human change (Quandt 2016). Political ecology directs attention towards the political environment, economic pressures, and societal regulations to deepen understanding of the decisions that different actors take over land. It adopts a local case-based approach and analyses human and environmental relationships at different scales, focusing on identifying the winners and losers, trade-offs and differentials in power (ibid.).

In line with Lambin et al. (2001) and Howes and Wyrwoll (2012), the conceptual framework used in this report holds that land change needs to be understood in terms of the generic qualities of the drivers and the place-based, human-environment conditions that shape land change. The conceptual framework is depicted in Figure 1.2. Following Redman et al. (2000) land changes are viewed as interactions or mediating activities at the interface of the human and ecological components of a socio-ecological system. A socio-ecological system is made up of a bio-geophysical unit and its associated social actors and institutions (Glaser et al. 2008). The impacts of land change can be assessed using various frameworks. In this report, we use the UN Sustainable Development Goals (SDGs) as our primary reference to consider the implications of land change for human wellbeing and security (see section 1.3.3 for further explanation).

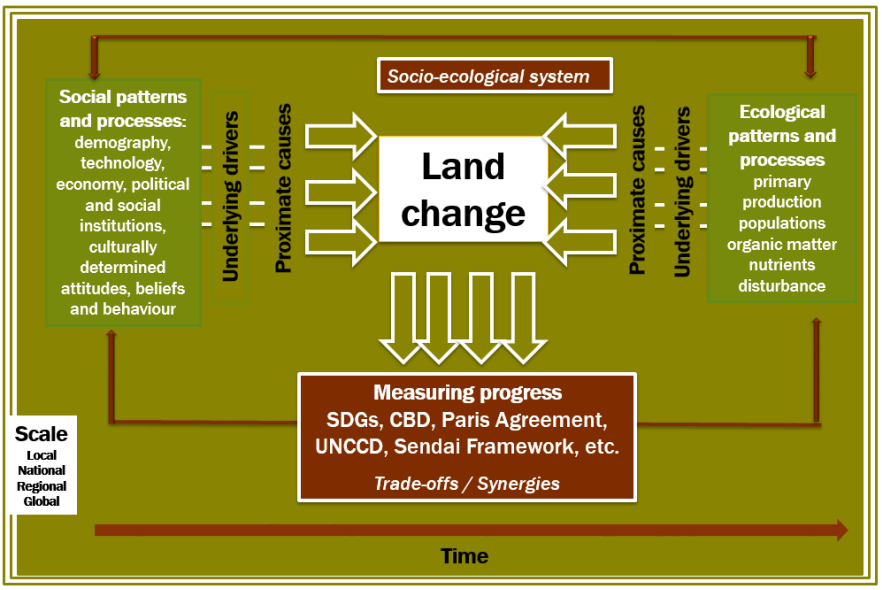

Figure 1.2 Conceptual framework for understanding drivers of land change and their consequences

Source: Authors

Briassoulis (2009) has identified the following types of factors thought to influence land change.

Biophysical factors: Biophysical features of the land have an importance influence on land change as they constrain, regulate and modify human activities. Biophysical features make the land more suitable for some uses than others and thus more or less susceptible to land change. They include climate and weather, topography, type of bedrock and soil type, water resources, and land quality. The significance of biophysical factors can be seen from the fact that remote mountainous areas with poor soils for agriculture experience much less human disturbance than more accessible areas under native vegetation that exhibit attributes attractive to agriculture.

Demographic factors: Demographic factors that influence land change include population size, composition, spatial distribution and temporal change. At household level, gender and average age of the household head can be determinants of land change. While it is common to associate change in population (both increase and decrease) with land change, the influence of population depends on geographic and historical context as well as existing cultural and technological systems, mode of production and institutions. Briassoulis (2009) suggests that population is better viewed as an intermediate force mediating land-society interactions, with natural increase and migration having an important influence on the direction and impacts of land change.

Income and affluence: Increases in income and affluence can lead to changes in land directly through the increase in capital available for land development and indirectly by increasing demand for goods and services that are generated from the land. Incomes may rise as a result of a change in production mode, which may be associated with institutional and demographic factors such as urbanisation.

Technology: Technology in a broad sense refers to the artefacts, knowledge, skills, and techniques found in socio-technological systems. Socio-technological systems are systems where interaction

occurs between society's complex infrastructures and human behaviour. Technology can influence the type, location, scale and rate of land change, but new technologies do not drive land change; rather they facilitate land change by reducing the influence of biophysical constraints on land use. Briassoulis (2009) suggests that the influence of technology on land change is best analysed in terms of “clusters” of technological innovations, which include industrialisation, mining, transportation, logging, agricultural intensification, and water control.

Socio-economic forces: Socio-economic changes that have resulted in land change include transitions from rural to urban and to industrial societies, and the transition from subsistence agriculture to cash crop production. Globalisation, the present global systemic level process of socio-economic change associated with increasingly integrated world markets, finance and production chains, may play a significant role in driving local level land changes by increasing demand for land and for commodities derived from land use. While socio-economic forces drive land change, their impacts are mediated by cultural, institutional and political factors.

Culture: Culture is not a driving force of land change, though it can influence attitudes towards land exploitation and transformation, and it can influence population and lifestyles as well as other aspects of social and political life that affect land use through changes in demand. Land-use types, crops, cultivation methods, and land management practices can all be influenced by cultural traditions, values and norms.

Institutions: Institutions play an enormous role in land change. Broadly defined, they are the structures or mechanisms of social order. They include systems of formal and informal rules, decision-making procedures, and programmes. Institutions can drive land change through their intent or through their weaknesses. At the local level, the most important institutions for land use include land ownership, tenure and land markets. At national and subnational level, development and conservation policies, spatial planning, property regimes as well as economic, financial, and social policies and markets can have profound impacts on land use. Institutions at the international level that drive land change include conventions and other agreements, development aid, foreign direct investment and global finance. In developing countries, informal institutions such as traditional leaders, informal moneylenders and informal labour markets can have a major influence on the direction of land change.

Political factors: There is strong historical evidence associating land change with political change. Land change has occurred when political changes have led to new policies on land use and the creation of new social organisations for land development. Throughout history, different rulers have preferred different land uses for religious, economic and political reasons. Political strife can also lead to land-use change as a result of people fleeing to and developing land in safer areas.

Proximate causes, underlying drivers and the causal “chain of explanation”

In studies of land change, it is useful to distinguish between proximate causes and underlying drivers. The proximate causes are human activities or immediate actions responsible for land change (Nelson 2005). For example, in the case of forest conversion and degradation, these could include shifting agriculture, logging and mining. The underlying drivers of change operate diffusely and affect one or more proximate causes. Keeping with the example of forest change, they could include drivers such as growing international markets for timber and wood products and internal migration policies that encourage settlement around forest fringes.

A causal “chain of explanation” for land change that links proximate causes with underlying drivers at increasingly higher levels can be developed (Blaikie and Brookfield 1987) (Figure 1.3). There can be a succession of underlying drivers from the more to the less diffuse leading to land change. For example, increasing global affluence may lead to increased demand for timber for housing and consumer products such as furniture, which may lead investors in country A to see this as an opportunity to demand that politicians make more forests available for logging, who then might place pressure on the forest department to speed up the issuance of logging licenses. This could result in the forest department giving its forest officers less time to conduct proper land investigations before granting licenses, which could then result in more forests being designated for logging, including forests that may have been better put to some other land use. The causal chain of explanation also includes analysis of possible feedbacks that impacts have on the drivers.

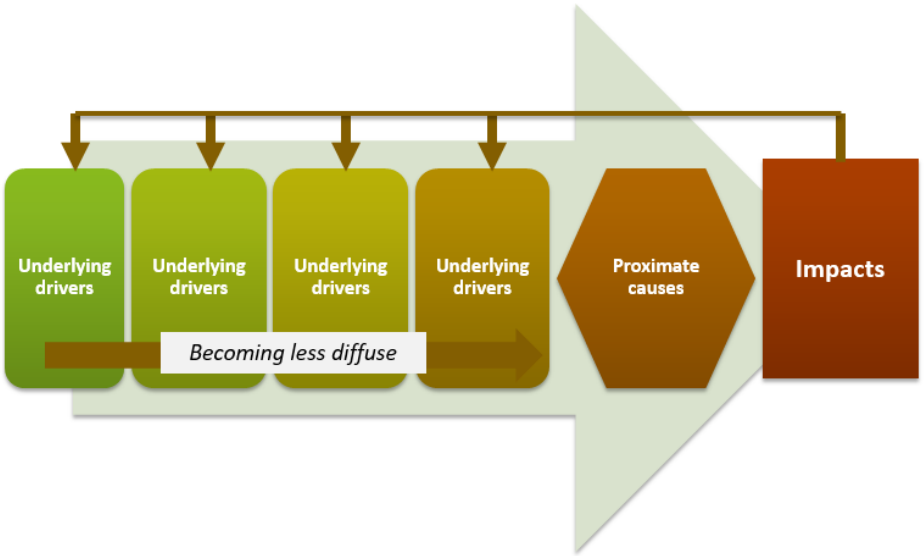

Figure 1.3 “Chain of explanation” for land change

Source: Authors, based on Blaikie and Brookfield (1987)

Spatial and temporal dimensions

As depicted in Figure 1.2 drivers and their impacts need to be examined at various spatial scales, as societal and environmental processes operate at different scales (Olson et al. 2004). The scales can range from ecosystems and landscapes, farms and other land management units, communities, concessions, and jurisdictions, to regional and global levels. That land use change in one area may affect land use in another area also needs to be considered (Zhao et al. 2006).

Land change drivers and their effects operate and interact over time, so to understand land use change requires a study of land change trajectories and their interactions (Zhao et al. 2006). The temporal patterns of driving forces emanating from society-environment change include longer-term slow acting processes, such as demographic changes or economic development, and sudden changes such as extreme weather events or new policies that lead to rapid land changes (Olson et al. 2004).

1.3.3 Assessing impacts of land change and identifying ways forward

A wide range of expectations are placed on land. Land must provide places for homes, industry and recreation, food, water, energy, and materials for construction and manufacturing, as well as biodiversity and ecosystem services. How is land change to be assessed against all these expectations and more?

Global goals

The concept of sustainable development is used in this report as a frame of reference to assess whether or not land changes are in the interests of human wellbeing and human security (Figure 1.2). Sustainable development is an organising principle for meeting all human development goals without compromising the biodiversity and ecosystem services on which economy and society depends. Sustainable development is the core principle of the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs), which provide the leading frameworks for international cooperation. The 2030 Agenda for Sustainable Development recognises eradicating poverty in all its forms and dimensions as the most important global challenge and essential for sustainable development. It also commits to protecting the planet by promoting sustainable consumption and production, conserving natural resources and taking necessary action on climate change (United Nations General Assembly 2015).

The SDGs consist of 17 goals measured by progress against 169 targets to be achieved by 2030. Land-related targets and indicators can be found under SDGs 1 – No Poverty, 2 – Zero Hunger, 5 – Gender Equality, 11 – Sustainable Cities and Communities, and 15 – Life on Land. As a cross-cutting issue, land management is also highly relevant to SDGs 3 – Good Health and Wellbeing, 6 – Clean Water and Sanitation, 7 – Affordable and Clean Energy, 13 – Climate Action, and 14 – Life Below Water.

In addition to the 2030 Agenda for Sustainable Development, land use features in various other international frameworks (Table 1.1). For example, the UNCCD (United Nations Convention to Combat Desertification) Strategic Framework 2018-2030 calls upon states to achieve a land degradation-neutral world by 2030, while the Sendai Framework for Disaster Risk Reduction 2015-2030 highlights the importance of healthy ecosystems and urban planning for disaster risk reduction. In many cases these international frameworks share targets and indicators of the SDGs. For example, targets of the Sendai Framework for Disaster Risk Reduction 2015-2030 correspond to SDG targets 1.5, 11.5, 11.b, and 13.1. This alignment of targets arose through a strong commitment by member states to streamline the targets and indicators from various frameworks to reduce the burden of monitoring and reporting. Post-Sustainable Development Agenda frameworks have also taken into account synergies with the SDGs.

Trade-offs and synergies

The approach used in this report to assess land change and identify ways forward underscores the existence of trade-offs and synergies. In any one location there can be several ways of using the land. One possible use of land might contribute more to job creation and economic growth and another more to the preservation of biodiversity. Once a land-use choice is made, there may be various alternative sets of management practices that can be applied. For example, in the case of agriculture, one set of management practices might focus on maximising annual per hectare yields of a few commercial crops, while another might focus on long-term ecological sustainability and

crop diversity. Any decision over what land is to be used for and the management practices to be applied involves trade-offs and offers possibilities for synergies across the SDGs, as depicted in Figure 1.2.

Table 1.1 International frameworks relevant to land use and land use change*

Framework	Period	Relevance to land use	Relevant SDGs **	Reference
Paris Agreement	2015 – 2030	Aims to reduce greenhouse gas emissions (including from the land sector) through Intended Nationally Determined Contributions	7, 13, 17	United Nations (2015)
Sendai Framework for Disaster Risk Reduction	2015 – 2030	Aims to integrate disaster risk reduction in land-use policy development and implementation throughout all phases of disaster management, including prevention, mitigation, response and reconstruction.	1, 11, 13	United Nations (UNISDR 2015)
Strategic Plan for Biodiversity (including the Aichi Biodiversity Targets)	2011 – 2020	Aims to improve biodiversity by conserving at least 17% of terrestrial and inland water areas, as well as 10% of coastal and marine areas by 2020 and integrating the conserved areas into wider landscapes and seascapes.	14, 15	Convention on Biological Diversity (2010)
New Urban Agenda (Habitat III)	2016 – 2030	Promotes sustainable, non-discriminatory, and coordinated land-use planning and practices. Cities cover only 2% of total land area, however represent respectively 70% of economy, greenhouse gas emissions, and waste globally.	8, 9, 11, 12	United Nations (2016)
The United Nations Convention to Combat Desertification (UNCCD) Strategic Framework	2018 – 2030	The vision of the strategic framework is "a future that avoids, minimises, and reverses desertification/land degradation and mitigates the effects of drought in affected areas at all levels and strive to achieve a land degradation-neutral world." Strategic Objectives of the framework include improving the condition of affected ecosystems through monitoring trends in land cover and land function. UNCCD is secretariat to the Voluntary Land Degradation Neutrality Target Setting Programme.	1, 15	United Nations (2017)
New York Declaration on Forests	2014 – 2030	Political declaration endorsing a global timeline to cut natural forest loss in half by 2020, and end it by 2030. The Global Platform for the New York Declaration on Forests was launched in 2017 by the United Nations Development Programme (UNDP).	15, 17	United Nations (2014b)
United Nations Declaration on the Rights of Indigenous Peoples	2007 –	Lays out responsibility of states in providing mechanisms for protecting indigenous peoples' rights to land, territories and resources.	1, 5, 10, 15	United Nations (2007)
Beijing	1995 –	Reaffirms and provides details to the	5, 10, 16	United Nations

Framework	Period	Relevance to land use	Relevant SDGs **	Reference
Declaration and Platform for Action***		legal obligation of states to provide equal access to land and land rights laid out by the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW).		(1995)
Convention on the Rights of Persons with Disabilities (CRPD)	2006 –	States parties are obligated to ensure equal access to the physical environment and information and communication for persons with disabilities.	3, 10, 16	United Nations (2006)
SIDS Accelerated Modalities of Action (SAMOA) Pathway	2014 – 2030	Calls upon support towards Small Island Developing States (SIDS) for sustainable land use practices in conjunction with the effect on coastal and marine environments.	6, 14, 15	United Nations (2014e)

Note: This table is non-exhaustive and does not take into account regional or non-governmental frameworks. **Relevant SDGs: Only SDGs with the strongest relevance are listed herewith. The list is non-exhaustive. * See also Box 1.1.*

The 2030 Agenda for Sustainable Development explains that the SDGs must be understood as integrated and indivisible. This understanding is important for land management, as it means that land should not be used and managed for just one or a small number of goals or targets without considering impacts on other goals/targets. Rather, land must be managed to promote the SDGs in an optimal manner. “Sustainable land use” can be defined in these terms, i.e. as land use choices and management practices that provide the best outcomes for the SDGs and other intentionally agreed frameworks. It has also be defined more precisely as “the use of land resources, including soils, water, animals and plants, to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions” (WOCAT 2018). The case studies in this report apply this understanding of sustainable land use when considering options for land use and the impacts of land change.

Land governance – integration and coordination, accountability and equity

This report discusses both land governance and policy suites for sustainable land management, but focuses on the former. Lists of policies for better land management are easy to produce and there is no shortage of discussion on these in the literature. Acting on the policies is where the greatest challenge lies, and for this it is essential to strengthen governance in developing countries experiencing rapid and insufficiently or improperly directed or totally unplanned land changes. Where policies for achieving the Millennium Development Goals (MDGs) were effective, appropriate governance structures and the application of good governance principles underpinned their implementation (UNDESA 2015). Conversely, weak governance is a key underlying driver of land degradation and the over-exploitation of natural resources (Scholes et al. 2018), and leads to inequitable outcomes from land-use decisions.

The concept of governance

Governance is a neutral concept that describes the “complex mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights and obligations, and mediate their differences” (Palmer et al. 2009, 1). Land governance is essentially about power and the political economy of land (ibid.). It focuses attention on

stakeholders, interests, influence, institutions and relationships, and the wider forces driving land change and their articulation at local levels.

Land governance can be defined as the "rules, processes and structures through which decisions are made about access to land and its use, the manner in which the decisions are implemented and enforced, the way that competing interests in land are managed" (Palmer et al. 2009, 9). Processes determine which issues are considered and prioritised when decisions are made, how the decisions are made and implemented, who is held accountable, and how differences and grievances are managed (ibid.). In their broadest sense, institutions are the social constraints that structure political, economic and social interactions (North 1990). They are the formal and informal rules and structures that govern and mediate relationships, decision-making and enforcement (Palmer et al. 2009). Formal institutions are typically established by rulers, parliaments, and bureaucracies. Informal institutions, by contrast, are rules that are created, socially agreed and applied through informal processes (Helmke and Levitsky 2004).

Weak governance can exist in both formal and informal institutions. Collusion of public officials and private land developers to ensure controls on land-use decisions and management are only weakly enforced are examples of weak governance in formal institutions. The absence of traditional mechanisms for community-wide participation in decisions over the community's land is an example of weak governance in an informal institution.

In its review of national policies supporting MDG implementation, the Department of Economic and Social Affairs of the United Nations Secretariat underscored the following aspects of governance as critical for the SDGs: leadership with a clear vision of what needs to be achieved and the policy pathways that are available; national policy coordination; decentralisation; partnerships with non-governmental actors; and accountability (UNDESA 2015). These aspects of governance are highly relevant to land issues. Principles for good land governance could include equitable access to land and its resources, legal recognition and protection of a range of land rights, decision-making processes that are accountable, transparent and open to all members of society, and application of the rule of law to all (Palmer et al. 2009).

In this report, much of the discussion centres on what we consider to be two core principles of good land governance – integration and accountability – and one core aim of good land governance – equity.

Integration

The SDGs require policy integration and coordination between agencies and across levels of government. However, in many countries policies are not fully-aligned and sectoral ministries, planning and financing authorities are not well-coordinated (UNDESA 2015). Gaps in the linkages between difference levels of authority also hinder effective implementation. The strengthening of national processes to align and coordinate policies and the strengthening of vertical and horizontal linkages between government departments/jurisdictions are likely to be essential for effective land management. The following chapters take up the issues of integration and coordination, exploring where disconnects are, why they exist, what integrative approaches/strategies could be implemented, and how to move forward with them.

Accountability

Accountability is another key to improving decisions over land use and management practices. Due to lack of accountability, and the potential for wealth and influence that land offers, land

administration is widely thought to be the most corrupt sector in public administration (Burns and Dalrymple 2008). Chapter 4 on land grabbing in Papua New Guinea highlights the importance of accountability, explaining that a lack of accountability at all levels of government facilitated conversion of massive areas of natural forest to oil palm estates.

Equity

Because land can be a source of great wealth and influence, there is always a risk that powerful individuals or groups will seek control over land and that other people without influence but with genuine claims and interests in the land will be pushed aside. This explains why the institution of formal tenure is a central concern of land governance scholarship. Formal tenure determines who owns the land, who has the rights to use the land, and what the extent of the ownership and use rights are. Many governments in developing countries nationalised the ownership of areas considered uninhabited, such as forests, and then assigned rights to these areas to different groups for various purposes, including production and conservation. Many of these "uninhabited" areas were home to indigenous peoples and other local communities with land-based livelihoods. These local groups had their own systems of land tenure that were not acknowledged by the state. Conflict between governments and those they had assigned rights to on one side and local communities on the other subsequently arose and can still be observed in parts of the region. Examples of this type of conflict are mentioned in the case study chapters.

The issue of equity and rights in land issues has been taken up by several international agreements. The United Nations Declaration on the Rights of Indigenous Peoples (2007) calls upon states to protect the rights of indigenous peoples to land and land use, the Beijing Declaration and Platform for Action (1995) the rights of women to land, and the Convention on the Rights of Persons with Disabilities (2006) the rights of persons with disabilities to equal access to the physical environment (including land) (Table 1.1). Box 1.1 highlights how gender is an important equity consideration for land use and land-use change. The following chapters reflect on equity in land-use decision-making processes and their impacts.

Box 1.1 Gender and land use

Less than 20% of landholders are women, even though women constitute 43% of the agricultural labour force (FAO 2011). Villamor et al. (2014) found that a high disparity between men and women exists for (i) access to and management of information on new options for land use change, and (ii) perception and assessment of risk regarding land use. Due to differences in perceptions of risk, women tend to prefer subsistence farming and men tend to prefer market-oriented farming. For example, in Indonesia, men prefer to convert traditional rubber plantations to high value crops such as oil palm, whereas women prefer maintenance of rice cultivation under a matrilineal system (Villamor, Desrianti, et al. 2014).

Access to land is mentioned as a basic right for women in the Convention of the Elimination of Discrimination Against Women (CEDAW) (United Nations 1979): "States Parties … shall ensure to such women the right: … To have access to … appropriate technology and equal treatment in land and agrarian reform as well as in land resettlement schemes" (14.2.g). The Beijing Declaration and Platform for Action, adopted during the Fourth World Conference on Women reinforced this commitment by member states (United Nations 1995). The Sendai Framework also calls on women's active participation in all phases of disaster management.

In Japan, a Third Basic Plan on Gender Equality addressing gender equality in disaster risk reduction was in place as of 2010. However, during the reconstruction phase after the Great East

Japan Earthquake in 2011, it was observed that many gender gaps still existed. For example, paid jobs for reconstruction including civil engineering, architecture, and land-use planning were generally seen as “men’s work”, and contributed to the income gap, disproportionately affecting single-mother households. These observations led to updates in the National Disaster Risk Reduction Basic Plan in 2012 and the Disaster Management Basic Law in 2013 (Hara 2012). Internationally, a movement emerged leading to United Nations Economic and Social Council resolutions 56/2 and 58/2 on gender equality and the empowerment of women in times of natural hazards (United Nations 2014a, 2014c).

The United Nations Convention to Combat Desertification (UNCCD) carried out a review of gender mainstreaming in the implementation of the Convention in the period of 1998 to 2018. According to the review:

- UNCCD underlines the importance of both women and men in combating desertification, land degradation and drought.
- Drivers of land degradation are not gender neutral, having worse impacts on women.
- Rural women are more dependent on natural resources than men, and they are poorer than men due to limited access to critical resources such as land rights, finance and credit, appropriate knowledge and technologies. This issue is also to be addressed through SDG 5.a.
- Several parties including the Cook Islands have taken action to strengthen the legal protection framework for women concerning land, property and succession rights.
- Addressing livelihoods from the phase of project design, including women’s primary needs, is critical for addressing gender-based capacity gaps and identifying key points for empowerment of women (United Nations 2017a).

These points were taken into consideration for the strategic plan for 2018-2030 (United Nations 2017b), which lists the increasing role of women as agents for change in addressing land degradation.

1.4 Report structure and major findings

Chapters 2 and 3 of this report discuss the major types of landscape transformations that are taking place across the Asia-Pacific region, their drivers and implications for sustainable development, ways to strengthen land governance, and approaches to improve land management. Chapter 2 reviews landscape transformations in urban and rural areas as well as mixed-use areas around the urban periphery. It finds that the economic advantages of concentrating capital and infrastructure in urban areas are a major driving force behind the rapid rates of urbanisation that many countries are experiencing. However, while urbanisation is associated with the region’s growing affluence, urban growth has largely been unplanned and the resulting urban sprawl has led to the loss of important natural ecosystems and valuable agricultural land. These direct impacts of urbanisation on land are surpassed by its indirect impacts associated with the huge and increasing demand from urban areas for materials and energy, and from the open dumping of urban waste. Chapter 2 finds that the landscape transformations in rural areas are equally profound. New areas have been “opened up” for agriculture through the clearance of native vegetation, and the use of existing agricultural land

has been intensified through the application of high-yielding seed varieties, fertilisers, pesticides and modern irrigation systems. Overall, these land changes have generated significant economic benefits, but in many areas overuse of land results in declining land quality and desertification is becoming a major problem. These issues are placing the region's future food security in doubt. Chapter 2 provides a number of ideas for more holistic planning of urban and rural development including multilevel and collaborative governance systems, the creation of an urban policy at the national level that is set within a broad cross-cutting vision of sustainable and inclusive cities, initiatives to reduce the material footprint of cities, developing urban-rural linkages, upgrading slums, sharing experiences on sustainability across Asia-Pacific cities, reshaping national agricultural policies and reforming extension systems to prioritise sustainability over yields, and reforming markets to provide incentives for sustainable land use and natural resource management.

Chapter 3 builds on the discussion on rural landscape transformations in Chapter 2. It reinforces the idea that existing agricultural intensification practices ultimately harm the region's long-term interests and calls for working towards the SDGs while safeguarding the sustainability of agricultural lands and the health of agricultural soils. For the short-term, to achieve SDG 2 – Zero Hunger could mean not making an immediate and major departure from current agricultural systems but instead focusing on reducing food loss and distributional issues. However, over the long-term, national policies and coordination across sectors are required for more sustainable means of agriculture that make the best use of available space (including appropriate urban spaces for agriculture) and secure the health of soils and ecosystems. Chapter 3 also emphasises the need for decision-support tools that help governments weigh up the long-term pros and cons across sectors and regions of alternative agricultural land uses and land management practices.

Chapters 4 to 7 provide case studies of areas that have undergone rapid landscape transformations. The case studies begin with a description of the setting in which the landscape transformation has taken place and the features of the transformation. They then identify the drivers behind the transformation and assess its impacts with reference to the SDGs. Trade-offs that could have been avoided or better managed are identified and ways for implementing more holistic, integrated and collaborative approaches to land management are discussed.

Chapter 4 addresses the conversion of forests for agriculture and industrial plantations by agribusinesses, which is one of the most significant types of rural landscape transformations in Southeast Asia and parts of the Pacific. Specifically, it takes up the issue of large-scale conversion of forests to oil palm estates in Papua New Guinea (PNG) under special agriculture and business leases. It finds that under these leases, the customary landowners (local communities who own the land and natural resources according to their customs) have transferred the rights to use their land to outside developers with the expectation of receiving benefits that they could not obtain otherwise. However, in promoting this pathway to development, the government has not ensured that the local communities have all the information they require to make wise decisions over their land and that the legally required processes for land developments are properly implemented. Consequently, not all the rightful landowners gave consent to the land developments, the agreements they have with developers are grossly unfair to them, and the environmental harm associated with forest clearance is not properly acknowledged in land assessments. Chapter 4 calls for the government to enforce its controls and procedures for land development and to provide support to local communities for a type and scale of development suited to their customary institutions.

Chapter 5 is concerned with another significant type of landscape transformation, and one that can be observed in many of the uplands in the Asia-Pacific region. This is the conversion of landscapes

managed largely by local communities according to their traditions and exhibiting a mosaic pattern of interrelated land uses to standardised high-input, high-output farming that relies on the intensive application of chemicals. The case study assesses the drivers and consequences of the transformation of traditional Karen rotational farming systems to monocropping of azuki bean and maize in northern Thailand, which the government is promoting. It identifies increased household income as the main benefit of conversion to monocropping, but also identifies serious trade-offs for biodiversity, terrestrial carbon stocks and other ecosystem services. In addition, the loss of Karen rotational farming systems could affect the country's future food security as they preserve a large number of indigenous cultivars that are not found in other parts of the country. The study calls for government to recognise the multiple values of Karen rotational farming and to support Karen forms of land management that maintain high species diversity and healthy soils.

Chapter 6 traces how landscapes have evolved in East Kalimantan, Indonesia. It highlights how many drivers can interact to shape land-use change trajectories. East Kalimantan experienced high rates of deforestation associated with mining, estate crops, forestry, forest and land fires, encroachment and planned development. The initial focus of land and natural resource development was on forestry, but lack of accurate inventories, insufficient monitoring and law enforcement, and strong demand for timber resulted in unsustainable logging that left the forests depleted of commercially valuable timber. Efforts turned towards converting land to fast-growing tree plantations and oil palm plantations. In more recent years, the idea of setting aside forest for protecting and enhancing their carbon stocks (a concept known as REDD+) as part of the global effort to mitigate climate change is being developed in the province. Underlying these trajectories of land-use change is the persistence of problems with land governance. Various actors including the national, provincial and district governments, land investors and developers, and local communities all have interests in the land. The direction for land development and management set by the state has often not aligned with the interests of indigenous groups, and this has resulted in conflict, especially where indigenous people continue to use forest areas that the state has assigned for protection or production forestry. The case study also shows that different modes of agricultural development, e.g. cultivation of oil palm by agribusinesses versus by communities, can have quite different impacts on land-use patterns and local livelihoods. The challenge for land governance in the province is to establish collaborative processes through which stakeholders can agree on land uses and land management practices that meet both the interests of local people and those of the state.

Chapter 7 examines another major type of landscape transformation that can be observed across the region in the form of conversion of natural ecosystems and agricultural land for urban and industrial uses. It takes up two rapidly urbanising areas, Dhaka city in Bangladesh and the Santa Rosa Watershed near Manila in the Philippines, as case studies. Both areas are experiencing rapid land change associated with urban sprawl. In a period of about 400 years, Dhaka city expanded in size from 1 km^2 to 112 km^2 and continues to grow rapidly at a rate of about 2% per year. The highest rates of growth have been in the western and northern regions of the city, which are difficult to govern as they lie outside the jurisdiction of local urban government and are poorly equipped for urban planning. The growth of Dhaka city has been at the expense of water bodies, valuable agricultural land and natural vegetation. In the Santa Rosa Watershed, rice paddies, sugarcane and agroforestry systems were converted to industrial and residential estates. Local governments have found it difficult to control land use because of their limited resources and the growing number of people and investors drawn to the area due to its close proximity to Manila. Urban growth has undoubtedly contributed to economic development in both case study areas, but in both areas it has

resulted in serious trade-offs associated with its impact on the hydrological cycle. In Dhaka, the draining of wetlands for urban development threatens the city's water supply, as the wetlands are important for groundwater recharge. In the Santa Rosa Watershed, the expansion of impervious areas associated with urban development has increased the risk of flooding, which already poses major problems to residents and commerce in downstream areas. The case studies stress the importance of integrating urban and regional planning strategies, building the capacities of and providing adequate and predictable financial transfers to local governments, establishing mechanisms to coordinate land-use planning at the watershed or landscape scale, and collaborative processes that engage stakeholders in deliberating on problems and their potential solutions.

Chapter 8 takes up one of the common messages that come out of the case studies – the need to move towards more integrative approaches to the management of land and natural resources. The call for integrative approaches is not new, but has been augmented by the decision of the United Nations General Assembly that the SDGs must be promoted in an integrated manner. The chapter introduces several integrative concepts and approaches, discusses their potential contribution to the SDGs, highlights the challenges they are facing, and discusses ways of moving forward with them.

It begins with the landscape approach, which focuses on establishing collaborative governance mechanisms at the landscape scale. The landscape approach aims to ensure that land serves multiple functions in a socially optimal manner and that ecosystem services are protected and enhanced. The discussion then turns to REDD+. The chapter argues that forest carbon stocks will only be protected and enhanced permanently at significant scales when all sectors whose decisions affect land use and management agree on and commit to REDD+.

The third concept reviewed by the chapter is integrated water resource management (IWRM). The origins of IWRM lie in the recognition that single-sector strategies for water use result in efficiencies and serious trade-offs. IWRM involves the co-ordination of governance structures across tiers of government (vertical integration), and within the water sector and across sectors (horizontal integration). Growing water scarcity and uncertainty of supply in the face of climate change has made IWRM a regional imperative.

Chapter 8 introduces a fourth concept promoting integration – the water-energy-food nexus (WEFN) approach. WEFN aims to address the interconnected challenges of water, energy and food security. Water needs energy, energy needs water, and food needs both energy and water. Current strategies that do not recognise or manage these interlinkages in an integrated manner have resulted in growing water scarcity for some sectors.

The case studies point to the SDGs as being a useful organising framework for national and local governments to adopt more integrative and holistic approaches to management. Chapter 9 moves the discussion from the local to the global, arguing that the SDGs and other global goals relevant to land can be harnessed to drive transformative changes in land management. It identifies, analyses and reorganises the SDG targets relevant to land to make them more useful as a frame of reference for sustainable land management.

Chapter 10 reflects on the regional review and case studies to draw out general observations and recommendations. It concludes that if current processes affecting land continue, the Asia-Pacific region risks transgressing the boundaries of a "safe operating space", and highlights some of the policies and measures that can make sustainable landscapes a regional norm. It calls for the creation of a regional "landscape observatory" that serves as a science-policy-interface for

monitoring and analysing land-use change as well as for extracting lessons from initiatives to strengthen land governance.

1.5 Concluding discussion

The complexity of land change and its significance to human development is no more apparent than in the Asia-Pacific region. Massive changes in land use, land management and land cover have taken place across vast areas since the end of the Second World War. These transformations of landscapes are a key aspect of the region's "great transformation" over the past 70 years, from one mired in poverty to a region proclaimed as the world`s engine of growth. Land changes have contributed to this progress; however, they have also had profoundly negative impacts, especially on biodiversity and ecosystem services, and this could eventually cause development gains to roll back. The "economic miracle" of Asia has been achieved by converting biodiversity-rich natural ecosystems, by intensive application of chemicals to increase crop yields, by exploiting natural resources at unsustainable rates, by artificial control of the region's major waterways, and by using water bodies and land as dumping grounds for ever-increasing volumes of industrial and domestic waste. An expanding regional population and current production and consumption patterns are placing greater demands on the land at a time when land is becoming increasingly less able to meet these demands due to overexploitation, environmental degradation and the spread of invasive species. Climate change will compound the effects of this environmental harm on human wellbeing and human security.

Without transformational changes in economic production systems, consumption patterns and value systems that are driving land degradation, the region will continue heading towards a future of risk and uncertainty for human security. This report is cognisant of the broader call for "transformations for sustainable development" (UNESCAP et al. 2016, 2), or societal transformations at all levels, which can only be brought about by changes in governance structures and much stronger institutions (UNESCAP et al. 2016, 2, 14).

Strengthening land governance, planning and administration are urgent yet formidable tasks for the Asia-Pacific region. The forces acting on land are evolving rapidly and existing structures and processes are unable to deal effectively with them. Economic growth, transformation and integration are increasing the amount of capital available for land development, creating new opportunities for prosperity, but also requiring direction and control to avoid environmental and social harm. At the same time, society is evolving in complex ways, with new formal and informal actor networks springing up, with new information technologies enabling identities to escape the confines of geography, and with households generating income from a variety of sources, both near and far. The messages for governance that emerge from this review include the need for visions and strategies for sustainability at all levels of government, policy alignment, and integrated and inclusive decision-making processes across sectors and tiers of government.

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CHAPTER 2

Landscape transformations in the Asia-Pacific region, challenges for governance and possible ways forward: An overview

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Key messages

- *Urban forms are developing in ways that defy conventional urban planning solutions, while rural areas are also undergoing rapid changes that existing administrations are unable to manage.*
- *Landscape transformations associated with urbanisation can be observed within the urban core, in per-urban areas, in the "desakota" and in predominantly rural areas.*
- *The prevalent rural landscape transformations are associated with the territorial expansion of agriculture, the transition towards more intensive agricultural land use, the exploitation of natural resources in sparsely inhabited areas, and efforts to rehabilitate degraded land.*
- *The underlying messages for moving away from unsustainable land management are the same for urban and rural development. Governance must be strengthened and new creative governance solutions are required for effective implementation of existing sustainability strategies and policies and for the adoption of more holistic and inclusive approaches to land management.*
- *Efforts to strengthen governance for sustainable land management should inter alia focus on developing governance structures that span different government functions, types of knowledge, sectors and stakeholder groups.*

2.1 Introduction

This chapter provides an overview of the major transformations in landscapes in the Asia-Pacific region, what they mean for sustainable development, particularly their impacts on ecosystem services and biodiversity, the challenges they pose for land (including natural resources) governance, and possible ways forward. The discussion is divided into sections on urban and rural landscape transformations. That the distinctions between these areas are becoming increasingly blurred is acknowledged and the challenges this poses for land governance are discussed. Also, because of a wide range of interdependencies, sustainable land use will only be possible when urban and rural areas are managed in an integrated manner. Each section presents an overview of the location, scale, features, drivers, and impacts of the landscape transformations, and their implications for land governance, and discusses possible ways forward. The section on urban

growth explains how rapid urbanisation is transforming landscapes in the city cores, peri-urban areas, the "desakota"[2] and predominantly rural areas, not only in terms of land-use types and intensity, but also in terms of land quality. The section on rural change identifies land-use intensification, the expansion of rural areas and forestation as the predominant proximate processes associated with landscape transformation.

The messages for governance that emerge from this review include the need for visions and strategies for sustainability at all levels of government, policy alignment, and integrated and inclusive decision-making processes across sectors and tiers of government. Urban forms are developing in ways that defy conventional urban planning solutions, while rural areas are also undergoing rapid changes that existing administrations are unable to manage. These land changes and growing pressures on the land require creative governance solutions and integrative approaches. The discussion also highlights the need for processes that are suited to context, e.g. solution-oriented action planning when the foundations for formal planning are not in place, and to build capacities and ensure predictable financial transfers for lower tiers of government.

2.2 Urban growth and landscape transformations

Across the Asia-Pacific region, urban growth has contributed to economic development and been driven by it. It has had profound impacts on landscapes within existing urban areas as well as the urban periphery, the "desakota," and predominantly rural areas.

2.2.1 Location, scale and features

The Asia-Pacific region has a rich urban history. This history begins prior to Western contact, when cities were built to support regional trade and sacred cities were constructed as a supreme symbol of the State. Later, Western powers had great influence on establishing the dominant urban form of large multi-functional port towns, which existed alongside various kinds of second tier cities serving administrative functions and supporting the exploitation of resources. In the post-war period, nationalism and the creation of independent states influenced the patterns of urbanisation, but the most radical changes occurred from the 1960s onwards, when developing countries began setting the stage for attracting foreign investment (McGee 2009). Rapid urbanisation followed. The amount of urban land increased by 22% annually between 2000 and 2010 in East and Southeast Asia (Schneider et al. 2015).

It is no longer appropriate to present the region as predominantly rural (Figure 2.1). In 1950, 16.6% of the region's people were living in urban areas, by 2003 this figure had grown to 38.8% (Zhao et al. 2006), and it is anticipated that at some time in 2018 this figure will rise above 50% (UN-Habitat and ESCAP 2015). Half of the global increase in urban land in the next 20 years is expected in Asia and by 2050 two out of every three people in the region will be living in urban areas (ibid.). Urbanisation is resulting in rapid and fundamental changes in the structure of society and has created challenges to virtually every aspect of human organisation. The urban changes are historic. How they can be managed is one of the greatest challenges facing the region.

[2] "Desakota" is an amalgamation of the Indonesian terms *desa* (village) and *kota* (city).

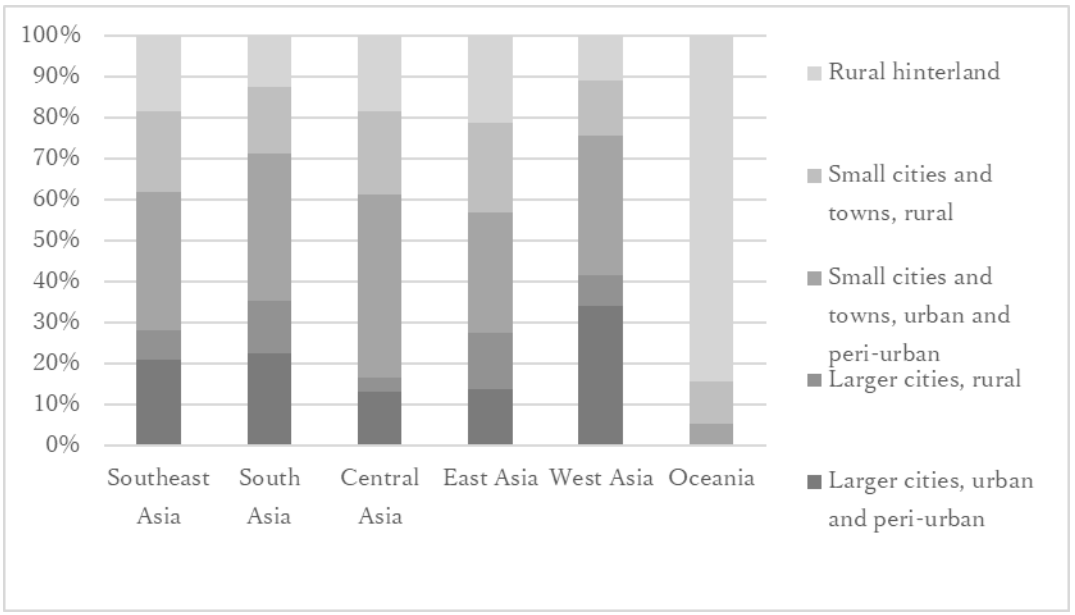

Figure 2.1 Share of population residing in the urban, peri-urban and rural areas in sub-regions of Asia and Oceania

Source: FAO (2017)

Rapid urbanisation has led to the emergence of megacities (population greater than 10 million), urban corridors and mega-urban regions. There are currently 17 megacities in the region, a number that is expected to grow to at least 22 by 2030 (UN-Habitat and ESCAP 2015). Urban "corridors" now link some of these megacities over long distances and more are expected to emerge. Providing an indication of how large these can be, the developing Mumbai–Delhi industrial corridor in India is about 1,500 km long (Nagendra et al. 2013), while urban expansion in China could create an 1,800 km coastal urban corridor linking Shenyang with Hangzhou (Güneralp and Seto 2013). Many of the megacities are located in "mega-urban regions", which consist of highly urbanised massive agglomerations encompassing cities, towns and rural areas.

Landscape transformations associated with urbanisation can be observed within the urban core, in per-urban areas, in the "desakota" and in predominantly rural areas. Restructuring of the cores from industry to service functions has occurred in many cities and has displaced inner city populations. In peri-urban zones, urban activities and built environments have replaced agriculture, wetlands, forests and other ecosystems. Outside the fringes of the cities lies what has been termed the "desakota", a zone where urban and agricultural land uses coexist next to each other (McGee 2009). This zone is characterised by high population densities, high population mobility, diverse livelihoods, and multiple land uses. "Desakota" have facilitated the development of mega-urban regions by providing a surplus labour force and cheap land.

Despite the emergence and expansion of megacities, medium-sized and small cities still provide homes for most of the region's urban dwellers (UN-Habitat and ESCAP 2015). Some medium-sized and small cities have experienced rapid growth, while others are experiencing depopulation. For example, the number of people living in small cities in Indonesia with populations in the range of 100,000–500,000 declined at an average rate of more than 2% per year between 1993 and 2007 (Seto and Lansing 2013).

2.2.2 Drivers

Cities are places where demographic, economic, social and environmental transformations are unfolding in unpredictable ways. Much of Asia-Pacific's urban development is either unplanned (UNESCAP 2017) or planned with a very narrow range of objectives. Understanding its drivers is critical for addressing the negative impacts urban development has on land as well as for harnessing the opportunities it offers for sustainable land management.

One of the major ideas that has shaped land use and management in the region both directly and indirectly is the notion that economic restructuring is necessary for countries to grow their economies (ADB 2013a). Specifically, this idea holds that countries must shift their economies from their agricultural beginnings towards generating the greater part of their gross domestic product (GDP) from industry, manufacturing and/or service sectors, which promise large gains in labour productivity. This notion has widely influenced economic policies across the region. As a result of these policies, the share of agriculture in regional GDP declined from 14% to 7% from 1970 to 2012, while over the same period the share of services increased from around 46% to 59% (UNESCAP et al. 2016).

One outcome of economic restructuring is that cities have become the region's hubs of economic growth and wealth creation, generating as much as 80% of the region's GDP (UNESCAP 2015). There has also been a shift in the world's industrial activity to Asia-Pacific developing countries and its concentration in the mega-urban areas, a trend that is ongoing (UN and ADB 2012).

The economic advantage provided by cities is one of the main factors for the region's urban growth. Urban areas support economies of scale, the development of mass markets and higher labour productivity by concentrating infrastructure, human resources, and administrative functions in one location. They thus act as a magnet for domestic and foreign investment, one which becomes increasingly powerful as urban facilities improve. Institutional reforms creating opportunities for domestic and foreign private capital, combined with the creation of industrial estates, export processing zones, container ports and other infrastructure facilities, have accelerated urban growth.

Box 2.1 illustrates this point, showing how a variety of policy decisions to promote inward investment and deregulate markets led to rapid urban growth in the Pearl River Delta, China.

The increased affluence brought about by economic growth coupled with technological advances in transportation and communications has also contributed to the growth of megacities and mega-urban regions. The development of national road systems and freeways has encouraged the use of private cars, which, combined with a desire of families to live outside the urban core, has led to dispersed and low-density sprawl (UNEP 2012a).

Population growth, together with the expectation of greater economic opportunities in cities, is also driving urbanisation. The Asia-Pacific region is home to more than half of the world's population, despite having only one third of the world's arable land (Richter, Benjamin, and Punpuing 2009). While progress has been made in slowing population growth through reductions in fertility rates in all sub-regions, population continues to grow in some countries as their population pyramids have a "youth bulge", i.e. a large number of people in the working age population (e.g. Philippines, Lao PDR, Afghanistan, Timor Leste and India).

Box 2.1 Factors facilitating urbanisation is the Pearl River Delta

Seto (2005) explains how economic and urban growth in the Pearl River Delta, China were spurred by decentralisation policies and market reforms in 1979. The decentralisation policies included replacing collective farming with the "household responsibility system", giving provincial and regional governments the freedom to establish development priorities and issue loans, and relaxing the household registration system, which restricted where people could live. The market reforms included removing agricultural quotas and allowing farmers to sell their products at market prices, establishing special economic zones and policies to attract foreign investment, allowing the transfer of land use rights, and creating markets for land.

There are also a set of push factors behind urbanisation. Extreme weather events and land degradation associated with climate change are encouraging rural-urban drift. In some places livelihood opportunities are declining because of the consolidation of landholdings in fewer hands and the mechanisation of agriculture. Policies promoting market integration play a part as they encourage investors to seek the advantages of economies of scale in agriculture, and they also expose smallholders to fluctuating world prices. Lack of on- and off-farm jobs and educational opportunities in rural areas, as well as the lower social status of farming in some countries can also be important push factors. Chapter 7 provides a case study on urbanisation in Dhaka city, Bangladesh, which finds a range of push factors behind the migration of rural dwellers to the city. These include floods and natural disasters, river erosion, low income levels, and exploitation by the rural elites and moneylenders.

2.2.3 Impacts

Urban growth affects not only existing urban areas but also peri-urban and rural areas. It can provide benefits for peri-urban and rural areas by increasing markets for agricultural products, creating off-farm job opportunities for the underemployed and unemployed, and improving access to higher-quality education and healthcare services. However, the region's rapid urban growth has largely been inefficient and unplanned. It is associated with unsustainable patterns of production and consumption that have detrimental effects within and well beyond urban boundaries, including environmental degradation, the unsustainable use of natural resources and the generation of huge and unmanageable volumes of waste. UNESCAP describes the urban legacy of the region as "fundamentally unsustainable" (UNESCAP 2017). Urban growth has resulted directly and indirectly in changes in land-use type and intensity with serious trade-offs for biodiversity and ecosystem services, as well as changes in land quality through the dumping of solid and liquid waste. The underlying processes responsible for these transformations are associated with the spreading of urban functions into the urban hinterland (urban sprawl), growth of the built-up area (urban growth), and growth of the urban population (urbanisation) (Nelson 2005).

Urban sprawl, by definition, involves a change in land use. Its environmental impacts include flooding, pollution, groundwater contamination and habitat loss (UNESCAP 2005). The urban area has been growing rapidly and in a disorganised manner across much of the Asia-Pacific region at the expense of other ecosystems and causing immense environmental damage. Another consequence of unplanned urban expansion is the increasing number of urban residents living in hazard-prone regions (UNDESA 2011).

Many examples of environmental and agricultural trade-offs resulting from urban sprawl can be observed across the region. Globally, 46 million hectares of crop land are expected to be converted to urban areas by 2030 (Bren d'Amour et al. 2016). In the 30 years up to 1985, urban land in India expanded by 1.5 million ha, mostly at the expense of agricultural land (Zhao et al. 2006). Further urbanisation along coastlines is projected and this could destroy sensitive habitats such as mangroves and sea turtle nesting beaches, as well as raise demand for fish, turtle eggs and other seafood (Nagendra et al. 2013). In neighbouring Bangladesh, between 1960 and 2005 urban expansion of Dhaka Metropolitan resulted in the loss of 7,614 ha of agricultural land, 2,336 ha of vegetation, 6,385 ha of wetland/lowland, and 864 ha of water bodies (Dewan and Yamaguchi 2009). Much of this urban growth centered on informal settlements with little effort made to mitigate environmental impacts (ibid.). In the Philippines, prime agricultural lands in Laguna and Cavite provinces near the capital Manila were converted into residential areas and industrial estates. This had a significant impact on the landscape and environment, including pollution of waterways due to domestic sewage (UNESCAP 2005). The resultant displacement of farmers has fueled the growth of slum areas (ibid.). In China, urban sprawl is associated with the loss of fertile agricultural land and biodiversity. Rapid urban expansion in Shanghai led to the loss of 100 wild plant species on Dajinshan Island (Zhao et al. 2006). Further pressure on biodiversity from urban sprawl is anticipated, as China's urban land in biodiversity hotspots is projected to increase to about 77,000 km^2 by 2030 (Seto and Lansing 2013). Urban sprawl is also threatening ecosystems and biodiversity in Oceania. Oceania's built-up area is expected to double by 2030 and many of its urban areas are located within biodiversity hotspots (Dyball, Ives, and White 2013). Rapid urbanisation in Oceania has resulted in the conversion of multispecies cropland and coastal and mangrove forests, leading to loss of fuelwood and medicinal plants, the destruction of important habitats for birds, crabs, finfish, shellfish, etc., and vulnerability of coastal areas to erosion, saltwater incursion and flooding (Thaman 2008).

Urban infilling and developments have also affected biodiversity and ecosystem services in some city cores. In India, many cities' existing green spaces have been transformed to "human-designed, landscaped and pesticide-intensive parks", and exotic plant species have been introduced (Nagendra et al. 2013, 68). This has reduced native bird species diversity and resulted in the spread of invasive exotic species into adjacent habitats (ibid.).

The indirect impacts of cities associated with their consumption and transformation of materials, their demand for water and energy, and their waste generation can extend to land use and land quality in far-off places. The impacts of urban activities on natural ecosystems in rural areas, which serve as a "resource frontier" (McGee 2009), has greatly increased because of their growing use of materials. The region's material footprint of consumption grew threefold between 1990 and 2010, with the construction sector accounting for most of the consumption (UNESCAP et al. 2016). When environmental controls are not strictly enforced, the extraction of minerals and other resources for urban-based industries and urban consumption can cause serious environmental harm in far-off places that goes unnoticed by urban residents.

Urban growth is also associated with changing consumption patterns that further raise levels of resource use and intensify rural land pressures. Trends in regional food consumption patterns include increased consumption of wheat and wheat-based products, growing consumption of high-protein and energy-dense foods, growing popularity of convenience stores, and increased consumption of imported food products (UNESCAP 2005). These trends have encouraged more intensive use of agricultural land, which has resulted in a regional decline in land fertility, the

pollution of aquifers and waterways by fertilisers, pesticides and animal wastes, and the over-extraction of water.

One outcome of the growing economic activity and the changing consumption patterns in urban areas is an explosion in the volume of regional waste. Urban areas in Asia-Pacific developing countries generate about 960,000 tonnes of municipal solid waste per day, a figure that is expected to more than double by 2025 (UNESCAP 2017). This waste contains non-biodegradable and toxic elements that are polluting land and water bodies. While waste management has improved in some municipalities, most city administrations continue to manage these huge volumes of waste by open dumping and uncontrolled landfilling (ibid.).

2.2.4 Ways forward: Governance, strategies and policies for inclusive and sustainable cities

Cities require innovative governance solutions. They are complex adaptive systems that seldom follow linear patterns and their decision-making processes are diverse. Decisions are made through processes that reflect hierarchical models of governance interacting with networks of various stakeholders such as businesses and civil society (UNESCAP 2017). Many decisions over urban land take place outside formal controls and much of the urban economy is informal. Urban planners and managers are poorly equipped to deal with this informality (Brown 2015).

The challenges to governance are exacerbated in cities experiencing rapid urbanisation, which struggle with congestion, pollution, ecosystems degradation and land supply. In rapidly growing cities, urban expansion has usually outpaced regulatory and planning frameworks, and lack of transparent governance and effective legislation make urban planning tough (Brown 2015). Governance becomes especially problematic when cities grow outwards across ecosystems and administrative boundaries. Fragmentation of responsibility, limited capacity and the mismatch between the scale of the problem and the scale of administration make effective urban management difficult. However, cities are also centres of innovation and home to a growing and well-connected middle-class. Small improvements in governance could bring about significant changes in urban design and strategies and in urban production and consumption patterns, easing pressure on land and reducing environmental harm.

Multilevel and collaborative governance

The complex challenges posed by rapidly growing urban areas and their informality can best be addressed through multilevel and collaborative governance systems (UNESCAP 2017). Multilevel governance is required to ensure actors come together at appropriate scales for effective urban planning and development. Vertical coordination of different levels of government – local, regional and national, and metropolitan and district – is crucial to ensure that decisions and actions at different levels are integrated. Conflicts can arise between different tiers of government, especially in decentralised settings where sufficient support has not been provided to lower levels of government. Strengthening technical capacity and providing adequate and predictable financial transfers to the lowest tiers of government can increase the effectiveness of city administration and mitigate the risk of conflict (Brown 2015).

Within the framework of multilevel governance, horizontal coordination between administrations at the same level will be required where urban areas have grown beyond municipal boundaries. In such cases, urbanisation can no longer be managed effectively just within the framework of municipal planning. (For further discussion on this point see Chapter 7, which provides an example

from the Philippines of inter-municipality cooperation to reduce the risk of flooding from urban development.) Administrative reorganisation and other regional responses as well as national policy directives may be necessary to enable comprehensive planning and coordinate city plans to ensure that they are complementary (McGee 2009; Güneralp and Seto 2013).

Collaborative governance aims at greater collaboration between city government, businesses and civil society to bring the interests of different stakeholders into decisions for more equitable and sustainable cities (Nagendra et al. 2013; Roberts and Addison 2015). Collaborative governance could help improve transparency in city decisions, which is particularly important for contested issues, including those with environmental implications such as spatial planning. Collaborative governance can also help breakdown the "silos" of urban governance that many public agencies work within (Roberts and Addison 2015). To achieve collaborative governance, the means for engaging non-state actors through structures and mechanisms that support effective relationships across public, private and community sectors must be provided (ibid.).

Collaborative governance will not be easy to achieve and should be viewed as a process of learning and continual improvement. Mistakes will be made and it may take a long time before governance is even near to being "right". Initiatives to promote collaborative governance have to deal with the growing inequalities in cities and power relations. People are competing over land. Some have much greater power to influence city authorities than others. The less powerful include people from rural areas who have moved into cities hoping for a better life but who have found themselves living in highly congested slums. The more powerful include wealthier urban residents who may see slums and urban wetlands and lakes as areas with high potential for new lucrative land developments. The land developments sponsored by the wealthy may be driving poorer people out of the city centres and away from their areas of employment. In such settings the challenges for collaborative governance include ensuring all residents have an effective voice in decision-making and that influential groups are not allowed to dominate processes.

Some initiatives supporting greater collaboration in city decisions can be observed in the Asia-Pacific region. For example, in the Republic of Korea public hearings, public displays for planning proposals, consultation with select committees on plans, review by an urban planning board and a resident's proposal system are parts of collaborative city planning processes that were introduced from the 1980s. Residents who take initiative on community-improvement projects receive financial support and the aid of a support team and a support centre (ibid.).

Visions, strategies, planning and design for sustainable cities

The urban landscape does not have to be a "concrete jungle" and can contain rich biodiversity and ecosystems that contribute to people's quality of life. Cities can include urban forests and other greenspaces, urban wetlands and lakes that provide places for recreation, encourage people to learn about the importance of nature conservation, reduce air pollution, decrease urban heat island effects, reduce flooding and increase groundwater recharge.

It may be useful to develop an urban policy at the national level and to set this within a broad cross-cutting vision of sustainable and inclusive cities to promote inclusive economic growth and reduce the environmental footprint of cities. This vision could be of a built environment that supports not only economic productivity, but also ecology and culture as well as regular interactions between people and nature. Indonesia's National Urban Development Policy for 2015-2045 provides a useful example. It aims for the nation's cities to be liveable, safe and comfortable, green, disaster- and climate-resilient, and smart and competitive. It includes indicators for "green cities" and aims for all

cities to achieve these by 2035. It also aims to develop linkages between cities and surrounding mixed-use areas within the national urban system (Parasati 2016).

An inclusive city is one in which inequalities are reduced and people have opportunities and support to flourish. To achieve this will require a real commitment from city governments to partnering with under-represented groups such as the urban poor, minority ethnic groups and women in developing city visions and strategies. Creative and innovative solutions are likely to emerge from such partnerships.

For cities to be sustainable, urban expansion must be brought under formal planning processes. Urban design strategies need to combat the low-density urban sprawl that can be observed in many Asia-Pacific cities. Metropolitan spatial strategies can set out areas for future city expansion, ensuring that sensitive areas, the best agricultural lands and natural assets are protected. For areas experiencing rapid transformations, small-area medium-term neighbourhood or local plans can be used to generate a shared vision for society, the economy and the environment (Brown 2015).

Urban design should promote urban forms that minimise energy use and support inclusive economic development. Urban design can create compact urban forms that reduce the need to travel and increase resource efficiency, though this requires local government to direct development in ways that ensure air and water pollution are avoided. Some cities in China have developed high-density compact areas to reduce pressure on land and have introduced urban growth boundaries (UNESCAP 2017). Retrofitting of urban cores, i.e. the process of redesigning existing city infrastructure, can also contribute to reducing a city's environmental footprint, but gentrification that forces low-income households to move away from their places of employment when suitable housing alternatives and public transportation do not exist should be avoided. Urban design can be incorporated into a broader city management strategy that aims to create sustainable and inclusive cities using concepts such as "eco-city", "smart city", and "low carbon city" (Brown 2015). Urban design can also include greening programmes, examples of which can be found in cities such as Singapore, Melbourne and Beijing.

Urban strategies can be based on development paradigms that assist cities and mega-urban areas to move away from car-dependent development towards more compact cities with mixed-use areas, pedestrian friendly environments and well-developed public transportation infrastructure. Effective public transport can reduce energy use, GHG emissions and air pollution. While promoting the use of public transport, policies can also discourage the use of private cars, employing a variety of instruments including road user charges, duties, fees and taxes that raise the costs of vehicle ownership, restricted and paid parking areas, and no-car zones. Examples of successful strategies to reduce the use of private motor vehicles and promote other forms of transportation with lower environmental footprints include the introduction of car-free days in highly congested areas by the Seoul Metropolitan Government, the introduction of urban development guidelines in Shanghai to remove cars from roadsides and make the streets "safe, green, vigorous and smart", which involved designing streets in favour of pedestrians, cyclists and public transport users, and the introduction of an "area licensing scheme" in Singapore, which requires motorists to purchase and display a paper permit for restricted zones in the downtown area (Centre for Liveable Cities and Urban Land Institute 2017).

Focus on problem solving

Effective formal planning may be impossible in some cities in developing countries due to lack of up-to-date maps, weak controls on development, outdated planning processes, and little public

understanding or compliance with planning regulations. In this setting, the focus should be on problem-solving, not plan development (Brown 2015). Rather than putting all their efforts into the favoured urban management approach of developing city master plans, which in developing countries usually prove impossible to implement, city governments can employ action-planning processes, focusing on critical problems and generating demonstrable benefits (ibid.). These could include providing some form of secure land tenure for the low-income sector, protecting wetlands and preserving and creating greenspace.

Reducing city demands for materials

Reducing urban waste and material use can generate large economic, social and environmental benefits. Strategies in urban areas that would reduce pressure on land and its resources include waste reduction, recycling, and green building codes that encourage the use of renewable materials and solar panels or micro wind turbines to generate power. These activities need to be designed from a holistic development perspective, of which the environment is one part. For example, if private sector involvement in waste recycling is encouraged, it should be part of a broader strategy that does not displace livelihood opportunities for waste pickers. Box 2.2 provides an example of an initiative by a municipal government to reduce urban waste and manage it in a way that provides economic opportunities and minimises environmental impacts.

Developing sustainable urban-rural linkages

Precisely because urban areas use so much energy, water and materials from rural areas, a small positive change in urban consumption and production patterns can have great benefits for rural development, biodiversity and ecosystems. Governance structures and institutions to promote and manage urban-rural linkages can help harness these opportunities. Various strategies can be used to encourage responsible urban consumption of food that contributes to rural livelihoods and supports sustainable agriculture. Support can be provided for the establishment of farmers' markets, informal urban food markets, and supply and storage systems to reduce food waste.

Box 2.2 Local initiatives towards zero waste in Phitsanulok Municipality, Thailand

With a total population of about 140,000 to 190,000 residents, Phitsanulok city in northern Thailand was generating 142 tonnes of waste per day in 2011, all of which it was sending to its landfills. The municipal government was finding open dumping increasingly difficult because of growing social resistance, shortage of land and increasing land prices. In 2007, it introduced a policy for "zero waste landfill," which incorporated the 3Rs (reduce, reuse, recycle) concept, the polluter pays principle, community-based waste management, the application of mechanical biological treatment (MBT), and a facility that extracts oil from plastic (refuse-derived fuel (RDF)) using pyrolysis. At household level, waste is separated into sellable materials, organic waste (which is composted by households), hazardous waste, infected waste (which is incinerated by hospitals) and waste to be disposed. The disposed waste undergoes MBT and screening, and oil is recovered from the salvaged plastic. To implement the new waste-reduction and management programme, the municipality undertook public awareness campaigns and promoted recycling businesses by visiting residents door-to-door, engaging waste buyers under free market conditions, regulating environmental and health impacts, and introducing a waste bank programme. Through these efforts, the city reduced its waste collection costs by USD 210,000 per year, the volume of waste sent to its landfills by 95%, and GHG emissions from its waste sector by 84%, and created new business opportunities.

Source: Sang Arun (2012)

McGee (2009) identifies governance of the "desakota" as deserving special attention because of the multiple functions these zones of diverse land uses serve in supporting the urban centres and because of the rapid land-use changes that are taking place in them. He argues that "desakota" are crucial to the natural bio-system of mega-urban regions and that the preservation of their natural resources and ecosystem services is crucial to the sustainability of the entire urban region. The "desakota" require innovations in governance because their complex array of intermingled land uses – agriculture, industry, settlements, recreational areas, shopping centres and retail – make them inappropriate for conventional planning approaches that divide areas into functionally specialised zones.

Upgrading of slums

Slums require special consideration in urban management, as they are homes for the poorest city dwellers and as they can have a large environmental footprint when city waste services are inadequate. Reflecting rising affluence in the region, the percentage of the urban population living in slums has declined, despite the rapid rates of urbanisation. In South Asia, the proportion of urban dwellers residing in slums dropped from 57% to 31% between 1990 and 2014, and for East Asia and the Pacific (excluding high income countries) from 47% to 26% over the same period (UN 2018b). However, the number of people who continue to live in slums is substantial, and providing them with basic services and effective forms of security are high development priorities.

The conventional paradigms of urban planning are poorly suited to the management of informal settlements and slums. City elites look on these as disorganised, dirty and inefficient places, but they are an important part of the urban cultural and economic landscape. They provide affordable housing and enable low-income households to participate in the informal economy and raise their income above what they could earn in their villages.

Rights-based approaches can be incorporated into city management strategies to ensure that the wellbeing of slum dwellers receives proper attention. Rights-based approaches eschew evictions of poor urban dwellers from slums in favour of the upgrading of slums and securing some type of

tenure for slum dwellers (Hearne and Kenna 2014). Physical improvements to water, drainage and sanitation, and support for waste recycling with health and safety standards in place, can improve the health of slum dwellers, provide new forms of livelihood, and reduce the environmental impact of slums on their surrounds. Solutions may best be found and implemented through participatory processes involving urban planners working closely with non-governmental organisations and residents, and by focusing on self-help options (Brown 2015).

Sharing experiences

Rapidly urbanising Asia-Pacific cities face similar challenges that are transforming land within, around and well beyond the urban core. Different cities have tried different approaches to address these challenges. Given their diverse experiences, with some cities having advanced more than others on certain environmental issues, Asia-Pacific city governments stand to learn a lot from each other. City-to-city cooperation can be an effective way to bring new ideas to city governments on how they can work towards a vision of inclusive and sustainable cities. Reviews of city-to-city cooperation have found that it can be an important way to involve a range of urban actors in urban development and reinforce urban governance from different angles (Ishinabe 2010). Japanese cities such as Kitakyushu and Kawasaki have been particularly active in promoting environmental city-to-city cooperation (ibid.).

2.3 Rural landscape transformations

The agricultural sector has undergone major transformations in conjunction with those in urban areas, most notably a shift towards much more intensive land use to supply agricultural produce to local, national and international markets. This shift, combined with growing affluence and opportunities outside rural areas, is responsible for a number of trajectories of agrarian change including (i) increasing integration of agricultural production into the national and global economy, (ii) diversification of livelihoods with some family members working in towns or cities, and even abroad, (iii) increased mobility that is stretching households and villages across space, and (iv) increasing connectivity of rural communities through advances in information and communications technologies (Drahmoune 2013). Many families continue to work the land but have diversified lifestyles that are characterised by mobility, multi-locality and market orientation (Hirsch 2012). With increased income and growing employment opportunities in urban areas and abroad, the activities of rural households are far less spatially confined than they once were. Sons and daughters are finding waged employment in far-off places. These changes are impacting divisions of labour, gender norms and identities, consumption patterns and lifestyles (Rigg 2001).

A wide variety of rural landscape transformations can be observed in the Asia-Pacific region. The most prevalent of these are associated with the territorial expansion of agriculture, the transition towards more intensive agricultural land use, the exploitation of natural resources in sparsely inhabited areas, and efforts to rehabilitate degraded land. In the sparsely inhabited areas, forestry has had the most significant impact on ecosystems, whereas efforts to rehabilitate degraded land have mostly focused on establishing new forests.

2.3.1 Location, scale and features

Territorial expansion of agriculture

The expansion of agriculture (and aquaculture) into areas occupied by largely undisturbed natural ecosystems is one of the most pervasive landscape transformations in the Asia-Pacific region. From 1700, in a period of about 200 years the total area of agricultural land in South Asia increased by 296% and in Southeast Asia by 1,275% (Zhao et al. 2006). Figure 2.2 shows that from 1961 to 2015 the total area under agriculture increased by 59%, 31% and 51% in Southeast Asia, East Asia and West Asia, respectively, and declined by 2% in both South Asia and Central Asia, largely because of land degradation. Agriculture is now the major land use in most Asia-Pacific countries.

While the general trend is towards the expansion of areas under agriculture, farm land is being abandoned in some rural areas, such as in parts of Japan affected by depopulation.

Agricultural intensification

In the process of agricultural intensification, rural landscapes across the region have been transformed from highly diverse farming to much greater uniformity in land use characterised by monocropping for national and international markets, the extensive use of irrigation systems and the heavy application of chemical pesticides and herbicides and fertilizers. In some countries of Southeast Asia, shifting agriculture characterised by high crop diversity has progressively decreased, giving way to intensive monocropping of commercial crops (Braimoh et al. 2010).

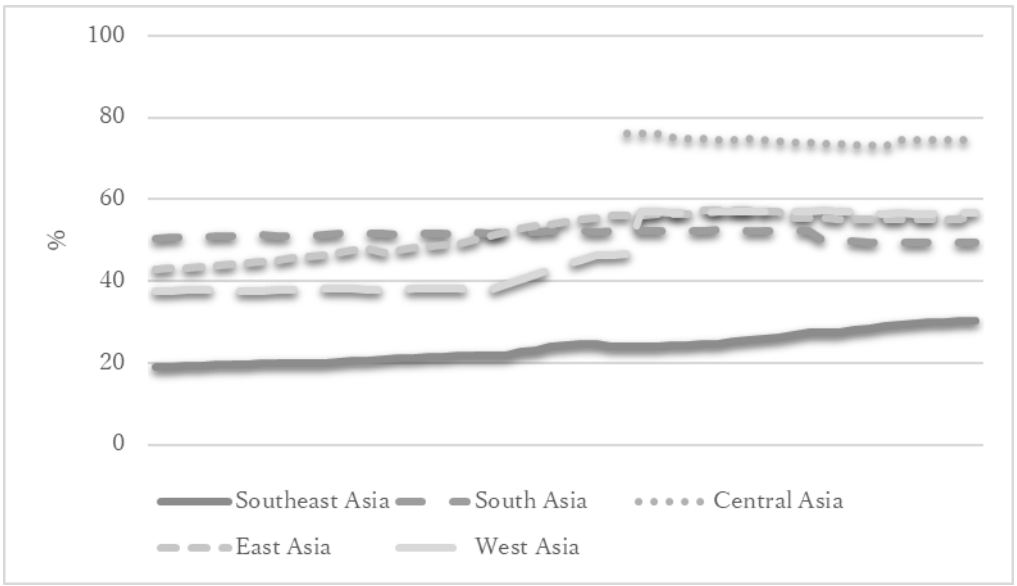

Figure 2.2 Trends in percentage of agricultural area by region

Source: FAO (2018)

Forest changes

Forest is one of the most significant land covers in the region and one that has experienced profound changes since the 1960s when logging of natural forests began to take off. In Asia, 593 million ha (about 19% of total land area) are designated as forest land, of which 117 million ha are primary forest and 129 million ha are planted forest (FAO 2015).[3] Between 2010 and 2015, 9.1 million ha of new planted forest were established, but the region lost 5.1 million ha of primary forest, making an overall increase in forest area of 4 million ha (ibid.).

The loss of primary forest can be observed in many parts of the region but has been particularly rapid in Southeast Asia. Indonesia and Myanmar were ranked amongst the 10 countries globally reporting the greatest annual forest reduction for 2010-2015. Indonesia lost on average 0.7% of its forest annually over this period and Myanmar 1.7% (ibid.). For the same period, the largest annual forest gain globally was in China (1.54 million ha), while there were also large increases in Australia (308,000 ha), Philippines (240,000 ha), Lao PDR (189,000 ha), India (178,000 ha) and Viet Nam (129,000 ha) (ibid.).

Changes within forests are also a notable aspect of the region's landscape transformations. Fifty-four million ha of forest experienced a decrease in canopy cover between 2000 and 2010 (ibid).

2.3.2 Drivers and proximate causes

Agricultural intensification and increase in agricultural area

The drivers of agricultural intensification include agricultural policies, the development of new crop and fertiliser production technologies, economic growth and integration, and the establishment of transportation infrastructure (Nelson 2005). Governments have set national production targets for specific crops and to achieve these have pursued agricultural intensification through various interventions and support mechanisms. These include the development of rural infrastructure such as roads and irrigation schemes, the formation of rural cooperatives, the provision of input subsidies, agricultural price supports, microfinance and farm credit, and rural extension programmes.

The development of new agricultural areas has also been a policy objective in some countries, though the unplanned encroachment by agriculture into forests can also be widely observed. An example of a planned development is the one-million-hectare mega rice project in Central Kalimantan, Indonesia promoted by erstwhile President Suharto. The objectives of this project were to promote national food security and reduce land pressure on Java Island by moving people to small agricultural holdings in Central Kalimantan to grow rice. The project involved deep drainage of the peat swamps and clearance of peat forest, but the project was later declared a "mega disaster" as the cleared land could not sustain permanent rice cultivation (Suyanto et al. 2009).

Another pattern of planned agricultural development, one that is prevalent in parts of Southeast Asia and some of the Pacific island nations, is the granting of agricultural permits to agribusinesses. The permitting processes of these operations differ between countries, from large concessions on state land granted in Indonesia to the alienation of land rights of customary communities and their consolidation in large blocks for agricultural developers in PNG. Governments expect that land

[3] In some countries part of the area designated by the government as forest land does not hold any trees.

development by agribusinesses will generate employment, contribute to the public purse and promote development at the local level. However, many developing Asia-Pacific countries experience weak land governance and this facilitates large-scale private sector rural developments through lax control of the land permitting and development processes. Global “land-grabbing” is also driving large-scale agricultural developments in the region. The consequences for local society and economy and the environment can be severe (see Chapter 4, which discusses land grabbing in Papua New Guinea). Land developments by agribusinesses have been identified as the region’s main proximate cause of post-1990 deforestation (Hosonuma et al. 2012).

The underlying drivers for the unplanned expansion of agricultural land include natural population growth, inward migration, lack of secure land tenure, poverty and lack of alternative livelihood options. In forested areas, agricultural encroachment is made possible by the construction of logging roads. Land policy also plays a role, as in some countries (e.g. Thailand) to ensure that it is not taken away from them, local people clear forest on the land to show they are living on and actively developing it. In Southeast Asia, the uplands have served as a pressure valve for overpopulation in the lowlands, with people moving to the uplands and clearing land for agriculture, often encouraged by governments as a way to open up the sparsely populated areas. In recent years, this practice has been confronted by the shift to the commodification of land and resources through agricultural, forestry and mining concessions.

Economic growth and regional and global economic integration are underlying drivers for both agricultural intensification and the development of new agricultural areas. While food security has traditionally been a central concern of governments in the region, agriculture has also become a significant foreign exchange earner for all sub-regions (Figure 2.3). Between 2000 and 2013 the total value of agricultural products exported by Asia-Pacific countries grew threefold (FAO 2018).

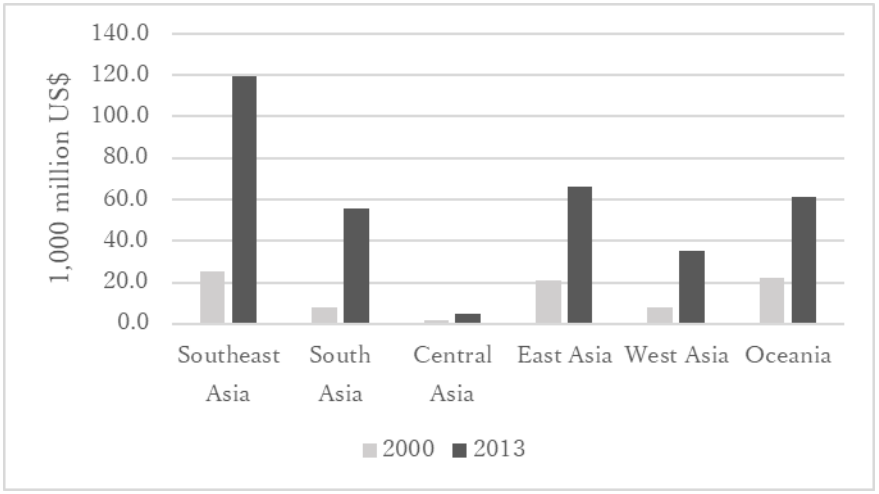

Figure 2.3 Total value of Asia-Pacific agricultural product exports by sub-region

Source: FAO (2018)

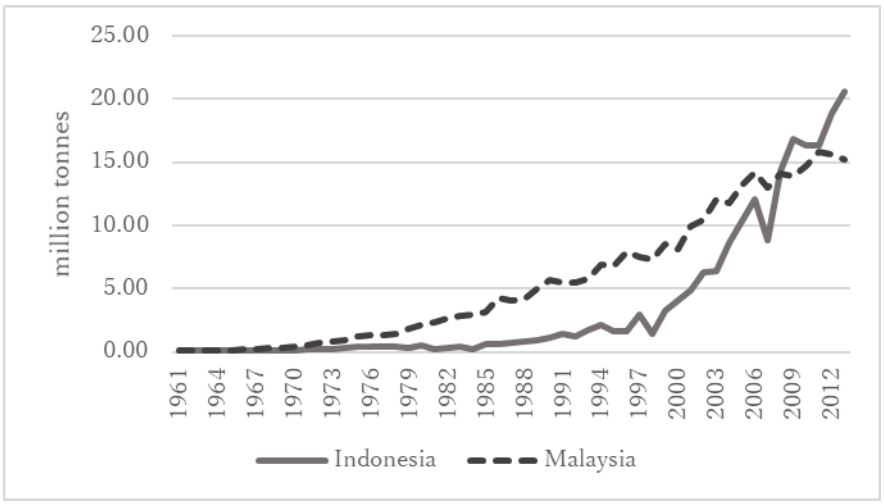

Figure 2.4 Palm oil exports from Indonesia and Malaysia, 1961-2012

Source: FAO (2018)

The main crops that new agricultural land is being developed for, particularly in peripheral and marginal regions, are commercial crops, especially oil palm, rubber, coconut, cassava, sugar cane, coffee, cocoa and tea. The export volume and value of some of these products has grown rapidly in recent decades. By volume, palm oil was Asia's largest exported agricultural commodity in 2013, with Indonesia and Malaysia being the largest producers (FAO 2018). The combined volume of their palm oil exports grew almost threefold between 2000 and 2013 (Figure 2.4). The major markets for their palm oil are China and India, which collectively accounted for 29% of global palm oil imports in 2013 (FAO 2018).

Reduction in forest area and forest degradation

Proximate causes

Commercial agriculture is the major proximate cause of deforestation in Asia and Oceania, accounting for about 35% of forest loss (Hosonuma et al. 2012). Figure 2.5 indicates that between 1995 and 2014 the area of agricultural land in East Asia (including Southeast Asia) and the Pacific more than doubled, while the forest area declined by about 18% (FAO 2018). Forest area increased slightly in South Asia, where communities have been successfully engaged in managing forest under the national forest policies.

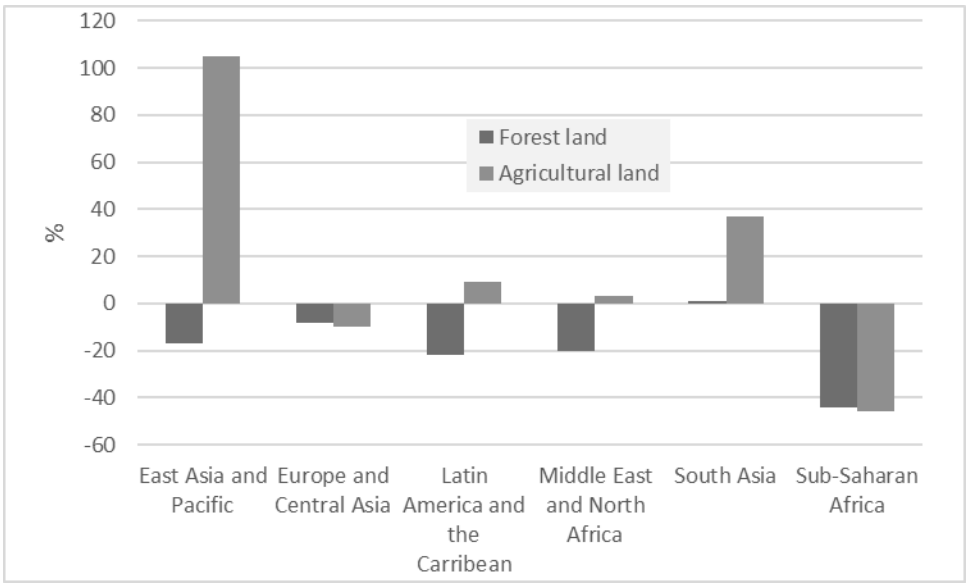

Figure 2.5 Change in per capita value of forest and agricultural land, 1995–2014

Note: East Asia includes Southeast Asia in this figure. Source: Lange, Wodon, and Carey (2018)

In Southeast Asia, other proximate causes of deforestation include the establishment of "fast wood" and rubber plantations for pulp and paper production, fires (especially in Indonesia), shifting agriculture and the conversion of mangrove forests to aquaculture (Stibig et al. 2014). Deforestation has also occurred because of mining (Indonesia and Lao DPR), urbanisation (Myanmar), fuelwood collection (Myanmar, Thailand, Viet Nam), resettlement (Lao PDR), construction of hydropower dams (Mekong Basin) and road construction (Lao PDR and Cambodia) (ibid.).

Logging operations cover much of the accessible natural forests in Southeast Asia and poor logging practices explain why many of these areas end up heavily degraded. In Asia, 42% of forests are designated for production of timber (FAO 2015). In Oceania, the area of production forest only accounts for 7% of the total forest estate (ibid.), but in the case of PNG, much of the accessible lowland forest has been allocated under logging concessions. Extensive logging operations can also be found in the Annamite mountain range (Lao PDR, Viet Nam, Cambodia), northern Myanmar, and in eastern Sarawak and central Kalimantan, Indonesia (Stibig et al. 2014). Logging and timber extraction are responsible for about 70% of forest degradation in the region (Hosonuma et al. 2012).

Fuelwood removals are another major proximate cause of forest degradation in some Asia-Pacific developing countries. In 2011, the largest wood removals globally were in India, where almost 90% of total wood removals were fuelwood (FAO 2015). However, fuelwood use is declining in the region due to rising incomes and urbanisation (Gumartini 2009).

Underlying drivers

Economic growth and integration and their effects on markets for agricultural and forest products, public policies, weak governance, incomplete decentralisation processes, lack of sectoral coordination, demographic factors (population growth and internal migration), market failure, poverty and insecure tenure are underlying drivers of deforestation and degradation in the region. Economic growth and integration are particularly significant, providing incentives not only for the development of new agricultural areas, but also for logging. As with major agricultural commodities,

there is growing intra-regional trade in timber and non-timber forest products, driven by growing affluence and facilitated by economic integration. In 2011, half of Malaysia's log exports went to India, with the remainder taken by other Asian markets; PNG exported 90% of its logs to China; and 56% of Myanmar's log exports went to India, with China taking another 30% (ITTO 2012). Figure 2.6 shows that in 2016 the major importers of lumber and sawnwood from Southeast Asia were countries in Asia. The same pattern can be observed for exports from Oceania.

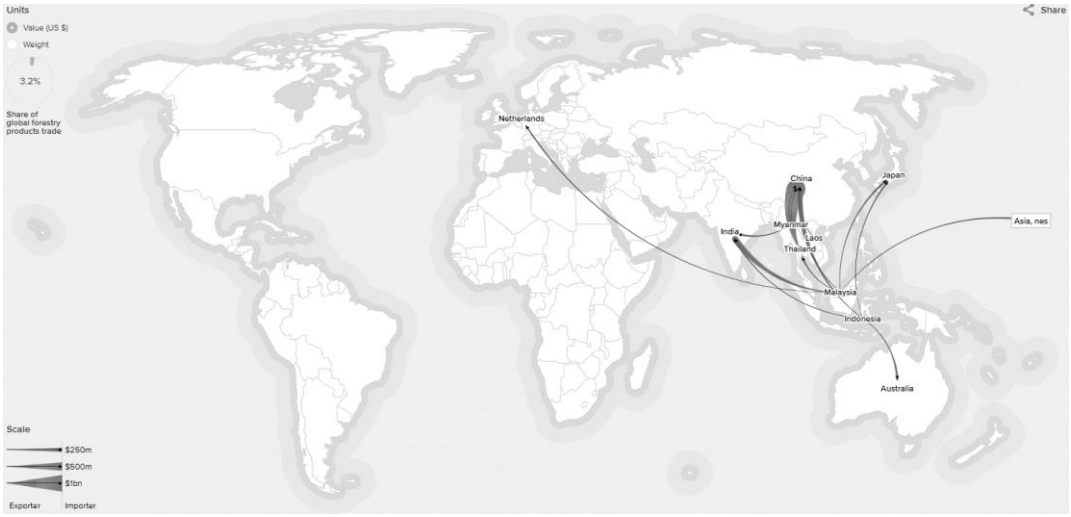

Figure 2.6 Lumber and sawnwood exports from Southeast Asia to all countries, 2016

Source: Chatham House (2018)

In parts of the Asia-Pacific region, domestic demand for housing as well as for furniture and other secondary wood products has been growing because of rising income levels, population growth and urbanisation. Experiences in India and China both illustrate this point. A boom in construction in India, which the government encouraged with loan subsidies and taxation incentives to the building industry, led to an increase in log and plywood imports. In China, urbanisation and rising income levels have increased the imports of wood for joinery and furniture as well as paper and paperboard for writing paper, magazines, photocopying, cardboard boxes, paper bags and toilet paper (Xiufang and Canby 2011; ITTO 2012).

Weak governance is also widely recognised as a key underlying driver of deforestation and forest degradation (Agrawal, Chhatre, and Hardin 2008). Regulations controlling the permitting of forest concessions and to reduce the environmental impacts of logging operations may be weakly enforced because forest departments are not provided sufficient resources to properly manage the vast tracts of forest they are responsible for and because of pressures placed on them by political leaders to develop forestry projects. After the harvesting of the largest trees, investors may be able to sway governments to allow conversion of the forest for agriculture or tree plantations, arguing that the forest no longer has any commercial value.

The underlying drivers of increasing fuelwood removal include poverty and the lack of low-cost, alternative fuel sources.

Increase in forest area

The increase of forest area following a period of forest loss that can be observed in some Asia-Pacific countries fits with the forest transition theory. This theory argues that after losing much of their forest cover and feeling the impacts of the consequent loss of forest ecosystem services, countries begin to take better care of their remaining forests and start to reforest, resulting in an increase in forest area (Gumartini 2009). The forest transition theory is supported by the experience of China, where the cutting down of the forest on hillsides for cultivation in the upper and middle reaches of the Yangtze and Yellow river basins contributed to devastating floods and four billion tonnes of soil being lost annually through erosion (Delang, Claudio, and Yuan 2015). Spurred by the impacts of this environmental damage, the Chinese government launched six forestation programmes targeting over 100 million ha. The forestation was conducted by giving sacks of surplus grain to households in degraded areas in return for them giving up the farming of marginal land (ibid.).

However, the transitions in forest cover observed in the Asia-Pacific region are more complex than what the forest transition theory suggest. Countries can be losing natural forest at the same time as they are attempting to rehabilitate once forested degraded land. Indonesia, for example, ran its National Movement of Forest and Land Rehabilitation (GN-RHL/*Gerhan*) programme to reforest several million hectares of degraded land in critical watersheds at the same time as it continued to lose more than 500,000 ha of primary forest annually.

2.3.3 Impacts

Land degradation and loss of socio-ecological production systems

Agricultural productivity gains have contributed immensely to food security and the improvement of human wellbeing in the region and agricultural intensification is widely recognised as essential to combat deforestation. However, in pursuing greater yields governments have not put in place strict environmental controls, which has resulted in serious trade-offs that make the future for the region's agriculture uncertain (UNESCAP 2009). On the positive side, yields of rice, the region's staple, have increased dramatically; for Indonesia, by fivefold between 1961 and 2010 (de Koninck and Rousseau 2013). On the negative side, land degradation poses a serious threat to agriculture and is one of the region's most pressing environmental problems, one that is worsening. The quality and quantity of arable land across Asia continues to deteriorate (Howes and Wyrwoll 2012), though there is considerable variation in the levels of vegetation degradation in the region (Figure 2.7).

Land degradation is particularly worrisome in Central Asia, where land is turning into deserts. Over two-thirds of the land in Kazakhstan is desertified (UNESCAP 2005), while in neighbouring Afghanistan, the Registan Desert is migrating westward and sand dunes are encroaching on agricultural land in the Amu Darya Basin (UNESCAP 2009). In China, degradation in the north-eastern and south-western parts of the country has caused the area of arable land to fall. Due to land degradation, crop yield in north-eastern China could diminish by 40% over the next 50 years and about 100 million people in south-western China could lose their land over the next 35 years (ibid.). In India, half the land is degraded, largely because of poor agricultural management practices (Howes and Wyrwoll 2012). The situation in Southeast Asia is no better, with over 24 million hectares of land considered degraded in Indonesia alone (MoEF and UNCCD 2015).

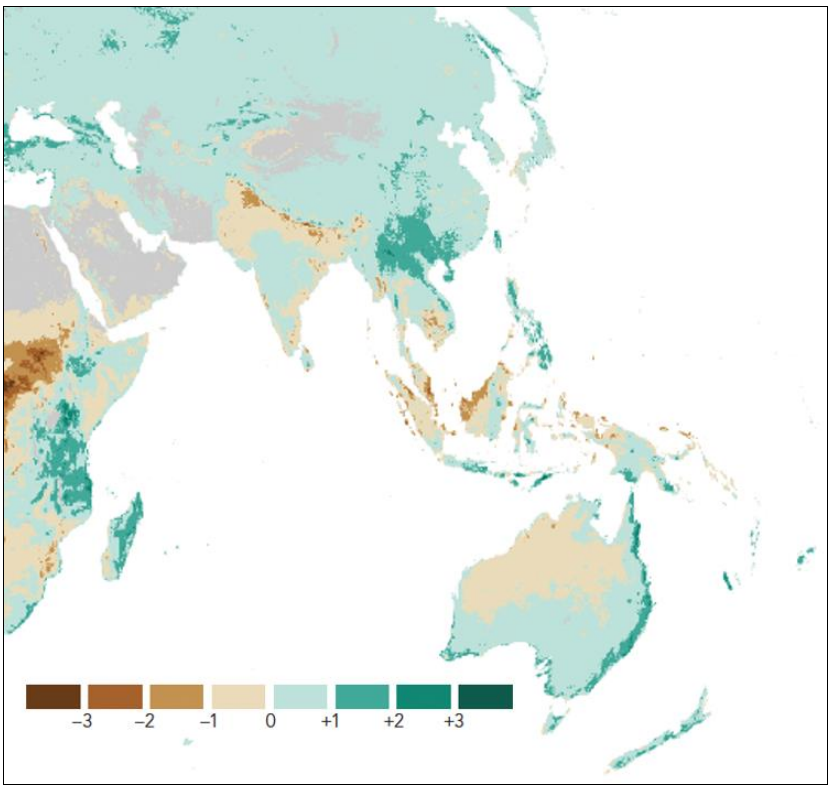

Figure 2.7 Change in net primary productivity, 2000-16 (grams of carbon/m^2/year)

Note: Net primary productivity refers to how much carbon plants absorb during growth; hence, a decline represents degradation of vegetation in an area. Source: World Bank (2018)

Agricultural intensification has also caused serious harm to water bodies (Box 2.3). Aquifers and waterways have been polluted by fertilisers, pesticides and animal wastes, and the over-extraction of water has resulted in the drying up of wells and the intrusion of saline water. As much as 40% of irrigated land in dry areas of Asia could be affected by salinisation (World Resources Institute 2005). Pigs and poultry in China, Viet Nam and Thailand have become the major source of nutrient pollution in the South China Sea (UNESCAP 2009).

The movement of intensive agriculture into areas under shifting cultivation also has trade-offs. From the narrow perspective of achieving national agricultural production targets, governments are happy to see areas under shifting agriculture being converted to chemical-intensive, high-yielding sedentary agriculture, yet this comes with significant costs. Shifting agricultural practices are embedded in local social structures, belief systems and wisdom that have evolved over many generations. The loss of traditional shifting landscape management practices is associated with the loss of rich bio-cultural diversity and indigenous cultivars that contribute to a healthy diet and food security (Takeuchi 2010).

Box 2.3 New Zealand's "deadly nitrogen addiction"

Expansion of global food production has depended heavily on the manufacture and application of nitrogen. The global use of nitrogen for fertilisation has reached the scale where it is considered to have exceeded "planetary boundaries". The problem is not just associated with the amount of nitrogen that is used but also the way in which it is applied. Less than 20 percent of nitrogen in fertilisers is used by plants. The remainder mostly ends up in aquatic systems where it accelerates eutrophication, in the worse cases resulting in algae blooms and the death of aquatic life. Some also is released into the atmosphere as nitrous oxide, a highly potent greenhouse and ozone-depleting gas.

New Zealand, which is widely promoted for its green rural landscapes, has a "dangerous addiction" with nitrogen. Its import of nitrogen increased from 60 tonnes in 1990 to over 600,000 tonnes in 2016. Much of this increase appears associated with livestock intensification, with exports of dairy products increasing by over 400 percent between 1990 and 2010.

The use of nitrogen for fertilisation contributes to the country's famous green landscapes. However, when values are placed on the environmental damage nitrogen use causes, it becomes apparent that the long-term costs may well outweigh the short-term benefits. Areas intensively farmed with livestock all show impacts on water quality and quantity. One regional council is already paying farmers to de-intensify farming to reduce the amount of reactive nitrogen entering a major lake. Also, by enabling intensify livestock farming, nitrogen is contributing to climate change; Livestock are responsible for about one sixth of global greenhouse gas emissions.

The solution involves moving towards more diverse farming systems that are not dominated by livestock in lowland parts of the country, as well as moving towards healthier diets with less intake of meat and dairy products.

Source: Data and discussion from Joy (2017)

Loss of natural ecosystems

Forests, wetlands, grasslands and other natural ecosystems all have important local, national and global values, so while their unsustainable exploitation and conversion can bring large economic benefits for certain groups, they also have serious social and environmental externalities. When forests are converted, local communities lose a source of fuelwood, game for protein, materials for constructing their homes, traditional herbs and medicines, non-timber forest products that they can sell at the local market to supplement their livelihoods, and sites with important spiritual values. Forest conversion also means that the watershed protection function of forests is entirely lost, often resulting in soil erosion and landslides, greater downstream flooding, diminished water quality and less stable river courses. In terms of global values, deforestation and degradation are responsible for a significant proportion of GHG emissions from anthropogenic sources and biodiversity loss. Sodhi and Brook (2006) estimate that by 2100 a quarter of the biodiversity in Southeast Asia could be lost through deforestation.

With respect to the main types of agricultural crops grown in the region, oil palm, which can only be grown in the humid tropics, has been particularly costly for biodiversity and ecosystem services. Vijay et al. (2016) found that 45% of oil palm plantations they sampled in Southeast Asia were on lands that were covered by forests in 1989. In the case of Indonesia, much of this area was

carbon-rich peat swamp forest. In addition to species loss, oil palm plantations are also associated with pollution from palm oil effluent and environmental problems such as eutrophication and hypoxia (Braimoh et al. 2010).

Export-oriented shrimp cultivation has also been particularly harmful to the natural environment. Mangrove forests have been cleared over vast areas to make way for shrimp farms. Almost all the mature mangroves in the Red River Delta in Viet Nam were cleared for shrimp production after the introduction of the *doi moi* liberalisation programme. In the Mekong Delta, salt intrusion in rice-producing areas encouraged conversion to shrimp production. These areas were quickly exhausted by intensive shrimp farming, leading farmers to move their production to sensitive mangrove areas. Being heavy users of artificial feed, pesticides, chemical additives and antibiotics, shrimp farms have reduced biodiversity, damaged fish stocks and degraded land (UNESCAP 2009).

Landscape restoration

The performance and outcomes of the afforestation and reforestation programmes that are transforming degraded landscapes in many areas across the region are mixed. Where they have been successfully established, planted forests can provide some of environmental services provided by natural forests, such as watershed protection and carbon sequestration and storage, and they can provide new habitats for wildlife. The successful engagement of communities in reforestation efforts and the management of planted forests can also contribute to community prosperity and resilience (Scheyvens, Hyakumura, and Seki 2007). However, one hectare of planted forest cannot replace the full range of values (especially biodiversity) when one hectare of natural forest is lost.

2.3.4 Ways forward: Governance, strategies and policies for sustainable rural landscapes

Strengthening governance

Weak governance and policies directed towards resource-intensive economic growth, and production volumes as one part of this, are holding back sustainability in rural landscapes of Asia-Pacific developing countries. Governance issues associated with land and natural resource management differ between countries, but they can include political interference in the workings of government departments, sector-based administration characterised by large power differentials between departments, corruption, lack of transparency and accountability within the public administration, failures in coordination across different levels of government, and lack of effective channels for stakeholder inputs. Poor sectoral integration is especially problematic in land and natural resource management as it leads to trade-offs that could have been avoided or minimised. The seriousness of this issue cannot be overstated. It is not an exaggeration, for example, to state that global climate change is a trade-off of the dominant patterns of economic and land development pursued in the Asia-Pacific region and globally. Without transcending institutional, governance and sectoral boundaries, land decisions will continue to be made according to narrow sectoral interests, resulting in serious environmental harm and resource scarcity. Efforts to strengthen governance for sustainable land management should *inter alia* focus on developing governance structures that span different government functions, types of knowledge, sectors and stakeholder groups (Scholes et al. 2018, 24).

Policy reform and alternative approaches for sustainable agriculture

National agricultural policies need to pay more attention to ways in which sustainable agriculture can be promoted and less to annual crop production targets. Rural extension and financial services may need to be reviewed, adjusted and strengthened to ensure that farmers have the support they need to adopt sustainable agricultural practices that protect soil fertility and the health of water bodies and surrounding ecosystems. An "agroecosystems" approach and other integrative approaches for production systems that combine traditional and local knowledge with new ideas and techniques for sustainable farming can be promoted. Agroecology challenges simplistic yield-oriented industrial agricultural growth models and highlights instead the importance of recognising complexity as central to the sustainability of production systems and directs attention at the importance of maintaining interactions between each part of the landscape mosaic (Francis et al. 2003). There is also considerable potential for urban and peri-urban agriculture to make significant contributions to urban food supply and, by doing so, to reduce food miles and pressure on rural land (Altieri 2018).

Global and regional responses

Global and regional responses are needed to support governments in addressing unsustainable rural land management. Indiscriminate demand for agricultural and forest products and foreign direct investment in land development are some of the major driving forces behind land degradation and the loss of natural ecosystems. Major consumers of wood and agricultural products from Asia-Pacific developing countries can support initiatives towards sustainable land management by ensuring that the products they purchase are not associated with environmental and social harm. On the demand side, awareness raising initiatives can sensitise consumers to the environmental and social risks of their purchasing decisions and to options such as eco-labelling to reduce these risks. On the supply side, both regulatory and voluntary measures can be considered. Australia, the EU, the US and Japan have all introduced regulations that prohibit the trade in illegally harvested wood and the effects of these policies have been observed down the supply chains. Public and private procurement policies that only accept wood verified as legal and sustainable are also having some effect. Wood suppliers are asking logging companies to show evidence that their operations are in full compliance with the laws of the country where the logging is taking place. This has led to increased interest in voluntary certification schemes for sustainable forest management and spurred the development of national timber legality standards. As of July 2017, 60 national and sub-national governments, 57 companies, 26 groups representing indigenous communities and 58 NGOs have signed the New York Declaration on Forests, committing themselves to taking action to achieve zero natural forest loss globally by 2030 (United Nations 2014d). Further national, regional and global efforts of this sort to reform markets will support the efforts of governments to work towards sustainable rural land management. To be effective, these initiatives need to target all major commodities with high environmental risks and engage as many countries and companies as possible to ensure that they do not merely shift the flow of commodities from discerning to less discerning buyers/markets.

2.4 Concluding discussion

This chapter has provided an overview of the historic changes in land-use type and intensity that are occurring over millions of hectares of land across the Asia-Pacific region. Urban areas are sprawling outwards over agricultural land and coastal and inland ecosystems. Forests, wetlands and grasslands are giving way to high intensity agriculture that requires large chemical inputs to maintain yields. Large tracts of accessible forest that have not been converted are being disturbed

through poorly controlled industrial-scale logging. Traditional and socio-ecological production landscapes with mosaic patterns of diverse interrelated land uses are giving way to high intensity monocropping of a few select commercial species. Rapid land-use change is occurring around the megacities, where landscapes that were once predominantly rural are now characterised by a dynamic mosaic of urban and rural uses. Contemporary consumption and production patterns of the region's burgeoning middle class and the huge volumes of waste they generate are having immense direct and indirect impacts on land use and quality. And the region has found itself with millions of hectares of degraded land and watersheds, which countries are trying to rehabilitate with mixed results through their national forestation programmes.

Landscape transformations have generated immense economic benefits in terms of employment, labour productivity, food security and affluence, but are associated with serious environmental degradation, the loss of ecosystem services, growing inequality and a decline in land quality, all of which increase the region's vulnerability, could cause development gains to roll back, and will be particularly harmful to the wellbeing of low-income households. The consequences for human wellbeing and security of the loss of biodiversity, ecosystem services and ecosystems resilience caused by unsustainable land management and land-use conversion will be compounded by climate change, making the region's future even more uncertain. Through unsustainable landscape transformations, the Asia-Pacific region is contributing to global climate change and becoming increasingly vulnerable to it.

The underlying messages for moving away from unsustainable land management are the same for urban and rural development. Governance must be strengthened and new creative governance solutions are required for effective implementation of existing sustainability strategies and policies and for the adoption of more holistic and inclusive approaches to land management. Particular attention needs to be paid to accountability from the perspective of service provision, and to stakeholder participation and vertical and horizontal coordination across sectors and levels of government, respectively. There is little point in forever revising policies to reflect the latest trends in development thinking when governance structures and processes are too weak for action on these policies. While development funding tends to follow the latest "fashions" in development thinking, multilateral, regional and bilateral development agencies should maintain governance as a core area of their work, especially in countries where policy implementation has been consistently weak.

Resource-intensive economic development patterns and population growth have resulted in land and resource scarcity, which is leading to increased sectoral competition over land. In this context, land-use decision-making processes need to be strengthened to ensure (i) that the trade-offs associated with alternative land uses are fully recognised and deliberated, and (ii) that land-use planning and management is coordinated across existing jurisdictions. This requires high level intervention to align policies, coordinate sectors and coordinate jurisdictions. This task is not easy, but national governments can use the UN SDGs as a framework for reviewing existing policies to ensure that they are aligned towards sustainability, and to launch discussions for better coordination between sectoral departments and between local governments. Local governments can also use the SDGs as a broad framework to ensure their own visions for sustainability are comprehensive and that policies are aligned with these visions.

Sustainability requires inclusion. Growing inequality can be observed in the region's megacities and the urban hinterland that services them. They host both slums, where living conditions are unhygienic and even the most basic services are unavailable, and luxury residential areas where the rich can enjoy and display their wealth. The SDGs direct attention at ensuring all people are able

to secure basic human needs and reducing inequality, which can threaten social and economic stability. For this, creative governance solutions that promote inclusion will be required. Here again the task is not easy, as the power to influence varies widely between stakeholder groups. Social structures in cities and rural areas in the Asia-Pacific region are largely characterised by relatively small groups of highly influential people (the “elites”), a growing middle-class with potentially some power to influence, and large groups of mostly powerless people in terms of ability to influence decisions on land issues. Creative governance solutions are needed to engage constructively with the powerless, and to move away from viewing them as obstacles to development or “subjects” for development. National governments can provide directives and support for departments and local governments to partner with groups such as the low-income sector, minority ethnic groups and women in setting visions and implementing strategies. The call here is for “inclusive landscapes”: inclusive cities, inclusive towns and inclusive villages.

These efforts to improve land and natural resource management will only be successful at scale when they take place within an enabling environment. If the forces of the economy continue to act counter to sustainable land management, i.e. they continue to reward the degradation of land and the destruction of natural resources, sectoral departments and local governments will struggle to implement sustainability policies. To create an enabling environment for improved land management requires shifts in the way that the global economy is organised. Lessons can be taken from the efforts to keep illegally harvested and unsustainable wood out of certain markets. In terms of total global trade their impacts are very small however, and much greater commitment will be required to move agricultural and industrial production and consumption towards sustainability within countries, regionally and globally.

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CHAPTER 3

Agricultural land transformations in Asia

Sivapuram Ventaka Rama Krishna Prabhakar

Key messages

- *Food production and productivity improvements have contributed to lifting millions of people out of poverty and reduced hunger and malnutrition, but are associated with patterns of land intensification that have degraded agricultural land and caused great environmental harm.*
- *Underlying drivers affecting land conversion to and from agriculture include population growth, economic growth and transformation, urbanisation, and developments within agriculture such as increasing private sector investments and technological progress.*
- *Drivers for agricultural intensification in Asia include access to inputs such as fertilisers, pesticides and improved varieties, and food security priorities reflecting the need to produce more from the limited available land.*
- *For the short term, the strategy to achieve SDG goals such as zero hunger could mean sustaining the current food production levels while addressing the food loss and distributional issues so that a significant part of the current disparities in food security are addressed without further stressing the agricultural systems.*
- *Over the long term, more transformational changes in agricultural production systems and consumption patterns will be required.*

3.1 Introduction

Agricultural land contributes to the human security goals of countries in the region. Any unsustainable trends in land use will undermine their ability to achieve these goals.

Despite the rapid and landscape-wide transformations in land use that can be observed in many parts of the region, agriculture is still the single largest user of land in Asia (FAO 2018). How Asian countries use their agricultural land today and in the near future will have long-term consequences, considering that a large number of people continue to live in rural areas and depend heavily on natural resources and ecosystem services. How they use the land and its resources will also be important to their national wellbeing.

As pointed out in Chapter 2, agricultural land in Asia has been undergoing significant transformations over recent decades as a result of several interconnected drivers. These include population growth, urbanisation, and growing affluence and its impacts on food habits (Vadrevu, Ohara and Justice 2017). These land transformations fall into two categories: changes in agricultural land area and changes in agricultural land use. The first category is to do with the

shifting of land use into and away from agriculture. The second category is to do with the way agricultural land is managed.

Overall, the amount of land employed for agriculture in Asia has been steadily growing over the past several decades, though the rate of change lessened after the 2000s and is not uniform across the region (FAO 2018). At the same time, agriculture has also been steadily losing land to other uses associated with urbanisation, infrastructure development and industrialisation. These changes have profound impacts on the agricultural livelihoods of rural populations, food security and the overall wellbeing of countries in the region.

In addition to changes in land area, intensification involving the movement away from extensive and subsistence farming to more intensive farming that increases land productivity has been an especially profound transformation within the agriculture sector in the region (Nin-Pratt 2016; Hazell 2009). Agricultural intensification can be observed in all Asian countries irrespective of the degree of their development, resulting in widely varied impacts from country to country on the demand for agricultural land. Understanding of intensification patterns and their impacts will contribute to better land management policies.

Keeping the above regional context in view, this chapter reviews a) the state of past and ongoing major agricultural land transformations in Asia in terms of changes in agricultural land use and intensification, b) drivers responsible for the changes, c) associated trade-offs, and d) policies and practices that could ease pressure on agricultural land.

3.2 State: Major agricultural land transformations in Asia

Two kinds of agricultural land transformations can be observed in Asia: a) agricultural land-use change and b) agricultural land-use intensification. The former refers to the change in land either by conversion of land into agricultural use or conversion of agricultural land away from agricultural use. The latter refers to how agricultural land is used and how it is managed. These two kinds of transformations are not independent of each other; one form of transformation can significantly impact the other and vice versa. For example, poor management of land may create more demand for land to be converted into agriculture to meet growing food demand.

3.2.1 Agricultural land-use change

Most Asian countries have witnessed significant land-use transformations over past decades. Between 1961 and 2015, the area of agricultural land remained constant in eight countries, declined in 10 and increased in 29 (Figure 3.1). From Figure 3.1 it is evident that a large portion of agricultural land in Asia did not record significant changes (striped areas). The countries that have lost a significant amount of agricultural land in terms of percentage change include Brunei Darussalam (66.7% decline compared to 1961), Japan (48%), Republic of Korea (35.3%), and Mongolia (24.6%). The five countries that experienced the highest rate of growth in agricultural land during the same period are Malaysia (49.5%), Viet Nam (47.8%), United Arab Emirates (44.5%) and Bhutan (40.7%). A different picture emerges when the absolute extent of land (in millions of hectares) either gained or lost from agriculture is considered during the same period. For example, China, Indonesia and Saudi Arabia gained 153, 18.6 and 87.2 million hectares (Mha) of agricultural land, respectively, whereas Mongolia and Iran lost 27.8 and 13.7 Mha, respectively. The trends indicate that there is now a very small proportion of arable land that can be converted to agriculture.

New agricultural land is often sourced from forests and grasslands, and any expansion of agriculture in the future would have to come at the cost of these land uses (FAO 2016).

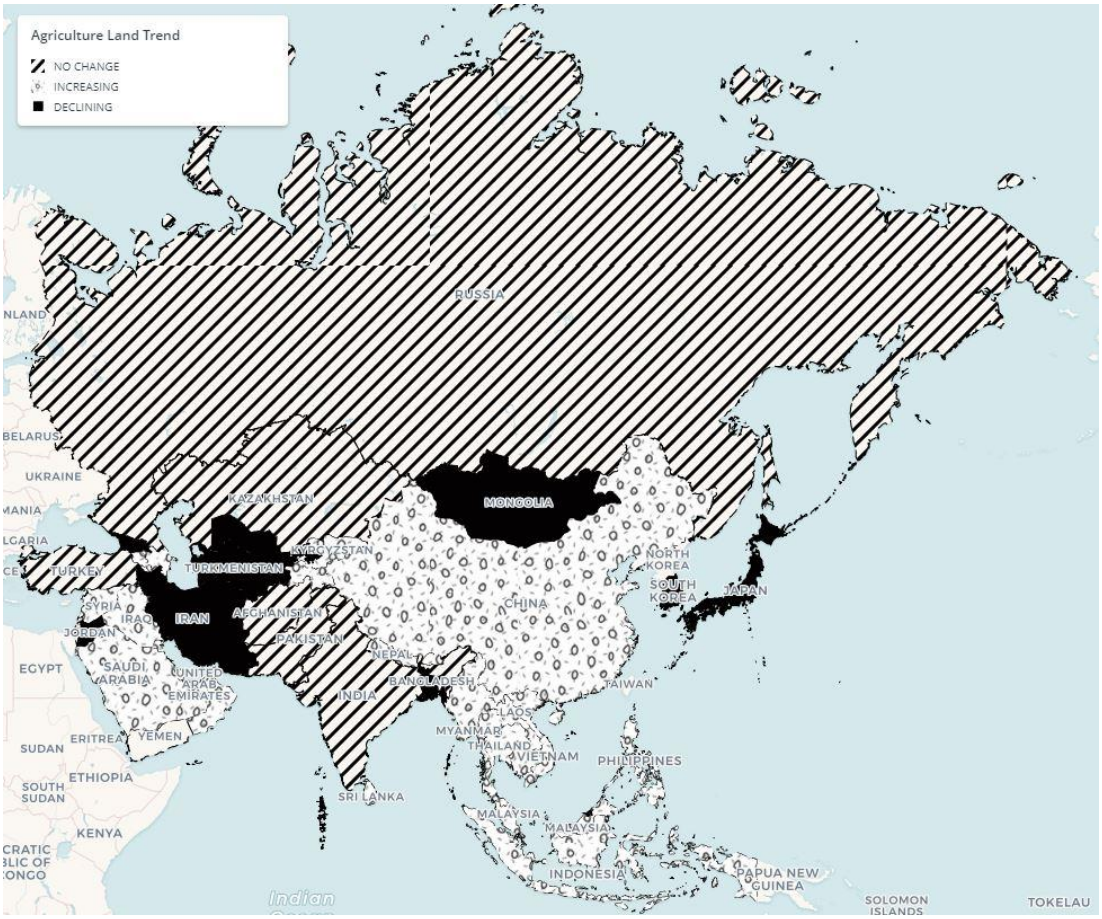


Figure 3.1. Change in agricultural land in Asia

Note: Striped area, no change; Black fill area, declining; dotted area, increasing. Source: Author, based on data from FAO (2018)

The source of new agricultural land differed for countries that gained agricultural land in the past three decades. For example, a significant amount of agricultural land came from "other land"[4] categories, i.e. land not used for agriculture and forestry, in China (30% of the agricultural land gained in the past two decades) and Saudi Arabia (almost all the agricultural land gained in the past two decades), while most of the gain in agricultural land in Indonesia came from forests, as indicated by the concurrent decline in forest land. Agricultural land lost in Iran and Mongolia has either gone to afforestation or to other land use categories (FAO 2018).

[4] The "other land" category in the FAOSTAT database refers to all other land categories not related to agriculture and forestry. This category includes land that was not put to any economic uses such as barren lands, and land used for dwellings and infrastructure such as roads.

3.2.2 Agricultural land intensification

In addition to the changes in area, major transformation is associated with changes in land management practices. These can broadly be classified as extensive and intensive land uses. Extensive agricultural land use consists mostly of peasant farming and other forms of ancient and traditional agricultural practices associated with subsistence farming, largely to produce food for own consumption. Extensive agriculture also includes certified organic agriculture, which targets health-aware consumers willing to pay premium prices. On the other hand, intensive agriculture involves the use of market-based production inputs such as chemical fertilisers and pesticides, as well as technological and labour inputs. Intensive farming can be characterised in terms of number of crops grown in a year (either simultaneously or sequentially), types of crops grown (e.g. cash crops versus cereals; high yielding varieties), amount of labour employed, investments made in farm mechanisation, and the amount of market-based inputs used. Hao et al. (2015) classified agricultural intensification as labour intensification, capital intensification, intensity of labour-saving inputs and intensity of yield increasing inputs.

Agricultural land-use intensification has also been defined as the degree of yield increase caused by production choices made (Dietrich, et al. 2012). However, even though crop yields can provide a picture of intensification, this interpretation needs to be treated with caution since factors other than human interventions, such as better rainfall and temperature, could contribute to better crop yields. With this in mind, the discussion in this chapter views trends in agricultural land-use intensification in terms of production factors.

Agricultural intensification can be measured by the amount of land employed to generate a certain amount of produce and the amount of inputs such as water, energy and chemical fertilisers and pesticides used in agricultural production. The availability of irrigation facilities often drives agricultural intensification by enabling farmers to grow multiple crops in a year using short duration high yielding varieties, and supports other inputs that increase intensification, such as fertilisers, pesticides and machinery, and reduces labour dependency. Hence, irrigation can be a good indicator of intensification.

Figure 3.2 provides percentage changes in chemical input use and irrigation along with changes in crop productivity in selected Asian countries. On the one hand, there have been remarkable increases in the use of chemical inputs in developing countries such as Bangladesh, China, India, Indonesia, and Viet Nam, whereas their use declined in developed countries such as Japan and Republic of Korea. Indonesia recorded the largest increase in chemical inputs use followed by India and Bangladesh. The decline in Japan and Republic of Korea is largely due to a decrease in their farming populations. The decline in their agricultural populations has received a lot of attention in the policy discourse in these countries, as this trend has significant implications for their food self-sufficiency and conversely their dependency on food imports

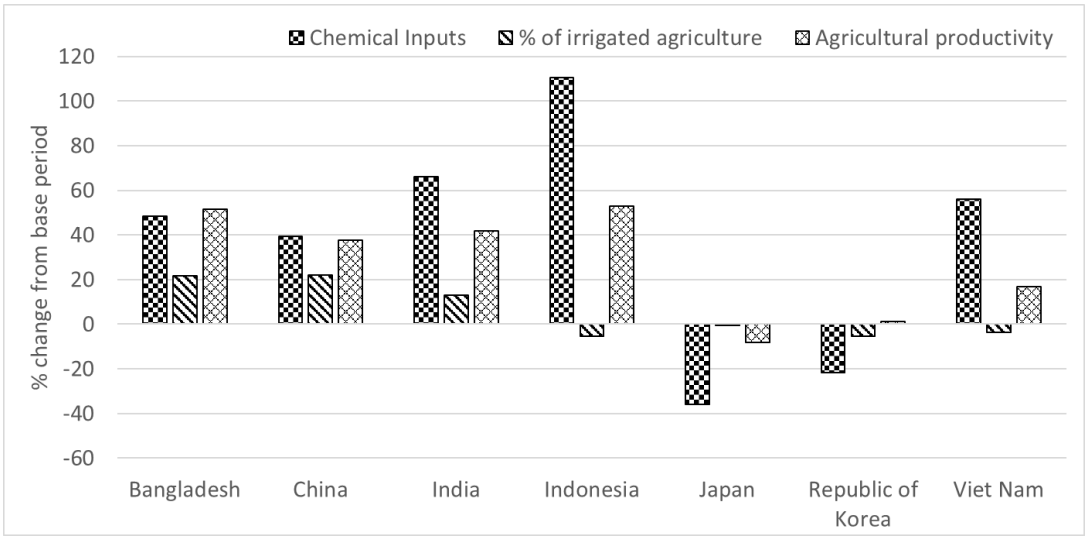


Figure 3.2. Trends in agricultural inputs in selected Asian countries

Note: Values are for 2015 expressed as % change from 2002. Source: Author, based on data from FAO (2018)

3.3 Drivers of change

Multiple drivers are behind agricultural land-use change and management in Asia. As listed in Table 3.1, some of the major drivers of land-use change include population growth, economic development, developments within the agriculture sector such as access to fertilisers, irrigation and other technologies, urbanisation and resource degradation. Characterising these drivers is a major challenge. The reasons for this include: a) feedback connections between drivers (e.g. rapid urbanisation providing better quality of life in urban areas could pull more agricultural labour out of the agriculture sector); b) that because some drivers are not particular to the agriculture sector they lie outside the influence of the decisions made within the sector (e.g. infrastructure- and energy-related decisions putting pressure on land); c) spatial variation in drivers within and between countries, which is not easy to capture in a macro analysis such as the one presented in this chapter; d) variation in drivers between farmer groups within a country reflecting their socio-economic and cultural circumstances, which may not be captured in a country- or regional-level analysis of drivers (disaggregated data based on farmer socio-economic and landholding size conditions is not widely available); e) drivers that are operating at the local level, which may not be captured at the national and regional level due to the masking effect of other drivers (e.g. upstream and downstream interactions along a river course or at a watershed level can have significant impact on land-use changes); f) limited time series and high quality data on agricultural land-use changes; g) the lack of systematic collection and reporting of drivers at the national and international levels making it difficult to assess them at specific spatial and temporal scales; and h) as a result of lack of data, few empirical evidence-based studies on drivers and their relationship with the observed land-use changes.

The literature reports on various drivers that create pressure on the land leading to land-use changes and land-use intensification. These drivers are complex and can be cascading in nature, i.e. some acting as precursor drivers for the next set of drivers. Table 3.1 lists drivers that have been

identified in a number of studies. It shows that some drivers are common to both land-use change and land-use intensification. An example is economic growth, which can encourage people to move out of agriculture (as is happening in many of the developed economies in the region) and can drive agricultural intensification (as is happening throughout the region).

Table 3.1 Drivers for land conversion related to agriculture and agricultural intensification reported in selected literature

Land conversion drivers	Reference	Agricultural intensification drivers	Reference
Population growth	(FAO 2016, Hosonuma, et al. 2012; Azadi, Ho and Hasfiati 2011)	Economic development Commercial investments in farming (commercial farming)	(Hao, et al. 2015; Alauddin and Quiggin 2008)
Economic growth Economic transition Rural private enterprise development Infrastructure including rural infrastructure and highways	(Azadi, Ho and Hasfiati 2011; Vadrevu, Ohara and Justice, 2017; Guo, Wang and Du 2014)	Crop diversification Improved varieties Controlled environments Type of crops grown	(Gunasena 2001; Hao, et al. 2015)
Agricultural development including commercial agriculture Private sector investments in agriculture Foreign direct investment in agriculture Increase in agricultural trade Food security priorities	(FAO 2016, Hosonuma, et al. 2012; Ravanera and Gorra 2011)	Irrigation Groundwater access	(Alauddin and Quiggin 2008; Gunasena 2001)
Urbanisation Urban population	(Guo, Wang and Du 2014; Azadi, Ho and Hasfiati 2011)	Fertilisers	(Nani, Sitaula and Bajracharya 2011; Gunasena 2001)
Land productivity Capital-labour ratio Land tenure security Governance of land-use change	(Azadi, Ho and Hasfiati 2011; Hosonuma, et al. 2012)	Proportion of non-farm income Contribution of family labour	(Hao, et al. 2015)
Climate change (especially water and temperature as limiting factors)	(Oliver and Morecraft 2014; Niles, Lubell and Brown 2015; FAO 2016)	Farm mechanisation Controlled environments	(Nani, Sitaula and Bajracharya 2011; Gunasena 2001)

Source: Author, from references cited

One distinctive feature of drivers for agricultural intensification is that most of the drivers are intrinsic to the agriculture sector. Other than the wider economic development happening in the region, agricultural intensification is reported to be driven by growth in irrigated area, growth in the use of fertilisers and pesticides, access to improved varieties and increasing investments in farm mechanisation and in controlled environments. Behind these drivers lie sets of agricultural policies for intensification and private sector investment in the agriculture sector. These drivers are enabling farmers to grow high yielding varieties and diversify crops. They also help them grow several crops

in a year, whereas farming under rainfed conditions typically only allows single-year cropping. Agricultural intensification has also helped farmers produce for the market, and their access to markets has a feedback effect of further driving intensification. The drivers and their interactions vary from one location to another.

3.3.1 Drivers of land conversion to and from agriculture

Most of the land conversion to agriculture is associated with deforestation. Three models have been developed to explain this conversion: a) environmental Kuznets curve (EKC), b) forest transition model, and c) Borlaug hypothesis (FAO 2016). The environmental Kuznets curve explains that land conversion to agriculture happens under conditions of poverty and has high environmental impacts, whereas the reverse happens beyond a certain threshold of economic conditions through the abandoning of low fertile land and natural regeneration. The forest transition model suggests that not all the forest that was cleared for agriculture remains in agriculture and that low fertile land will eventually be returned to forests through natural regeneration or forestation programmes. On the other hand, the Borlaug hypothesis suggests that the pressure on land declines as the productivity of land is improved through commercialisation. This has the net positive effect of reducing the demand for agricultural land, making it available for diverse uses including for environmental services.

The drivers for land conversion to agriculture are many and varied. Large-scale commercial investment has been reported as one of the most important drivers of land conversion to agriculture (FAO 2016). Mechanisation is another important driver as it encourages land conversion to agriculture by reducing dependence on labour. The resulting efficiency gains encourage more investment in the sector. Greater policy focus on agriculture and mining can also drive land away from forests. For example, price policies that are supportive of agricultural commodities can create demand for new agricultural land.

Regional economic integration and private sector and foreign direct investment are becoming increasingly influential drivers (Ravanera and Gorra 2011). These economic drivers complement government priorities in the region to boost food self-sufficiency and agricultural exports. Regional economic integration through regional frameworks, such as the Association for Southeast Asian Nations (ASEAN), has greatly facilitated the regional trade in agricultural goods. The ASEAN Trade in Goods Agreement (ATIGA), as a strategy to promote regional agricultural trade, aimed to reduce import duties on unprocessed agricultural products to 0-5% by 2017. This has helped boost regional trade and the agricultural economies of several ASEAN member countries (ASEAN 2007; Lim 2013).

Drivers that take land away from agriculture include urbanisation, industrialisation and infrastructure development. Urbanisation can result in greater land prices around expanding urban areas due to the increased demand for housing. This can drive land in the urban periphery away from agricultural use. The decrease in rural populations that is happening in developed Asian countries such as Japan is also driving land out of agriculture. Declining farm profits, market imperfections, poor farm price policies, natural hazards and growing education levels can all lead people to move out of farming, predisposing land to be converted away from agriculture.

To better understand the drivers behind agricultural land transformation in Asia, principal component analysis (PCA) was carried out using time series data between 2002 and 2015, the time period for which most data were available for reliable analysis. The analysis was carried out for two

classifications of countries: a) based on the trend in agricultural land (i.e. increased, no change and decreased), and b) based on their developmental status using UN classification (i.e. highly developed economies, medium developed economies and least developed economies). The variables included in the analysis are a) agricultural land area in a country (ha), b) GDP PPP (gross domestic product, purchasing power parity; constant 2011, international $), c) chemical inputs used in agricultural production (fertilisers and pesticides), d) percentage of irrigated area, e) total population and f) percentage of rural population. The number of principal components were based on the slope of the Scree Plot, indicating that a two-component analysis was adequate to explain the variance. Log transformation was done to accommodate the wide variation among countries to avoid the scale differences. The PCA was based on a correlation matrix and hence the variables were considered standardised.

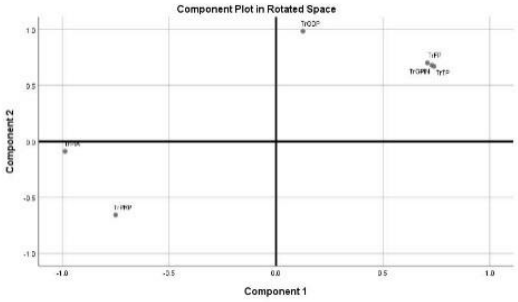
In Figure 3.3 the upper row of the component plot is related to the three trends of agricultural land change, i.e. increasing, no change and decreasing from left to right, and the lower row is related to the three developmental categories of countries, i.e. highly developed countries, medium developed countries and least developed countries. The analysis showed a positive correlation between principal components (PCs) 1 and 2 in most of the variables for which associations are presented.

When countries were grouped according to their agricultural land change trends, both the PCs correlated positively for percent of irrigated area, chemical inputs, gross production, GDP and total population, and correlated negatively for percent of rural population in countries where the agriculture land was either increasing or didn't change.

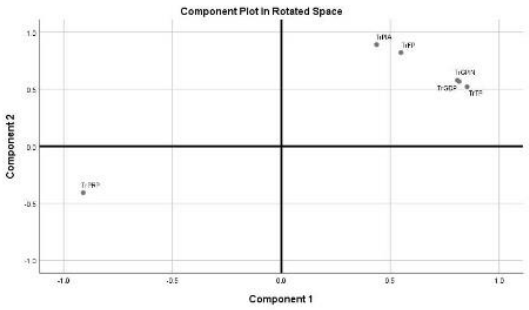
Further, the percent of irrigated area and chemical inputs maintained a positive relationship between the two PCs across the three developmental categories of countries, indicating that irrespective of developmental level these factors have a positive influence on agricultural land. Total population and gross production showed negative correlation between both the PCs across the three development categories.

Figure 3.4 shows the multiple linear regressions between the dependent variable (agricultural land) and independent variables (GDP, agricultural production, total population, rural population, irrigated area and chemical inputs). Results show that the factors explained a high proportion of variance in agricultural land in all country groupings except in countries where the agricultural land didn't change. In this case, only 53% of the variance was explained by the model. For example, the agricultural land in countries where it is increasing could be given as ($F(6, 6)=26.496$, $p<0.000$) with an R^2 of 0.964. In this case, the linear model for predicting agricultural land is 7.593+0.0382(GDP)+0.017(Chemical inputs)+0.018(Total Population)-0.107(% of irrigated area)-0.033(Gross Agricultural Production)-0.135(% of rural population). It can be deduced that the agricultural area in these countries increased in direct proportion to the increases in GDP, chemical inputs and total population, and decreased with investments in irrigated agriculture.

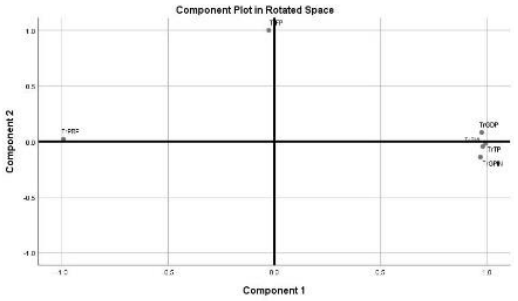
Countries Grouped According to Land Change Trend



Increasing agricultural land

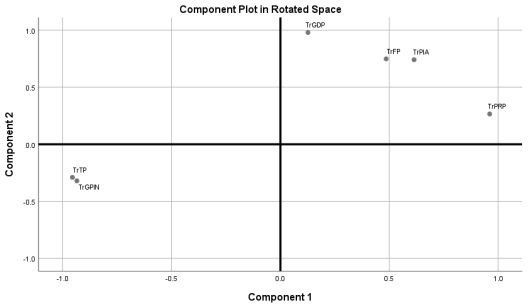


No change

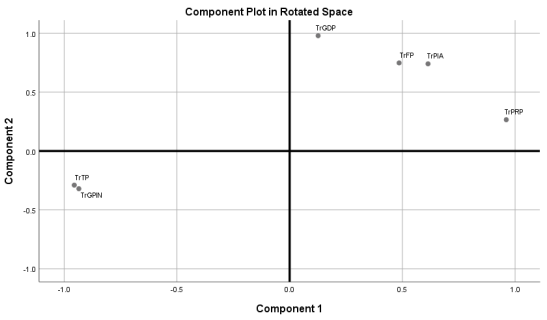


Decreasing agricultural land

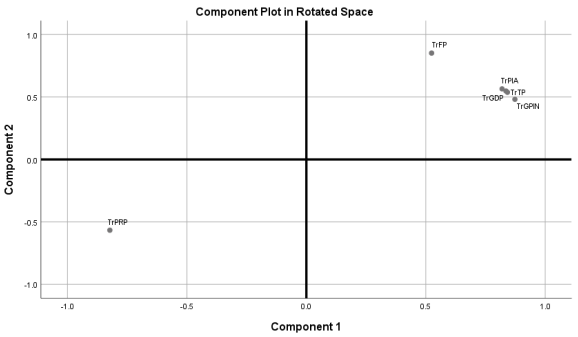
Countries Grouped According to Development Status



Highly developed



Medium developed



Least developed

Figure 3.3 Relationship between two principal components determining the agricultural land conversion

Note: TrGDP: GDP PPP (constant 2011); TrFP: fertilisers and pesticides; TrPIA: % of irrigated agricultural area; TrGPIN: Agricultural gross production index number (2004-2006=100); TrTP: Total population; and TrPRP: % of rural population. Source: Analysis by the author, based on data from FAO (2018)

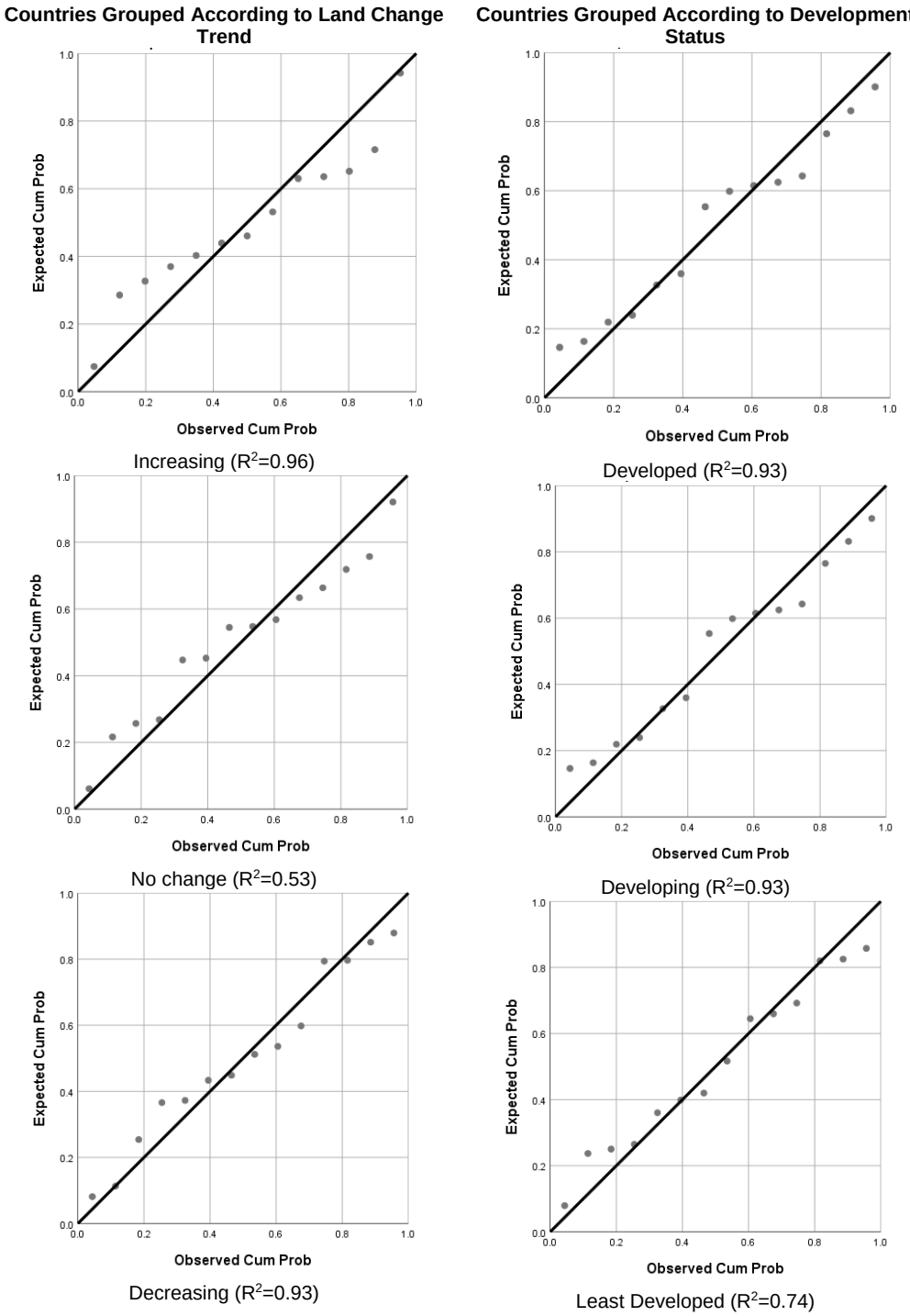


Figure 3.4 Multiple regression results for agricultural land and selected independent variables

Source: Analysis by author, based on data from FAO (2018)

Urbanisation has played an important role in driving land out of agriculture. Nearly 65% of Asian countries have experienced rapid urbanisation (FAO 2018) contributing to the loss of agricultural land. Lao PDR followed by Thailand, China and Bhutan have the highest urban population growth rates, whereas countries in West Asia are slowly deurbanising. The urban population in Lebanon declined by 12% over the past 15 years and declines in the urban population can also be observed in Jordan (6%), Kazakhstan (6%) and the Philippines (6%) (FAO 2018).

The relationship between percentage of urban population and the percentage of agricultural land is shown in Figure 3.5. In the figure, countries marked with asterisks show a statistically significant correlation between the percentage of urban population and the percentage of agricultural land. For Southeast Asian countries such as Cambodia, Lao PDR, Malaysia, Myanmar, Thailand and Viet Nam the correlation was highly significant. Countries where the correlation between agricultural land and urban population was negative mostly recorded a significant decline in agricultural land and for countries where the correlation was positive there was a significant increase in agricultural land. The growing domestic and international demand for biofuels is another significant driver for land conversion away from agriculture particularly in India (Schaldach, Priess and Alcamo 2011), China, Indonesia and Malaysia (Valin, et al. 2015).

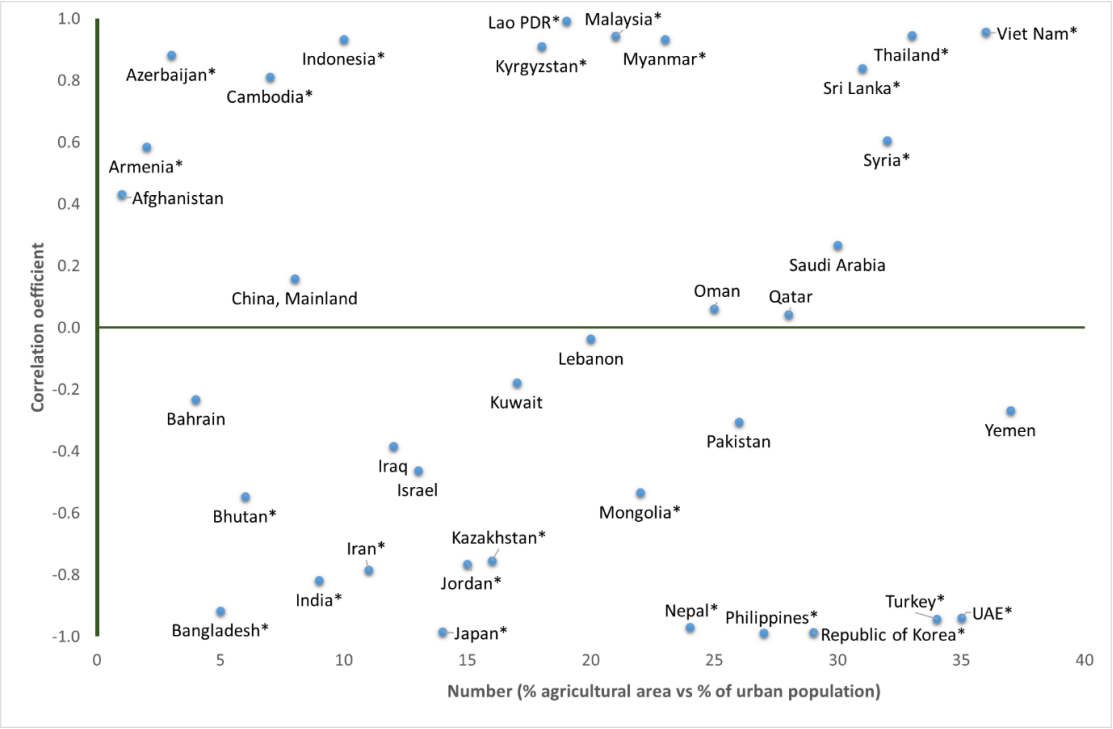


Figure 3.5. Relationship between urbanisation and loss of agricultural land

Note: Countries marked with asterisks show statistically significant correlation at a probability level of 0.05 and less. Source: Analysis by author, based on data from FAO (2018)

Globally, new forms of energy sources are becoming popular. Asia quickly responded to the growing international and domestic demand for biofuels by introducing biofuel promotion policies. Asian countries have started producing biofuels from feedstock such as cassava (Thailand, China),

oil palm (Malaysia, Indonesia, PNG), jatropha (India, Thailand) and coconut (Philippines). Many of the feedstocks were already being produced by farmers for feed and food purposes and hence they already possessed the knowhow for their production. Introduction of feedstock processing acted as a driver for farmers to produce feedstock for biofuel purposes. At the peak of the biofuels boom, Asian countries were looking at a production potential of as much as 80 million litres of bioethanol and 51,000 million litres of biodiesel per annum (Elder, et al. 2008). India had a major share of biofuels in South Asia with biofuels constituting 3.01% of its total transportation fuels in 2007 (ibid.).

Rapid economic development, a growing middle class, changing lifestyles and increasing trade are also changing the way Asia is employing its agricultural land. A grower of cereals in the 1970s, by 2010 Asia's livestock products had nearly doubled and it was producing more fruits and vegetables than cereals (ADB 2013). The region has also become a major meat consumer over the past three decades. The rate of growth of share of animal calories in total calorie intake is declining in Asian developed countries while it has increased at an increasing rate in developing Asia (FAO 2018). Meat production has increased at a compound growth rate of 12.6% over the past 38 years. Total per capita calorie intake, the per capita consumption of proteins and fats and meat imports have all substantially increased in the past three decades.

Increasing meat consumption is driving the demand for land for animal feed. Some of this land is employed for cultivating food for direct human consumption. There is a large trade-off associated with this change in land use, as employing land for producing animal feed is 100 times less efficient than cultivation of proteins for direct human consumption (Clark and Tilman 2017). Much of this land could be employed more efficiently for food for direct human consumption (ibid).

There has been rapid growth in the fast food markets in Asia with possible implications for the way agricultural land has been allocated among different crops. The Asia-Pacific fast food market expanded 11.7% between 1999 and 2003. With a market value of 77.9 billion USD in 2003, it is expected to grow even more rapidly in the near future with more expansion to come from China and India (Brown, et al. 2008). In terms of value, the Asia-Pacific region accounted for 28.3% of the global revenues from fast food markets in 2003 (ibid).

In a market survey conducted by Nielsen, most of the top fast food markets, in terms of frequency of consumer visits to fast food restaurants, are in Asia. Many are found in Hong Kong, Malaysia, Philippines, Singapore, Thailand, China, and India (Nielsen 2009). The number of fast food outlets has gone up at a fast pace in China. China's fast food market was estimated to be worth 29 billion USD (The Economist 2008). One study suggests that about 97% of Chinese eat at fast food outlets on a regular basis (Brown, et al. 2008). The Yum! Brands, the world's largest fast food chain restaurants' company, which is based in the US, aimed to expand their fast food chain to 20,000 restaurants in China (Yum! Brands 2008). Fast food sales grew at an annual rate of 15-20% and 30% in India and Korea respectively (Brown, et al. 2008) and fast food outlets served 44% of total meals served in the commercial food service sector in Australia in 2007 (BIS Shrapnel 2009). The recession of 2008 didn't stop the fast growth of the fast food industry (The Times 2008; The Guardian 2009). Some fast food chains such as McDonald have even put up a better revenue performance during this period than during better economic times (Chicago Tribune 2009).

The region also has seen a significant growth in breakfast cereals, new and emerging commodities such as quinoa and flax seeds etc. due to busy urban lifestyles that deprive consumers of their time to prepare their traditional cooked meals. Consequently, the retail sales of packaged food products in China, Indonesia, Philippines, India, Viet Nam, Japan, Singapore and South Korea increased at

an average annual growth rate of 11.7% during 2001-2007 (United States Department of Agriculture 2008). The highest growth rate was recorded in China (20.5%) followed by India (20.1%) (ibid.). In these countries, the packaged food sales were estimated to be USD 26.4 billion in 2007 (ibid.).

The growing fast food, packaged food and other trends described above could have important indirect implications for agricultural land use. They demand heavy food processing, encourage meat consumption and often promote unhealthy food choices. They also produce more food waste than the traditional practice of preparing food at home, which is a lost food security opportunity. They also have other environmental implications associated with the use of land, fertilisers and water for producing food. In addition, they work by sustaining and promoting urbanisation, which leads to further land-use change.

3.3.2 Drivers of agricultural intensification

Several of the main drivers behind agricultural intensification are listed in Table 3.1. The expansion of irrigation facilities, greater access to chemical inputs (chemical fertilisers and pesticides) and high yielding varieties are the traditionally and predominantly reported drivers of agricultural intensification in Asia. The “Green Revolution”, i.e. the technological breakthroughs that spurred significant food production gains during the 1900s, significantly expanded these drivers.

Trends in agricultural land intensification were examined using the three categories of countries described earlier, i.e. countries that gained agricultural land, countries that lost agricultural land and countries where the total area of agricultural land has been stable. Agricultural land intensification was expressed as a function of the combined market inputs of water, fertilisers and pesticides used in agricultural production and gains in agricultural productivity. Agricultural land-use intensification trends were examined with these parameters in 2002 and 2015 and expressed as percentage change from 2002 values.

The trends in agricultural intensification are presented in Figure 3.6 and Figure 3.7 for the three major land-use change categories and three income categories of countries, respectively. The analysis shows that an increase in the use of pesticides and fertilisers played a major role in agricultural intensification in the countries where agricultural land expanded. However, countries have not differed much in terms of drivers such as irrigated area. Countries where agricultural land declined had marginally higher productivity gains than those where agricultural land expanded. Similarly, the area under irrigation was marginally higher in countries where the agricultural land declined compared to the countries where agricultural land remained stable. This suggests that marginal gains in irrigated area and agricultural productivity may have contributed to a decline in agricultural land in some countries, while the countries that gained agricultural land were using more pesticides and fertilisers. The intensification trends observed in land-use trend groups (Figure 3.6) followed largely similar trends as those of the income groups with few deviations (Figure 3.7). For example, gains in agricultural productivity played a positive role in expanding agricultural land in low income countries compared to advanced economies and middle-income countries. Similarly, pesticides and chemical fertilisers appeared to have positive effects on the area of agricultural land in the advanced economies.

The food-fuel nexus deserves special attention due to the significant impact of this nexus on socio-economic and environmental aspects of agriculture. Here, the food-fuel nexus refers to energy use for farming operations (i.e. tillage, planting, harvesting and post-harvest operations

including processing and storage). This nexus is an important component of agricultural intensification.

Regional disparities exist in the strength and nature of the nexus between food and water and food and energy, reflecting the level of development of agriculture systems. In general, agriculture in fertile deltas and river basins is facing more serious nexus issues than regions dominated by rainfed and subsistence farming, as their agriculture relies heavily on off-farm inputs. Increasing freshwater and energy use in agriculture and food production in these areas is associated with the intensive use of chemical inputs and irrigation systems for the cultivation of high-yielding crops, a set of interventions that has its origins in the Green Revolution. No significant deviation in this pattern of intensification can be seen in the region. While low input-based agriculture has garnered increasing attention, it has not supplanted the dominant high input-based intensive agriculture.

Policies promoting intensification, either in the form of support prices or subsidies on agricultural inputs, have been adopted by most developing countries in Asia, while developed countries are slowly moving away from input subsidies to direct cash payments (Hudson, et al. 2011). Many of the price support policies are justified by governments as necessary to support economic and agricultural growth (Lopez, He and Falcis 2017), reduce poverty and secure farm profitability (Phakdeewanich 2017) and for meeting food security goals (Government of India 2014). These policies help keep farmers in farming, support priority agricultural crops and help farmers to sustain agricultural input rates (Dorward 2009; Lopez, He and Falcis 2017).

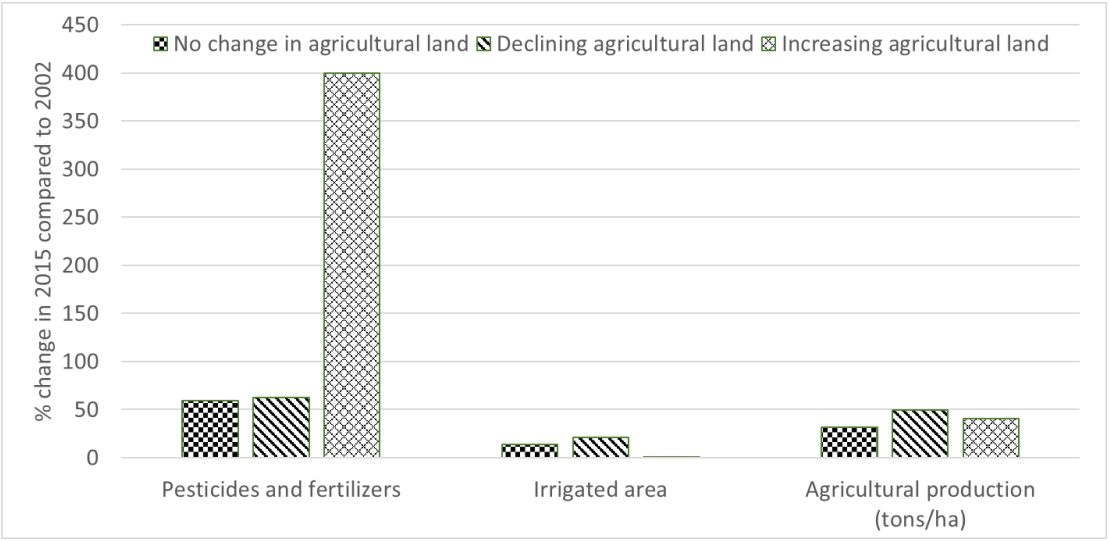


Figure 3.6. Percentage change in three drivers of agricultural intensification in three categories of countries during 2002 and 2015

Source: Author, based on data from FAO (2018)

The production of agricultural produce for export has contributed to agricultural intensification in some areas. Agricultural exports constitute a significant proportion of the GDP of countries in Asia. Developing countries such as China, India, Thailand, Viet Nam, Indonesia and Malaysia are major exporters of agricultural produce, with their exports accounting for 3.2, 13.2, 17.0, 15.2, and 26.5

per cent of their GDP, respectively in 2016 (World Trade Organization 2016). Developed countries and economies in transition also export agricultural produce, though not at the level of developing countries. In 2016, agricultural exports accounted for 1.6% of Japan's GDP and 2.1% for South Korea. The underlying drivers for export-oriented agricultural production include the higher prices offered by international markets, growing demand for agricultural imports from developed countries, investments in agribusiness and finance and technology for export-oriented crops (Barker, et al. 2004; Mundlak, D.F.Larson and Butzer 2002; ADB 2013).

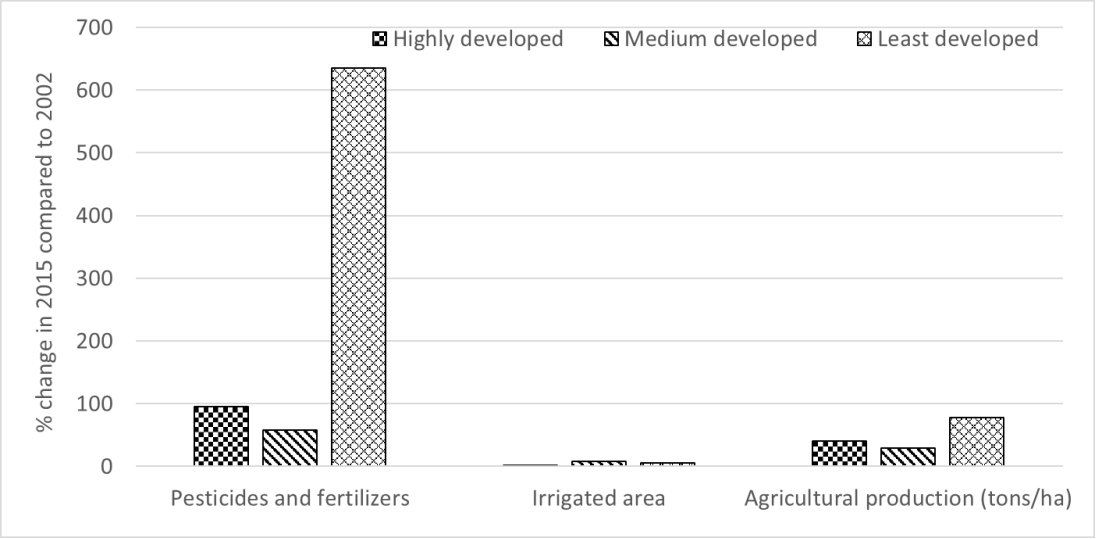


Figure 3.7. Agricultural intensification in advanced, middle- and low-income economies during 2002-2015

Source: Author, based on data from FAO (2018)

3.4 Trade-offs of current agricultural land-use changes and land-use intensification for sustainable development

Many of the major agricultural land changes that are taking place in Asia are contributing in important ways to some of the SDGs, at least in the short-term. However, the focus on increasing yields, targeting export markets and accommodating the desires of the region's growing middleclass is driving patterns of land transformation that have serious social, environmental and economic trade-offs. Agricultural land changes are contributing to some SDGs, while harming others. Land degradation and desertification are particularly important trade-offs of unsustainable agricultural practices as they affect the performance of agricultural land over vast areas.

Figure 3.8 shows that agricultural land-use changes can have negative outcomes for crop productivity, soil quality, climate change (both in terms of greenhouse gas emissions and community vulnerability to climate change impacts) and ecosystem services. Changes in agricultural land can have significant implications for SDGs 1 – No Poverty, 2 – Zero Hunger, 3 – Good Health and Wellbeing, 6 – Clean Water and Sanitation, 12 – Responsible Consumption and Production, 13 – Climate Action and 15 – Life on Land (Vlek, Khamzina and Tamene 2017). Figure

3.8 depicts the anticipated relative impact of land-use changes on each SDG by using different sized boxes. The extent of impact of land-use changes on each SDG depends on how the impacts compound in a hierarchical manner and how other policies and actions compensate for these impacts. For example, while some agricultural land changes could negatively impact poverty, rural development programmes supporting livelihood diversification could alleviate the effects of this impact. However, some SDGs such as 15 – Life on Land and 6 – Clean Water and Sanitation may not benefit from such a compensatory advantage due to poor development of compensation mechanisms. It is important to note that the feedback connections between land changes and SDGs are bi-directional in nature, i.e. any changes in the status of SDGs could have either detrimental or beneficial impacts on agricultural land and vice versa.

The increased consumption of meat products has significant implications for agricultural land. It has led to greater allocation of land for production of livestock feed and thus competition with other agricultural land uses, greater competition for water and greater potential for land and water pollution (Ahuja 2012). The rapid changes in consumer preferences are forcing food producers to change their crop production choices. Only those farmers with the wherewithal to acquire skills and material inputs are able to reap the opportunities this offers, while many farmers are unable to tap the emerging market opportunities, either forcing them to quit farming or cope with the loss of income. The national agricultural research and development systems are too slow to react to these developing market conditions and have not been able to help farmers take advantage of these opportunities and steer these trends in the right direction. Several of these changes also have implications for food waste (discussed below), with significant environmental, social and health consequences.

Social trade-offs

The conversion of forests for agriculture has a range of social implications. Deforestation has incited local conflict and negatively impacted food security by harming the environmental services that forests provide (e.g. pollination, soil development and conservation, watershed protection, etc.) that are important for agriculture and direct provision of food for those living around forest areas (FAO 2016). Evidence from countries where forest areas remained stable or have increased showed a clear positive benefit of forests on food security in these countries (e.g. Viet Nam and Georgia in Asia) (ibid.).

Unsustainable agricultural practices are associated with widespread land degradation in Asia and this results in serious social trade-offs (environmental aspects of land degradation are discussed in the next section). SDG 15 – Life on Land emphasises the importance of reducing desertification, which requires effective strategies to arrest land degradation. Globally, the number of people living on degraded agricultural lands has increased in the past two decades with consequent implications for their wellbeing (Barber and Hochard 2016). People who are living on increasingly degraded lands may no longer be able to sustain themselves through gainful crop production. In some cases they have been forced into the distress sale of their lands to the wealthy, who have converted them to other more profitable uses such as commercial aquaculture, which contaminates waters and degrades the land even further (Scott 2008). Once the land that poor farmers depend upon is degraded it is unlikely to recover. Local agricultural extension systems and other government departments engaged in rural development often lack knowledge and the resources to assist poor farming households recover their land fertility.

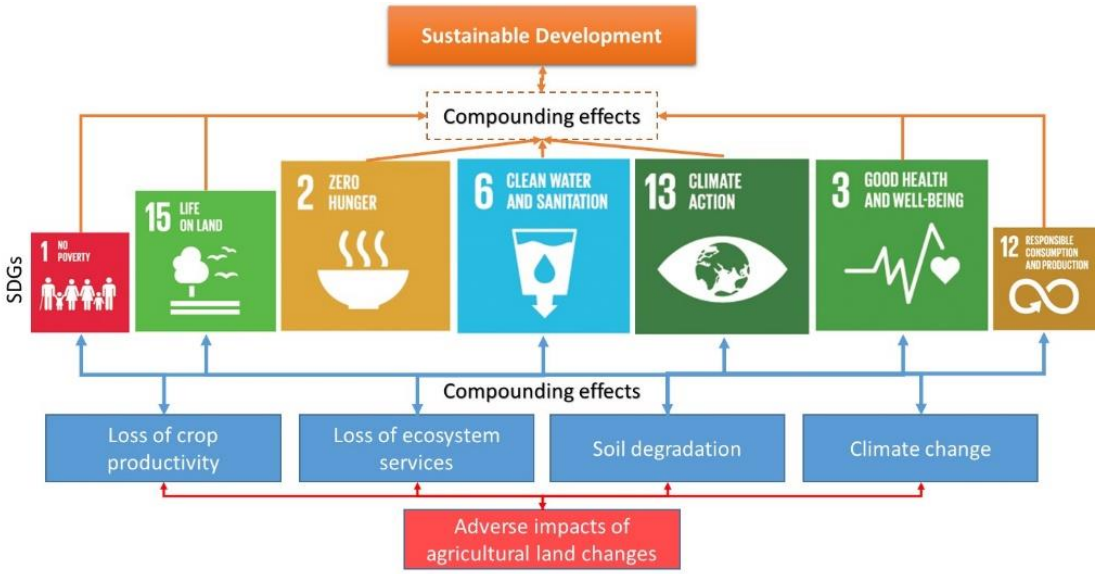


Figure 3.8 Possible trade-offs from agricultural land changes on SDGs

Source: Author

Environmental trade-offs

There is a large literature on the impact of land-use changes within agriculture on the environment. This literature highlights impacts on soil and water and their relation to the maintenance of ecosystem processes (Hamidov, Helming and Balla 2016; Vlek, Khamzina and Azadi, et al. 2017).

Land degradation has been an important environmental trade-off of agricultural land-use transformations. Poor controls on land-use intensification processes have resulted in excessive tillage, excessive cropping without replenishment of soil nutrients, cultivation under unfavourable conditions, e.g. where water quality is poor or on slopes with fragile soils, and limited soil protection from surface runoff leading to erosion. This has resulted in degradation and abandonment of nearly 12 Mha of agricultural land in tropical Asia alone (Gibbs and Salmon 2015). Agricultural lands in India, China, Indonesia and Malaysia are reported to be significantly degraded due to water and wind erosion, nutrient depletion, salinity, contamination and loss of physical characteristics of soils (Bai, et al. 2008). Agricultural land degradation is especially evident from the intensively cropped Ganges and Mekong River basins due to intensive use of pesticides, chemical fertilisers, and monocropping.

Another important environmental trade-off from land-use intensification is associated with the water-food-energy nexus. This nexus can take the form of both a synergistic nexus and an antagonistic nexus. In a synergistic nexus, the policies and actions in one sector (e.g. food) will have beneficial impacts on the other components of the nexus (e.g. water). In an antagonistic nexus, any changes in one component will lead to negative impacts on other components. Due to a strong nexus between food, water and energy associated with land use and absence of efforts to decouple antagonistic linkages, sectoral efforts to meet food, water and energy needs in the region are increasingly leading to negative outcomes on the other components of the triad. As the food, water and energy nexus can have a series of cascading impacts, efforts to initiate and strengthen synergistic nexus are of paramount importance. Increased water and energy consumption are two

obvious environmental trade-offs associated with agricultural land-use intensification and some changes in crop types. Traditionally, the water-energy nexus debate has focused on energy used for groundwater pumping, while ignoring the impact of price supports and other agricultural policies on water and energy use (Sinha, Sharma and Scott 2005). These policies have led to a disproportionate expansion of rice and wheat crops, with much greater consumption of water compared to other cereal crops (Sharma 2015). The biofuel boom of early 2000s spurred debate on food-fuel-water conflicts, as the production and processing of biofuels can consume a significant amount of water, and as biofuel production has the potential to displace traditional food crops. For example, soy feedstock can require 52,239-227,000 litres of water per MMBtu (million British Thermal Units) energy produced (O'Connor 2012; Edenhoffer, et al. 2012).

Agricultural land changes and intensification can have significant impacts on biodiversity (Kehoe, et al. 2015) and these impacts can manifest at the farm and landscape levels. Biodiversity loss is an especially serious concern in South and Southeast Asia, where the loss of native habitats has been accelerating. In these sub-regions, agriculture contributes significantly to habitat loss (Squires 2013). It is projected that 13-85% of the biodiversity in Southeast Asia could be lost by 2100 (ibid). Another major component of agricultural change affecting biodiversity is the rampant use of pesticides in agricultural fields and plantations (Gupta 2012). The problems include continued use of hazardous pesticides, improper use of pesticides including improper doses and application methods, and non-adherence to the safety norms for pesticide applications.

South Asian agriculture can be considered "environmentally-intensive" because of its extensive use of and impacts on groundwater (Alauddin and Quiggin 2008; Acharya 2014). Agricultural land-use intensification involving the increased use of chemical inputs has led to pollution of sub-surface and surface water sources, increased runoff and the resultant silting of reservoirs, and eutrophication (Wasantha, Hoang and Wilson 2015). The use of groundwater for irrigation has been widely promoted in the region and can have positive impacts for livelihoods, especially of smallholders, and food security (Molden 2007). However, without proper management irrigation can result in significant harm to the physical environment and threaten agricultural production in the long run. The price paid for groundwater use has often been lower than the social opportunity cost resulting in its overuse in South Asia (Alauddin and Quiggin 2008).

Land-use conversion to agriculture and agricultural intensification are also contributing to climate change (Nani, Sitaula and Bajracharya 2011). The conversion of forests to agriculture is associated with the release of huge volumes of carbon dioxide into the atmosphere. Intensification is contributing to climate change through the use of fertilisers that originate from fossil fuels, the use of fuels associated with farm mechanisation for tillage and groundwater pumping, and through the burning of crop residues. Expansion of agriculture in the tropics has been reported to have a warming effect on the atmosphere because of surface brightening and consequent reduction of net radiation not balancing the increase in temperature associated with reduced transpiration (Duveiller, Hooker and Cescatti 2017).

Economic trade-offs

Agricultural land changes can have significant potential for economic trade-offs. The expansion of agricultural land could be expected to lead to a decrease in import dependency for cereals. However, on the contrary, the import dependency for cereals of some of the countries where agricultural land increased continued to increase and at a higher rate than the countries where agricultural land either declined or stayed the same (Figure 3.9). This is especially so in Indonesia, where food grain imports continue to increase despite expansion in agricultural land, due to

relatively higher per capita consumption of rice and inefficient production practices (Indonesia Investments 2017). Plausible reasons for this trend could include rapid population increase at a rate higher than the rate of increase in agricultural production, increasing demand for food associated with a rapid increase in purchasing power, and any increase in agricultural productivity not being able to meet the demands of the growing population.

There has been a steady growth in agricultural areas reporting a stagnant or even decline in factor productivity, as in the case of the Gangetic Basin (Prabhakar and Elder 2009). The declining factor productivity is characterised by declining agricultural output despite increase in inputs such as fertilisers, pesticides, water and labour. Much of the declining factor productivity, especially in South Asia, has partly been attributed to a) the loss of soil fertility due to unbalanced application of fertilisers, b) soil degradation due to intensive cultivation practices with declining organic inputs (Kumar, Mittal and Hossain 2008) and c) inefficient irrigation systems supported by input subsidies to water and electricity (Government of India 2006; Hasanain, Ahmad, et al. 2013).

Declining factor productivity has a significant impact on farm profits and the net income of farmers, and can force them out of farming. If unnoticed and unmanaged, declining factor productivity can also have a significant impact on the environment as farmers may simply resort to increasing inputs with little or no increments in production in return. Agricultural research and extension systems are yet to tackle declining factor productivity effectively.

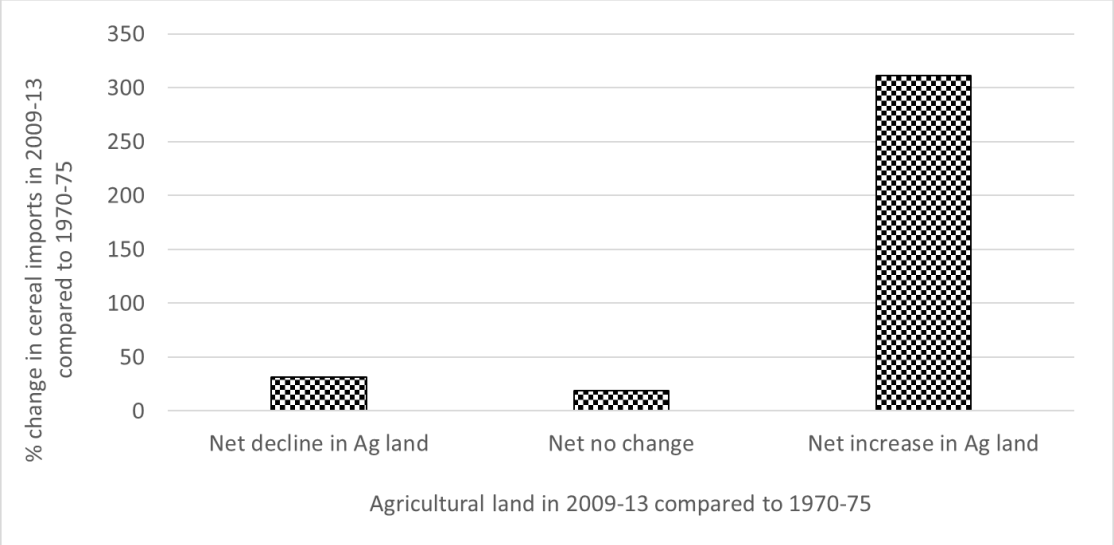


Figure 3.9. Food import dependency in three categories of countries compared for the periods 1970-75 and 2009-13

Source: Author, based on data from FAO (2018)

Another aspect of the economic trade-offs associated with agricultural intensification is the financial burden that government support to agriculture, such as price support and fertiliser subsidies, places on the public purse. Countries in Asia spend more than the rest of the world combined on agricultural subsidies (World Watch Institute 2014).

3.5 Measures for easing pressure on land

Any recommendations for addressing agricultural land conversion and intensification-related issues in Asia would have to comply with the national food security goals of the countries in the region and their current developmental needs. This is because agriculture still employs a significant proportion of their populations. These efforts would also have to take into account the impacts of climate change and other global pressures that the region is increasingly been exposed to.

Not all countries are experiencing the same level of agricultural land conversion and intensification and trends differ between countries. Hence, recommendations would have to be specific to each country or country groupings. Some drivers and related pressures originate outside the agricultural domain and hence agricultural policies or actions of agricultural ministries alone cannot fully address the issues arising from agricultural land-use and management changes. A coordinated policy environment within countries that takes a holistic view of the problem and addresses it from multiple angles is needed.

The discussion in this section is mainly focused on two kinds of desirable outcomes of policies and approaches, i.e. a) reduction in the demand for agricultural land and b) mitigating the negative impacts of intensive agriculture such as land degradation (i.e. the perils of intensification). The blue bars in the figures 3.10 and 3.11 indicate the potential of various solutions to reduce demand for agricultural land and to ease pressure of agricultural intensification. From Figure 3.10 and Figure 3.11 it is evident that approaches that can reduce the demand for agricultural land can also help avoid the perils of agricultural intensification to varying degrees. Many of the solutions introduced in this section have been widely discussed among the policy community and some are being implemented to varying degrees. The crux issue is scaling up the application of these solutions to effectively address pressure on the land and the associated natural resource degradation.

Increasing agricultural productivity without harming the environment: Improving agricultural productivity is a low-hanging fruit that can lessen the demand for new agricultural land (Prabhakar 2012). Agricultural productivity has been on the rise in the past three decades across the region, albeit with variations among countries in terms of the rate of productivity gains. Also, productivity gains are becoming harder as the rate of increase in productivity is far outweighed by the rate of increase in farm inputs used per unit of output. This situation is disturbing, especially considering that the food demands of growing populations are outpacing food productivity gains. The total factor productivity (TFP), which is the production per unit input, has been either stagnating or on the decline in various parts of Asia (Prabhakar and Elder 2009).

Achieving gains in agricultural production and productivity without harming the environment is an important concern of most governments in the region. Practices to achieve these outcomes exist, but require further development and upscaling (Ladha, et al. 2016). Agricultural research systems in the region are increasingly investing in developing farming practices and methods such as integrated management of water, nutrients and pests, and innovative irrigation techniques to sustainably improve land productivity. However, in some places some of these practices and methods may not be successful due to irreversible structural changes that have already taken place in the agriculture sector. For example, rapid mechanisation has displaced animal power from agriculture, and this has cut down the supply of organic manure that most farmers in the region once used as a staple fertiliser.

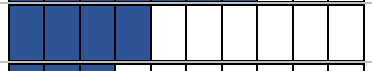
The means	The End	
	Potential to reduce demand for agricultural land	Potential to ease the pressure of agricultural intensification
Smart subsidies		
Unconventional productivity gains		
Sustainable agriculture		
Improved input use efficiency		
Agricultural water pricing		
Food labelling		

Figure 3.10. Potential of various agricultural approaches for reducing demand for agricultural land and easing agricultural intensification pressures

Note: Bars indicate the extent of change brought by the means listed on the left, based on author's judgement of these policies. Source: Author

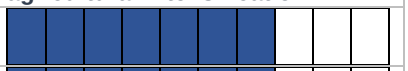
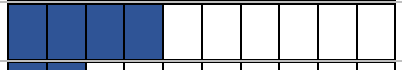
The means	The End	
	Potential to reduce demand for agricultural land	Potential to ease the pressure of agricultural intensification
Prudent bioenergy policies		
Renewable energy use		
Food lifestyle changes		
Food waste reduction		
Addressing changing food consumption patterns		
Urban & vertical farming		
Integrated land governance		
Land degradation neutrality		

Figure 3.11. Potential of various approaches that need policy coordination across different ministries of governments

Note: Bars indicate the extent of change brought by the means listed on the left, based on author's judgement of these policies. Source: Author

As irrigated areas are exhibiting productivity fatigue, most countries are focusing on productivity gains from rainfed agriculture, which seems to have huge potential. There is a need for renewed investments in rainfed farming with more private sector engagement, which has largely been confined to irrigated well-endowed agro-ecologies. Private sector investment can especially benefit rainfed agriculture by expanding irrigation facilities through the build-operate-transfer mode. This could substantially reduce the burden on government in expanding irrigation facilities.

Sustainable agriculture: There is growing recognition among countries of the need for sustainable agriculture. There has been an increase in the area under organic and other forms of sustainable agriculture in the region (Sano and Prabhakar 2009). Growing consumer awareness of the health benefits of organic food is driving demand for organic food from domestic and international markets. While organic agriculture can effectively address the perils of agricultural intensification including land degradation, it cannot fully address the region's burgeoning food demand (Reganold 2016). The impact of organic agriculture on demand for agricultural land can be mixed. It may be negligible or it can lead to renewed interest in agriculture, due to high revenue potential per unit output compared to conventional agricultural products.

The Food and Agriculture Organisation of the United Nations (FAO) has been promoting climate-smart agriculture (CSA) as a form of sustainable agriculture, with a view to reducing the impact of agriculture on climate and reducing the impact of climate change on food production and farming communities (Lipper, et al. 2018). The "smart" in CSA involves utilising the opportunities provided by climate change while tackling the challenges associated with it. CSA seeks to integrate global environmental and developmental issues in a single approach. CSA practices aim to reduce the demand for off-farm inputs, energy and water, and increase production and productivity within sustainability bounds, while protecting food production and rural livelihoods from climatic vagaries. CSA is attracting growing attention from policymakers in many Asian developing countries. CSA practices can be scaled up by capacity building of farmers and stakeholders engaged in the agricultural supply chain and making available relevant technical information that is location specific.

Labelling and certification: Food certification and labelling can support sustainable agriculture and could help significantly diminish the negative impacts of agricultural intensification. Countries such as Japan, Australia, New Zealand and South Korea have made great inroads into food certification and labelling. However, current food certification and labelling are largely restricted to providing information on food composition (especially for processed food), nutritional information and to an extent the origin of the food. Food certifications and labels that cover environmental burdens, such as water consumed in producing the food, chemical and pesticide load, and carbon emissions, and that carry other information on ecological footprint can help consumers make responsible food choices. Organic certifications and related labelling have largely been successful in promoting organic food and helped the organic food sector to grow in the region; however, the proportion of the total food supply that is certified as organic remains very low.

There is a need for further development of certification and product labelling schemes. Governments should coordinate their various ministries to ensure that information on environmental burdens and health are included on product labels. To more widely promote sustainable agriculture, food certification and labelling requires a coordinated effort between multiple ministries including the ministries of agriculture, health, and trade and other government agencies engaged with consumers.

Smart subsidies: In Asia, agricultural input subsidies play a critical role in agricultural intensification. Subsidies can help with meeting certain national objectives, such as poverty reduction and food security, but they can also result in inefficiencies and excessive use of inputs. Smart subsidies that better target poor farmers and others who really need them should replace the blanket subsidies that are currently prevalent in most countries (Dorward 2009).

Price support given by governments to agricultural commodities is another area of concern. Although such support has been declining with more governments employing direct cash transfers, agricultural commodity price support is still a major policy intervention in many countries, including India and China. Agricultural commodity support has been argued as necessary to support a country's food security and rural development goals, but it distorts markets, can maintain the use of off-farm inputs at unnecessarily high levels and can contribute to land degradation from unsustainable agricultural intensification. However, targeted commodity price support for sustainable and healthy food could contribute to the long-term viability of the agriculture sector, and the health and wellbeing of food producers and consumers. When properly designed, such support could help ensure adequate nutrition for the poor and can be implemented as part of nutrition assistance programmes.

Avoiding food-fuel conflicts: Food-fuel conflicts are a concern for the region and were observed during the biofuel boom of early 2000s. With declining fossil fuel prices globally, the biofuel fervour has also been on the decline with several major private sector plans to invest in biofuels in the region either being put on hold or scrapped. Biofuel production in India has either stabilised (as in the cases of ethanol) or has risen continuously at a low pace (as in the case of biodiesel) (USDA 2014).

Some governments have introduced policies to mitigate the risk of food-fuel conflicts. The Government of India, for example, introduced its National Biofuel Policy in 2009, which succeeded in limiting biofuel production to non-food feedstock from degraded lands, thereby lessening the likelihood of food-fuel conflicts by promoting the production of jatropha, a biodiesel feedstock that is largely grown on marginal and degraded lands (Prabhakar and Elder 2010). The success in limiting feedstock production to degraded and marginal lands could also be attributed to the way the policy was implemented, i.e. close monitoring by the local agricultural departments with the involvement of private agencies that supply the seed and procure the feedstock (ibid). While this policy has restricted biofuel to non-food feedstock, there is no policy in the region that restricts the growing of feedstocks to marginal and degraded lands, as feedstocks include cassava, sugarcane and corn, which are also grown for human food. Farmers are not restricted to growing jatropha or any other biofuel crops only on degraded lands. Perceived profits could lure them to cultivate biofuel feedstock rather than food crops on fertile cultivable lands (The Guardian 2009). This indicates the limitation of policies in having precise impact on the ground even though they are well intentioned. Hence, it is essential to combine such policies with support from local farming groups such as cooperatives and other pressure groups to ensure that farmers do not convert fertile lands for biofuel production.

While the uncontrolled cultivation of biofuel feedstocks should be avoided as they can displace food crops, there is a case to be made for biofuels when these fuels can be obtained from environmentally, socially and economically sustainable sources. In this regard, third generation biofuels such as those produced from algae could have immense potential (Alswad, et al. 2015). Producing third generation biofuels at the scale at which they make economic sense requires significant investments by the private sector and governments to develop affordable technologies.

Renewable energy in agriculture: Increased energy access is an important driver of agricultural intensification, one that is supported by agricultural electricity subsidies in some Asian countries. The current forms of energy employed for agriculture are largely carbon intensive and their use leads to high GHG emissions. Interventions promoting the use of renewable energy in agriculture can reduce the demand for grid-electricity, the use of coal and the associated use of water for

thermal power generation. Alternative energy sources can lead to cleaner air and reduce GHG emissions from the power sector.

Biogas plants can reduce the demand for fossil fuels such as kerosene for domestic consumption and increase the energy security of rural households. They can also provide a number of indirect benefits associated with motivating farmers to keep cattle. Cattle provide manure, which can to some extent replace fertilisers generated from fossil fuels, and help improve agriculture yields and soil health. Governments in South Asia are promoting biogas in their rural energy programmes, and this can generate significant benefits for rural development, food and energy (Practical Action 2014; Government of the People's Republic of Bangladesh 2011; Ministry of Science, Technology and Environment 2008; Ministry of New and Renewable Energy 2014). Such integration into rural development programmes is a way to scale up sustainable energy production.

Improving water use efficiency: Crop production technologies that promote efficient water use could conserve energy by reducing the need for pumping and make water available for other priority sectors. Asian countries have promoted water efficient practices in agriculture over the past several decades albeit with limited scaling up of these practices. The challenges to upscaling include lack of farmers' capacities, lack of positive incentives and the presence of disincentives such as electricity subsidies, lack of required water control and management infrastructure, and absence of dependable water sources (Hasanain, Ahmad, et al., 2012). Appropriate water pricing, as a means to improve water use efficiency, has been advocated, though efforts are needed to convince policymakers of its merits. Water pricing can be applied to both surface and subsurface water resource use and could mitigate the problem of excess irrigation. When combined with irrigation water rationing, the overall impact on water resource utilisation could be substantial.

Reducing food waste: Food waste has often been thought of as an issue of developed countries (Parfitt, Barthel and Macnaughton 2010); however, in developing Asia huge volumes of food also end up as waste. In India, for example, an estimated USD 12 billion worth of food is being lost as waste every year (Rabo India Finance 2007).

Food waste is an issue for sustainable production (including processing, transportation and storage) and consumption, as well as for food security. The reasons for food wastage include lack of proper storage and transportation facilities, lack of training and knowledge about the shelf life of the food, absence or poor enforcement of food handling standards, changing food consumption patterns, insufficient development of the food processing industry, food pricing and ill-informed food production decisions by the producers leading to gluts (World Food Program 2009). Addressing food waste can have multiple environmental and social benefits beyond reducing pressure on land, but policy development to reduce food waste is still at nascent stages in Asia, which has been preoccupied with increasing food production.

Multi-sectoral and multi-stakeholder collaboration is required to address the issue of food waste as the problem stretches beyond the agriculture sector. Comprehensive national food waste minimisation strategies should be promoted by targeting the entire lifecycle of food. At the consumer end, introduction of food waste reduction campaigns could be effective, as in the case of Republic of Korea which introduced a national food waste reduction plan in 1996 (Lee 2006). At the producer end, food wastage in the perishable food markets can be reduced by a) providing seasonal price forecasts to farmers, b) introducing futures contracts, c) establishing food storage facilities, including cold storage facilities, in the vicinity of production centres, and promoting public-private partnerships and involvement of farmer cooperatives in installation and operation of the facilities,

and d) small-scale on-farm food processing. Food wastage can also be reduced through supply chain initiatives. The introduction of food labelling with appropriate expiry dates, and making available suitable sizes of food packs would help consumers make responsible purchase choices. Establishing networks for distributing unsold food, including cooked food from restaurants and households, among the needy sections of the society may help in reducing hunger and food wastage, for example as is happening in Mumbai (Pasricha 2018; BBC 2016).

Natural hazards are a major proximate cause of crop loss and food wastage in Asia. Cropping patterns, crop selections and agronomic practices aim at maximising productivity under average conditions, making agriculture highly vulnerable to natural hazards such as extreme events for which production systems are not designed. Countries are undertaking agricultural research and development efforts to address natural hazard-associated losses through changes in crop varieties, crop management practices and crop diversification approaches. Further efforts are required. These can include improved seasonal forecasts to enable farmers to better manage risks when making seasonal decisions, including by modifying seasonal calendars to better reflect weather and climate patterns. Some of these approaches have been incorporated into climate-smart agriculture, but are yet to be widely scaled up. The ability to forecast extreme events also needs to be improved. Another useful investment would be strengthening the local farming input supply and support systems for seeds, fertilisers and irrigation, so that farmers can take advantage of the short favourable window that may open up after a major monsoon failure.

Urban and vertical farming: Urban and vertical farming have potential to reduce pressure on existing agricultural land and reduce conversion for agriculture if designed and promoted appropriately. The idea of promoting food production within urban areas has gained increasing attention among sustainability professionals and policymakers. The FAO and international initiatives such as 100 Resilient Cities have started looking at urban farming as a means of promoting livelihoods, local fresh food and waste recycling (FAO 2018; Fox 2013). As urban areas procure food from faraway places, food production within or in the vicinity of urban areas has potential to reduce carbon emissions from food transport and water miles as well as the larger ecological footprint of urban areas. While there are no macro-level comprehensive assessments on the food production potential of urban areas in Asia and the associated environmental benefits and costs, pilot initiatives have already been introduced in Asia for promoting urban food production. However, there is no evidence that these pilot initiatives have taken a broader view of the competition for resources that is already taking place in urban areas. As cities are increasingly facing electricity and water shortages, urban farming should be promoted in ways that do not place high demands on energy and water from conventional systems, nor should urban farming increase demand on already strained urban spaces.

Promotion of food production in urban areas should be coupled with the promotion of renewable energy, water harvesting, organic inputs, waste reduction and recycling approaches including composting (Prabhakar and Ramanjaneyulu 2016). The elements of sustainable urban food production would also include appropriate agricultural practices (selecting varieties and adjusting practices to reflect urban microclimates), the enforcement of environmental standards and quality controls, and linkages between the food producers and local markets to ensure there is no food waste. Sustainable urban food production could be made one objective of urban planning, which can optimise urban spaces to fully realise the potential of urban food production. Vertical farming, a form of growing food in vertically stacked layers resembling multi-storied greenhouse structures or buildings with appropriate climate control systems, could be a sustainable solution for urban areas that are already space constrained as it enables more food to be produced per unit area. Vertical

farming promotes sustainable input use through rainwater harvesting for water, renewable energy for lighting and organic urban compost for fertilisers. Through climate forcing, vertical farming can produce food throughout the year and isolate food production from the surrounding microclimate and related vagaries.

Integrated land governance: Land must be governed in an integrated manner to avoid environmental harm, social conflict and suboptimal outcomes of land use. Integrated land governance consists of structures and processes that bring sectors, different levels of government and stakeholders together to agree on how land should be used and managed. Forests and agricultural land must be managed together because of the two-way flow of ecosystem services that exist between them. Also, a narrow focus on the management of one of these sectors could result in great harm to the other, as is especially obvious in the high rates of forest conversion for agriculture that can be observed in parts of Southeast Asia. Integrated landscape approaches to land management such as *satoyama* (see Chapters 5 and 8) recognise these interlinkages and the need to manage ecosystems and the relationships between them. However, land governance today is highly fragmented, and initiatives to promote *satoyama* and forms of community-based landscape management are yet to make a significant impact at the regional and global scale.

There are a number of challenges to the realisation of integrated land governance. First, integrated land management approaches must reflect the scale, diversity and severity of the problem, which requires them to be tailored to diverse contexts. Existing approaches cannot simply be copied from one place to the next. Second, an information problem exists as government agencies focus on their mandates, yet integrated land governance requires each agency to be cognizant of the impacts of its decisions on the purview of other agencies responsible for land. Third, land-use planning processes should be informed by environmental and socio-economic impact assessments of alternative land uses. This knowledge provides certainty for decision makers about the consequences of allocating land to specific use categories and to land investors. Resources and capacities for such assessments are often lacking, however. Fourth, integrated land governance will bring in the perspectives of disaster risk reduction and climate change adaptation into land-use decision making and land management. While this is certainly needed, it loads up the expectations that are being placed on the land.

Countries such as the Philippines are slowly moving towards land-based decision making for designing their development strategies. Several countries in the region have established specialised land management bureaus for managing land as an integrated unit so that sectoral policy decisions are well informed. Digitisation of land records, establishing clear land tenure and land budgeting have been introduced, albeit at a slow pace. These all help build the foundations for integrated land governance. Integrated land governance requires land management bureaus to have a bigger say in the land management decisions of individual ministries, beyond their current role of mere information providers. They should be given the authority and sufficiently resourced to validate the impacts of proposed policies on the overall land resources in the country in the same way a congressional budget office provides transparent analysis on impacts of proposed budgets on the overall wellbeing of a country.

Land degradation neutrality: The Land Degradation Neutrality (LDN) agenda is a result of a decision made at the 12th Conference of Parties of the UN Convention to Combat Desertification (UNCCD). LDN is an integrated target-based overarching policy approach to limit land degradation. LDN is defined as “A state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within

specified temporal and spatial scales and ecosystems" (UNCCD 2015). The notion is that countries should counterbalance the loss of productive land with the recovery of degraded lands. Though LDN is an overarching concept and can be applied to a variety of land use classes, it is especially relevant to agricultural lands, as the discussion earlier in this chapter highlights. LDN for agriculture means putting long-term interests ahead of short-term interests for resilient ecosystems and societies. Countries can begin working towards LDN with their available resources. For example, they can strengthen and scale up available approaches such as watershed management, land-use planning and integrated land administration.

3.6 Conclusions

In this chapter an effort was made to identify trends in land-use changes within agriculture and understand various drivers behind these changes and their consequences. Important underlying drivers affecting land conversion to and from agriculture include population growth, economic growth and transformation, urbanisation, and developments within agriculture such as increasing private sector investments and technological developments. Important drivers for agricultural intensification in Asia were found to be access to inputs such as fertilisers, pesticides and improved varieties, and food security priorities reflecting the need to produce more from the limited available land.

Agricultural land changes have social, environmental and economic impacts, not all of which receive sufficient attention from decisionmakers. These impacts interact with each other, with serious implications for many of the SDGs. Agricultural intensification has caused great harm to the land in the form of land degradation and pollution, with serious impacts for health, biodiversity, ecosystem services and long-term human security. Identifying the precise impacts of agricultural land-use changes on the SDGs at the macro level is challenging, as impacts are masked at the macro level by wider economic and social changes. Detailed case studies can help in characterising the impacts of agricultural land-use changes on the SDGs by isolating these impacts from those of other changes.

Achieving the SDGs while safeguarding the sustainability of agricultural lands and the health of agricultural soils presents a paradoxical problem for Asian countries. The food production and productivity improvements in the region have contributed to lifting millions of people out of poverty and reduced hunger and malnutrition, but they are associated with patterns of land intensification that have degraded agricultural land and caused great environmental harm. For the short term, the strategy to achieve SDG goals such as zero hunger could mean sustaining the current food production levels while addressing the food loss and distributional issues so that a significant part of the current disparities in food security are addressed without further stressing the agricultural systems. Policies such as land degradation neutrality would support such a strategy well. Over the long term, more transformational changes in agricultural production systems and consumption patterns will be required. They could include innovative means of food production such as urban and vertical farming, initiatives to change food habits towards healthy and sustainable choices, and introduction of new sources of food that may demand significant cultural adjustments but do not burden the environment.

The implications of agricultural land-use decisions extend beyond the agriculture sector and have wider consequences for human wellbeing and human security. Hence, there is a need for agricultural land-use decisions to be informed by a broad vision that captures these wider

implications. This calls for integrated land-use decision support systems, but these are currently not well researched and developed in Asia. To the contrary, land continues to be governed in a fragmented manner. Without a paradigm change towards integrated land governance, unsustainable agricultural land transformations will continue to take place.

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CHAPTER 4

How the global "land grab" is reshaping landscapes, economy and society in Papua New Guinea

Henry Scheyvens

Key messages

- *A massive transformation of rural landscapes is taking place in Papua New Guinea (PNG), with hundreds of thousands of hectares of biodiversity rich rainforest being cleared for agriculture.*
- *This transformation is deeply troubling both in terms of the processes through which it was made possible as well as its impacts on economy, society and the environment.*
- *The failures in governance at all levels and in all stages of the processes associated with the issuance of, and land development under, special agriculture and business leases have profound implications.*
- *Without addressing the governance issues, any large-scale land development in PNG will be deeply problematic.*
- *The entire development paradigm under which the state depends so heavily on developers to provide services and infrastructure in rural areas needs to be revisited.*
- *Key to sustainable development are control of foreign investment capital, internal interdependence and solidarity among citizens, wise use of natural resources and the environment, and participation of local communities in economic development, as advocated by the national Constitution.*

4.1 Introduction

In Papua New Guinea (PNG) a massive transformation of landscapes of unprecedented scale is taking place in the form of the conversion of natural forests to oil palm plantation estates, or in some cases ostensibly for oil palm but ending up as deforested degraded land. This transformation can be viewed as part of a global "land grab", which is characterised by a huge increase in transnational investment in agricultural projects in developing countries (McDonnell, Allen, and Filer 2017). From 2003 to 2011 agricultural leases were granted for commercial agricultural developments over 5.1 million ha of customary land, mostly to foreign-owned companies. This alienation of land development rights has taken place through an instrument known as a special agricultural and business lease (SABL). With forest clearance authorities that allow the complete removal of trees and other vegetation having been granted for over 800,000 ha of natural forest that fall within SABL

areas, and with a total of four million ha of closed canopy forest inside SABLs, the potential scale of deforestation is unprecedented in PNG's short history.

This chapter examines the transformation of mostly forested landscapes to plantation estates or degraded land under SABLs, its drivers, the trade-offs involved and its implications for sustainable development. The discussion begins with a brief description of rural landscapes in PNG and the major transformations in land use that are taking place. The impact of SABLs on the landscape and the findings of the Commission of Inquiry set up to investigate them are then discussed, and the facilitating factors and underlying drivers of the landscape transformations under SABLs are assessed. A discussion on trade-offs follows, focusing on the dramatic landscape transformations under four SABLs that are taking place in Pomio district, East New Britain. The need for the government to recognise customary land tenure as an asset of the nation, rather than a hindrance to economic development, and to invest in building local capacities and institutions, rather than hoping that development will come through the alienation of land rights for foreign developers, is highlighted.

4.2 PNG's rural landscapes

The rural landscapes of PNG are diverse, reflecting a complex interplay of social and biophysical patterns and processes. At a fundamental level, accessibility has a major impact on the land. Much of the country is largely inaccessible because of steep terrain and other natural barriers that protect it from direct human disturbance. In accessible areas where land can be cultivated and settled, social and economic life and land-use patterns are intricately intertwined. In these areas the rural landscapes have been shaped by the settlements and agricultural activities of the local clans and their relationships with forests and other natural ecosystems, and in some areas by large commercial investments in land development and natural resource exploitation.

In PNG's rural landscapes, outside of estate plantations or other areas that have undergone some type of major land-use transformation, forests are almost everywhere. Forest is the largest land cover in PNG, accounting for 77.8% of the total land area (CCDA 2017a). Forests can be found across the country from sea level to elevations at several thousand metres on landscapes that range from seasonal savannah to continuously wet cloud forest. Historically, the rate of deforestation has been quite low, with about 0.7% of the total forest cover being lost between 2000 and 2015 (ibid.). However, about one quarter of the forest cover is classified as "disturbed", and of this disturbed class most has been heavily modified by selective large-scale logging of commercial tree species (ibid.). Outside of forests, the other major land covers are cropland (11% of the total area), which includes land under both shifting and commercial agriculture, grassland (5.3%) and wetlands (4.8%), with settlements including villages and cities covering only 0.9% of the land area (ibid.).

Family agriculture, supplemented with gathering from the wild and small-scale local trading, describes the livelihoods of many Papua New Guineans and has a major impact on land cover patterns around the forest fringes. Family agriculture is an umbrella term used by the Department of Agriculture and Livestock to describe family-based agricultural activities. These include subsistence agriculture, which consists of shifting cultivation and gardening, as well as small-scale cash cropping of coconut, cocoa, coffee, vanilla and the like. Shifting cultivation is fundamental to the livelihoods of many families, providing the main source of food on the table, and has a significant impact on rural landscapes, being responsible for about 63% of deforestation associated with

conversion of forests for cropland (ibid.). In shifting cultivation areas, the original natural forest is cleared to establish small garden plots of about one ha or less and the land is cultivated with root crops, bananas, leafy vegetables and other staples for one or two years. By then, nutrients in the soils are depleted so the family will clear another area for cultivation. Forests play an important role in this farming system as natural revegetation by grasses, shrubs and pioneer tree species during the fallow period replenishes the soil nutrients, enabling the family to re-cultivate the land after a number of years.

In addition to family agriculture, selective logging of natural forests under concessions, plantation estates in lowland areas, and mining are reshaping PNG's rural landscapes. Logging concessions extend over much of the lowland forest and 11.9% of the total forest area is considered to have been disturbed by large-scale logging (ibid.). These areas retain forest cover, but are susceptible to conversion as the logging roads open them up for settlement. In terms of their total size, until recently plantation estates have had less impact on rural landscapes. Coffee and cocoa producers have focused on renewing stock and improving growing techniques, rather than extending their plantations, while oil palm has been dominated by two firms that have committed to international sustainability certification, which requires them to maintain or enhance high conservation value habitats (ibid.). As with logging concessions, plantation estates can also have significant indirect impacts on the landscape through the construction of roads, which open up new areas for settlement and cultivation.

4.3 Landscape transformations under SABLs

Through the issuance of SABLs, oil palm developments have risen from a minor to a major cause of deforestation in PNG in the span of less than a decade. Historically, conversion of forests for oil palm estates has not been a significant proximate cause of landscape transformation in PNG. Only 90,000 ha of forests were converted for oil palm during the 30-year period from 1972 to 2002 (Shearman et al. 2008). In stark contrast, through SABLs issued between 2003 and 2011, new oil palm developments are planned for over 2.2 million ha (Gabriel et al. 2017). The total area under the SABLs is 5.1 million ha, representing 11% of the country and over 16% of accessible commercial forests (Winn 2012). The SABLs were issued mostly for 99 years for the purposes of "agro-forestry", but in PNG the term agro-forestry is not used in the conventional sense to describe mixed cultivation of agricultural crops and trees; rather it is a misnomer used to describe the clearance of native forest for the cultivation of an export crop. There are currently four million ha of closed canopy forest in SABLs that could be converted to agriculture (CCDA 2017a). In 2013, the Forestry Authority reported that permission for the complete clearance of forests had already been issued for 878,764 ha (PNGFA 2013).

The location of SABLs is shown in Figure 4.1, which reveals that land under SABLs is found over much of the country where conditions are supposedly suitable for agricultural estates. A large number of SABLs are for low lying coastal areas, but there are also a considerable number of SABLs in inland areas. Their sizes range from the medium to the massive, with some falling below 20,000 ha and some above 700,000 ha (Winn 2012).

4.4 Commission of Inquiry in to SABLs and subsequent events

Serious problems regarding the SABLs began to emerge and drew international attention. Paul Barker, Executive Director of the PNG Institute for International Affairs, used the term "land grab" to

describe systematic abuse of SABLs in a feature article of one of the national newspapers in May 2009 (Filer 2017). On 11 March 2011, the United Nations High Commission for Human Rights (UNHCR) issued an early warning letter expressing concern that customary lands were being leased without the consent of the customary owners and without their understanding of the proposed developments. In May 2011, a diverse group of people met at James Cook University to discuss the future management and conservation of PNG's forest and issued the "Cairn's Declaration", which urged the PNG government to declare and enforce an immediate moratorium on the creation of new SABLs, halt the issuing of new forest clearance authorities and suspend existing ones (Winn 2012).

In response to these growing international concerns, in May 2011 acting Prime Minister Sam Abal announced a Commission of Inquiry (COI) into SABLs and issued an immediate moratorium on the granting of any new leases, forest clearance authorities and environmental permits. The COI was mandated to investigate the legal authority and procedures involved in the issuing of the SABLs and to examine all the leases. Three senior lawyers were appointed as commissioners. They gathered evidence from August 2011 through to March 2012. Two of the commissioners submitted their reports, which cover 42 leases, in June 2013, but the third commissioner never submitted his report, stating that he faced problems associated with inadequate financing for the investigation. The two commissioners' final reports and transcripts of hearings, including those conducted by the third commissioner, are available through the Prime Minister's departmental website (http://www.coi.gov.pg/sabl.html).

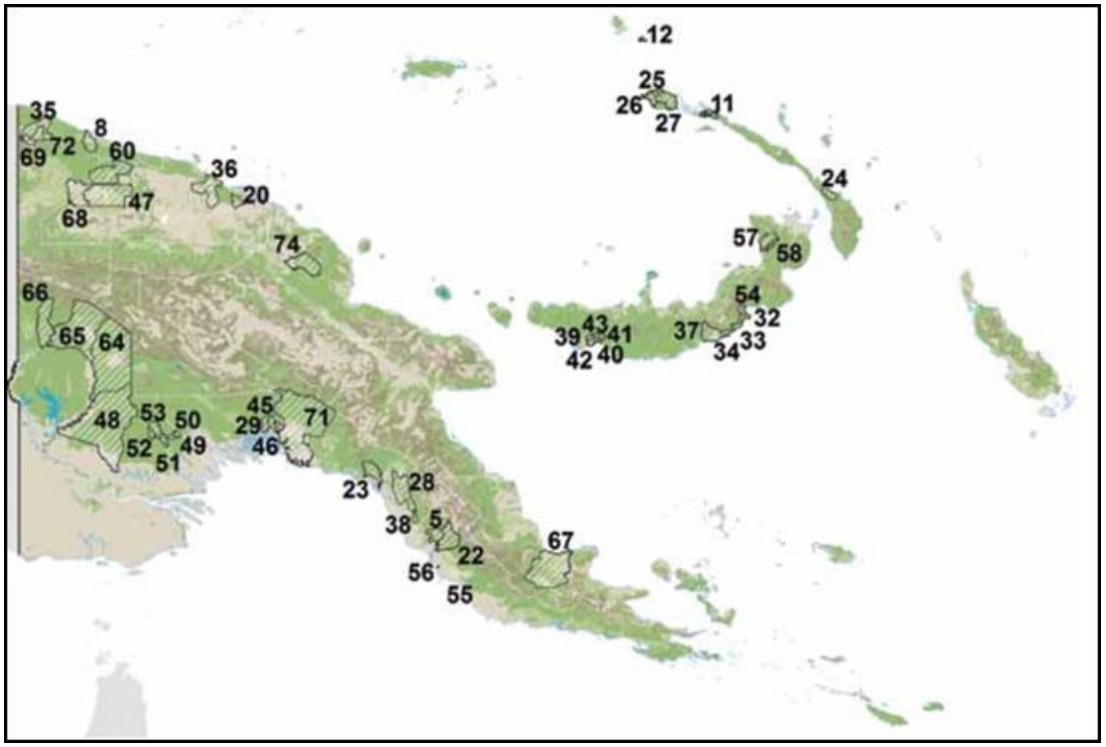

Figure 4.1 Location of SABLs

Note: SABLs are numbered in order of issuance. Source: Winn (2012)

The findings of the COI were shocking, showing massive violations of principles laid out in PNG`s Constitution. The Commission found that only four of the 42 SABLs investigated had obtained landowner consent, with the remainder being secured through corrupt means. Widespread abuse and fraud, failure and incompetence of government officials to ensure compliance, accountability and transparency from the application stage to registration, processing, approval and granting of the SABLs had been uncovered. The Commission was told of bribes and inducements being offered by project developers and representatives of landowner companies to procure SABL titles, and it received evidence of undue political pressures being put on government officials by senior Ministers and politicians to fast-track SABL applications and issue titles.

After presenting the two final reports of the COI to the national parliament in September 2011, Prime Minister Peter O'Neill established a Ministerial Committee to recommend an appropriate course of action within a period of two months. Later he stated that a taskforce to design a new legal framework for the conversion of customary land into leasehold land would be appointed by the Minister for Lands and Physical Planning. The Ministerial Committee met in May 2014 and its recommendations were the basis for a cabinet decision in the following month (Filer 2017). In this decision, all SABLs recommended for revocation by the COI were to be revoked; the Ministerial Committee was to be asked to propose what should be done with the SABLs that one commissioner had failed to submit his report on; a SABL taskforce was to be established under the Forests Ministry; no more SABLs and forest clearance authorities in SABLs were to be granted; the Land Act was to be amended to remove provisions allowing SABLs; and administration of the land group incorporation process was to be transferred from the Lands Department to the Investment Promotion Authority. The response of government to the Ministerial Committee's recommendations was not decisive, which may be partly explained by the promoters of SABLs including influential people such as the then leader of the opposition, a minister, a former Provincial Premier, provincial administrators and local politicians (ibid.).

4.5 Facilitating factors and underlying drivers of landscape transformations under SABLs

The landscape transformations taking place under SABLs can be understood as an outcome of the interplay of local biophysical factors and social drivers. The biophysical factors include the suitability of the soils, terrain and climate for oil palm and other agricultural crops, the presence of intact forests with commercial timber species, and accessibility. The social patterns and processes facilitating and driving the transformations are more complex and are deeply problematic; hence, they are the focus of the discussion below. The discussion begins with the legal instruments that have facilitated landscape transformation then turns to the major drivers responsible for the transformations.

Table 4.1 describes the steps involved in the development of agro-forestry projects in terms of the legally required processes and the actors involved. From this table, land group incorporation, SABLs and forest clearance authorities can be seen as the key legal instruments through which landscape transformation has taken place. Landowner companies (LOCs) have been key actors in driving the transformations.

Land group incorporation: The national Constitution recognises and promotes customary ownership of land, but the alienation and consolidation of rights to make land attractive to

developers is a key policy objective. Most people have customary rights to use land and to gather from the wild. Customary rights recognised by the Constitution include rights to all natural resources, with the exception of minerals, petroleum, water, and genetic resources. This means that commercial land development cannot take place on customary land without the approval of the customary landowners. As there is no legal process for permanent alienation of customary land and no effective process for land registration that would enable the customary owners to engage in commercial dealings over their land, legal recognition of the corporate status of customary landowners was introduced to facilitate their consent for resource exploitation (Winn 2012). Corporate status of the customary landowners is achieved through land group incorporation, a process that is set out by the Land Groups Incorporation Act 1974, which gives legal and formal recognition, protection and powers to customary land-owning groups. The purpose of the Act is to recognise the corporate (relating to a united group) nature of customary groups that allows them to hold, manage and deal with land (Filer 2012). Incorporated Land Groups (ILGs) must be registered by the Register of Land Titles in the Department of Lands and Physical Planning.

Table 4.1 Steps in the development of agro-forestry projects

1	The customary landowners and developer agree on a development proposal for an area of land.
2	The customary landowners of the land area form incorporated land groups (ILG) for each clan and may establish a landowner company to represent the ILGs.
3	The land area is surveyed and the Local Land Court approves the agreement reached among the landowners. The ILG registers the land area for development with the state and the application for lease-leaseback is lodged with the Provincial Government and forwarded to the Department of Lands and Physical Planning (DLPP). A land investigation report is prepared by the Provincial Lands Office and forwarded to the DLPP.
4	The customary owners lease the land parcel to the Minister of Lands on behalf of the state at no rent ("head lease" or "customary land dealing"), which formalises the title and allows transfer to non-citizens.
5	The Minister of Lands grants the SABL back to "a person, group or incorporated body" (e.g. an ILG or LOC) approved by customary landowners for a period of up to 99 years for the purpose of agricultural or business development at no rent.
6	The lease holder makes a sublease (development agreement) with a developer (a registered company) and the sublease is registered with the DLPP.
7	The Department of Agriculture and Livestock assesses the feasibility of the project proposal and gives approval.
8	The developer applies to the PNGFA for a forest clearing authority (FCA).
9	The developer proceeds with forest clearing, establishment and operation of the plantation according to the sublease agreement, monitored by PNGFA, which ensures that no more than 500 ha are cleared at one time, and by DAL, which ensures adherence to other applicable regulations and codes of practice.

Source: Modified from Column 1, Table 7.1 Gabriel et al. (2017)

SABLs: The state is the only non-citizen body that is legally entitled to enter in land dealings over customary land, but after independence the government found itself with no legal instrument for this purpose. In lieu of an effective legal process to register land titles, the government introduced the lease-lease back scheme as a stop-gap measure until legal registration of customary land became feasible (Filer 2011). The intent of the SABL policy was to increase economic activity in rural areas and to benefit local communities through rental payments, employment, welfare services and facilities (Winn 2012).

The lease-lease back scheme was introduced in 1979 (McDonnell, Allen, and Filer 2017) but it takes its current legal form from two sections of the Land Act of 1996. Under the Land Act, the government can lease land from the customary owners then lease it back at no rent to "a person,

group or incorporated body" approved by customary landowners for a period of up to 99 years for the purpose of agricultural or business development. The leaseholder then subleases the land to a developer, which must be a registered company. All customary rights are suspended for the period of the lease, except those specifically reserved in the lease.

Forest clearance authorities: SABLs grant developers the right to undertake an agro-forestry project, but it is a forest clearance authority that grants the developer the right to convert the forest for agriculture. Sections 90A and 90B of the Forestry Act 1991 allow and set out the process for a legal person to apply for an authority to carry out agricultural or other land use development that involves clearing the land of forest.

Land group incorporation, SABLs and forest clearance authorities have made the conversion of forests for large-scale agricultural estates possible. It is the following set of inter-related factors and processes that have driven the conversion.

4.5.1 Low level of economic development

Across the rural landscapes of PNG people are looking for ways to improve their lives. In 2016, PNG was ranked 154th out of 188 countries against the United Nations human development index and was listed in the "low development category" with a score of 0.516, which had only risen slightly since 2011 (UNDP 2016). In 2015 life expectancy was only 62.8 years, mean years of schooling only 4.3, and the maternal mortality ratio was as high 215 deaths per 100,000 births (compared with 78 in neighbouring Vanuatu) (ibid.). Many areas do not have good medical and educational facilities or roads that link them with the local towns and regional centres, and most families survive off the land with only a little cash income. As they can live off the land and have strong social support networks, people do not view themselves as living in poverty. Having land provides them with identity, basic food and materials, and security, but they are attracted by opportunities to earn more cash and they want infrastructure, especially roads, and better services. In this setting, it is understandable that without the government improving services and investing in infrastructure and without effective awareness programmes and institution-building in the communities, a speech by a local politician promising many benefits and not disclosing likely negative impacts from an oil palm project may be all that is needed for some customary landowners to hand over their land-use rights.

4.5.2 Dominant development paradigm

While there is a great diversity of views in PNG on how development can best be achieved, there are many who adhere to, or can be easily convinced by, the notion that foreign investment in land and natural resource exploitation for export markets is key to the country's future prosperity. The proponents of this development paradigm argue that foreign investment will bring services and infrastructure to underserved rural areas, create employment opportunities for the local population and provide much needed cash through the payment of land rentals and resource royalties, as well as provide revenues for the national coffers.

This thinking has shaped the national economy, which centres on the export of mostly unprocessed natural resources extracted by foreign investors. The forestry sector illustrates this point well. Large-scale logging operations and log exports are mostly organised by foreign interests and the main wood export is unprocessed logs from native forest (Scheyvens and Lopez-Casero 2013). In a short statement on agriculture under the heading "Priority Projects" the Prime Minister's Departmental website explains that a promotional programme will be undertaken to invite foreign

investors to invest in the sector, but makes no mention of rural extension services to support agricultural development by local people (http://www.pm.gov.pg/project/agriculture/). It seems that prosperity is to come by creating an environment attractive for forest investment, more so than through support for local initiatives.

4.5.3 Politicisation of land development and service delivery

The development paradigm centred on foreign investment in land and resources appeals to PNG's political system. In PNG, many hundreds of traditional political communities (tribes, villages or clans) aspire to place their representative in the national parliament, both for the prestige that this brings and for the development of their areas (2003/2004 Review Team 2004). A reciprocal relationship exists between voters and their elected representatives in which voters aim to secure tangible benefits such as roads, schools, and royalties from development projects, and the members of parliament aim to win re-election (Faal 2007). A major concern of members of parliament is to secure portfolios that enable them to bring benefits back to their constituencies (ibid.). If they are unable to do so, their life in government is likely to be short-lived. Land development and service delivery are thus highly politicised. Politicians and senior government officials become active proponents of land development projects, and, as the COI discovered, in this setting the rule of law is easily and often compromised. Their interest in land development partly explains the weak public-sector performance described next. The COI found political interference in SABL processes to be widespread and to extend to the highest levels of governments: "We received evidence of undue "political pressures" being put on government officials by senior Ministers and politicians to fast-track SABL applications and issue titles. Incidences of political interference are numerous." (Numapo 2013, 236).

4.5.4 Weak public-sector performance

The COI into SABLs revealed tremendous failures in the performance of state agencies and provincial administrations responsible for controlling SABLs. If controls were enforced and proper oversight provided, the findings of the COI indicate that very few of the 42 SABLs it reported on would have been granted. The reported failings include failing to ensure that incorporated land groups provided proper representation of customary landowners; failing to consult all customary landowners regardless of whether they belonged to ILGs or not; processing SABL titles without confirming they were suitable for agricultural development; failing to walk the boundaries of the proposed agricultural developments; losing records either accidently or intentionally; acting outside the law; approving agricultural development plans submitted by a developer who left the project; failing to adequately assess proposals or monitor progress; and allowing logging to proceed without forest clearance authorities. The performance of the Department of Lands and Physical Planning (DLPP), which is responsible for leading the SABL process, is especially distressing. The COI found the DLPP to be "totally dysfunctional and incapable of managing the most important asset belonging to the people of PNG, their land" (Numapo 2013, 237).

The underlying reasons for the dismal performance of local administrators and the government agencies are many. In the permitting of land development under SABLs provincial administrators were very influential as due to budget limitations national government agencies mostly delegated their responsibilities to them, leaving the provincial administrator to be involved in "every step of investigating, reporting, certifying and approving a lease and in every step of its logging, clearing and planting" (Winn 2012). Provincial administrators promoted SABLs in their province and ignored

claims that the customary landowners had not all given consent to lease their land. The COI used the expressions “reckless failure” and “criminal negligence” when describing the performance of provincial administrators on some leases (Numapo 2013, 88, 100).

Failings in the performance of the national agencies responsible for SABLs is partly explained by a combination of lack of budgets and general resources, staff discipline issues, leadership and senior management level issues, political interference and lack of procedural provisions to guide land investigations (Mirou 2013; Numapo 2013). Public servants were able to derive extra benefits by way of allowances and other incidentals paid by the developers to be able to conduct the land investigation reports, leading the independence and integrity of the SABL process to be compromised (Mirou 2013, 158, 181). The lack of resources created an opening for the developers to lead preparations for the SABLs. The costs they paid included survey costs, mobilisation costs to assemble landowners, subsistence costs, costs of registration of incorporated land groups, costs of land use and agriculture plans, and costs of incorporation of landowner companies (Mirou 2013, 180). Consequently, developers were able to forge agreements with the customary landowners that extinguished all customary rights and were entirely unfair in terms of benefit distribution.

Because of the power behind SABLs, efforts to rectify their injustices have faced serious backlashes. This was the experience of the Catholic Church, when one of its lay missionaries, former law lecturer Douglas Tennent, was arrested and expelled from the country. Tennent had worked for three years as an administrator in the Archdiocese of Rabaul (2014-2017) and was attempting to bring attention to what he saw as injustices that customary landowners were facing in Pomio from an oil palm project under SABLs on their land (Pacific Media Watch 2017). Specifically, Tennent was offering the landowners legal advice on behalf of the Archbishop of Rabaul. The official reason for his expulsion from PNG was an alleged “visa violation” based on the premise that Tennent as a religious worker should not have been involved in sensitive land issues. The Archbishop responded that to support vulnerable and marginalised people in West Pomio is, for the Church, an evangelical mandate (agenzia fides n.d.).

4.5.5 Lack of preparedness of local communities and the culture of “big men”

Given that under SABLs people surrendered rights to use land that has underpinned their livelihoods, a key concern of the state should have been to ensure that communities were well-prepared for taking this profound decision. They were not. In part this is because of the lack of interest in and investment by the state in preparing communities, but part of the reason also lies in the way in which local society is organised. In its investigation of individual SABLs, the COI revealed many cases where the community was not acting in a concerted manner in consenting to SABLs and negotiating subleases with developers. To the contrary, the common pattern was for one or a few or more people to agree with the developer on its proposal, and then through one means or another obtain (or construct) the signatures of enough customary landowners to make it look like consent had been given. In other words, local people leading the dealings over the land were not at all concerned to ensure all affected customary landowners gave their free, prior and informed consent to the proposed development.

The types of trouble within and between local communities over consent for SABLs and sublease agreements observed by the COI are familiar to other forms of large-scale investment in land and resource exploitation in PNG. The social structure of Melanesian society is characterised by segmented lineage groups, locally held together by faction-leaders who compete for power in the social structure of horizontally arranged and principally equal groupings (factions). Within the

lineage groups the “big man” is an historically-important local leadership figure. Marshall (1963, 289) describes him as combining an ostensible interest in the general welfare with a more profound measure of self-interested cunning and economic calculation. The quality of big men’s authority derives from personal power (ibid.), which is acquired through acts and inheritance (Tunama 2014). For ambitious local men wanting to be big men or bigger men, an SABL could be very attractive as the payment of land rentals, timber royalties and other “benefits” would more than amply meet the expectations placed upon them to distribute resources to their faction and to other big men. The culture of big men partly explains why in some cases different landowners from the same area formed alliances with different developers, leading to disputes that became violent.

4.5.6 Global markets and capital

The major global forces driving landscape transformation in PNG are associated with global capital in search of profits and markets. According to a Greenpeace study, 3.9 million ha of the 5.1 million ha under 72 SABLs are controlled by foreign-owned corporations, with Malaysian interests controlling 34 SABLs covering 1.13 million ha and Australian interests controlling six SABLs covering 2.18 million ha (Winn 2012). In their study of SABLs granted for oil palm schemes, Gabriel et al. (2017) found subleases under 26 of 29 SABLs were held by Malaysian companies, one by an Australian company, another by a company from Hong Kong, and another whose origin could not be identified. The two companies with well-established oil palm plantations – New Britain Palm Oil Ltd. and Hargy Oil Palms Ltd. – hold very little of the land under SABLs issued since 2003, so it is an entirely new set of companies that have acquired rights for oil palm schemes (ibid.).

In the case of SABLs, developers gain access to the land as well as the timber on it. The timber harvested inside SABLs can be exported and the land inside SABLs can be developed for export crops. Global markets for tropical timber and oil palm have been strong in recent years. Ninety percent of PNG’s log exports are to China, where prices for tropical logs increased 5% between the first half of 2016 and the first half of 2017 (Global Wood 2017). Global palm oil prices have more than doubled since 1990 (IndexMundi 2017), though were down in the second half of 2017 due to ample supplies from Indonesia and Malaysia (World Bank Group 2017).

For companies primarily interested in the timber, SABLs present a far more profitable and much quicker way to secure timber rights than forest management agreements, which are the framework for sustainable timber harvesting from native forest established by the Forestry Act 1991. Filer (2017) even suggests that the idea of agro-forestry projects originated as a way for logging companies to gain ready access to large volumes of timber. Sections 90a and 90b of the Forestry Act 1991 were revised in 2007, removing the requirement for calling for public tenders from registered logging companies to “salvage” logs in areas to be cleared for agriculture. This means that the same developer can now hold both the rights to develop the land for agriculture and to clear the forest on it. SABL holders who have secured forest clearance can harvest all the trees and are able to export the timber. This explains why there was a dramatic increase in the area under SABLs issued after the legal revisions, and why logs exported from SABLs came to constitute as much as one third of the country’s total log exports (Global Witness 2014).

4.6 Assessing the trade-offs of competing land uses: Family agriculture and community timber enterprises vs. oil palm under four SABLs in Pomio

The new oil palm plantation developments authorised through SABLs compete with existing and other possible land uses. For each land use there are opportunity costs and there are potentially a wide range of impacts, positive and negative, on economy, society and the environment. When customary landowners are being asked to make decisions of profound significance over their land, the trade-offs of alternative land uses should be comprehensively investigated and presented to them.

This section takes up the issue of trade-offs, focusing on two patterns of competing land uses in Pomio district, East New Britain, where a dramatic transformation of landscapes under SABLs has taken place. The competing uses are the pre-existing land use, which was characterised by family agriculture (subsistence farming and cash cropping) and in three villages also included community timber enterprises, and the land use that has replaced it, oil palm grown on plantations by an outside developer. Of the two oil palm development projects in Pomio, the discussion focuses on the Sigite Mukus Integrated Rural Development Project, which is located within the Melkoi, West Pomio Mamusi and Central Inland Pomio local level governments, and encompassed four SABLs. The way decisions for the SABLs were made, the transfer of land development rights and the resultant land developments are all driving major transformations in the local society and economy. Figure 4.2 provides an indication of the location and scale of landscape transformation.

The four SABLs were issued over 55,400 ha in 2008 and 2009, and in 2010 a forest clearance authority was issued for 42,400 ha which had been approved for agricultural development. Of this, 31,000 ha have been allocated for oil palm. The four SABLs represent different tribes – Pomata, Nakiura, Ralopal and Unung. Each tribe has formed incorporated land groups and are represented in the project by four landowner companies. All of the landowner companies operate under Memalo Holdings, which is a local initiative acting as a “middleman” between the landowner companies and Rimbunan Hijau, the project developer. Rimbunan Hijau is the largest operator of logging concessions in PNG and the Sigite Mukus Integrated Rural Development Project represents its first investment in oil palm in the country. As observed elsewhere, it appears that the preparations for the SABLs were funded by the developer; COI transcripts record that Memalo Holdings approached Rimbunan Hijau for financial assistance to prepare documentation for the SABLs (Jerewai 2011a). The subleases were granted to Gilford Ltd, a subsidiary of Rimbunan Hijau, which appointed Sinar Tiasa (PNG) Ltd., another Rimbunan Hijau subsidiary, as a contractor to undertake the timber and agriculture project at Drina (Tunama 2014).

The area under the project was selected for the study of trade-offs not only because of the extent of landscape transformation that has taken place, but also because earlier studies and investigations in this area provide data and analysis that helps with the trade-off analysis. Although Commissioner Alois Jerewai, who was responsible as part of the national COI into SABLs to investigate the SABLs in New Britain, never submitted a final report, the transcripts of his hearings are available and provide many insights into the processes through which the SABLs were organised. Insights regarding livelihoods and living conditions prior to the SABLs can be found in a survey in three affected villages conducted by the author in 2008 (Scheyvens 2009), while a balanced account of the impacts of the oil palm development, especially on women, can be found in the Master’s thesis written by Doreen Tunama (Tunama 2014). Other useful references for understanding some of the impacts of SABLs on local communities in Pomio are a Global Witness report (Global Witness 2017),

unpublished observations from Andrew Lattas (Lattas 2014) and documents associated with disputes between local communities and the logging company.

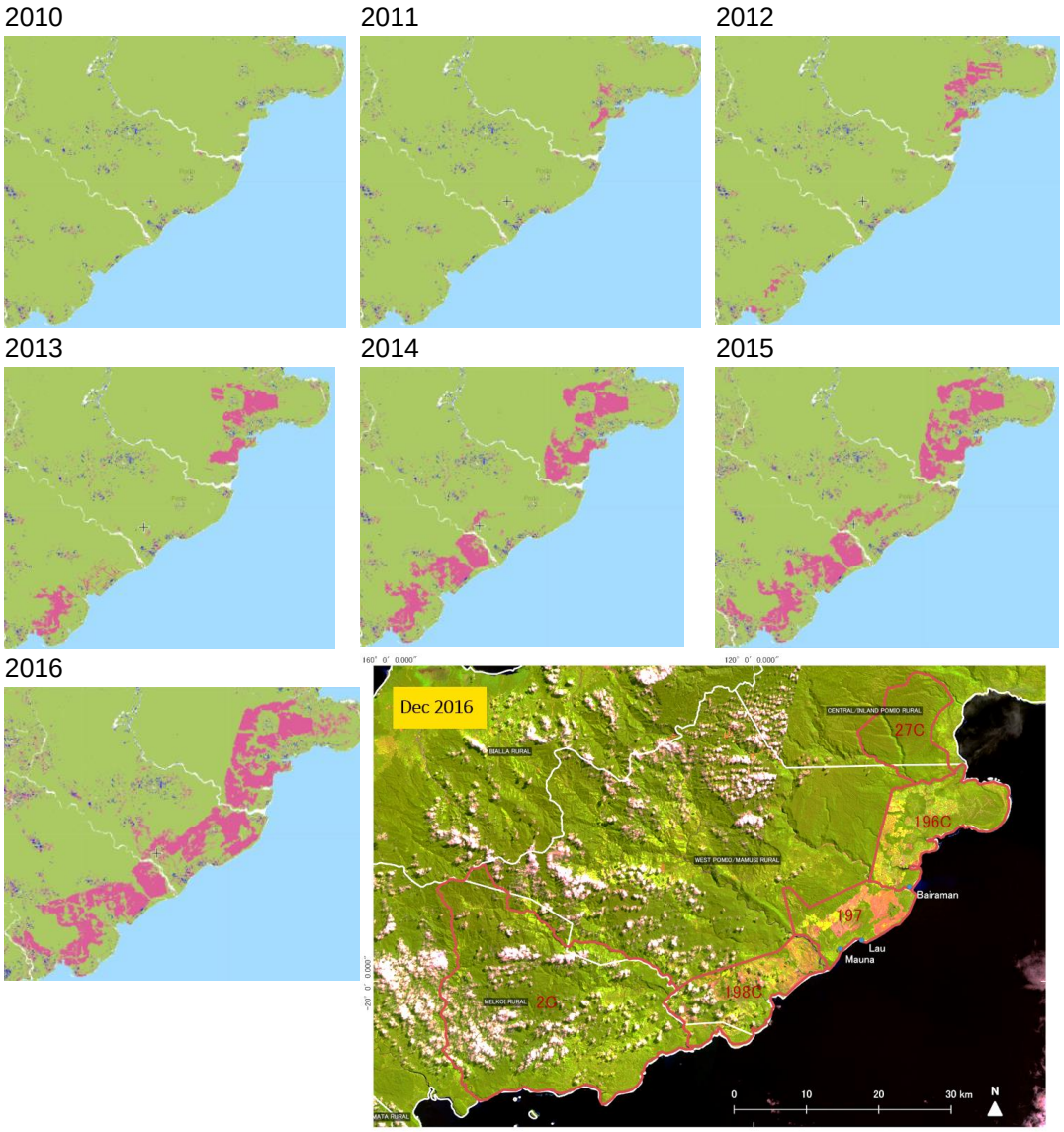

Figure 4.2 Progress of deforestation in SABLs under the Sigite Mukus Integrated Rural Development Project

Note: Bottom right figure shows SABL boundaries imposed on processed Landsat image. Source: World Resources Institute (2014), except bottom right image (author)

4.6.1 Before the oil palm development

Figure 4.3 provides a set of photos taken in 2008 in the project area that provide some idea of the local economy, society and environment prior to the oil palm development.

Economy and livelihoods

Prior to the land development under the SABLs the local communities based their livelihoods on the land and the coastal waters. As in other parts of the country, shifting cultivation and gardening provided the food for the household and for community events, and sales at the local market provided small cash flows. Households met most of their economic needs from the land and purchased basic items such as salt, cooking oil and soap from the local trade stores. Fishing, hunting and collecting edible plants from the forest contributed to the local diet. Families raised livestock such as pigs and chickens on a small scale for consumption, sale and ceremonies, and most households were growing cash crops to supplement their income.

Forests were central to the economy and daily life of the local communities later affected by the logging and oil palm development. A high value conservation (HCV) assessment undertaken in Bairaman village in January 2011 and March 2013 by foresters from the Forest Management and Product Certification Service (FORCERT) highlights this fact. The HCV assessment was a significant undertaking and conducted in a participatory fashion with 32 Bairaman men and 29 Bairaman women participating. The men and women identified 51 plant species in their forests that they use for a variety of purposes, including timber, firewood, material for buildings, paddles, canoes and kundu drums, carving, spear and axe handles, decoration, food and cooking, clothing, traditional herbal medicines, shade, traditional customs and fencing (Figure 4.4). Many plants were used for more than one purpose. Based on the importance of their uses, 19 of these were identified as high conservation value. The community identified 15 animals and insects in the wild that they used for food, materials and as a source of income. Seven of these were identified as high conservation value. The community also identified 31 birds with local uses, 28 of which were categorised as high conservation value.

The three villages surveyed by Scheyvens (2009) – Bairaman, Lau and Mauna – all generated income from a variety of land uses. All the villages had produced copra, though their interest in this had declined because of high transportation costs, and generated nominal income from the sale of garden produce (about K10 per week at most). Cacao blocks could be found in all three villages: in Mauna, every family had a cacao block and even some school children had their own cacao blocks; in Lau, planting of new cacao trees had recently taken place; and in Bairaman cacao had just been introduced. Mauna was the most active grower of cacao and was able to generate a net income of K12,800 in 2007. As the villagers had just planted new trees, it was expected that their income would rise in a few years. Also, the growers were mostly selling wet beans and there was potential for them to increase their returns several times by fermenting and drying the beans. Mauna had used some of the sawn timber from its community forestry enterprise to construct fermenting sheds, but more fermenting sheds were needed across the three villages. As a result of an earlier extension project, rice was being cultivated for sale under community/school projects. This was a significant achievement, as rice, while being popular, is nearly always purchased from local stores.

Bairaman, Lau and Mauna were producer members of FORCERT, a not-for-profit company that promotes certified sustainable community forestry. As members of FORCERT, the communities received a variety of support services to assist them in creating and implementing land-use and forest management plans, establishing and running their timber enterprises, and marketing their sawn timber. In return for these services, they committed to selling sawn timber from their forests to timber yards (“central marketing units”) which were also members of the scheme. The three communities had been timber producers for over 10 years and their operations had been certified against the Forest Stewardship Council standards for forest management and chain-of-custody.

Freshly caught fish, Lau community

FSC certified community-managed and owned forest, Lau

Timber drying shed, Lau

Mauna village

Mauna community with their portable sawmill

Women returning with garden produce, Mauna

Figure 4.3 Photos in project area prior to oil palm development

Source: Author

They had sold certified sustainable timber to international and local buyers, contributed a large amount of timber to community infrastructure, such as schools, a first aid post, a church, and teachers' and nurses' houses, and provided timber at low or no cost for villagers to construct more permanent houses. Their assets included well-constructed timber drying sheds, buffalos and trailers for transporting the timber, portable sawmills, chainsaws and block-chain sets. Comparing with other income sources, community forestry provided a significant source of income for Bairaman, at one time possibly the largest source of income for Lau, though milling had become very irregular with long periods of non-production, and the second largest source of income after cacao for Mauna. The income from the sale of timber was used mostly to pay wages of community members

participating in the timber milling and transporting the timber, and in this way income from the community timber enterprises was distributed across the villages. Wages varied with the positions in the community timber enterprises, roughly ranging from K1 – K2 per hour. Women's groups assisted in moving the sawn timber from the forest to the drying sheds and were paid a small fixed weekly amount, which they used for their group activities. Given their investment in the land and their community, it is not surprising that many of the members of the Bairaman, Lau and Mauna communities oppose the oil palm development (Gabriel et al. 2017; Global Witness 2017), though some had been won over by the promised benefits of the oil palm development.

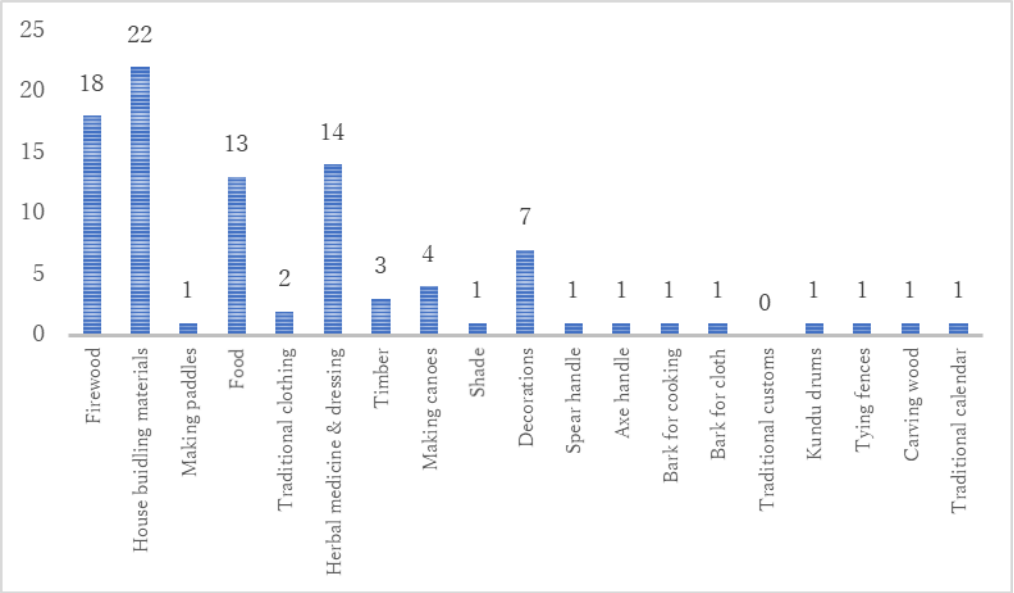

Figure 4.4 Results of HCV assessment, Bairaman Village

Source: Unpublished FORCERT report

In sum, prior to the oil palm development families were able to meet their basic day-to-day needs and provide food and other inputs for communal and customary events, but covering periodic larger expenses such as fees for tertiary education and medical treatment was challenging for them. The road network was very poor and sea transport was limited and expensive, so transporting goods to the market or travelling for medical care was difficult. This had an impact on the local economy as it meant that transporting goods to the larger markets, such as Kokopo, was costly and took a lot of time. With external support, a few communities had made significant investments in livelihood projects, and potential to increase the returns from these existed. A constraining factor was the lack of a well-funded national rural extension programme.

Society

In traditional society in PNG the relative welfare of the tribe and clan members as a whole is placed above that of the individual. Strong social bonds in and between families, clans and tribes are paramount and are underpinned by the concept of mutual reciprocity (Jannsen 1977). People share in each other's successes and are obligated to assist those in the clan who are in need. Participation in communal activities is valued highly, and this has carried over to newer institutions in Bairaman, Lau and Mauna villages, which include church groups, women's groups and youth

groups. In these villages, one day a week is set aside for community work. The importance of communal values can also be seen in the way in which the three communities used their timber enterprises. All of the communities provided timber for community projects and they used some of the income from the sale of timber for church donations, contributions towards educational costs, purchasing fuel to run the generator for community events, and purchasing prizes for sporting events.

In traditional society in PNG great importance is given to submitting to the authority of the village elders and headmen. Tunama (2014) describes how in Pomio the men's house, which can be found in each village, is a significant social institution that maintains the strength and wealth of the clan and its status with other clans. The men's house is used to discuss how to deal with threats to and opportunities for the clan and to pass on knowledge to the younger men.

Another important aspect of traditional society in Pomio is the status ascribed to women, which largely derives from their relationship with the land. Society is matrilineal, meaning that the inheritance of land follows the female lineage of the clan, though men normally take the final decisions over land use (Tunama 2014). Women are respected for working hard on the land growing crops for subsistence, raising livestock and providing food and income from the sale of their produce for customary feasts and rituals.

Some of the development interventions that could be found in Pomio prior to the SABLs were sensitive to and strengthened the traditional institutions. FORCERT's support for certified community forestry is a good example. As part of its support programme FORCERT facilitated a process of community-level land-use planning that involved the entire community. In each community, village meetings were held to identify land uses and places of importance such as sacred sites. With this information communities sketched rough land-use maps on the ground, which made it easy for everyone to participate. FORCERT then transferred this information to topographic maps and at a second meeting the communities reviewed these maps. Once the communities had agreed on their maps they organised a traditional communal feast to announce the adoption of their land-use plans and put their maps on public display. The communities were encouraged to review their maps after one year at a general meeting and make any revisions they felt necessary.

The stock of natural capital and the natural environment contributed to social resilience and wellbeing. As noted in the economy and livelihoods section above, the forest provided materials that were used for traditional occasions and cultural practices, and they also provide areas considered sacred and as cultural sites.

Environment

The natural environment prior to the SABLs was impressive and was largely protected by the area's isolation and low population density. Much of the land was undisturbed by human activities and any application of chemicals in the area under family agriculture would have been minimal. This meant that the rivers ran clear all the way to the coast. As the HCV assessment in Bairaman testifies, the forest provided alternative food sources, materials for constructing houses and for customary and community events, and timber for community forestry. Through their HCV assessment, the Bairaman community also identified 14 rare and endangered species in the area covered by their land-use plan. The forests also provided critical watershed services, including soil protection and the regulation of river flows. Bird watchers and adventurers, amongst others, were attracted to the

area. In terms of global values, the forests later affected by SABLs contained high levels of biodiversity and high carbon stocks.

Without the SABLs there is little to suggest that any dramatic change in environmental values associated with land use would have occurred in Pomio, though it seems likely that the high population growth rate would have resulted in the conversion of some natural forest for family agriculture. In their HCV assessment, the Bairaman community noted that some plants and animals were not so readily available near the village, but that many would remain abundant if the forest remains intact. The major threat they identified to HCVs was unsustainable forest use. The Bairaman community and other communities who had gone through the HCV assessment process had developed their own conservation rules, fees for breach of these rules and committees for their enforcement. This can be viewed as part of their social capital.

4.6.2 After the oil palm development

Economy and livelihoods

The development under the SABLs has brought about a fundamental change in livelihoods. Families have moved from working on their land to depending on the developer for wages and purchasing goods mainly from the company trade stores. This transformation in the local economy has taken place in an incredibly short period of time. Reflecting similar developments elsewhere it appears to have had some positive impacts, but also many negative impacts that were not foreseen or simply not considered important by the proponents of the land development.

The oil palm development has brought more cash into the local economy, although the total amount is difficult to quantify. The developer states that the project will inject around K33.4 million (USD 10.3 million) per year into the East New Britain economy through royalties, premium payments, infrastructure and levies and other community funding, and that it will create jobs for 3,000 people (Rimbunan Hijau 2011). Due to a lack of data it is difficult to assess these statements, but some observations can be made.

Timber royalties are a large, short-lived cash flow for the landowner companies (Jerewai 2011a, 2011b), whereas land rentals provide income over the life of the project but are small. According to Tunama (2014) the land rentals are distributed evenly between the customary landowners regardless of the size of their land holdings; however, it is unclear how much each family would receive on average. According to the COI transcripts, the landowner companies receive K1 per ha per year for land prior to the planting of oil palm (Jerewai 2011b). For the Sigite-Mukus area the land rental has been increased from K1 to K1.40 per ha. On the assumption that the land rental would be K1.4 per ha for all the 31,000 ha allocated for oil palm, on average the landowner companies will receive about K10,850 (USD 3,266)[5] per year. By any standards, the payment per ha is an incredibly small amount. For the payment they receive for the use of one full hectare of their land for a whole year, a family would not even be able to buy one packet of dry biscuits at the company's trade store.

Wages for those working on the plantation could be a substantial source of income for those families whose family members are able to secure employment. According to the project's backers, people working in the palm oil nursery are paid K175 to K200 weekly (The National, 2012). If these

[5] K1 = 0.30102 USD (https://www.oanda.com, 23-05-2018)

figures are correct, wages for working on the oil palm plantation are greater than income previously derived from other sources and this may explain why some people have abandoned their gardens to work for the company (Tunama 2014). Other than these direct cash flows, the oil palm project has also contributed to new business opportunities for the communities. Some women are able to generate income by selling food to the plantation workers and some households have set up local businesses, such as stores and poultry ventures, using the income from the project (ibid.).

Economic benefits can also be expected if the roads promised by the project are constructed to national standards. However, a number of concerns have been raised regarding the quality of the road construction and road maintenance, the construction of temporary bridges using waste logs, and the destruction of gardens and cash crops during the road building (Tunama 2014). A document providing information in support of an affidavit for reinstating a restraining order for the forest clearance authority in west Pomio SABL areas, Pomata and Ralopal, alleged that the company had not constructed any permanent public roads or bridges, other than its own roads, and that heavy traffic of vehicles had made the existing government constructed road unusable.

Overall, it is clear that the oil palm project has increased the amount of money circulating in the local economy and that it is likely to create new economic opportunities, but whether this contributes to wellbeing depends on how the money is used. The impacts observed thus far are mixed. Some of the income is being used wisely, some not, it seems. Some families have used the income to set up small businesses, pay for educational fees and medical expenses, provide support to relatives, and to construct permanent houses, but some of the income is being used in ways that have adverse social impacts (Tunama 2014). Tunama (2014) estimates that men spend about half their wages on alcohol, cigarettes and "customary activities", leaving half for the extended family. The "compensatory" income flows – royalties, clearance fees and land rentals – are paid to the landowner companies and this too raises concerns about how money is used. In general, landowner companies have a very poor record when it comes to distributing benefits and representing customary landowners (Hasagama 2014). In his investigation of the four SABLs, Commissioner Alois Jerewai found that chairpersons of the landowner companies were not acting responsibly and had acquiesced to leasing arrangements that are fundamentally unfair for the customary landowners (Jerewai 2011c).

While the oil palm development is bringing some economic benefits, it also involves major economic trade-offs. These include the loss of land, biodiversity and ecosystem services that traditionally underpinned people's survival and wellbeing, the destruction of cash crops and gardens, the loss of land for family agriculture, and the loss of land and ecosystem services that supported local enterprises. Where forests have been converted, the communities no longer have access to all the plants, insects, animals and birds that they identified as important to their lives and livelihoods in their HCV assessments. This means no access to good timber and other materials for constructing houses, canoes and tools, no more fruits, nuts, game and other forest products that were an important part of the local diet and provided a small source of income, no more traditional medicines, etc. from this land.

While the project developer states that 11,500 ha of the total project area will remain as a natural reserve to provide for the people's traditional activities, people are now gardening on less fertile land or have lost access to arable land entirely and because of this food security has become an issue. In the villages she surveyed Tunama (2014) found that food shortages during the dry season had become the main concern of mothers, some of whom reported that the income from the plantation was not sufficient to purchase food from the local stores. Communities are resorting to search for

any land not converted by the developer for gardens, and what land is still available for gardening is coming under increasing pressure, leading to soil degradation as well as conflict between clans (ibid.).

The loss of their source of timber is of particular concern for the Bairaman, Lau and Mauna communities, as each had established and invested a lot of time and energy into community timber enterprises. In addition to the loss of ecosystem services, there is fear amongst local people that heavy use of chemicals in the plantation will pollute the streams and rivers they depend upon and the soils in whatever garden areas they have left (Tunama 2014; Lattas 2014).

Society

The land developer states that it will contribute to social development through its planned social contributions, which include education and health facilities (Rimbunan Hijau 2011), though no information could be found to assess these promised contributions. However, it is clear that there have been a range of serious negative social impacts associated with the preparation and authorisation processes for the project and with its implementation. The COI transcripts and local surveys reveal that customary land rights have been transferred for the land development without the free, prior and informed consent of all customary landowners. Major failings include the failure to fully inform and prepare all customary landowners for a decision over their land of such importance (i.e. all development rights to all land transferred for 99 years), failures to ensure that all customary landowners gave informed consent for the land development, and failure to recognise pre-existing incorporated land groups that did not support the SABLs (Jerewai 2011a, 2011b, 2011c, 2011d; Global Witness 2014; Tunama 2014; Global Witness 2017). In Pomio, some communities (including Bairaman, Lau and Mauna) opposed the SABLs and renewal of the forest clearance authority but to no effect, some customary landowners signed consents with no idea of what they were signing, others signed under pressure but later regretted doing so, and those supporting the project were responsible for illegalities in the formation of incorporated land groups and landowner companies (ibid.). Police intimidation and violence played a role in generating signatures and suppressing opposition (Tunama 2014; Lattas 2014).

Allegations of abuse of customary landowners opposed to the logging by the police stationed at the Drina logging camp were brought to the attention of the Division Police Headquarter in Kokopo by PNG Eco Forestry Forum Inc. in a letter dated March 2012. The response of the Chief Superintendent was to call a meeting of a few people including from the company, the Chaiman of Memalo, and the PNG Forestry Authority. According to the Chief Superintendent's letter back to the Eco Forestry Forum, unsurprisingly given their stakes in the forestry and land development, all present felt the allegations were baseless. The Chief Superintendent proposed for a "neutral team" to undertake a fact-finding mission to the affected area. This proposal was accepted and a team comprising a national newspaper (Post Courier), the Eco Forestry Forum, and representatives of government departments, local government, the police and the Ombudsman Commission was put together. The team interviewed 31 eyewitnesses of events from five villages in the affected area. The final report of the fact-finding mission provides a detailed and alarming account of consistent and corroborated descriptions of police abuse of local people who were against the logging operations, including:

- Rounding up and severe beating of boys in the middle of the village (Totongpal village);
- Severe beating of boys; locking up of youth in police cells without charge; imposition of illegal fines; forcing all committee members of Mauna landowner group to sign agreements

at the Drina logging camp not to disrupt company operations and discouraging them from conducting “ecoforestry” activities on their land (Mauna village);
- Arrest of 16 men who had cut logs to block further access without consent by company speed boats up the Lau River (the case against them was dismissed by Kokopo Court) (Lau village);
- Locking up 2 villagers in a shipping container without food and water for two days (Bairaman village);
- Fines for obstructing the logging and forced signing of agreements without giving people time to read and understand them (Mu village) (Independent Fact Finding Mission 2013).

The team’s overall findings included:

- Policemen were flown into the area and were being deployed in the hire and care of the logging company, Gilford Ltd, and were accommodated at the Drina Logging Camp;
- Police officers were used by Gilford Ltd for their purposes which is to thwart any attempt by the local people to stop the logging operation;
- Force used by policemen in dealing with ordinary villagers as alleged was grossly excessive, unwarranted and amounts to a criminal intent to do grievous bodily harm;
- Treatment received from the policemen whilst in their custody and under their care is inhuman and amounts to a breach of their human rights (ibid.).

In a comment on the report that was included as one of its appendices, a police member of the fact-finding mission stated that the landowner company, Memalo Holdings, and not the logging company, Gilford Ltd, had requested actions by the police. It seems that the prime intent of the comment was to exonerate Gilford Ltd. Regardless of who called for the police stationed at the Drina logging camp to take action and who decided the type of action taken against the local people opposed to the logging and land development, or opposed to the way it was being conducted, it is clear that the police were acting in the interests of the developer and were in no way behaving in a non-partisan way to ensure law enforcement. The outcome is further breakdown in the fabric of society associated with distrust and fear of the national police force.

The implications for society from the failings in process are immense. Customary landowners opposing the land development have lost faith in the state agencies and their relationship with the police, who at times have been on the payroll of the developer (Global Witness 2017), has become hostile. The immediate impacts are growing tension amongst local groups that has in some cases led to violence. Land disputes are increasing and have diminished the bonds that existed between tribes (Tunama 2014). The function of the men’s house in holding the community together and fostering responsible attitudes amongst the male youth is declining, with the income from the project being used to fund meetings of the incorporated land groups and landowner companies far away in hotels in the major towns. With the loss of their connections with the land, the status of women has declined significantly. They have also become the victims of violence in their communities associated with the increased consumption of alcohol (ibid.). Other negative social impacts of the land development that have been alleged include increased health problems associated with the pollution of waterways, exposure of plantation workers to chemicals without protective equipment and the loss of access to traditional medicines; loss of identify and sense of place; and destruction of sacred sites.

Environment

The environmental trade-offs of the oil palm development are massive. By February 2017, under the forest clearance permit the developer had clear-felled mostly intact rain forest over almost 210 km^2 (Global Witness 2017), meaning that the rich forest biodiversity and multiple forest ecosystem services have been entirely lost from this the last intact area of lowland rainforest on New Britain Island. Because of the very shallow limestone soils in the area, palm oil production can only be sustained with continued and heavy application of fertilisers, which could seriously damage river and marine systems, and the health and livelihoods of local people who depend upon them. The soils are fragile and highly susceptible to erosion, meaning that sediment loads in the local streams and rivers will increase, affecting water quality and aquatic life. Adverse changes to local microclimates can be anticipated and the land development is clearly out of tune with the government's National REDD+ Strategy 2017-2027, which aims to address greenhouse gas emissions from the forest and land-use sector (CCDAb 2017). Assuming 222.8 tons of carbon per ha in above ground biomass in lowland primary forest and a root-shoot ratio of 0.37, as used by the Climate Change Development Authority (CCDA) for the national forest reference emissions level (CCDA 2017a), the release of carbon dioxide into the atmosphere from this deforestation can be conservatively estimated to total about 35 million tons CO2e. Assuming a price of USD 3 per ton of carbon dioxide equivalent, which was the average value across all sectors in the voluntary carbon markets in 2016 (Hamrick and Gallant 2017), the protection of these forests from the threat of conversion could have generated about USD 104 million for the local economy. So, through the release of greenhouse gases stored in living forest biomass, the oil palm development not only contributed to global climate change but also to a lost economic opportunity for local communities. Several of the communities were involved in a process to develop a REDD+ project and 60 permanent sample plots had been established for this purpose. This investment plus the potential income from REDD+ have all been lost.

4.7 Discussion

Promoters of the oil palm development paint a picture of Pomio as being economically depressed and unable to move forward prior to the SABLs, but this is a simplification and mis-representation of living conditions and livelihood opportunities. As described above, people were able to survive off the land and generate a small amount of cash income, and strong social bonds within and between families, clans and tribes contributed to the resilience of local society. Potential to increase returns from the land and its resources, without alienating and concentrating rights in the hands of foreign developers, existed. What was needed was for the government to take responsibility for *inter alia* developing a road network and providing adequate funding for a rural extension programme to support land-based livelihoods and local businesses. The delivery of public infrastructural developments is the responsibility of the government, including at district and local level government levels. Rather than pursuing this course of action, political leaders and the provincial government promoted the idea of attracting a foreign developer with the necessary resources to bring a large area of land under agricultural development, with the notion that this would generate income for both the state and customary landowners and that the developer would construct roads. The developer funded the process of organising the SABLs required for the land development, the landowner companies easily agreed with the developer's proposal for the land, and the customary landowners basically had no idea of what was going on or what the implications for them were. The adverse observed outcomes could have been easily anticipated.

The Sigite Mukus Integrated Rural Development Project will generate some economic benefits, but the fact that the customary landowners have no equity in the project shocked Commissioner Jerewai (Jerewai 2011a). The form of production system that is being used in this project is known in PNG as a "joint venture" scheme, but in practice all this means is that the customary landowners have leased their land to the company in return for land rentals. Effectively, the scheme is that of a plantation where the developer provides all the capital and conducts and manages the entire operation. The customary landowners have no equity, share or ownership of the agricultural component of the project. Tunama (2014) compared the impacts and implications of the Sigite Mukus Integrated Rural Development Project with a nucleus-estate smallholder scheme (locally known as village-based oil palm) in Pomio. In the latter case, the project includes the establishment of oil palm and cacao blocks and the developer will return the land to the customary landowners once the blocks have been established. In the case of oil palm, it is understood that after the developer has recovered its establishment costs (within 5 to 6 years) the land will be handed back to the customary owners who will then manage the palms and sell the fresh fruit bunches to the developer. In the case of cacao, each participating family will have a one ha block to provide them with a source of income. Another key difference between the projects is that the communities in the second project have kept some forest land for gardening and for collecting forest products. Unsurprisingly, Tunama (2014) found that the land development under the nucleus-estate smallholder scheme had far less adverse impacts on local communities than that of the Sigite Mukus Integrated Rural Development Project.

Commissioner Jerewai also found it unbelievable that the landowner chairpersons had agreed to conditions in which the landowners are liable to pay the amount of the profits from the oil palm production and the oil extracted from the palms for 60 years, if they are found to be in default in any way (Jerewai 2011a). As there is absolutely no way that the landowners could find such an amount of money to compensate the developer, there is no way for them to legally obstruct the oil palm operations if they find problems with it.

Instead of leading to net economic and social advancement for the Pomio communities involved, both the processes for organising the SABLs and the subsequent land development actually lead to a considerable deterioration of their current situation and would score poorly against many of the 17 UN Sustainable Development Goals (SDGs). With the loss of access to the land and the destruction of ecosystem services, poverty (SDG 1) and hunger (SDG 2) could become concerns for some families (Tunama 2014; Global Witness 2017). Tunama (2014) reports that loss of access to the land and the failure to ensure women are represented as legally required in incorporated land groups and landowner companies are having significant adverse impacts on gender equity (SDG 5). SDG 6 – Clean Water and Sanitation has also been compromised, as has SDG 10 – Reduced Inequalities, with royalties and land rentals only going to the customary landowners and not to those people who only have land-use rights (ibid.). SDG 11 – Sustainable Cities and Communities has been undermined by the breakdown of social bonds brought about by growing mistrust and tensions between the local proponents of the SABLs and the police on one side, and those who never agreed to the oil palm development on the other. In a world facing the threat of dangerous climate change and accelerating and alarming biodiversity loss, the destruction of biodiversity-rich intact rainforest without a comprehensive land assessment is contrary to SDGs 12 – Responsible Consumption and Production, 13 – Climate Action, and 15 – Life on Land. The loss of forest ecosystem functions is significant not only for climate change mitigation but also for adaptation, as forests provide alternative food and material sources when other sources fail. With the improper formation of incorporated land groups and failings in the state apparatus, such as police being used to quell

legitimate opposition to the land development, SDG 16 – Peace, Justice and Strong Institutions has also suffered.

The problems with SABLs are largely about governance and the lack of an appropriate national vision for prosperous, vibrant and resilient communities. A first step to address the governance issues would be for the government to act decisively on the cabinet decision in June 2015 that called for SABLs recommended for revocation by the COI to be revoked, the SABLs not included in the COI final report to be addressed, administration of the land group incorporation process to be taken out of the hands of the Lands Department, etc. The government also needs to address the failures in the processes designed to ensure that customary landowners give free prior and informed consent for any development on their land. Additionally, there are deeply troubling issues associated with land investigation and project development that require attention.

The experiences in Pomio expose the problems with the development paradigm that dominates in policy circles in PNG, which focuses on alienating rights from customary owners to make land and resources available to foreign investors. Not only is this paradigm contrary to the principles of the Constitution, it is based on the flawed economic thinking that alienation and consolidation of land rights is essential to the country's development. The proponents of this paradigm argue that by "depositing their collective property rights" clan members will derive income from availing their land (Fairhead, Kauzi, and Yala 2010, 3). With this thinking, an optimal situation for oil palm might be the case of a family both earning income from land rentals and wage employment with the oil palm company. Data compiled by Anderson (2015) in Table 4.2 however, reveals that the combined weekly income from these activities is much lower than the income that can potentially be generated from informal sector business, including an activity as basic as road side sales, and much lower than the cash equivalent value of subsistence agriculture.

The discussion above suggests a vision for rural development in PNG consisting of strong local institutions, strong family links with the land, and diverse livelihoods. In this vision, families retain their rights to the land, the land continues to provide them with identity and security, and they earn sufficient cash income to provide for household needs, cover large expenses they occasionally face and improve their living conditions. Economic security would come from the land and economic wellbeing would be enhanced by the formal economy. With this vision, in a remote and poorly connected area such as Pomio where household incomes are low, the government would understand its responsibilities to include constructing a road network to connect villages with larger markets and providing well-resourced rural extension programmes for farmers and small- and medium-sized locally-owned businesses. The government would not rely on developers to provide infrastructure and services, as this exposes the entire political system to manipulation, and enforcement agencies would not rely on the developers as this threatens their neutrality as upholders of the law.

Table 4.2 Estimates of formal and informal sector incomes in rural PNG

Income sources	Average weekly earnings (Kina)
Formal sector incomes	
Ramu Sugar basic wage, 2006 (Madang, 2007)	42
RD Tuna factory wage, 2006 (Madang, 2007)	34
Ramu Nickel construction wage, 2006 (Madang, 2007)	50
VOP/LSS (oil palm) growers (Oro, 2002 / 2009)	60/107
Mama Lus Frut (oil palm) income (West New Britain, 2000 / 2006)	29/49
Chicken factory workers (Morobe, 2011)	102
Private store workers, Kokopo (East New Britain, 2011)	45
Papindo store workers, Kokopo (East New Britain, 2011)	100
National minimum wage, (2006 / 2011)	37.20/91.60
Leasing family land to oil palm company (per ha, K20-100/year)	2
Informal sector incomes	
Family subsistence production (7 people, *Kina equivalent*)	[258]
Informal sector business (Central)	158s
Informal sector business 2003 (East New Britain)	124
Informal sector business 2003 (Morobe)	130
Informal sector business 2003 (Western Highlands)	138
Roadside sellers (mainly women), 2006 (Madang) [weighted]	286 [138]
Roadside sellers (mainly women), 2011 (Morobe) [wtd]	285 [144]
Roadside sellers (mainly women), 2011 (Eastern Highlands) [wtd]	230 [230]
Roadside sellers (mainly women), 2011 (East New Britain) [wtd]	198 [144]

Source: Anderson (2015)

4.8 Conclusion

A massive transformation of rural landscapes is taking place in PNG, with hundreds of thousands of hectares of biodiversity rich rainforest being cleared for agriculture. The assessment of drivers and trade-offs reveals that this transformation is deeply troubling both in terms of the processes through which it was made possible as well as its impacts on economy, society and the environment. The failures in governance at all levels and in all stages of the processes associated with the issuance of, and land development under, SABLs have profound implications. Without addressing the governance issues, any large-scale land development in PNG will be deeply problematic, as the experiences of the Sigite Mukus Integrated Rural Development Project testify to. Serious trade-offs have occurred that were not explicitly acknowledged by the proponents of SABLs. In handing over land rights, the customary land owners receive land rentals and other “benefits”, but lose a wide range of ecosystem services, and the rights to the land that has been the mainstay of their livelihoods, given them identity and provided security. Major investments they have made in land-based income generating activities have been lost and the social bonds that hold people together have been weakened. The opportunity costs include the lost opportunities of alternative land-use development strategies, including those that focus on building the capacities of local communities to develop their land and resources themselves at scales appropriate to their level of social organisation.

In terms of policy reform, the entire development paradigm under which the state depends so heavily on developers to provide services and infrastructure in rural areas needs to be revisited. This dependence exposes the country to development interventions that local people have little to no understanding of, yet they are expected to hand over their rights to land and resources under

agreements that are grossly unfair. It also draws the enforcement agencies into supporting the interests of the developers and disregarding the human rights of the customary landowners. The call in the Constitution for strict control of foreign investment capital, internal interdependence and solidarity among citizens to be actively promoted, wise use to be made of natural resources and the environment, and emphasis in economic development to be placed on small-scale artisan, service and business activity (PILI 2015) remains as relevant today as in 1975, when it was adopted.

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CHAPTER 5

Transformations in socio-ecological production landscapes: From agricultural diversity to monocropping in Karen farming systems in northern Thailand

Jintana Kawasaki and Yasuo Takahashi

Key messages

- *Karen rotational farming systems maintain a wide variety of indigenous cultivars that could be significant for resilience building against the impacts of climate change and long-term food security.*
- *Transformation of land use from traditional agroecosystems to commercial monocrop farming is taking place in Karen landscapes, driven by government policies and the need and desire of Karen people for greater cash income.*
- *This conversion to intensive monocropping brings cash benefits but results in land degradation and the loss of ecosystem services that have underpinned Karen livelihoods, security and wellbeing.*
- *Efforts should be directed towards building understanding of the values of Karen traditional landscape management, assisting Karen communities make wise land-use decisions, training and extension on sustainable agricultural practices, capacity building on preserving aspects of local culture and tradition in business development, and collaborative landscape governance.*

5.1 Introduction

Socio-ecological production landscapes and seascapes (SEPLS) are areas traditionally managed by local people to provide for their food, fuel, water and other material needs as well as to generate income (Takeuchi, Ichikawa, and Elmqvist 2016). The boundaries of SEPLS are often determined in unwritten forms among neighbouring communities. The spatial patterns within these boundaries reflect dynamic mosaics of habitats and land uses that are closely interrelated. Local communities manage the landscape employing traditional and local knowledge and practices they have developed over many generations. SEPLS are found around the globe and are known by different names in different countries: *Satoyama* (landscapes) and *satoumi* (seascapes) in Japan, *Dehesa* in Spain, *Ahupua'a* in Hawaii, etc.

Globally, SEPLs have been disappearing due to the expansion of intensive monocrop agriculture for higher economic returns from the land, or to land abandonment. Underlying threats to SEPLs

include lack of official understanding of the benefits of customary land management regimes for both local economics and biodiversity, inwards migration and natural population growth, which place greater pressure on the land, rural depopulation, which means not enough people to manage the landscape and maintain its values, and market failure, i.e. conversion of the land for profit without taking account of impacts on biodiversity, ecosystems services, society and culture. The solution for sustainable landscapes partly lies in raising awareness of policymakers on the importance of the multiple benefits derived from SEPLs for food security, biodiversity, climate change mitigation and adaptation, and other ecosystem services that contribute to social resilience and cultural diversity.

This chapter describes a customary land-use system and the implications of its transformation into monocropping in northern Thailand, where indigenous Karen communities have practiced rotational farming. The Karen's rotational farming system in the studied area has a relatively long fallow cycle to maintain land productivity, and this creates patches of grassland, scrub and forest at different succession stages. These, together with uphill forests protected by customary rules and other diverse agricultural land uses, form mosaic landscapes. These landscapes are deeply rooted in Karen's beliefs and culture, and underpin their livelihoods, security and wellbeing. The transformation of Karen's customary land use system to monocropping causes tremendous changes in all aspects of their life. The transformation of Karen's customary land use system to monocropping causes tremendous changes in all aspects of their life.

Field data and information used in this chapter were collected in December 2015 by researchers from IGES and the Indigenous Knowledge and Peoples Foundation (IKAP) from three Karen villages – Hin Lad Nai, Mae Yod and Mae Um Pai Tai. This chapter focuses on Mae Yod Village, which has experienced rapid land-use shifts. The field study included site observations, semi-structured interviews with 55 villagers and focus group discussions. A literature review was also conducted. The literature reviewed included reports and statistics published by the government and non-governmental and community-based organisations, as well as academic literature.

5.2 The Karen socio-ecological production landscape and its contributions to livelihoods, security and wellbeing

For generations Karen people in northern Thailand have relied on mixed agriculture centred on uphill rice cultivation and the production of various agro-forest products in forest areas along the Thailand-Myanmar border (Buadaeng 2007). The three surveyed Karen villages – Hin Lad Nai Village, Chiang Rai Province; Mae Yod Village, Chiang Mai Province; and Mae Um Pai Tai Village, Mae Hong Son Province (Figure 5.1) – are representative of the typical Karen SEPLs found in northern Thailand. The three villages are located within and adjacent to protected forests in a hilly tract and between 1,000 and 1,500 metres above sea level. This area has a tropical monsoon climate, with an annual rainfall that varies from 1,130 to 1,690 mm and monthly minimum and maximum temperatures that range from 13-24 and 27-39 degrees Celsius, respectively.

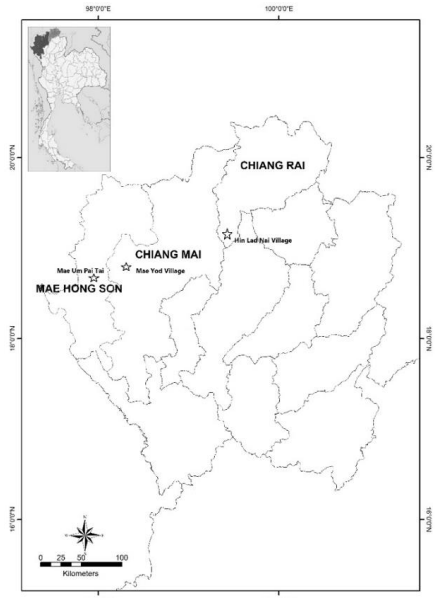

Figure 5.1 Location of the three studied Karen communities

Source: Yimyam (2006)

The three Karen communities settled in their current location more than 100 years ago (Trakansuphakon et al. 2006). Since then, their management and use of the land and its resources have resulted in a unique mosaic agricultural landscape that is well adapted to the hilly terrain (Figure 5.2).

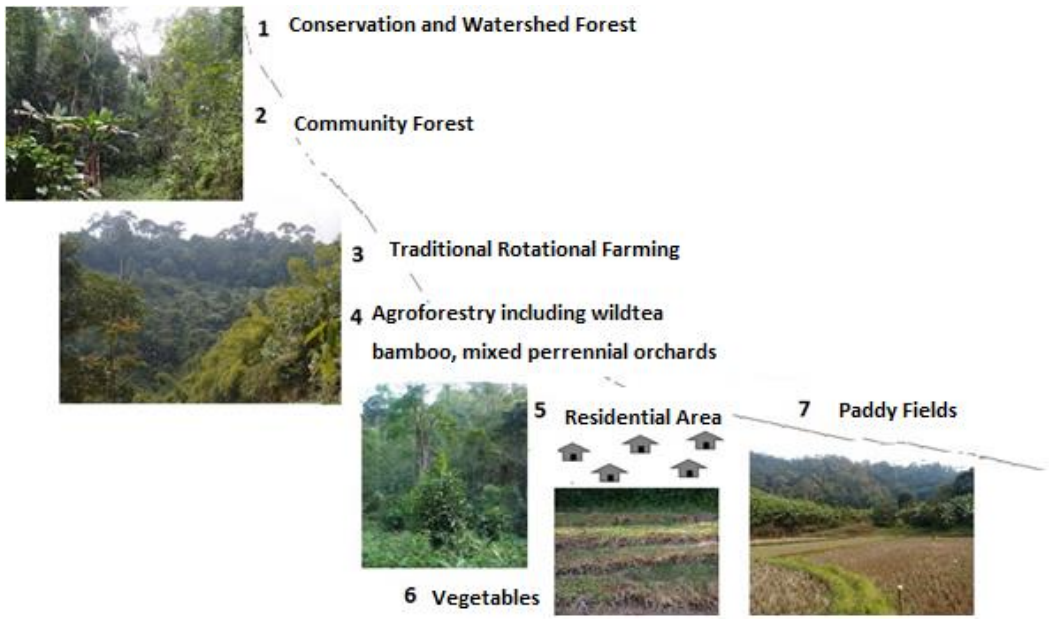

Figure 5.2 A typical Karen landscape from hilltop to paddy fields, as observed in the three study villages

Source: Authors

The communities place “forests on hilltops”, or conservation and watershed forests, under customary forms of protection using their traditional system of land classification. These include sacred forests, which they protect as homes for the spirits of nature and for rituals; “cemetery forests”, where they bury their deceased; and “child navel forests”, where parents supplicate for the health of their new born babies by tying the umbilical cords to trees. “Community forests” are maintained for their products and other practical uses. The communities classify agricultural land use into three categories: (i) rotational farming, which is located on the hill slopes above settlements; (ii) permanent fields, which lie beneath the settlements; and (iii) paddy fields, which are located at the bottom of the hills and in the valleys.

Rotational farming (RF) is practiced by all three villages and includes a relatively long fallow cycle ranging from seven to 12 years. RF creates a mosaic of diverse vegetation and uses. Vegetation on fallow land will be at various stages of succession, depending on where the land is within the fallow cycle, i.e. how long the land has been left to rest. In the first year of agricultural use, land on the higher slopes will be used for the cropping of upland rice and in the following few years for growing native vegetables and herbs. In addition, agroforests are formed in locations around the settlements, where native tea trees, bamboos, fruit trees and vegetables are grown. Considerable variation can be seen between communities in their proportions of forest lands, agricultural lands and residential areas (Table 5.1).

Table 5.1 Area under forest, agriculture and residence land types in the three study villages

Villages	Type of land use						Total areas
	Forest lands		Agricultural lands		Residential areas		
	Area	%	Area	%	Area	%	
Hin Lad Nai	9,527 rai (1,524.3 ha)	82.89	1,955 rai (312.8 ha)	17.01	12 rai (1.9 ha)	0.1	11,494 rai (1,839 ha)
Mae Um Pai Tai	9,527 rai (1,524.3 ha)	27.78	3,387 rai (541.9 ha)	69.86	114 rai (18.2 ha)	2.35	4,848 rai (775.7 ha)
Mae Yod	15,644 rai (2,503 ha)	49.64	15,546 rai (2,487.3 ha)	49.32	328 rai (52.5 ha)	1.04	31,518 rai (5,042.8 ha)

Note: One rai is equal to 0.16 ha. Source: Data provided to authors by Mae Suek Subdistrict Administration Organisation, Ban Pong Subdistrict Administration Organisation and Mae Tho Subdistrict Administration Organisation

The rich mix of different land uses adapted to hilly terrain in the Karen landscape complex is a key aspect of the biological and cultural diversity and their interlinkages found in the upper Mekong sub-region. Table 5.2 summarises the ecosystem goods and services derived from the lands under different uses based on the data collected through a questionnaire survey with 55 respondents and through focus group discussions in the three villages. The research participants were given a list of ecosystem goods and services classified under the 18 “Nature’s Contributions to People” (NCP) categories (Pascual et al. 2017) and were requested to identify and describe those in the lands under the three different uses. The table also identifies the UN Sustainable Development Goals

(SDGs) to which the respective ecosystem goods and services can contribute, to clarify their importance to the Karen communities. This identification is based on the authors' judgement.

Table 5.2 Ecosystem goods and services from the land under permanent forests, Karen rotational farming and monocrop intensive farming and their significance for the Sustainable Development Goals

Ecosystem goods & services category*	Permanent forest (weight rank**)	Rotational farming (weight rank**)	Intensive monocrop farming (weight rank**)	Relevant Sustainable Development Goals
1. Habitat creation & maintenance	Provide wildlife habitats & food (2)	Provide habitats & foods for wild birds & other vertebrates (2)		Goal 15. Life on land
3. Air quality regulation	Clean air supply (2)	Clean air supply during fallow period (2)		Goal 3. Good health and wellbeing
4. Climate regulation	High carbon stock (3)	Medium net carbon stock (2)	Low carbon stock (1)	Goal 13. Climate action
7. Freshwater/ coastal water quality regulation	Clean water supply (2)	Clean surface water (2)	Water pollution/eutrophication (-2)***	Goal 3. Good health and wellbeing Goal 6. Clean Water and Sanitation
8. Formation, protection & decontamination of soils & sediments	Soil erosion & sedimentation control ; soil nutrient retention & supply (2)	Soil erosion & sedimentation control; soil nutrient supply; soil structure maintenance (2)		Goal 2. Zero hunger Goal 15. Life on land
9. Hazards & extreme events regulation	Reduced flash floods; windbreaks (2)	Reduced flash floods; windbreaks (2)		Goal 1. No poverty Goal 11. Sustainable cities and communities Goal 13. Climate action
10. Pest regulation	Traditional bio-pesticides (2)	Traditional bio-pesticides (2)		Goal 2. Zero hunger
11. Energy	Fuelwood supply (2)	Fuelwood & charcoal supply (2)		Goal 7. Affordable and clean energy
12. Food & feed	Non-timber forest products (NTFPs) including nutritious food ingredients, bushmeat (1)	Upland rice; vegetables; herbs – low net present value (NPV) (1)	Maize, azuki bean – high NPV (3)	Goal 1. No poverty Goal 2. Zero hunger Goal 3. Good health and wellbeing Goal 8. Decent work and economic growth
13. Materials & assistance	Timber; cotton (2)			Goal 8. Decent work and economic growth
14. Medicinal, biochemical & genetic resources	Medicinal herbs; genetic resource stock of native plants & wild animals (2)	Medicinal herbs; diverse native plants during fallow period (2)		Goal 3. Good health and wellbeing
15. Learning & inspiration	Youths' learning	Inspire folksongs;		Goal 4. Quality education

Ecosystem goods & services category*	Permanent forest (weight rank**)	Rotational farming (weight rank**)	Intensive monocrop farming (weight rank**)	Relevant Sustainable Development Goals
	ground; generate & transmit knowledge on edible plants, insects, hunting & resource management (2)	generation & transmission of knowledge (2)		
16. Physical & psychological experiences	Ecotourism destination (2)			Goal 8. Decent work and economic growth
17. Supporting identities	Venue for festivals, rituals & cemetery (2)	Central to the Karen's identity (2)		Goal 16. Pease and justice, strong institutions

*Note: Information on carbon stocks and net present value of different land uses is provided below. * For the classification of ecosystem goods and services, the nature's contributions to people categories (Pascual et al. 2017) were applied to enable more explicit eliciting of non-material values of nature. ** As the basis for the trade-off analysis presented in Table 5.6, the weight rank (3 high; 2 medium; 1 low) was identified in brackets for each item when comparative difference in quantity across different land uses was identified. "2" was assigned to the factors in which quantitative difference across different land uses were not identified. A minus sign was assigned to negative factors. *** Inferred from Tirado et al. (2008) and Tawatsin (2015). Source: Authors*

RF is central to the livelihoods and culture of Karen people. The research participants in the three Karen villages all identified RF as the most important land-use unit. The primary purpose of RF is the production of upland rice, which provides households with their staple food and some income. The native beans, vegetables and herbs that Karen people grow after the rice is harvested contributes to their nutrition and provides them with ingredients for their traditional medicines. The latter include *Top Kad Wa*, which is used to treat snake bites, and *Chor Tum Mae*, which is used to treat wounds. Our survey recorded over 60 types of native plants that are used for human consumption in the Karen RF systems, including 15 types of native rice (three glutinous and 12 non-glutinous), over 40 species/varieties of vegetables and herbs, and 15 varieties of beans (Table 5.3). A lot of the indigenous rice varieties are now difficult to find outside these areas, and this could be important for the country's future food security in the context of climate change. The area of land under traditional Karen management has been referred to as one of Thailand's indigenous rice genetic centres by scientists at Chiang Mai University (Rerkasem et al. 2002; Yimyam et al. 2012).

Karen RF systems consist of land management practices that maintain land quality and generate ecosystem services. When clearing secondary forest in their RF areas, Karen farmers clear fire breaks to stop the spread of fire and cut trees and bamboos at heights that allow them to quickly regenerate. Soil nutrient and structure are maintained by allowing the land to rest under long fallow cycles. Our survey found that the productivity of upland rice in the RF system in Mae Yod Village in the year of harvest was about 13.6 tonnes/ha, which was substantially higher than that of paddy field-grown rice (4.70 tonnes/ha). The Karen farmers use artisanal bio-pesticides that they make from herbal and insect materials. Vegetation quickly succeeds in the fallow period and the resultant secondary forest contributes to the regulation of air and water quality and a more comfortable local

micro-climate, protects against soil erosion, moderates water flow, and reduces the risk of and damage from natural hazards. Regenerated forests on fallow land provide important habitats for wild plants and animals.

RF also contributes to a vibrant and resilient local society through regular exchanges of food and other products and sharing labour for agricultural activities between households. Karen people generate and share knowledge on ecological production management associated with their RF practices, and this sharing of knowledge is an important part of their social life. They create songs and folktales to pass on knowledge about nature and good land management practices from old to young. The knowledge accumulated over generations from RF is integrated into Karen beliefs, culture and identity. Karen landscapes are thus areas rich in bio-cultural diversity.

Forests are an integral part of Karen landscapes. In contrast to dominant forms of land management on the lowland floodplains of Thailand, forests and agriculture are not managed separately. Karen people view and manage forests and agricultural land in an integrated fashion across their entire landscape. Karen people protect forests on hilltops and in headwaters as sacred and culturally significant places, and in doing so secure important watershed services. This contrasts with the heavy logging encouraged by the government in hill areas in earlier decades, which led to widespread erosion, flooding and loss of life, and ultimately to a national ban on the logging of natural forest (Hirsch 1990). Forests also have utilitarian value for Karen people. They use the forest for fuelwood, wild food such as mushrooms, bamboo shoots, insects and honey, as well as medicinal herbs, timber and fabric materials. Through rituals and customs, Karen people generate and transmit knowledge about their forests and the biodiversity found within them.

Table 5.3 Native plant species identified in the study RF sites in 2015

Type of plant	Species (Local names)	Total number
Glutinous rice	Pi Ai Su Bu Ru, Pi Ai Kor Kare, Pi Ai Su	3
Non-glutinous rice	Bue Ker, Bue Pho, Bue Pa Mae, Bue Kee, Bue Tho Pokee, Bue Kare Wa, Bue Bu Ru, Bue Ma Li Doi, Bue Pa Kor, Bue Lor, Bue Ka, Bue Su	12
Bean	Ser Bei Su, Ser Gor Bei Su, Ser Bei Ker, Bor Ba Sa, Per Ter Nor Ki, Per Ter Chi Mue, Ser Baw, Per Ba Per Chi, Per Ter Per Pue, Ser Ber, Per Ter Ker, Ser Ker Bei Wa, Ser Ker Na Ra, Ser Ker Ka, Ser Ke Pho	15
Chilli	Mu Sa Pa Bor, Mu Sa Ber, Mu Sa Pa Dor	3
Cucumber	De Wa, De Mue Wa, De Ge, De Pa Wa	4
Corn	Bue Ke Pho, Bue Ke Wa, Bue Ke Jor Wa	3
Burweed	Hor Ter Der	1
Tomato	Ser Kor Chi, Ser Kor Lue	2
Basil	Hor Wor, Hor Wor Sei, Por Kae, Ser Ker	4
Pak Choi	Ser Ba Wa, Ser Ba Yo,	2
Sesame	Nor, Nei Sor	2
Bitter melon	Sor Ka Sar	1
Loofah	Chi Pho Dei	1
Pumpkin	Lu Kei Gi	1
Ginger, Galanga	Ser Aei, Ser Aei Cha Kei	2
Millet	Sue, Per Sue	2
Herbs	Por Ker Vae, Nor Por, Cho Por, Chor Tum Mae, Tod Kad Wa	5
Taro	Kue Kor, Kue Wa, Kue Sue	3
Total		66

5.2.1 Transformation of Karen landscapes and the experiences of Mae Yod Village

Modern and intensive monocropping of maize and azuki bean, which currently is rapidly replacing RF in some areas in northern Thailand, raises per hectare yields and increases the cash income of farmers. However, conversion of areas under RF to intensive monocropping results in a massive loss of ecosystem goods and services, meaning that there are stark differences between these two different sets of land management practices in terms of benefits and opportunity costs.

Forest area in the northern regions of Thailand decreased by approximately 35% from 1973 (113,595 km^2) to 2013 (74,042 km^2) (Royal Forest Department 2013). Over the same period, farmland increased by 17% (ibid.), mainly through the expansion of commercial maize production, which has been driven by the global demand for livestock feed. Areas zoned as forest land have been brought under maize production. In Chiang Mai province, in 2013 60% of the area under maize production was located in forest land (Land Development Department 2013).

The trends, direct and underlying drivers and possible future consequences of land-use transformation were studied in Mae Yod Village, which was the most susceptible of the three study villages to land-use transformation. Interviews with villagers identified land transformation in two main directions in Mae Yod Village. One direction is the conversion of RF areas to commercial maize and azuki bean monocropping. The other is the increase in forest cover due to the abandonment of RF practices in distant areas. The conversion of RF areas into maize and azuki bean monocropping is encouraged by the Royal Project in the village. In 2015, 16% (409 ha) of the agricultural land in Mae Yod Village was used for growing the major commercial crops (Table 5.4).

Table 5.4. Area of different land use types in Mae Yod Village in 2015

Land use type	Area	
	Ha	%
Rotational farming	1,853.64	74.5
Permanent fields	408.87	16.4
Paddy fields	140.69	5.66
Others	84.12	3.38
Total	2,487.31	100

Source: Data provided by village head

A large-scale land transformation in Mae Yod Village has been triggered by the interplay of multiple factors including:

Labour shortages: Mae Yod Village has experienced a shortage of farm labour, as some of the youth are more interested in working in the cities. The inadequate supply of farm labour has resulted in the abandonment of RF, particularly in the areas distant from the village centre.

Higher income from intensive monocropping and changing lifestyle: Intensive monocropping provides a higher financial return than RF. Under intensive monocropping the annual net present

value (NPV)[6] of azuki bean is 998 USD/ha/year and maize 306 USD/ha/year (based on field data collected in December 2015, a 20-year time frame and 5% discount rate) (Kawasaki 2016). In the case of Mae Yod Village, the conversion of a parcel of land under RF into a maize field increases income by USD 98/year. Many farmers in Mae Yod converted some of their traditional permanent fields for azuki bean production to earn more cash to pay for cultivation and new expenses, such as their children's education, and wants such as vehicles and mobile phones.

External economic forces: The growing global market for livestock feed and other commercial crops coupled with aspiration towards modern lifestyle provided an impetus for land-use conversion.

Cultural prejudice: Prejudice against the Karen RF system can be found in mainstream society. RF is viewed as an obsolete system and one that is detrimental to nature conservation.

Poor institutional support: Government recognition of the customary livelihood practices of Karen people that centre on RF, and their contributions to biological and cultural diversity, is limited (Hares 2009). Forest policies generally do not permit rotational farming on forest lands. In contrast, agricultural policies promote the expansion of intensive monocrop production, even into the lands previously designated as forest lands. The Royal Project, which supported azuki bean production through subsidies for maintaining the prices of azuki bean, is one example.

Over the past two decades, the Government has promoted sustainable forest management and aimed to increase the number/area of National Parks and protected forest areas. In 1992, Mae Yod Village was included in a National Park, a designation that does not allow settlements. Villagers claimed that they possessed land rights that pre-existed the park's designation, and in their representation to government emphasised that their traditional rotation farming does not negatively impact the balance of the environment. The cabinet passed legislation on 30 June 1998 to clarify land use rights, granting usufruct rights to villagers who were using land before the park's designation. However, the villagers are still encouraged by the Government to reduce the fallow period and convert RF areas to intensive monocrop agriculture.

5.2.2 Consequences of landscape transformation

The transformation of SEPLs in the studied area is characterised by the replacement of RF with maize or Azuki-bean monocropping. We identified the future consequences of this transformation by comparing the provision of ecosystem goods and services from the lands under these competing uses. As part of this analysis, we estimated net present value (NPV) from agricultural production and carbon stocks. On this basis, we assessed the implications of the landscape transformation for the SDGs.

The changes in the provision of ecosystem goods and services caused by the transformation of RF into maize and azuki bean monocropping can be understood by comparing the "rotational farming" and "intensive monocrop farming" columns in Table 5.2. RF provides 12 types of ecosystem goods

[6] NPV per hectare was calculated using a 20-year time frame and a 5% discount rate. Revenue from upland rice cropping in RF areas was considered only for the harvest of the cropping year within a 12-year fallow cycle. Data was collected from a field survey and interviews with 17 villagers in Mae Yod Village in 2015. Average above-ground carbon stocks were estimated from data provided by earlier studies (Northern Development Foundation and Huay Hin Lad Community 2011; Takeuchi et al., 2014) and 2015 land-use data obtained from the Karen Network for Culture and Environment, Chiang Mai Province.

and services encompassing regulating services, material goods and non-material goods. In contrast, monocrop farming only provides food, at the expense of 11 other goods and services.

The assessment of the NPV of lands under competing uses identified azuki bean monocropping as generating the highest net capital gain (Table 5.5). Quantification of the carbon stock of land under different uses found the highest carbon stock to be in RF lands. This, and the anecdotal evidences presented in Table 5.2, revealed that the land transformation in Mae Yod Village has significantly increased the flow of cash into farmers' households, but at the expense of many ecosystem goods and services that have supported the livelihoods, security and wellbeing of the community. Also, agricultural intensification can degrade land quality and have a range of other deleterious effects. Intensive inputs of synthetic pesticides and fertilisers required for monocropping can directly harm human health during application and indirectly through water and soil pollution (Tirado et al. 2008; Tawatsin 2015). Intensive monocropping depletes soil nutrients and can lead to soil erosion, resulting in declining land productivity over the long term. There are also economic risks to smallholder farmers in Karen villages who move towards intensive monocropping of commercial crops. Integration into the global supply chain places smallholder farmers in a position of limited bargaining power and they face risks associated with oversupply and fluctuating global market prices.

The possible future implications of land-use transformation in Mae Yod Village for the SDGs are outlined in Table 5.6. The table indicates the weighted sum of a number of factors, particularly with respect to the ecosystem goods and services presented in Table 5.2, that can contribute to each SDG for different land uses. Factors were weighted (3 high; 2 medium; 1 low) when a comparative difference in quantity across different land uses was identified. "2" was assigned to the factors in which quantitative difference across different land uses were not identified. A minus sign was assigned to negative factors, e.g. health risk caused by exposure to agrochemicals and water pollution (Tirado et al. 2008; Tawatsin 2015). The arrows in the "change" column indicate the change in the weighted number of the elements contributing to each SDG caused by transformation from RF to azuki bean or maize monocrop farms. This analysis supports the point made above that land-use transformation from RF to intensive monocropping can contribute to household income and economic growth (SDG 8) but can undermine the provision of ecosystem goods and services that support the achievement of other SDGs. The rightmost column indicates that some of the elements lost due to land transformation can be substituted with manufactured goods and services and infrastructure.

Table 5.5 NPV and carbon stocks for lands under competing uses, Mae Yod Village

Type of land use	NPV (USD/ha)	Carbon stocks (tonnes/ha)
Rotational farming (RF)	26*	152 **
Azuki bean	998*	65 ***
Maize	306*	65 ***
Paddy rice	49*	49 ***

*Source: *Kawasaki (2016); ** Northern Development Foundation and Huay Hin Lad Community (2011); ***Takeuchi et al. (2014)*

There are two caveats to these findings. First, there are likely to be few perfect substitutes. Natural capital-based ecosystem goods and services and their manufactured alternatives are associated with different processes, which can have serious implications. For example, possible substitutes for some of the products and materials that Karen people gather from forests on their RF lands may be available in the town markets, but if RF is lost, then so too is the rich bio-cultural diversity that goes

with it. Second, the assumption that monocrop production can bring sufficient and stable income for farmers to purchase alternatives would not hold if lands are degraded through overuse and poor management to the extent that productivity falls over the long term, as observed in another area in northern Thailand (Turkelboomab, Poesenb, and Trébuilc 2008). This assumption also would not hold if global market prices fall suddenly, as happened to global maize prices, which plunged by half between 2013 and 2015 (Index Mundi 2018).

Table 5.6 Assessment of possible consequences of the current trend in land transformation in Mae Yod Village for the SDGs

SDG	Forest	RF	Monocrop farm	Change	Possible substitutes
	1	1	3	↑	
	5	5	3	↓	Food sold at markets
	7	7	1	↓	Modern medicine and crinical treatments
	2	2	0	↓	Modern and national-standard education
	2	2	-2	↓	Portable water harveset and supply system
	2	2	0	↓	Power grid
	5	1	3	↑	
	2	2	0	↓	Dams and river works for flood prevention
	5	4	1	↓	
	4	4	0	↓	
	2	2	0	↓	

In sum, large-scale land-use transformation from RF to intensive monocrop production would provide a substantial cash gain for Karen people in the short-term and this would assist them to meet their growing needs for cash. However, when measured against the SDGs, it is clear that serious trade-offs are occurring when this transformation takes place. Now is a critical time for Karen people. The total area of fields under intensive monocropping is still modest (8.11% in Mae Yod in 2015, compared to 36.75% of the land under RF and 49.64% under permanent forest), but

farmers are being encouraged to convert more RF areas. The analysis of the benefits and trade-offs of alternative land-uses presented in this chapter indicates that this policy needs to be reconsidered.

To ensure that land is managed optimally for the SDGs, it is critical for government and non-government entities to engage with Karen communities, applying a holistic perspective to landscape management and not just focusing on commercial crops and annual yields. Support for income generation from alternative sources and enhancing the productivity of RF can be considered. Karen communities would benefit from support to establish and act on long-term plans that strike a balance between increasing cash income and maintaining ecosystem goods and services, with a view to securing sustainable livelihoods, resilience and wellbeing.

5.3 Conclusion and ways forward

In Karen communities, transformation of land use from traditional agroecosystems to commercial monocrop farming is taking place. There is a mix of drivers behind this transformation, including government policies, the need and desire of Karen people for greater cash income and the attractions of modern lifestyles. However, whether intensive monocropping that relies on heavy application of chemicals is ecologically sustainable is highly questionable, and the conversion to intensive monocropping results in land degradation and the loss of ecosystem services that have underpinned Karen livelihoods, security and wellbeing. The losses extend to the whole country, as Karen RF systems maintain a wide variety of indigenous cultivars that could be significant for resilience building against the impacts of climate change and long-term food security.

What needs to be done? First, further efforts to build understanding within the Government and other stakeholder groups of the values of the Karen agroecosystem for biodiversity, climate change mitigation and adaptation, watershed services, and local livelihoods, security and wellbeing are needed. The analysis presented in this chapter and further studies can help to build this understanding. Second, support can be provided to Karen communities for them to make wise decisions over their land, i.e. choosing land uses and management practices that on balance best reflect their interests. For them, this means having access to information on the costs and benefits of alternative land uses. Third, training and extension support on sustainable agricultural practices can be made readily available to Karen farmers who decide to convert some of their land to cultivate new commercial crops. Fourth, training and appropriate financial services can be provided for Karen communities to develop businesses based on their traditional agricultural products, cultural beliefs and practices, unique landscape points of attraction, etc. The potential to develop new markets can be explored, tapping into Thailand's growing number of health-conscious consumers, people searching for new experiences, and people interested in alternative medicines. Fifth, the potential for collaborative landscape governance can be explored. An appropriate collaborative governance arrangement would involve Karen people taking responsibility for sustainable agriculture and some aspects of natural resource management, and the Government creating an enabling environment for sustainable landscapes. Both Karen people and the Government have taken steps that support collaborative governance. Karen organisations such as the Indigenous Knowledge and Peoples Foundation (IKAP) have assisted Karen communities in mapping their customary tenure and management systems so these can be more explicitly recognised in the state and provincial legislation and land-use plans. The Government, for its part, reached a cabinet resolution that recognises Karen practices as national cultural heritage. Further efforts are required to strengthen the reciprocity between Karen communities and the Government so that they link up to build up and implement truly sustainable and adaptive landscape management systems.

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CHAPTER 6

From natural forest to oil palm estates: Landscape transformations in East Kalimantan, Indonesia and options for REDD+

Masayuki Kawai

Key messages

- *Rural landscapes in East Kalimantan have undergone rapid, often non-linear transformations, reflecting a complex interplay of drivers at various levels and feedback mechanisms.*
- *Kalimantan has experienced extensive deforestation and forest degradation since the 1970s due to large-scale commercial logging, illegal logging, expansion of oil palm plantations, coal mining, encroachment of people into conservation areas and forest fires. The current main trend in land use is transformation to oil palm plantations.*
- *The changes in land-use have generated benefits, but they have also resulted in many trade-offs, such as loss of control of local people over their customary land.*
- *There are a variety of REDD+ activities that can be implemented in East Kalimantan to achieve both emission reductions and local development. These include the protection of high conservation value forest in plantation areas, support to smallholders for the planting and harvesting of rubber and cacao as an alternative livelihood activity without requiring them to give up their land-use rights, and village and social forestry.*

6.1 Introduction

This chapter presents a case study on landscape transformations in East Kalimantan, Indonesia. It does not paint a simple picture of a single linear trajectory of land-use change. To the contrary, it illustrates the point made in Chapter 1 that land-use change trajectories can be complex and difficult to predict. It also highlights how drivers exist at various levels and evolve over time and how trade-offs are associated with all land uses. Part of the challenge for the SDGs lies in identifying among competing uses which on balance provide the best outcomes and setting out and implementing policies to support these uses. The chapter identifies social forestry and smallholder plantations as land uses that can make an important contribution to a number of SDGs, and suggests how they can be promoted as part of a provincial REDD+ strategy.

The conversion of natural forests to oil palm is a key feature of the landscape transformations that have taken place in East Kalimantan, Indonesia's second largest province. Over 52% of East Kalimantan is covered by forest, but the province's forest cover ratio used to be much higher. East

Kalimantan has experienced extensive deforestation and forest degradation since the 1970s. The proximate causes behind this include large-scale commercial logging, illegal logging, expansion of oil palm plantations, coal mining, encroachment of people into conservation areas and forest fires. Opportunities for better forest management and forest conservation in the province may be growing however, as the provincial government has expressed commitment to tackling climate change. Also, East Kalimantan was selected for a sub-national result-based REDD+[7] payment programme (the expected emission reduction monitoring period is 2019-2024) under the World Bank's Forest Carbon Partnership Facility (FCPF) Carbon Fund.

The objective of this chapter is to examine the land-use changes that have occurred in East Kalimantan, focusing on land-use conversion for oil palm plantations, as this is one of the main causes of deforestation in the province. This chapter also considers the prospects for REDD+ to mitigate the negative impacts of oil palm land developments and support alternative land uses that provide multiple benefits. This chapter first provides an overview of forest cover change in Indonesia. Second, it discusses the relationships and disconnects between national land-use classification, development activities in each sector (forestry, estate and mining), and local people's customary land-use systems. Third, the impact of the decline of the logging industry, the development of oil palm plantations and a high-yielding rubber development project on the economy of the local people are described. Finally, the chapter considers the possibility for REDD+ to mitigate the negative impacts of oil palm plantations and support alternative land uses, reflecting on the FCPF Carbon Fund sub-national REDD+ programme. Several land-use policies and activities that could be linked to REDD+ implementation, including encouraging local people to cultivate cacao and expansion of the area under social forestry, are discussed. The potential of these policies and activities to contribute to the United Nations Sustainable Development Goals (SDGs) is also discussed.

6.2 Forest cover change

Figure 6.1 depicts land cover in Indonesia in 2017. According to the Ministry of Environment and Forestry (MoEF), Indonesia had a total natural forest[8] area of approximately 89.9 million hectares (ha) in 2016, equivalent to approximately 48% of its territory (MoEF 2018a). The percentage of area covered by natural forest on each major island was 37.7% in Papua, 29.3% in Kalimantan, 13.2% in Sumatra, 10.3% in Sulawesi, 5.5% in Maluku, 3.1% in Bali and Nusa Tenggara, and 1.0% in Java (ibid).

[7] REDD+ refers to activities that reduce greenhouse gas emissions from deforestation and forest degradation, and enhance forest carbon stocks. Chapter 8 discusses the need for landscape level interventions for REDD+.

[8] In Indonesian National Standard (SNI) 8033:2014 on "Method for calculating forest cover change based on results of visual interpretation of optical satellite remote sensing image", forests are classified into six natural forest types (primary dryland forest, secondary dryland forest, primary swamp forest, secondary swamp forest, primary mangrove forest and secondary mangrove forest) and plantation forest. When plantation forest is included, the total forested area of Indonesia in 2016 was approximately 95.3 million ha (MoEF 2018a).

Figure 6.1 Land cover in Indonesia, 2017

Source: http://webgis.menlhk.go.id:8080/kemenhut/index.php/id/peta/peta-interaktif (accessed 18 May 2018)

Indonesia has experienced serious deforestation and forest degradation since the 1970s when large-scale commercial logging started. According to Forest Watch Indonesia and Global Forest Watch analysis of forest cover maps developed by the Government of Indonesia, in 1950, forest covered about 162 million ha and occupied 84% of the total land area of Indonesia (FWI/GFW 2001). However, 42.6 million ha of forest was lost by 1985 and another 20.5 million ha of forest was lost between 1985 and 1997 (FWI/GFW 2001). Most of the deforestation occurred in Kalimantan (8.5 million ha) and Sumatra (6.7 million ha) during this latter period (ibid.). According to Indonesia's Forest Reference Emission Level (FREL) submission to the United Nations Framework Convention on Climate Change (UNFCCC), 9.0 million ha of forest was lost in the period 1996-2000 at a rate of 2.26 million ha per year (MoEF 2015). The deforestation rate during 2000-2003 was 0.44 million ha per year and for 2006-2009 was 0.91 million ha per year. Indonesia's FREL submission explains that the overall high rate of deforestation in the period 1996-2000 was likely caused by fires due to a prolonged El Niño event in 1997/1998, as well as illegal logging, expansion of industrial timber plantations and rapid expansion of oil palm plantations. Indonesia's FREL also shows that approximately 78% of deforestation occurred in Sumatra and Kalimantan in the period 1990-2012, while the figure was much lower in Sulawesi and Papua at 8% (MoEF 2015).

Important trends associated with direct drivers for land cover change in Indonesia include the decline of the logging industry after decades of over-exploitation of natural forest and the increase of industrial tree plantations and oil palm plantations. In 1993, the total area of logging concessions in natural forest was 62 million ha, while the concession area for industrial plantations was only 100,000 ha (Fujiwara et al. 2015). By March 2018, the area of natural forest concessions had decreased by about 19 million ha and the area of industrial plantation concessions had increased by about 11 million ha (MoEF 2018a). The area of oil palm plantations grew from 1.13 million ha in 1990 to 11.92 million ha in 2016 (Figure 6.2).

For biodiversity, the oil palm plantations support much fewer species than natural forests. Many forest species are lost during habitat conversion to oil palm as oil palm plantations are architecturally much simpler than natural forests (both primary and secondary forests) with fewer canopy layers and less diverse elements of lianas, epiphytes and litter (Fitzherbert et al. 2008; Koh and Wilcove 2008; Foster et al. 2011). Natural forests also offer superior habitat for native forest species than plantation forests, though abundance and richness of species depends on the context

(e.g. whether forest is managed for production or conservation, the planted tree species are exotic or native species, the term of rotations are short or long, etc.) (Brockerholff et al. 2008).

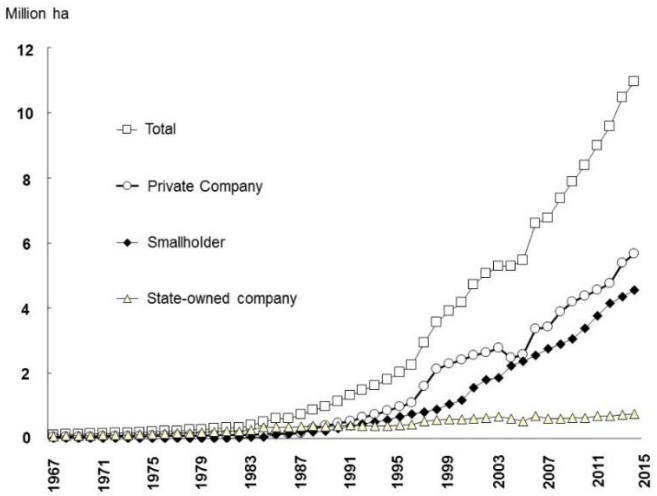

Figure 6.2 Area of oil palm plantations in Indonesia by ownership type

Source: MoA (2017)

6.3 Relationship between administrative land classification, development activities and customary land classification

When assessing rural land-use changes in Indonesia, the relationship between administrative land classification, development activities and customary land classification of local people must be clearly understood. Concession rights and the right-of-use for natural resources and land, including for oil palm plantations, logging, mining, and participatory forest management involving local people, are based on the administrative land classification. The Forestry Act No. 41/1999 defines "forest area" (*kawasan hutan*) as "a specific area that is designated or established by government to maintain the presence as permanent forest", and classifies forest area into three categories based on function: conservation forest (*hutan konservasi*), protection forest (*hutan lindung, HL*) and production forest (*hutan produksi*) (Table 6.1). Conservation forest is forest that has the principal functions of conserving plants and animals (biodiversity) as well as ecosystems. Protection forest is forest with the principal functions of preventing floods, controlling erosion, preventing sea water intrusion, and maintaining soil fertility. Production forest is forest with the principal function of producing forest products. Decree of Minister of Forestry of Indonesia No. P. 50/2009 refers to areas that are not classified as forest area as "*Areal Penggunaan Lain*/APL (other use area)".

The ministries/government agencies responsible for each class of forest area are different. MoEF has the authority to issue permits/concessions for forest product utilisation and restoration/conservation in forest areas, while local governments, i.e. provincial and district/municipal governments, have the authority to issue various kinds of business permits in the land use sector in APL. The permits for land associated with tenure and right-of-use in APL are issued by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (Kementerian Agraria dan Tata Ruang/Badan Pertanahan Nasional).

Development of oil palm plantations is allowed only in APL, while natural forest logging and industrial tree plantations are allowed only in production forest. Coal mining is allowed in protection forest, production forest and APL.[9] Social forestry is allowed in conservation forest, protection forest, production forest and APL. The social forestry schemes in Indonesia include village forest (*hutan desa*/HD), community forest (*hutan kemasyarakatan*/HKM), community plantation forest (*hutan tanaman rakyat*/HTR), customary forest (*hutan adat*/HA), partnership forestry (*kemitraan kehutanan*/KK) and people's forest (*hutan rakyat*/HR). Under the National Mid-term Development Plan (Rencana Pembangunan Jangka Menengah Nasional/RPJMN) 2015-2019, the total national area targeted for social forestry is 12.7 million ha.

Table 6.1 Administrative land classification and concession

Category based on purpose	Category based on function	Sub-Category based on function
forest area (*kawasan hutan*)	conservation forest (*hutan konservasi*)	nature reserve forest area (*kawasan hutan suaka alam*/KSA)
		nature conservation forest area (*kawasan hutan pelestarian alam*/KPA)
		hunting park (*taman buru*/TB)
	protection forest (*hutan lindung*)	
	production forest (*hutan produksi*)	permanent production forest (*hutan produksi tetap*/HP)
		limited production forest (*hutan produksi terbatas*/HPT)
		convertible production forest (*hutan produksi yang dapat konversi*/HPK)
other use area (*areal penggunaan lain*/apl)		

Source: Author, based on Forestry Act No. 41/1999 and Decree of Minister of Forestry of Indonesia No. P. 50/2009

The term "forest area" should be carefully used. The land that is administered as forest area (*kawasan hutan*) does not equate exactly with areas covered by forest vegetation. There are some areas categorised as forest area for administrative purposes that have no forest vegetation. Conversely, there are other areas categorised as APL that have rich forest vegetation. Figure 6.3 shows the area of forest and non-forest cover in both *kawasan hutan* and APL. Deforestation by oil palm developments occurs mainly in APL forested areas (except for illegal oil palm plantation developed in the "forest area"). To avoid confusion, in this chapter the term "forest area" is used for areas administered as forests (*kawasan hutan*), while the term "forested area" is used for areas covered by forest vegetation.

[9] Only underground mining which does not change the vegetation on the ground surface is allowed in protection forest, while both open pit mining and underground mining can be applied in production forest and APL.

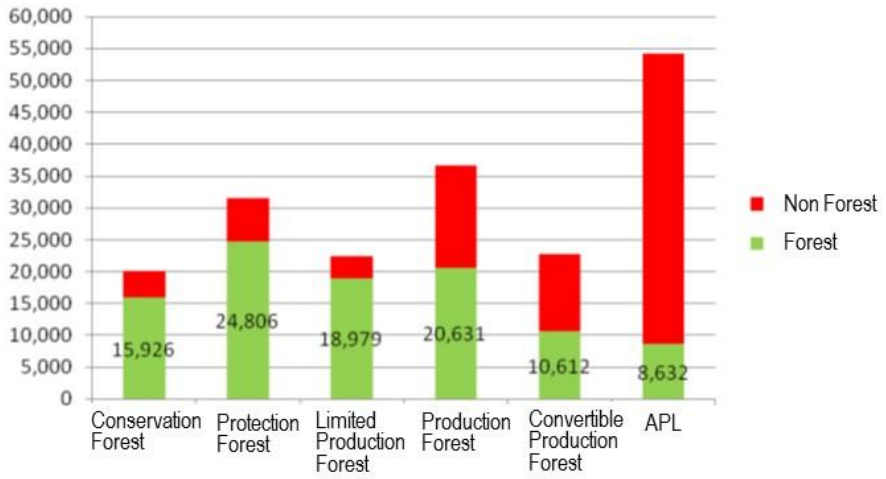

Figure 6.3 Forest cover area of in Kawasan Hutan and APL in 2011 (thousand ha)

Source: Gambar 5 in FWI (2014)

In addition to the national administrative land classification, indigenous communities have their own customary systems of land classification. According to the national census in 2000, Indonesia has more than 1,000 ethnic groups (Nagatsu 2012). These indigenous local communities had their own territory and developed their own land-use classification based on their customary law well before Indonesia was founded as a country. The customary right to land held by the indigenous communities is called *hak ulayat*.

The areas that indigenous communities claim customary rights to and their land classification systems overlap with the national administrative land-use classifications. Areas that indigenous communities have managed according to their customs have been assigned by the State for various uses including protection forest, limited production forest, production forest and APL. However, often villagers do not know or choose to ignore the administrative land classification and continue to conduct their land- and natural resource-based livelihood activities based on their customary rules (*hukum adat*). These activities include shifting cultivation, planting cash crops such as rubber and cacao, timber harvesting, replanting, gathering non-timber forest products (NTFPs), and hunting and fishing.[10] The indigenous communities believe that they have customary rights to undertake these activities as their history of land use and management pre-dates the formation of the Indonesian state.

The co-existence of, and gaps between, administrative and customary land-use classification have implications for the possible livelihood options of local people and the potential for conflicts. As many researchers and non-governmental organisations (NGOs) have reported, conflicts between

[10] For example, the local Bahau Dayak people in East Kalimantan, who the author visited, employ several customary classes of land use. These include *Tana' Luma'* (swidden), *Tana Talun* (fallow), *Tana' Lepuun* (fruit gardens), *Tana' Pra'* (customary conservation forest), *Tana' Berahan* (forest for various activities by villagers, such as logging, hunting, fishing and other NTFP-gathering activities), *Tana' Jaka'* (Grudge forest; areas where accidents, murder or other incidents happened) and *Tana' To'* (Spirit forest) (Kawai 2011; Inoue and Kawai 2010). Devung (2015) studied customary land use of Bahau Dayak people in detail.

companies and local people frequently occur (Urano 2014; McCarthy, Gillespie, and Zen 2012; Gillespie 2012; McCarthy 2010; Marti 2008). Forest Watch Indonesia identified 2,585 cases of conflicts in 27 provinces involving local communities during 1990-2010, including 1,065 cases in forestry, 563 cases in estate and 174 cases in mining sectors (FWI 2014). It also reported that the number of conflicts increased sharply during 1997-1999 (ibid.). At that time, government repression of local people diminished and they became more vocal, ultimately leading to the fall of the Soeharto regime.

Since 1999, the state has increasingly recognised the customary rights of local people and passed laws and regulations in support of these rights. In addition, the decision of the Constitutional Court (MK) Number 35 / PUU-X / 2012 stipulated that forest lands (*kawasan hutan*) occupied by customary law communities (*masyarakat hukum adat*) should not be classified as state-owned forest.[11] Although the enforcement of these laws and regulations is wanting and the decision of the constitutional court has limitations, efforts to secure the rights of local people are underway.[12]

6.4 Land cover change in East Kalimantan

East Kalimantan is Indonesia's second largest province, covering 12.9 million ha and accounting for 6.7% of the country's total land area (Badan Pusat Statistik Provinsi Kalimantan Timur 2016). The province consists of three cities (Samarinda, Balikpapan and Bontang) and seven districts (Mahakam Ulu, Berau, Kutai Kartanegara, East Kutai, West Kutai, Paser and Penajam Paser Utara). The population of East Kalimantan is 3.4 million as of 2015 (ibid.). It includes indigenous Dayak and Kutai, as well as Javanese, Chinese, Banjarese, Bugis, and Malay people (Republic of Indonesia 2016).

In East Kalimantan, the forest cover in 2012 was 6.8 million ha (ibid.). This consisted of 2.17 million ha of primary dryland forest, 4.32 million ha of secondary dryland forest, and 0.33 ha of other forest (primary and secondary mangrove forest, and primary and secondary swamp forest) (ibid.). Figure 6.4 shows the administrative boundaries, Figure 6.5 shows the land cover of East Kalimantan in 2017, and Figure 6.6 shows the administrative classification of the forest area. Primary and secondary dryland forest remains on hilly or mountainous areas. These areas are basically where conservation forest, protection forest and limited production forest are found. However, some of these forest areas under administration classification have already been converted to bush/shrub and shrub-mixed dryland farms. Most of the bush/shrub, swamp shrub, plantation forest and estate crop plantations are located in the lowland areas, from the centre to the southeast part of East Kalimantan.

[11] As a result, for example, Article 1 Number 6 in 1999 Forestry Act "Customary forest is state forest which exists in customary law community area" became "Customary forest is forest which exists in customary law community areas".

[12] One of the important conditions for the recognition of customary forest as *hutan adat* is that the local government recognises the existence of customary forest as *hutan adat*. Badan Registrasi Wilayah Adat (BRWA), an organisation established by NGOs to register customary territory of indigenous people, identified 9.3 million ha of existing customary forest. This includes both the customary forest already recognised and not recognised by local government. The Joko Widodo administration has recognised 21,918 ha of customary forest (*hutan adat)* as of 2018 (MoEF 2018b). Because many of the customary forests exist in forest area (*kawasan hutan*) and concessions including natural forest logging and industrial tree plantation concessions have been issued for these areas, it will take time to recognise all these customary forests.

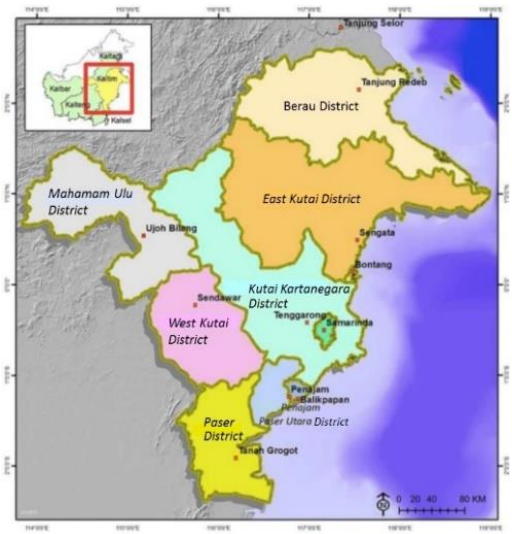

Figure 6.4 Administrative map of East Kalimantan province

Source: Figure 1 in Republic of Indonesia 2016

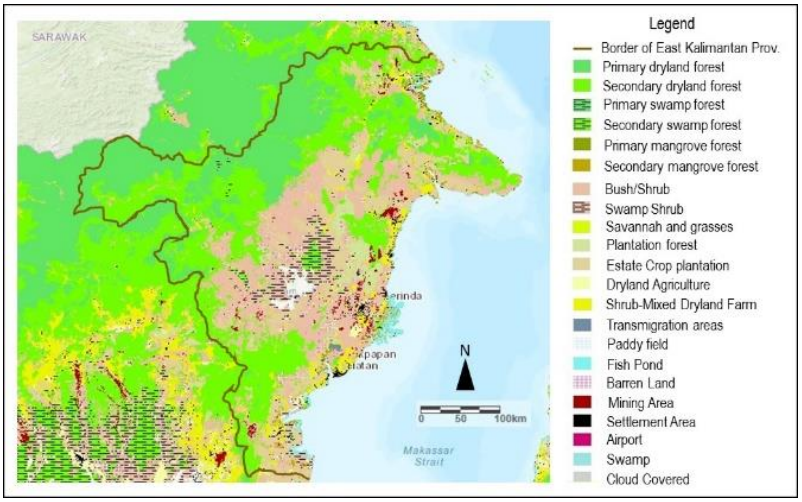

Figure 6.5 Land cover of East Kalimantan, 2017

Source: WebGIS MoEF Indonesia
http://webgis.menlhk.go.id:8080/kemenhut/index.php/id/peta/peta-interaktif (accessed 18 May 2018)

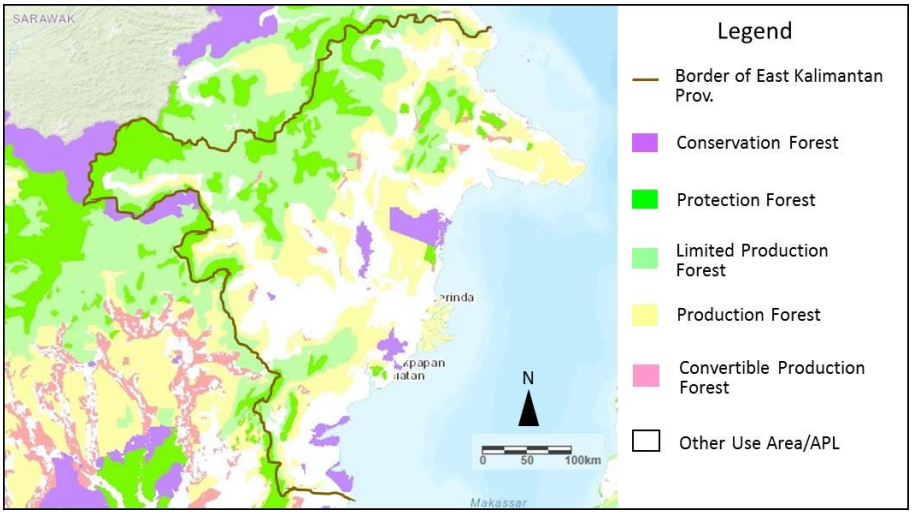

Figure 6.6. Administrative land classification of East Kalimantan as of 2018

Source: http://webgis.menlhk.go.id:8080/kemenhut/index.php/id/peta/peta-interaktif (accessed 18 May 2018)

Photo 6.1 Oil palm plantation in Paser district, East Kalimantan

Source: Taken by author in July 2009

According to statistics of the provincial estate office of East Kalimantan, the planted area of oil palm was 0.34 million ha in 2007 (Dinas Perkebunan Kalimantan Timur 2011), which increased to 1.15 million ha in 2016 (Dinas Perkebunan Kalimantan Timur 2017a). Oil palm plantations occupied

87.6 % of a total 1.3 million ha of plantation areas in East Kalimantan in 2016.13 Of the total of 1.15 million ha of oil palm, 75.9% was established as company oil palm and 24.1% as smallholder oil palm. Other tree crop plantations including cacao, coconut, pepper and coffee were developed by smallholders, with the exception of rubber.14 Oil palm plantations are found in all seven districts; 39.1% in East Kutai, 17.6% in Kutai Kartanegara,15.7% in Paser, 11.1% in West Kutai, 10.5% in Berau, 4.1% in Penajam Paser Utara, 1.8% in Mahakam Ulu, and 0.1% in three cities (Samarinda, Bontang and Balikpapan) (ibid.).

6.5 Impact of decline of the logging industry and oil palm and rubber land developments on livelihoods of local people

This section provides an overview of the impact of the decline of the logging industry, oil palm plantations and high-yielding rubber plantations/smallholdings on the livelihoods of local people based on the author's field work during 2007-2009 in East Kalimantan (Inoue and Kawai 2010; Kawai 2011; Kawai 2011). The study areas are shown in Figure 6.7.

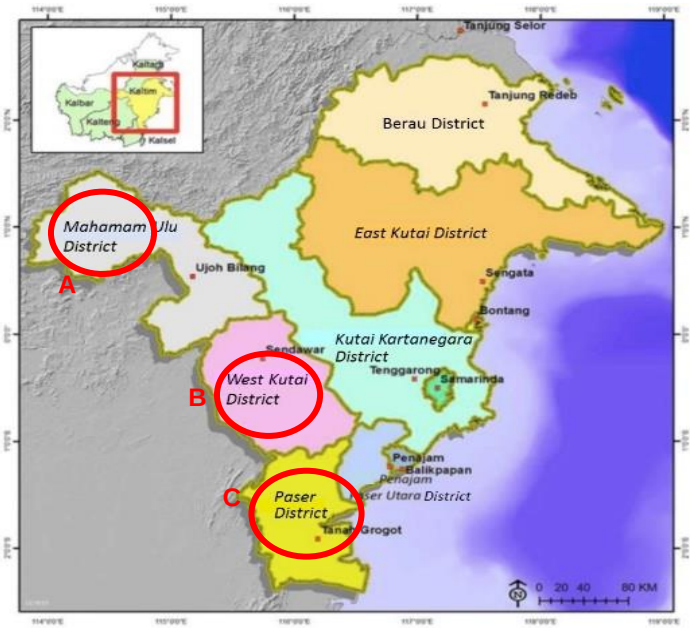

Figure 6.7 Study sites in East Kalimantan

Source: Author, based on Figure 1 in Republic of Indonesia 2016

[13] The area of oil palm was 1,150,078 ha; rubber, 116,869 ha; cacao, 7,931 ha; coconut, 22,897 ha; pepper, 9,382 ha; coffee, 3,049 ha: and others, 2,771 ha (ibid.).

[14] 80.4% of rubber plantations covering a total of 116,869 ha were developed by smallholders and 19.6% by companies (ibid.).

6.5.1 Decline of the logging industry in Mahakam Ulu district

The monetary economy has penetrated rapidly since commercial logging began in 1970 in the upstream of the Mahakam River (Site A in Figure 6.7). Many local people started working as labourers and sold fish and vegetables to the logging companies. Villagers were able to purchase modern appliances. The use of electrical generators, outboard engines, televisions and other electrical appliances spread. However, while the local communities enjoyed some benefits from the logging, the state ignored their systems of customary land classification and granted logging companies the rights to fell and remove trees in customary forest. At that time, villagers could not protest because the companies were protected by the military and the police. In 1998, democratisation and decentralisation processes accelerated as a result of the resignation of President Soeharto. Since then, government repression of local people has declined. Forestry Act No. 41/1999 was introduced, recognising the existence of customary land to the extent that it does not conflict with the national interest. The influence of the military declined and companies were required to obtain the agreement of local people to operate on their customary lands. Local people were granted more rights.

Due largely to unsustainable rates of timber harvesting, the logging industry has been in decline. Illegal logging has also become more difficult because of restrictions introduced by the Yudoyono administration in 2006. As a result, many local people faced economic hardship. They called this situation the "*Musim Krisis*" (crisis season). In response, local people began planting commercial tree crops and fast-growing trees, such as rubber and silk trees (*Albizia chinensis*).[15] In 2007, the Government launched a large oil palm plantation programme in the region.

According to the author's survey in 2007,[16] 33.4% of sampled households lived under the Indonesian poverty line of US$ 0.60. Many lost their cash income as a result of the decline of the commercial logging industry and the actions against illegal logging. People obtained only a little income from fishing and working on neighbours' farms.[17] Some households could not meet educational and medical expenses. In this region, households required 20 million Rupiah (equivalent to 2,188 USD as of 2007[18]) per year to meet their basic living requirements. The only people who earned this level of income were public servants and shopkeepers. Opportunities for such jobs were limited. In addition, because of a long drought, many families had to buy rice from external sources in 2007. In these circumstances, the villages decided to accept oil palm developments.

6.5.2 Oil palm development in Paser district

Paser district (Site B in Figure 6.7) is the first district in East Kalimantan where an oil palm plantation was developed. The land development began in 1983. As of 2008, the total area of oil palm plantations in Paser district was 95,822 ha. The state-owned company had established 13,440 ha of

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[15] This tree is known as *Kayu Sengon* in Indonesia. Its wood is used to produce medium-density fibreboard (MDF).

[16] A structured household survey was conducted of members of *Credit Union Petemai Urip* (CUPU) which was developed by local people in nine villages from November 2007 to March 2008. One hundred and fifty members were selected randomly from 2,246 CUPU members, omitting members who were under 17 years old, staff and board members. Of these, 101 households were interviewed. In this paper, data from 48 households in the Middle-Upper Mahakam region are used for the analysis (Kawai 2011).

[17] A system of labour exchange exists in the village for swidden agriculture. This has a redistributive function of providing cash income to the poor.

[18] 1 USD was 9,140 rupiah in 2007 (Bank Indonesia 2008)

oil palm plantations; private companies, 46,475 ha; the state-owned company for smallholders, 24,854 ha; smallholdings with the support of the local government 9,345 ha; and smallholdings without any support, 1,708 ha.[19]

"T" village and "G" village were selected as the research sites. Both villages are located at the centre of the oil palm industry and had oil palm plantations and oil palm mills established by the state-owned company.

In both villages, indigenous people were initially discriminated against in oil palm plantation development. At that time, during the Soeharto regime, state-owned companies expropriated customary land with the support of the military. Villagers described their economic situation as hard. They cultivated rice in both swidden and paddy fields and obtained a little cash income from selling rattan and day labour. In G village, after 1993 the local government began to support the establishment of oil palm smallholdings for local people. However, participation was low. Also, oil palm plantations for local people were not developed, despite promises made by the state-owned company. In 2000, after the resignation of Soeharto, some villages, including T and G villages, demonstrated against the state-owned company. They then received support for oil palm planting from the state-owned company through its support programme. The state-owned company also hired many local people.

The household survey found that in T village 17 sampled households with oil palm smallholdings had holdings with an average area of 2.3 ha.[20] They generated an income of 18 million Rupiah per year from their oil palm. In G village, the average area of oil palm of 20 households with smallholdings was 3.3 ha. They earned 33 million Rupiah per year from oil palm.

The advantage of oil palm cultivation is that it can be developed as a side business. There are only two harvest times each month. Application of fertiliser and weeding are required only 2-3 times per year. Some smallholders hire workers for the harvest. Smallholders, then, need not devote much time to their oil palm. Thirty-one sampled households received income from other businesses in addition to the income from their oil palm smallholdings. Other researchers also identified the same economic benefits of oil palm smallholdings (Feintrenie, Chong, and Levang 2010; Zen, Barlow, and Gondowarsito 2005).

Regarding land expropriation, 15%-19% of the land in T village and 36% of the land in G village was expropriated. Because many wetlands still exist in the area of T village, land expropriation is limited and paddy fields and oil palm plantations can coexist. However, in G village, oil palm monoculture is expanding and few paddy fields and vegetable farms remain. This issue has become critical for the preparation of the next generation's land. The household survey highlighted the importance of considering how much customary land should be provided to companies for oil palm. Regarding

[19] The data were from the interview of officials of the estate office of Paser District (*Dinas Perkebunan Kabupaten Paser*) in July 2009. The total area of smallholdings of oil palm that did not receive support is likely to be much higher than that reported because there are smallholdings of oil palm which were not registered in the estate office of Paser District.

[20] In T village, 31 households were interviewed. Data from 25 indigenous households are used for this paper. Seventeen households had oil palm smallholdings. These consisted of smallholdings supported by a state-owned company, smallholdings supported by the district government, and non-supported oil palm smallholdings. In G village, the household survey covered 20 indigenous households with oil palm smallholdings supported by the provincial and district government. Simultaneously some households also had oil palm smallholdings supported by the state-owned company and/or non-supported smallholdings (Kawai and Inoue 2010; Kawai 2011).

environmental impacts, some villagers stated that after oil palm plantations were developed, the groundwater often dried up. The impact on forests was not as significant as they were already heavily degraded by the time oil palm took-off in the area.

6.5.3 Rubber plantation development in West Kutai district

The main livelihood of local people in the centre of West Kutai district (Site C in Figure 6.7) was selling latex from rubber trees. The trees were first introduced by Dutch missionaries during the colonial era. This area was selected by the Government for one of the state programmes to develop high-yielding tree crops under the Rejuvenation, Rehabilitation and Expansion of Export Crop/*Peremajaan Rehabilitasi dan Perluasan Tanaman Ekspor* (PRPTE) financed from the national budget, and the Tree Crop Smallholder Sector Project (TCSSP) funded by the Asian Development Bank. One of the main differences between these projects and the oil palm programme supported by the oil palm company in Paser district was that local people did not provide any customary land to a company for rubber. The reason for this is that latex can be sold to buyers in remote areas. With 1,208 ha of rubber established by PRPTE from 1981 to 1983 and 9,179 ha of rubber established by TCSSP from 1992 to 2001, a total of 10,387 ha of high-yielding rubber smallholdings were developed. The majority of participants are the Tonyoi Dayak people.

"N" village was selected as a research site in this region. In N village, a total of 508 ha of high-yielding rubber smallholdings (34 ha, PRPTE; 474 ha, TCSSP) were established, occupying 15.5% of the village area. In 2008, the cash income from rubber smallholdings made up 86% of the total cash income of the village. Fifteen of 18 sample households[21] who joined the project were in the middle or rich category. Two "very low income" households did not join the project. Before the project started, the villagers' main occupations were shifting cultivation, vegetable cultivation, fishing, and hunting in the forest. Their sources of cash income included unstable day labour and selling rattan. Villagers stated that they could not improve their lives when they engaged only in traditional farming. After the high-yielding rubber project began, the participants had more stable cash incomes and could meet most of their needs/wants for food, education, motorcycles, electrical appliances, furniture, and housing. According to villagers, the advantage of rubber smallholdings is that participants can earn stable cash income through only two hours of work every morning. Participants can work in other jobs and have time to rest in the daytime. Villagers regarded the lifestyle change through the project positively.

Through these three cases, the impact of the penetration of the monetary economy on the livelihoods and lifestyle of local people in East Kalimantan can be observed. As the first case clearly shows, the decline of the logging industry had significant negative impacts on the local people, as the logging industry provided them opportunities to create alternative income sources and enabled them to enjoy the benefits of modern appliances. The second case showed that oil palm had positive impacts on the local economy, but for local people was at the expense of the expropriation of some of their customary land. The third case suggests that the high-yielding rubber project also provided positive economic impacts, but not at the cost of people having to give up their customary land. The next section discusses the current situation and the land-use plan of East Kalimantan.

[21] In N village, West Kutai district, 20 sample households were randomly selected in RT 3. Eighteen households had rubber smallholdings supported by the project, 1 household had a rubber smallholding without support, and 1 household works on another person's rubber smallholdings supported by the project (Kawai and Inoue 2010; Kawai 2011).

6.6 Prospects for REDD+ and East Kalimantan's land-use plan

Since the 13th Conference of the Parties (COP) to the UNFCCC, which was held in Bali in 2007, Indonesia has been preparing for REDD+ at national and sub-national levels. Indonesia's first Nationally Determined Contribution (NDC) submitted to the UNFCCC at the 22nd COP positions REDD+ as an important part of the Government's strategy to achieve the NDC emission reduction target (Kawai et al. 2017). The basic architecture for REDD+ at the national level – a national strategy, a national forest reference emission level (FREL), a national forest monitoring system (NFMS), and a safeguards information system (SIS) – is mostly now in place. The Government states that in Indonesia REDD+ is a national approach with sub-national implementation.

Because much of the national REDD+ architecture is now set up, the focus of REDD+ readiness has moved to the sub-national level. At the sub-national level, 11 pilot provinces have developed provincial REDD+ strategies and action plans. The World Bank's Forest Carbon Partnership Facility (FCPF) Carbon Fund (CF) Programme is aiming to pilot result-based payments for REDD+ at the sub-national level. East Kalimantan was selected as one of the CF Programme sites in 2015. A strategy to reduce net carbon emissions from forests will be implemented and its effectiveness monitored at the province level.

According to Emission Reductions Program Idea Note (ER-PIN) submitted to FCPF by the Government of Indonesia, deforestation occurred over 1.6 million ha and forest degradation over 0.86 million ha in East Kalimantan during the period 1996-2012. The CF Programme in East Kalimantan targets major sectors/sources identified as the drivers of deforestation and forest degradation in the *Strategi dan Rencana Aksi Provinsi* / Provincial Strategy and Action Plan (SRAP) including oil palm and coal mining (Table 6.2). The Programme is intended to be implemented with the participation of stakeholders including central and local governments, international organisations, NGOs, private sector actors, local people and academia. The expected period of the CF Programme is 2019-2024. The annual emission reduction target is 7,403,800 tCO_2e (Republic of Indonesia 2016).

Figure 6.8 shows the map of spatial planning of East Kalimantan (2016-2036), which was issued by the Governor as an East Kalimantan provincial regulation in 2016. The light green colour shows the area for plantation in APL, which covers 3.7 million ha, or 29% of the land area of East Kalimantan. As the plantation area was 1.3 million ha in 2016, this means that a maximum of 2.4 million ha of new plantations can be developed. However, the Provincial Government also aims to conserve 640,000 ha of natural forest and 50,000 ha of peatland that exists in the area set aside for plantations by 2030. The Provincial Government also aims to promote the implementation of Indonesian Sustainable Palm Oil (ISPO), a national mandatory sustainable palm oil certification system (Herdianto 2018). To support sustainable palm oil production, it also intends to develop a web-based estate geospatial information system to provide data for policies, support people to obtain land certificates, monitor high conservation value areas, and implement systems to prevent land fires, control pests as well as handle conflicts (ibid.). In terms of forest protection, the Provincial Government aims to implement the national moratorium on new permits for the development of peatlands and natural forests.[22] The national government first committed to this moratorium under a

[22] *Keputusan Menteri Lingkungan Hidup dan Kehutanan No. SK.6559/MenlhkPKTL/IPSDH/PLA.1/12/2017 tentang Penetapan Peta Indikatif Penundaan Pemberian Izin Baru Pemanfaatan Hutan, Penggunaan Kawasan Hutan dan Perubahan Peruntukan Kawasan Hutan dan Areal Penggunaan Lain Revisi XIII*.

Letter of Intent it signed with Norway. These areas are located in conservation forest and protection forest and are depicted in Figure 6.9.

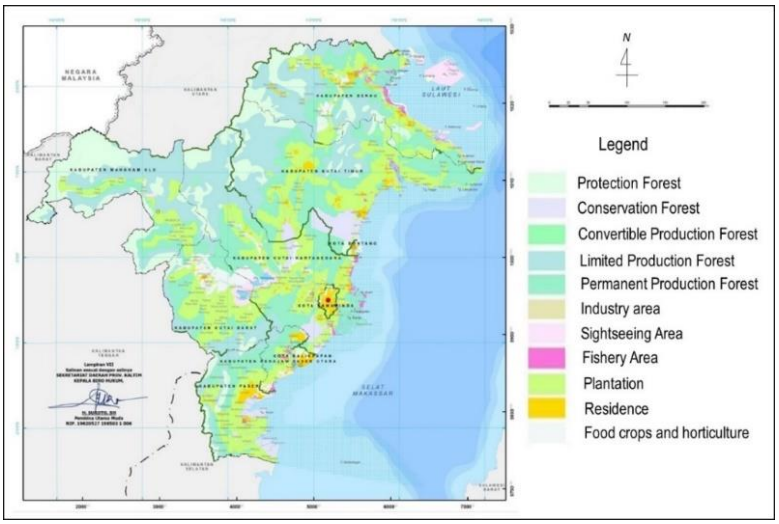

Figure 6.8 Map of spatial planning of East Kalimantan (2016-2036)

Source: Peta Rencana Pola Ruang in Peraturan Daerah Provinsi Kalimantan Timur Nomor 01 Tahun 2016 Tentang Rencana Tata Ruang Wilayah Provinsi Kalimantan Timur Tahun 2016-2036

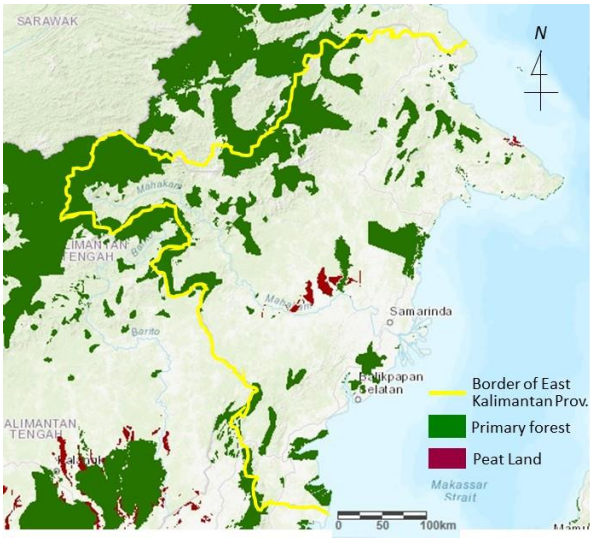

Figure 6.9 Area of moratorium for new permits

Source: http://webgis.menlhk.go.id:8080/kemenhut/index.php/id/peta/peta-interaktif (accessed 18 May 2018)

According to a report of the Mahakam Ulu District Government, which it developed with the World Wildlife Fund, 93% (1.8 million ha) of the district was covered by forest in 2013 (Pemerintah Kabupaten Mahakam Ulu 2014). As Figure 6.5 and Figure 6.8 shows, rich secondary forest still

remains in the area designated for plantation/APL. By reducing the area of new oil palm plantations to be developed, the District Government could avoid the emission of a huge volume of greenhouse gases associated with the removal of the existing vegetation. Mahakam Ulu district is thus expected to play an important role in the implementation of REDD+.

The biggest proximate cause of deforestation in Mahakam Ulu in the period 2009-2013 was the development of oil palm plantations (ibid.). Figure 6.10 shows the location of deforestation that occurred from 2009 to 2017. Much of the deforestation occurred in the APL area. According to data of the estate office of East Kalimantan (Dinas Perkebunan Kalimantan Timur 2017b), location licenses (the first stage in the licensing process for the development of an oil palm plantation) had been issued for a total of 258,931 ha by 2017, which covers most of the area for plantations in APL in Mahakam Ulu district.[23] However, all licensed areas will not necessarily be developed as oil palm plantations. In 2017, the total area covered by business licenses for oil palm (the second stage in the licensing process for oil palm) was 118,966 ha, while the total area of concessions on land (*Hak Guna Usaha*) (the final stage of the licensing process for oil palm) was only 35,047 ha. There are many requirements for companies to obtain the necessary licenses and concession rights, including having an environmental impact assessment (EIA) conducted and obtaining land rights from local people/communities in accordance with the relevant laws and regulations. In 2016, the total area of oil palm established by companies was 18,214 ha, compared with a total of only 678 ha under smallholders (ibid.). The latter area is well below that required by the regulation on plantation development licenses, which obliges companies to ensure that smallholder oil palm is at least 20% of their total plantation area.[24]

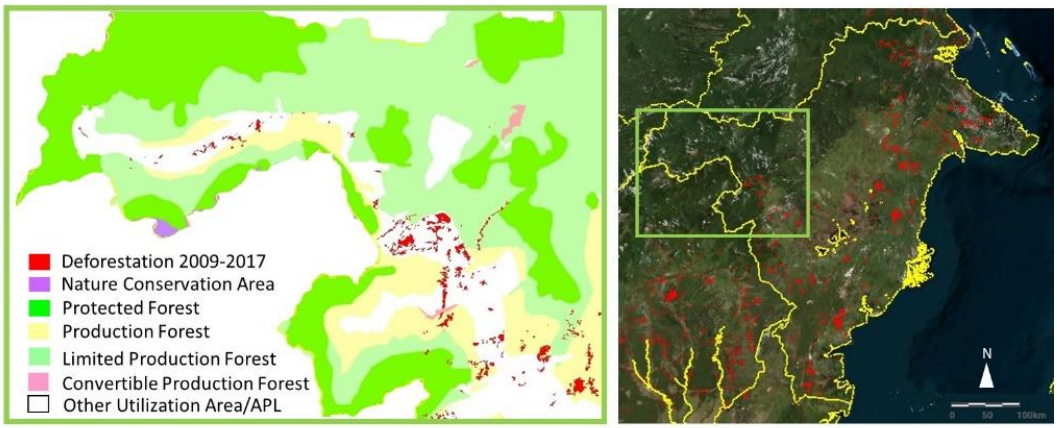

Figure 6.10 Deforestation in the upstream of Mahakam River during 2009-2017

Source: http://webgis.menlhk.go.id:8080/nfms_simontana/home/mapview/ (accessed 18 May 2018)

[23] In the spatial planning of East Kalimantan (2016-2036), the area for plantation in Mahakam Ulu district is 275,725 ha; agriculture (food crops and horticulture), 4,900 ha; aquaculture, 6,159 ha; industry, 662 ha; and residence, 2,790 ha (*Peraturan Daerah Provinsi Kalimantan Timur Nomor 1 Tahun 2016 Tentang Rencana Tata Ruang Wilawah Provinsi Kalimantan Timur Tahun 2016-2036*). As Figure 6.8 shows, most part of the APL area in Mahakam Ulu district is for plantation (light green colour).

[24] In 2017, none of the companies in Mahakam Ulu district were certified by Indonesian Sustainable Palm Oil (ISPO) or the Roundtable of Sustainable Palm Oil (RSPO).

In addition to the challenges of meeting the requirements of the licensing processes, it is also unlikely that oil palm plantations will be developed over the entire APL because of the existing land uses of the local people. These include rotational farming, fruit gardens, traditional rubber gardens, cacao plots, customary conservation forests, etc. (Inoue et al. 2013).

During a survey conducted by the author in 2017, cacao production was found to be an alternative livelihood that local people favoured over oil palm. The district agricultural office and NGOs were providing support for this, including building local people's capacities and developing small cacao processing plants in several villages. The increase of village budget allocation from the national and local government under the Law on Villages 2014[25] provides an opportunity for further support to local cacao production. Using its budget, one village allocated 700 million Rupiah for a new cacao nursery. Photo 5.2 shows cacao planted by local people in upper Mahakam River. They plant cacao with rice in swidden and also plant other fruit trees. In doing so, they are able to maintain a much more diverse and multifunctional landscape than is found in large-scale oil palm monoculture plantations. Local people can obtain cash income through cacao without giving up their customary land. They sell the cacao beans to a processing factory in Sulawesi through middlemen.

For REDD+, cacao production by customary landowners seems to be preferable to large-scale oil palm estates. Local people are able to generate income from their cacao trees and continue to use their land to provide for some of their basic food needs and to produce other agricultural produce for sale. In the case of giving up their land to an oil palm company, they receive some income from the company but lose their rights to the land. REDD+ includes a set of safeguards for local people and indigenous communities, governance and the environment that were agreed by Parties to the UNFCCC. A smallholder-based cacao industry would appear to align well with these safeguards and could be an important part of REDD+ implementation in the district.

Photo 6.2 Cacao planted by local people

Source: Taken by Author in 2006 at DB village (left) and in 2010 at LT village (right) in Mahakam Ulu district

Social forestry could be another important element of the district's REDD+ implementation. MoEF granted permits for village forests (*hutan desa*) to eight villages in 2017 (Figure 6.11). The total area

[25] *Undang-undang Republik Indonesia No. 6 Tahun 2014 tentang Desa.*

covered by the permits is 28,380 ha. The national target to achieve 12.7 million ha of social forestry translates to a potential area for social forestry for 15 villages in the district of 30,856 ha. The social forestry areas are basically former logging concession areas. The permit for village forests requires villages to conserve the forests while allowing utilisation of forest products and environmental services.[26] This means that village forests can contribute to REDD+ in terms of avoiding emissions that would have occurred if the same forests had been handed over to companies for conversion.

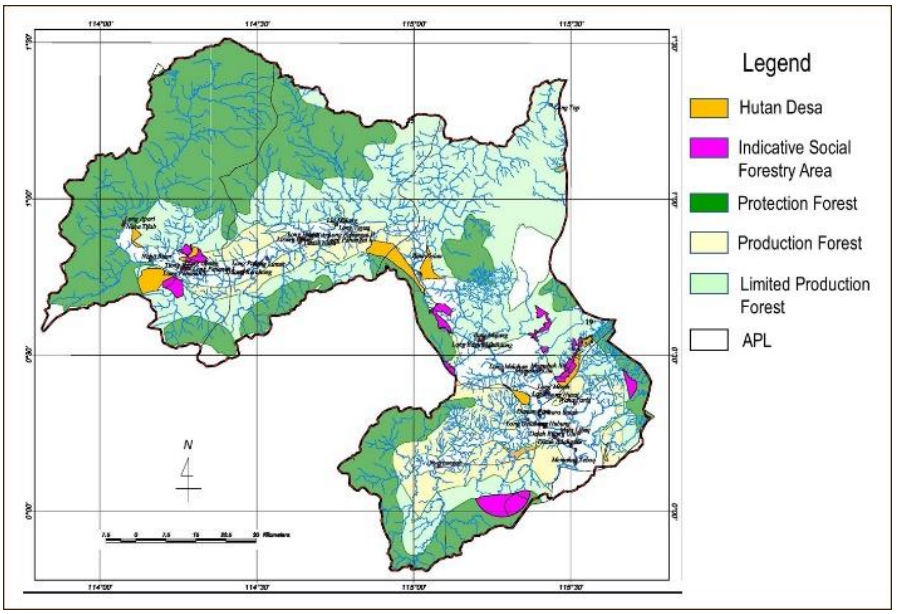

Figure 6.11 Social forestry and the planning area in Mahakam Ulu district

Source: Peta Indikatif Areal Perhutanan Sosial (PIAPS) Kabupaten Mahakam Ulu Provinsi Kalimantan Timur

Fujiwara (2017) reported many challenges in the application process of the *hutan desa* scheme based on the experiences of East Kutai district. In this district, power imbalances between an industrial tree plantation company and local people hindered the process of villagers securing official rights of use over natural resources. However, there are no industrial tree plantation companies operating in Mahakam Ulu district and it does not suffer from the same power imbalances observed in East Kutai. This may explain why relatively many *hutan desa* were approved in the district. Various forms of support may now be required for the eight villages to successfully manage their village forests. What support is required and how this might be provided under the district's REDD+ programme should be studied.

[26] Regulation of the Minister of the Environment and Forestry on Social Forestry No. P.83/MENLHK/SETJEN/KUM.1/10/2016 stipulates the right and duty for the permit holders of social forestry including *hutan desa*.

6.6.1 Contribution of REDD+ to the SDGs

Policies and activities likely to be linked with REDD+ implementation have potential to contribute to various SDGs. For example, supporting cacao production as a REDD+ activity could, by improving local livelihoods, could contribute to SDG 1 – No Poverty, SDG 2 – Zero Hunger[27] and SDG 8 – Decent Work and Economic Growth. As a REDD+ activity, social forestry could contribute to SDG 10 – Reduced Inequality by providing local people with land use rights. Smallholder oil palm plantations, as part of a broader REDD+ strategy, could contribute to several SDGs by improving the economic status of local people. The moratorium on new permits for the conversion of primary forests and conserving natural forest in the area set aside for plantations contribute to SDG 13 – Climate Action and SDG 15 – Life on Land. There is also potential for oil palm plantations to contribute to SDG 13 when they are established in open areas or degraded areas with low carbon stock (Gibbs et al. 2008 and Hartemink 2005 in Sheil et al. 2009).

For biodiversity conservation, which falls under SDG 15, there are two major approaches. The first is "land sparing", which involves spatially separating agriculture from biodiversity conservation by maximising the productivity of agricultural lands. The aim is to increase the area of contiguous natural ecosystems that can be protected for biodiversity. The second approach is "wildlife friendly farming" under which forest fragments are maintained for biodiversity at the plantation level (Foster et al. 2011). Complex social-ecological interaction between humans and nature is assumed in this concept (Fischer et al. 2008).

It appears that the spatial planning of East Kalimantan and the moratorium on permits for new land developments adopt the "land sparing" approach (Figure 6.8 and Figure 6.9). The "land sparing" approach is regarded as a better choice from an efficiency perspective with respect to biodiversity conservation and agricultural productivity. However, "wildlife friendly farming" should also be considered in the context of landscapes in which secondary forest, oil palm, swidden agriculture, and cacao cultivation co-exist. This would require the involvement of various stakeholders including local people, companies, NGOs, international organisations and local government.

The approach that is most appropriate and feasible depends on historical and socioeconomic contexts including historical land ownership patterns and individual farmers' preferences (Fischer et al. 2008). The selection of an approach should reflect their relative contribution to SDG 15 and how this contribution relates to other SDGs. In either approach developing effective partnerships (SDG 17) among relevant sectors and stakeholders is key.

6.7 Conclusion

The area under oil palm plantations in East Kalimantan is expanding rapidly. Oil palm is changing the landscape, even in the upstream forested districts where the last major areas of tropical forest remain. As the case study in Mahakam Ulu district shows, the decline of the logging industry resulted in economic hardship for local people, who had come to enjoy the benefits of modern goods and services. Alternative livelihoods for cash income are now crucial for them. In the case of Paser district, oil palm had positive economic impacts on local people, but forced them to part with some of their customary land. The high-yielding rubber project in West Kutai district demonstrated

[27] According to the author's survey, there was no hunger amongst local people in Mahakam Ulu district even in years of drought. They were able to obtain necessary foods through swidden agriculture, fishing, hunting and the gathering of other NTFPs.

that it is possible for local people to be involved profitably in the production of commercial crops without land expropriation. Various land uses of local people were observed in Mahakam Ulu district, including swiddens, land in fallow, fruit gardens, traditional rubber gardens, cacao plots, and customary conservation forests. So, while the current main trend in land use is transformation for oil palm plantations, other options exist to diversify the livelihoods of local people. Cacao is the current preferable livelihood of local people in the upstream part of the Mahakam River. They are receiving support from NGOs and the local government for their cacao cultivation through capacity building and the construction of a small cacao processing factory.

Sub-national level REDD+ under the FCPF CF programme can provide opportunities for all relevant sectors and stakeholders in the land and estate sector, including local people in East Kalimantan, to participate and contribute to the emission reduction goal through their own ways and actions. This study on land use and land-use change suggests that there are a variety of activities that can be incorporated into East Kalimantan's REDD+ implementation, and that these activities would also contribute to a number of the SDGs including SDG 1, SDG 2, SDG 8, SDG 13, SDG 15 and SDG 17.

The estate sector can and has pledged to contribute to REDD+ through ISPO and the protection of high conservation value forest (HCVF). Support to smallholders for the planting and harvesting of rubber and cacao, without requiring them to give up their land-use rights, can provide alternative livelihoods that are well-suited to local lifestyles and avoid carbon emissions. Village forestry and other social forestry approved by MoEF have the potential to increase the rights of local people to natural resources. Social forestry is not just about rights, however. It also comes with obligations for conservation, which makes it highly relevant to REDD+. Further study is now needed on how these opportunities can be maximised for sustainable land use in the context of pressure for oil palm expansion.

Acknowledgements

This work received support from the Japan Society for the Promotion of Science under Grants-in-Aid for Scientific Research A (Project No. 17H00804 Institutional design for biodiversity conservation in Indonesian side of the Heart of Borneo: linking local reality with global issues, led by Professor Makoto Inoue, Waseda University) and the Japan Society for the Promotion of Science under Grants-in-Aid for Scientific Research A (Project No. 26257005 Oil palm smallholders and estate companies: the behaviour changes with globalisation and the impacts, led by Associate Professor Hideki Hayashida, Doshisya University).

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CHAPTER 7

Drivers and implications of rural-urban landscape transformations: Analysis of rapid urbanisation in Dhaka Metropolitan Area, Bangladesh and Santa Rosa Watershed, the Philippines

Bijon Kumer Mitra, Brian Johnson, Ngoc-Bao Pham, Isao Endo, Rajib Shaw and Damasa B. Magcale-Macandog

Key messages

- *Enhancing the continuity and connectedness between urban and rural regions is crucial for reducing poverty, natural resource management, and maintaining ecological and cultural diversity.*
- *The case studies illustrate broader trends and challenges that rapidly urbanising areas are facing across the Asia-Pacific region. Urban growth in Asia-Pacific developing countries as a whole has largely been unplanned and disconnected from rural planning.*
- *Rapid urban growth in Dhaka city has to led to high rates of urban poverty, a shortage of infrastructure and services, and degradation of the environment.*
- *The key underlying drivers of Dhaka's geographical expansion include rapid population growth, economic growth, weak governance, policy bias and economic transformation.*
- *Policy measures and instruments that can be implemented to control unplanned urban development in Dhaka include investments to increase the attractiveness of other less populous cities, approval of the draft Urban and Regional Plan Act 2017, and incentive mechanisms, such as transfer of development rights (TDR).*
- *Land-use changes in the Santa Rosa Watershed, the Philippines are driven by industrial and residential development and have increased flood risk. Climate change is also expected to bring more rainfall events to the area, which will also contribute to more frequent flooding*
- *Countermeasures recommended to alleviate the increased risk of flooding include zoning enhancement, river rehabilitation, increasing capacity of local governments to develop climate actions, and making full use of the Santa Rosa Watershed Management Council.*

7.1 Introduction

In Chapter 2 it was pointed out that as much of half of the region's GDP is now generated in urban areas and that most of the region's population now lives in cities. These trends are set to continue, which may lead some to believe that the importance of rural areas for regional wellbeing and security is declining. However, urban and rural areas have strong economic and environmental interdependencies due to the high flow of goods (agricultural and manufactured), people, information, and ecosystem services between cities and their surroundings. These interdependencies, commonly understood as the urban-rural continuum, are affected by uncontrolled urban development and will be increasingly affected by climate change. The consequences are likely to be wide-ranging, and could include increased risks of and vulnerability to natural hazards in urban areas, degradation of ecosystem services in and from rural areas, and loss of biodiversity.

The importance of linkages between urban and rural areas is recognised in global frameworks such as the UN SDGs. SDG 11 – Sustainable Cities and Communities emphasises the importance of national urban policies and regional development plans for positive economic, social and environmental links between urban, peri-urban and rural areas. It calls for sustainable urbanisation incorporating participatory approaches and the integration of climate change and disaster resilience into development policies and plans at all levels of settlement planning. Urban-rural interlinkages are also critical for achieving other SDGs, including SDG 2 – Zero Hunger, SDG 6 – Clean Water and Sanitation, SDG 7 – Affordable and Clean Energy, and SDG 15 – Life on Land. However, at present different regional authorities conduct spatial planning and resource development/management on a case-by-case basis through conventional and legal administrative planning jurisdictions. In a rapidly urbanising world, the need for more creative policy and administrative solutions for managing urban-rural linkages is becoming increasingly evident. Enhancing the continuity and connectedness between urban and rural regions is crucial for reducing poverty, achieving a satisfactory level of access to and management of resources, and at the same time maintaining the ecological and cultural diversity that is essential for regional resilience.

Chapter 2 provides an overview of rural-urban transformations and their implications in the Asia-Pacific region. The aim of this chapter is to underscore the complexity and difficulty of the issues, and the need for frequent reassessment of the problems. As with the other case studies in this report, it points to the need for place-specific solutions, though also provides more general ideas for managing rural-urban transformations.

As pointed out in Chapter 1, rapid uncontrolled transformation of rural to urban areas is a "wicked problem". "Wicked problems", by definition, defy simplistic solutions. They require in-depth understanding of local specificities and, given their dynamic nature, their analysis needs to be frequently updated. In the case of rural-urban transformation, drivers are not static and may evolve in unpredictable ways, as the landscape mosaic is changing rapidly, asserting feedback effects on the drivers. New issues, of which climate change is an especially worrying example, also arise and can quickly invalidate the results of earlier assessments and plans.

To achieve its aim, this chapter presents two case studies. The first case study is focused on a megacity that is rapidly expanding: the Dhaka Metropolitan Area of Bangladesh. The second case study focuses on a previously rural watershed that is now undergoing rapid urbanisation due to its proximity to Metro Manila: the Santa Rosa Watershed in the Philippines. Though the scale and context of these two cases are very different, they face common issues and challenges associated with rapid and insufficiently directed urbanisation.

This chapter begins with a brief overview of urban land expansion in Asia, building on the information presented in Chapter 2. The cases are then presented separately, beginning with Dhaka Metropolitan Area, followed by the Santa Rosa Watershed. The concluding discussion provides recommendations specific to both case study areas, as well as more general recommendations for areas experiencing uncontrolled or insufficiently directed urban expansion.

The contents of this chapter are based on a literature review as well as research projects conducted in the two case study areas by the Institute for Global Environmental Strategies (IGES) and its local partners.[28]

7.2 Urban land expansion in Asia

Asia is home to ancient urban civilisations. They constructed the world's largest ancient cities of Sravasti and Champa in 400 BC, and Pataliputra (Patna today) in 250 BC. Large-scale expansion of Asia's urban areas started from the mid-16th Century. This was concentrated around major port facilities, because of the demand for industrial raw materials from Europe. At the end of the colonial era, many Asian leaders made transitioning from agriculture to industry a national priority. This has served as an underlying driver of rapid urbanisation.

Of the ten most populous cities of the world, seven are in Asia: Tokyo, Delhi, Shanghai, Mumbai, Beijing, Dhaka and Kolkata. Currently, about 50% of people in Asia live in urban areas (United Nations 2018). By 2050, Asia's population is projected to grow by one billion people, with 90% of this population growth projected to occur in cities (Schneider et al. 2015).

These figures indicate that an immense increase in built-up area can be expected. Urban areas have been growing rapidly in recent decades, though there are great disparities in the pace of urban area expansion within the region. Urban expansion has been especially rapid in China, where the urban area grew from 12,200 km^2 in 1992 to 72,900 km^2 in 2015 (Xu et al. 2016).

Figure 7.1 shows population growth and urban land expansion in selected Asian megacities from 2000 to 2010. Urban land expansion rates ranged from 3% in Tokyo to 117% in Shanghai. A large amount of public investment in urban construction in Shanghai partly explains the city's rapid outwards growth. Dhaka experienced the second highest land expansion rate in the same period; however, urban expansion per additional inhabitant was the lowest in Dhaka, as it is the region's most densely populated city.

[28] The first case study draws on research conducted by IGES in collaboration with University of Dhaka in Dhaka Metropolitan Area on the integrated governance of urban-rural resource flows. The second case study uses the results of an ongoing study by IGES and the University of the Philippines Los Baños on watershed management in the Santa Rosa Watershed in the Philippines.

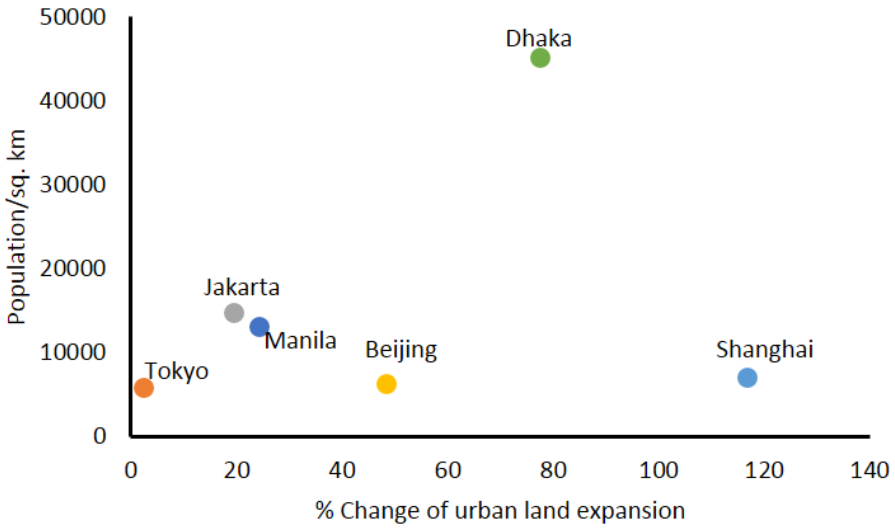


Figure 7.1 Population and urban land expansion in selected megacities in Asia

Source: Prepared by authors based on World Bank (2015)

Urbanisation in Asia has contributed to impressive economic growth and poverty reduction in the region and has improved the lives of hundreds of millions of people (World Bank 2015). However, when not well planned, urban expansion can lead to social problems, such as conflict between different interest groups, substandard housing, unhealthy living conditions and insecure and unsafe employment. Poorly managed urban growth can also result in food and water insecurity due to loss of agricultural land and natural water bodies as well as overexploitation and degradation of natural resources. The social and environmental implications of unplanned urbanisation are explored more deeply in the two case studies.

The case studies analyse the trends, drivers, and trade-offs of the land-use changes associated with urban expansion in the two case study sites. The Dhaka case study provides an example of a megacity's rapid growth into surrounding rural areas. Santa Rosa Watershed, located near Manila (another megacity), provides an example of how urban growth and urbanisation spreading from a nearby city can affect a rural area historically used mostly for agriculture and agroforestry.

7.3 Dhaka city

Dhaka, the 11th largest megacity of the world, is the centre of economic development in Bangladesh and is responsible for most of the country's urban growth. Dhaka is home to nearly 10% of Bangladesh's population, and around 36% of the country's urban population lives in this city (World Bank 2017a). Dhaka is the largest economic centre and place for non-farm job opportunities in Bangladesh. Its economic growth has been mainly dominated by industrial development. Population growth has gone hand-in-hand with the city's economic growth. Dhaka's population growth has mainly been driven by migration of the rural population to the city in search of non-farm jobs and better social services including education and health.

The growth of Dhaka has largely been unplanned and uncontrolled. This has resulted in high rates of urban poverty, a shortage of infrastructure and services, and degradation of the environment.

Water quality and air quality have been severely affected. The low-income groups are especially exposed to these negative impacts. Dhaka's outward expansion and the dumping of waste have also jeopardised natural resources and the environment in the peri-urban area. This has had negative feedback effects on the city, including increased water insecurity due to groundwater depletion and water pollution, and more severe and longer flood events.

7.3.1 Urban expansion trends in Dhaka Metropolitan Area

Dhaka became Bangladesh's largest city about 400 years ago. Over this period, the area of the city expanded from 1 km^2 in 1600 to 112 km^2 in 2010 (Figure 7.2). Rapid urbanisation began after Bangladesh's independence in 1971. The city's growth accelerated, with the urban land area expanding from 138 km^2 to 365 km^2 between 1989 and 2014 in greater Dhaka (Figure 7.2) (UN-HABITAT, n.d.). It is likely that rapid urbanisation will continue in Dhaka Metropolitan Area in the coming years. Dhaka's population could grow by more than 10 million people to become the world's sixth largest megacity by 2030 (UNDESA 2014).

To cater to the growing demand for new urban areas, the Capital Development Authority (RAJUK) prepared a new Dhaka structure plan for 2016-2035. This new plan recommended expansion of Dhaka Metropolitan Area beyond the administrative area of Dhaka City Corporation by transforming suburban and rural areas of the neighbouring districts (Figure 7.3). The size of the Dhaka Metropolitan Area is 1,528 km^2 and it covers multiple administrative boundaries: four city corporations (Dhaka South, Dhaka North, Narayanganj and Gazipur City), five municipalities (Savar, Tarabo, Kaliganj (Part), Kanchan (Part), Sonargaon (Part)), and seventy union parishads[29] distributed in three districts (Dhaka, Narayanganj and Gazipur).

Explosive population growth has already been reported in peri-urban areas outside of the Dhaka City Corporation's boundaries. The highest growth rates have occurred in the western region (Savar) at 9.26% annual growth, and in the northern region (Gazipur) at 7.43% annual growth between 2001 and 2011 (RAJUK 2016). This unplanned and scattered urban development is posing great challenges to the sustainability of Dhaka city.

[29] The Union Parishad is the smallest rural administrative and local government unit in Bangladesh.

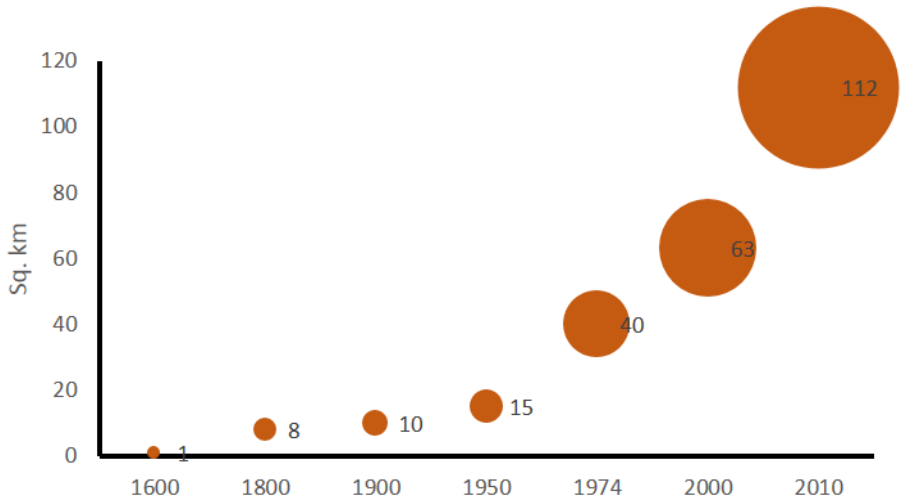


Figure 7.2 Historical trend of spatial expansion of Dhaka Metropolitan Area

Source: Compiled from Ahmed et al. (2014) and Pramanik and Stathakis (2016)

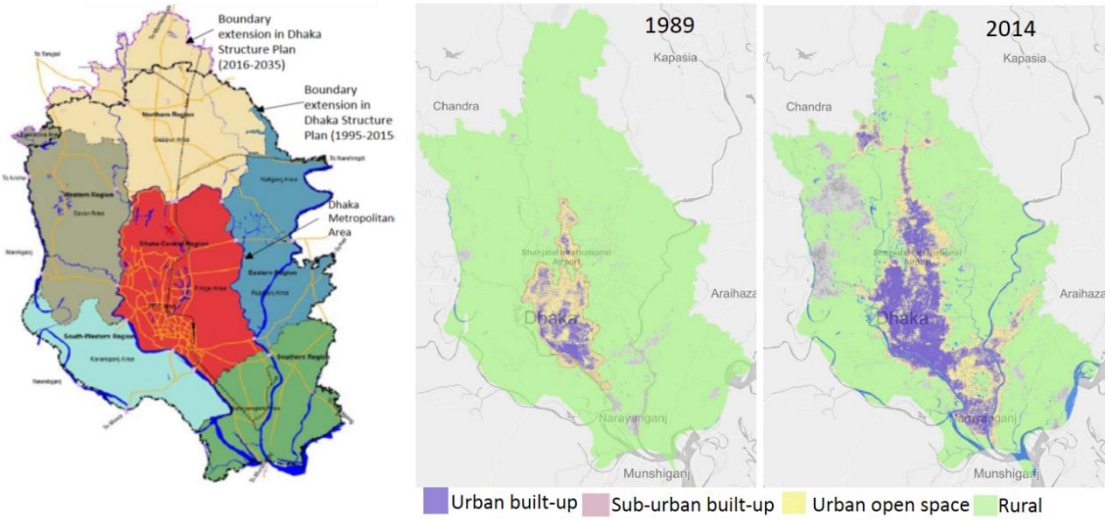


Figure 7.3 Maps of Dhaka Metropolitan Area and future extension plan, and urban land expansion from 1989 to 2014

Source: RAJUK (2016) and UN-HABITAT (n.d.)

7.3.2 Major land use changes in Dhaka Metropolitan Area

Urban expansion is responsible for major physical and environmental change of the Dhaka Metropolitan Area, mainly as a result of land transformation (Rahman and Hasan 2011). Figure 7.4. shows an analysis of land-use data between 1989 and 2014, which found that Dhaka's built-up area reached 178 km^2 in 2014; this was 82% larger than the city's built-up area in 1986 of 98 km^2 (Morshed, Yorke, and Zhang 2017). This expansion of built-up area resulted in the loss of other

classes of land use including 17 km^2 of water bodies (48% area loss), 72 km^2 of vegetation (23% area loss) and 25 km^2 of agricultural land (87% area loss) between 1989 and 2014 (Figure 7.4). Dhaka took over a variety of rural areas, including farms, wetlands and areas under natural vegetation, as it grew.

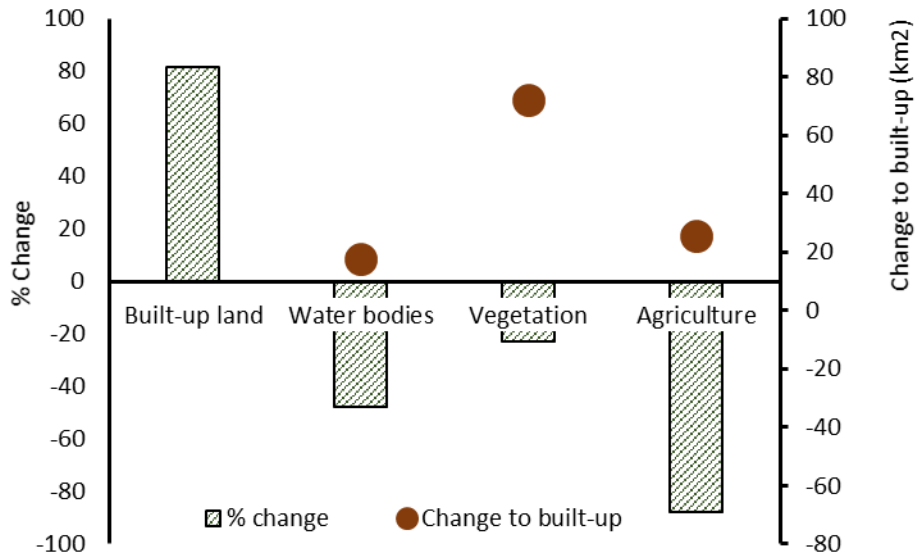


Figure 7.4 Land-use change in Dhaka Metropolitan Area between 1989 and 2014

Source: Prepared by authors based on Morshed et al. (2017)

7.3.3 Underlying drivers and proximate causes of rural-urban transformation in Dhaka Metropolitan Area

Dhaka is the largest and fastest growing urban agglomeration of Bangladesh. The key underlying drivers of its geographical expansion include rapid population growth, which is mainly a consequence of inward migration, economic growth, weak governance, policy bias and economic transformation (Figure 7.5).

Migration-driven rapid population growth

Dhaka's population has been growing at a very fast rate of 5%/year over the last two decades, which is higher than the national population growth rate of 2.2%/year (RAJUK 2016). This remarkable population growth is mostly a result of rural to urban migration. In 2011, rural to urban migration contributed to 63% and natural population increase to 37% of the population growth in Dhaka (Figure 7.6). Every year Dhaka city receives 300,000 to 400,000 migrants from rural areas (World Bank 2007). Rural people migrate to Dhaka because of both "push" and "pull" factors. The major push factors include floods and natural disasters, river erosion, low income levels, and exploitation by the rural elites and moneylenders in their hometowns.

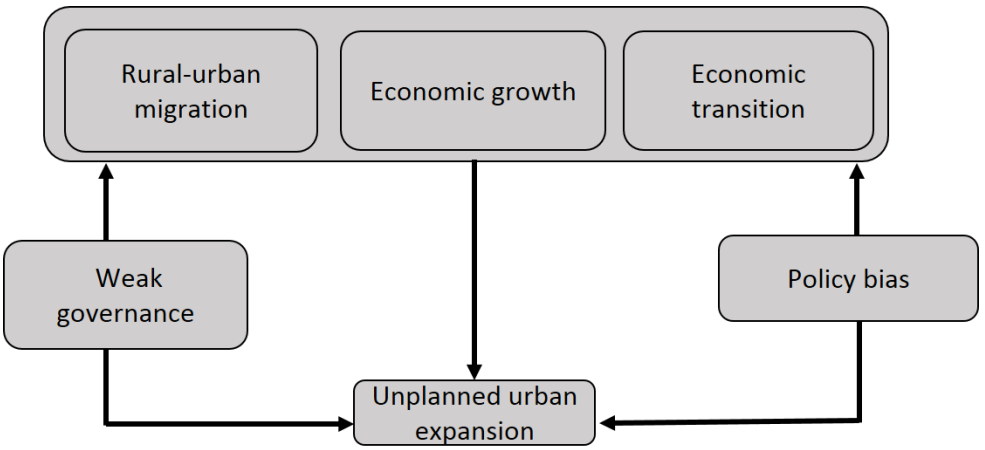


Figure 7.5 Underlying drivers of urban land expansion in the Dhaka metropolitan area

Source: Prepared by authors

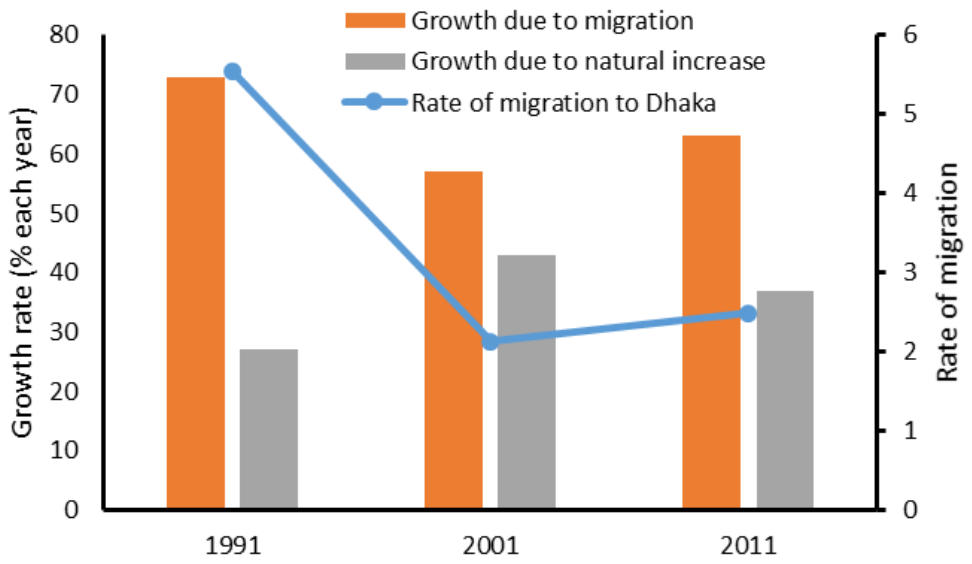


Figure 7.6 Population growth rate and causes in Dhaka, 1991-2011

Source: Prepared by authors based on RAJUK (2016)

A survey of 334,431 households found that 20% of respondents were pushed to migrate to Dhaka because of low rural income levels, 17% by river erosion and 13% due to displacement by rural elites (Figure 7.7). A significant portion of the migrant community came to Dhaka searching for better job opportunities. The demand of migrants for housing led to the expansion of built-up areas in the greater Dhaka region.

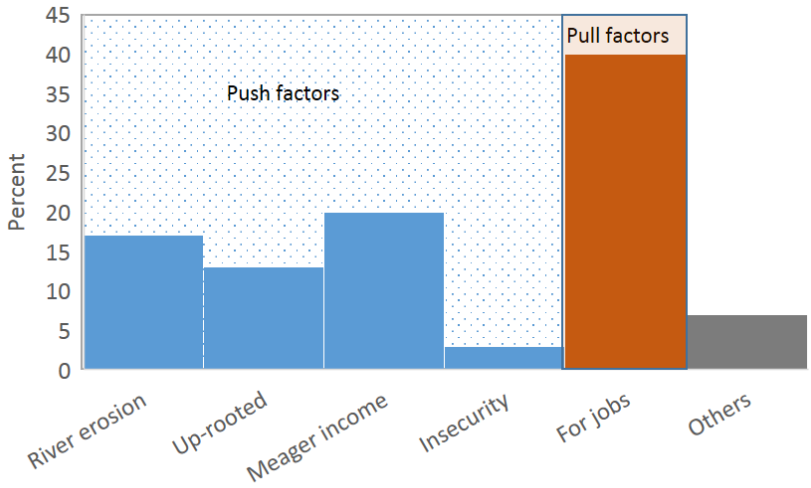


Figure 7.7 Push and pull factors for migration from rural areas to Dhaka

Source: Prepared by authors based on Rahaman and Ahmed (2016)

Economic transition and growth

In Bangladesh Vision 2021, the Government has set an ambitious target for Bangladesh to become a middle-income country by 2021. To achieve this target, the Government aims for Bangladesh to gradually shift from an agriculture-based economy to an industry- and service-based economy. It is promoting industrial policies to encourage the private sector to lead industrial growth, attract foreign direct investment, and create employment opportunities for women. As a result, the number of industrial establishments increased from 27,917 in 2001 to 42,792 in 2011 (Bangladesh Bureau of Statistics 2012). Dhaka accounts for 35% of total GDP and provides over 62% of total industrial sector-related employment opportunities in Bangladesh (Jahan 2017). Figure 7.8 shows the share of greater Dhaka of the total employees of the country in the major industrial sectors. These data reinforce the notion that employment opportunities are pulling rural people to the capital city.

Policy bias

As Dhaka is the capital city, the national government of Bangladesh tends to focus its national urban development plans on it. This favouritism often involves disproportionate allocation of the national budget to, and the provision of a higher level of public services in, Dhaka than in other cities. In fiscal year 2016, of the 13,470 million Taka[30] allocated by the Government for 11 city corporations, more than 50% (6,850 million Taka) went to the two city corporations of Dhaka. The national government also invests far less in infrastructure development and public services in other cities. Policy bias in favour of Dhaka can also be seen in the development of industrial parks and export-import markets in the Dhaka metropolitan region. All this means that there are better services and greater economic opportunities in Dhaka, making other cities less attractive for rural migrants.

[30] Conversion rate of USD to Taka = 77 as of July 1, 2016.

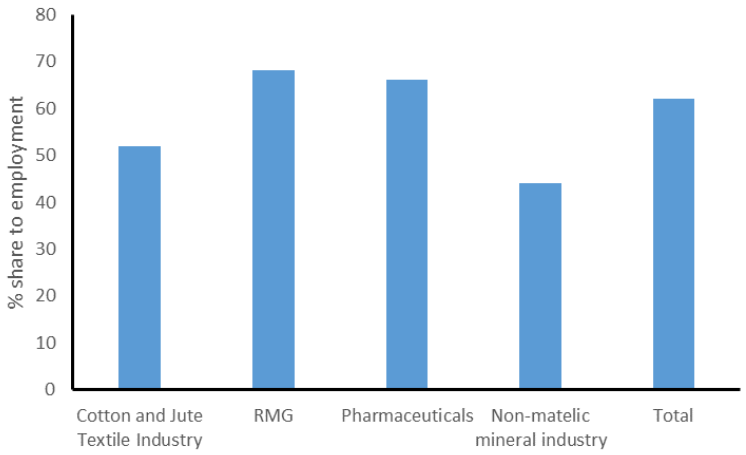


Figure 7.8 Share of major industrial employment of Bangladesh accounted for by Dhaka Metropolitan Area in 2006

Note: RMG stands for ready-made garments. Source: Prepared by authors based on Jahan (2017)

Weak governance

The urban development trend in Dhaka mostly follows an incremental development model driven by private entities, with limited consideration of needs and circumstances (Swapan et al. 2017). One of the key reasons for this development pattern is the gaps between the development plan and the implementation of development strategies, which is associated with inadequate supervision and guidance from the major urban development agencies.

The main actors in urban planning and development in Dhaka are RAJUK and local government bodies, including city corporations, pauroshova (municipalities), and union parishad. RAJUK and local government bodies belong to two separate ministries; the Ministry of Works and Housing, and the Ministry of Local Governments, respectively. No coordination mechanism among these actors has been established, and this contributed to unplanned and uncontrolled urban expansion.

RAJUK was provided the mandate of sole approving authority of building plans within Dhaka Metropolitan development area by the Building Construction Act 2006, but this Act did not nullify the powers provided to the pourashavas by previous laws. As a result, the pourashavas are still approving building plans within their jurisdiction using the Building Construction Rules 1996.

Recently, the Cabinet approved the Urban and Regional Plan Act 2017 to control urban development. Enforcement of the Act will require better coordination among the development agencies in the Dhaka Metropolitan Area.

7.3.4 Impact of Dhaka's uncontrolled urban expansion on natural resources

Unplanned and uncontrolled urban expansion and development in Dhaka Metropolitan Area poses serious threats to natural resources, which places the liveability and sustainability of the city at risk. Dhaka has been ranked as the fourth least liveable city in the world by the Global Liveability Report 2017. Among the ten least liveable cities, Dhaka received the third lowest environment score (Economist Intelligence Unit 2017). Unplanned urban expansion has caused many environmental

problems including declining soil quality, water scarcity, water quality deterioration, loss of wetlands, increasing food risk, biodiversity loss and air pollution.

Due to uncontrolled rapid urbanisation, most of the agricultural lands surrounding Dhaka have already been converted to built-up areas, and consequently the capital city's food self-sufficiency level is decreasing day-by-day (Rashid 2016). Conversion of agricultural land and wetlands to built-up areas is also increasing flood risk in the Dhaka Metropolitan Area. Most of the agricultural lands were floodplains, and these lands together with converted wetlands retained water during monsoons (Dewan andCorner 2014).

The urban flood extent in the Dhaka Metropolitan Area could increase from 35.2 km^2 in 2005 to 230 km^2 in 2050 (Verbeek 2017). While Dhaka is exposed to increasing flood risk, it also faces an acute shortage of freshwater due to water pollution. Population growth and industrialisation are responsible for water pollution in the rivers around the capital city. Deterioration of the water quality of surface water bodies has resulted in a loss of aquatic biodiversity. At the same time, dependency on groundwater for meeting the growing water demand is increasing and this has led to a decline of the groundwater level of more than one metre per year (Shamsudduha et al. 2009).

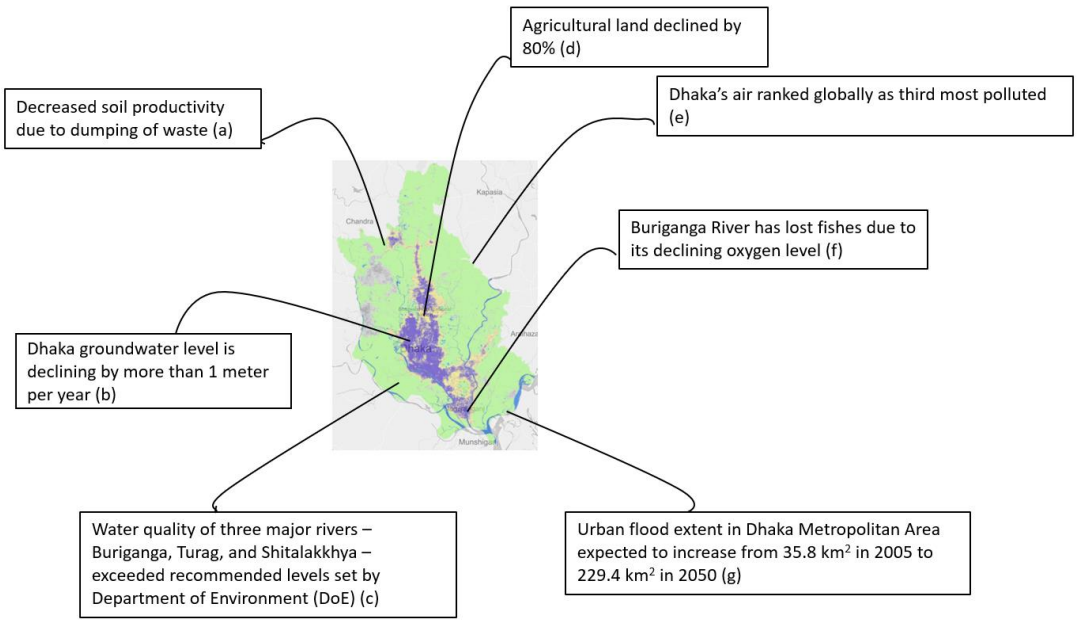


Figure 7.9 Examples of the negative impacts of uncontrolled urbanisation in the Dhaka Metropolitan Area.

Source: Compiled from (a) Islam et al (2012), (b) Shamsudduha et al. (2009), (c) Islam et al. (2015), (d) Morshed et al. (2017), (e) WHO (2018), (f) Baki et al. (2017), (g) Verbeek (2017)

The environmental impacts of unplanned urbanisation in the Dhaka Metropolitan Area reach far beyond the built-up areas. Untreated industrial and domestic wastewater from part of Dhaka city and Gazipur city has reached the Belai Beel, a wetland stretching over 8 km^2 located in the rural

area of Gazipur district.[31] The resulting pollution has affected soil health and fish production in Belai Beel. This threatens the livelihoods of 300,000 local people and affects Dhaka's food security. Figure 7.9 provides examples and evidence of negative environmental impacts of unplanned urbanisation in greater Dhaka.

7.3.5 Way forward

Dhaka is growing rapidly and in an unplanned manner. The resulting rural-urban landscape transformations have led to the deterioration of natural resources in Dhaka city as well as surrounding peri-urban and rural areas, including reduction in agricultural land, greenspace and wetlands, and degradation of water resources due to increasing pollution loads. The environmental impacts make Dhaka less liveable and threaten its long-term prosperity. For the SDGs, the future development of the Dhaka Metropolitan Area must emphasize sustainable urban development and minimise anthropogenic environmental impacts. The following policy measures would aid in controlling unplanned rural-urban landscape transformation and ensure that Dhaka Metropolitan Area is liveable, functional and resilient.

Policies to reduce unplanned migration to Dhaka: Dhaka city has spontaneously developed in response to its growing population, which is mainly due to mass migration of rural people to the city. As of today, there is no national policy or policy at the local government level to address migration issues under development plans. Making other cities more attractive to rural migrants by creating greater employment opportunities through investments in economic infrastructure, building or upgrading education facilities and improving basic services, would help ease the pressure on Dhaka.

Approval of the draft Urban and Regional Plan Act 2017: Lack of coordination and conflict of mandates among major actors largely explains why much of the development in Dhaka is unplanned and why the Dhaka city development plan is not properly implemented. Approval of the draft Urban and Regional Plan Act 2017 by Cabinet is key to strengthening institutional coordination among the city corporations, development authorities such as RAJUK, municipalities, and other local government bodies on land-use planning and environmental issues for sustainable development of the city and adjacent areas. The draft Act should be passed without unnecessary delays. It could help protect agricultural land, wetlands and natural vegetation from unplanned conversion by imposing penalties.

Transfer of development rights mechanism: The city development authority can introduce a transfer of development rights (TDR) mechanism to contribute to the conservation of agricultural land, wetlands, water bodies and natural vegetation. Under this mechanism, landowners can sell development rights to a developer or interested parties. These development rights can be transferred to increase the concentration of development in another designated area. As a simple example, a developer with rights to construct a building in an urban area with a specified number of floors would be able to increase the number of floors under TDR.

Restructuring of property tax: Restructuring of property tax can be another measure to control unsustainable conversion of land to built-up areas. For example, property tax could be higher for converted agricultural land, wetland, water bodies and natural vegetation, and tax exemptions could be provided for conservation of these type of lands.

[31] Unpublished observation of field survey by IGES and University of Dhaka in 2018.

7.4 Santa Rosa Watershed

The Santa Rosa Watershed, located about 40 km south of the national capital of Manila, is one of the 24 watersheds constituting the basin of the country's largest lake, Lake Laguna. The watershed has an area of about 11,750 ha, accounting for 4.1% of the entire lake basin (WWF-Philippines 2011). Approximately 570,000 people reside in this watershed, which consists of four municipalities: Silang (upriver), Biñan, Cabuyao, and Santa Rosa (downriver) (Tongson, Hernandez, and Faraon 2012; Tongson 2012). In terms of the local hydrological conditions of the area, there is excess water in most months (i.e. surface and groundwater supply exceed demand), but during the dry season from January to April there is little surface runoff and high competition for water for various uses (Tongson, Hernandez, and Faraon 2012). In terms of groundwater supply and demand, a study by WWF Philippines found that the domestic, commercial, institutional, and industrial demand for groundwater in the area already approaches the level of groundwater recharge (WWF - Philippines 2011), so further expansion of impervious areas and further increases in demand from new developments are likely to cause demand to exceed the annual recharge rate. Thus, the main problem in the watershed during the rainy season is flooding and the main problem during the dry season is limited water availability. Figure 7.10 shows an overview of the study area.

7.4.1 State and drivers of land-use change in the Santa Rosa Watershed (1990s-2014)

Much of the watershed has been converted over the past few decades from agricultural and agroforestry lands to residential, commercial and industrial areas (Lasco and Espaldon 2005). Different types of land-use changes have occurred in the downstream, midstream, and upstream areas of the Santa Rosa River, as shown in Figure 7.11 (Magcale-Macandog et al. 2011). .

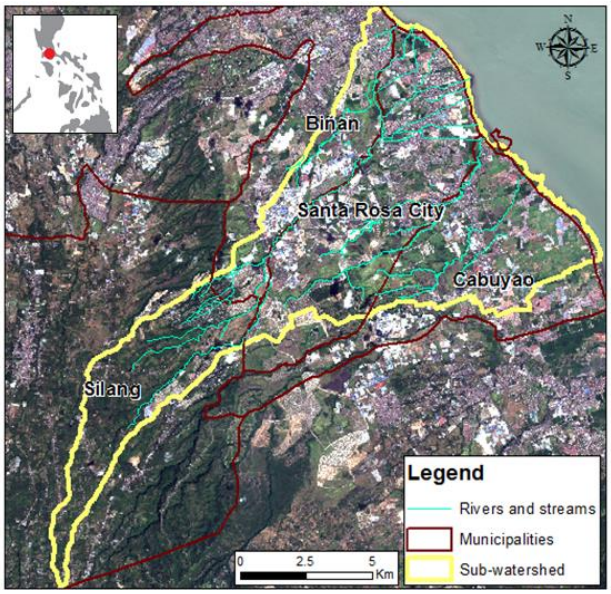


Figure 7.10 Santa Rosa Watershed of the Philippines.

Note: Laguna Lake can be seen in the upper right corner of image. Source: Authors

These land-use changes have been a significant cause of increased flooding, mainly because impervious built-up areas have higher volumes and rates of rainfall runoff than vegetated areas (which can absorb rainfall into the soil). The cities of Santa Rosa and Biñan, located in the downstream of the watershed, experience serious floods almost every year due to heavy rainfall, high surface runoff, and inadequate storm drainage systems. Further land-use changes upriver due to development in the town of Silang, as well as climate change, are likely to exacerbate flooding downriver (Endo et al. 2017).

As summarized in Figure 7.11, a major driver of land-use change in the downstream area of the watershed has been industrial and residential development, which has led to a loss of nearly all of the rice paddies that previously dominated the area. Figure 7.12 shows an example of this type of rapid land conversion, with large areas of rice paddies converted to residential, industrial and commercial areas in only seven years (between 2007 and 2014). The midstream area of the watershed was previously dominated by sugarcane plantations, but as residential and industrial development began to spread from the downstream area, land prices increased to such a degree that the major landholders sold their agricultural lands to developers. The upstream area was previously occupied by forests but was converted first to coffee plantations and later to pineapple plantations. There is also still a mixture of different types of agroforestry systems in this upstream area, including coconut and banana farms.

Looking at the impacts of recent land-use changes in the area, a study conducted by IGES and University of the Philippines Los Baños (UPLB) showed that between 2000 and 2014, the total impervious surface area of the watershed increased by 54%, from 3,239 ha to 4,988 ha, while the vegetated area (mainly agroforestry and agricultural land) decreased by 21%, from 8,509 ha to 6,760 ha (Johnson et al. 2015) (Figure 7.13). It is also noteworthy that the impervious area increased by 102% in the upstream municipality of Silang, and that there were significant increases in impervious surface area in the upstream parts of Biñan and Santa Rosa as well. These upstream areas have the highest amounts of rainfall in the watershed, so the increases in runoff due to land-use change in these locations are a major cause of the more frequent and intense flooding downstream.

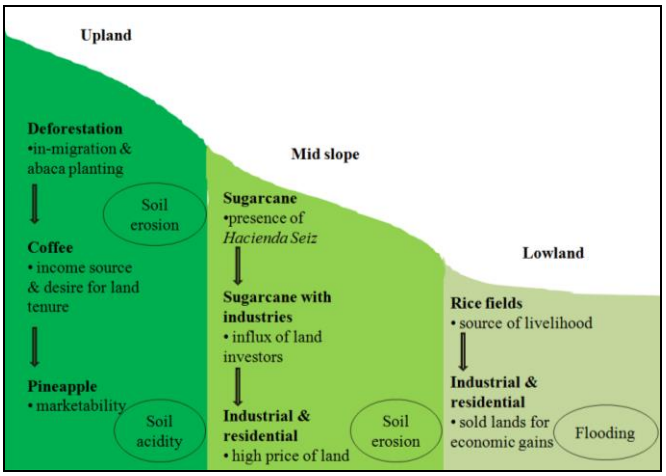
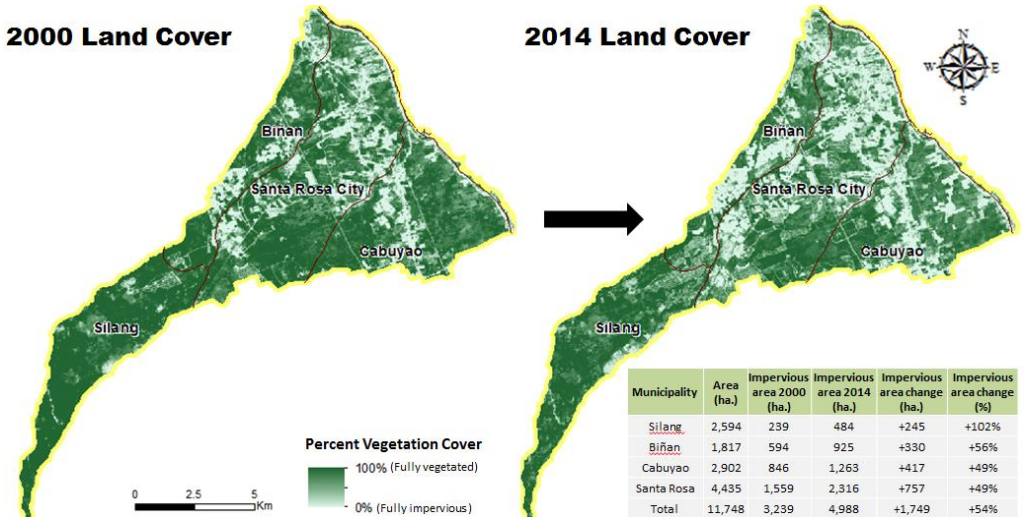


Figure 7.11 Land-use change in Santa Rosa Watershed from the 1990s to the 2010s

Source: Magcale-Macandog et al. (2011)

Figure 7.12 Land conversion in the downstream area of Santa Rosa City ((a) 2007, (b) 2014) as seen in high resolution Google Earth images



Municipality	Area (ha.)	Impervious area 2000 (ha.)	Impervious area 2014 (ha.)	Impervious area change (ha.)	Impervious area change (%)
Silang	2,594	239	484	+245	+102%
Biñan	1,817	594	925	+330	+56%
Cabuyao	2,902	846	1,263	+417	+49%
Santa Rosa	4,435	1,559	2,316	+757	+49%
Total	11,748	3,239	4,988	+1,749	+54%

Figure 7.13 Land conversion of vegetated areas to built-up land in Santa Rosa Watershed

Source: Johnson et al. (2015)

7.4.2 Future land-use changes in the watershed (2014-2025)

Aside from understanding the historical land-use changes and their impacts on the watershed, it is also useful to try to predict future land-use changes and their potential impacts to better improve the planning process. One popular method for gathering data on future land-use changes is referred to as “participatory mapping”, which involves gathering relevant stakeholders (e.g. municipal planners and environment officers) and having them draw out the likely future land-use changes in map form based on their local knowledge. The IGES/UPLB research activities in the Santa Rosa Watershed conducted participatory land-use mapping exercises with the four local governments in the watershed, and found that most of the remaining agroforestry and agricultural areas are expected to be converted to residential developments by circa 2025, with the main drivers of this future development being further increases in population (due to immigration and natural population growth) as well as continued economic growth in the area (Figure 7.14). Local government officials reported that the area is receiving (and will likely continue receiving) many immigrants due to the presence of large factories in the watershed that provide job opportunities, as well as due to people moving to the area and commuting to work in the Metro Manila area. Most of the agricultural and agroforestry lands in the watershed were reportedly already sold to developers, although in some areas there are ongoing land disputes between the local tenant farmers and the land developers.

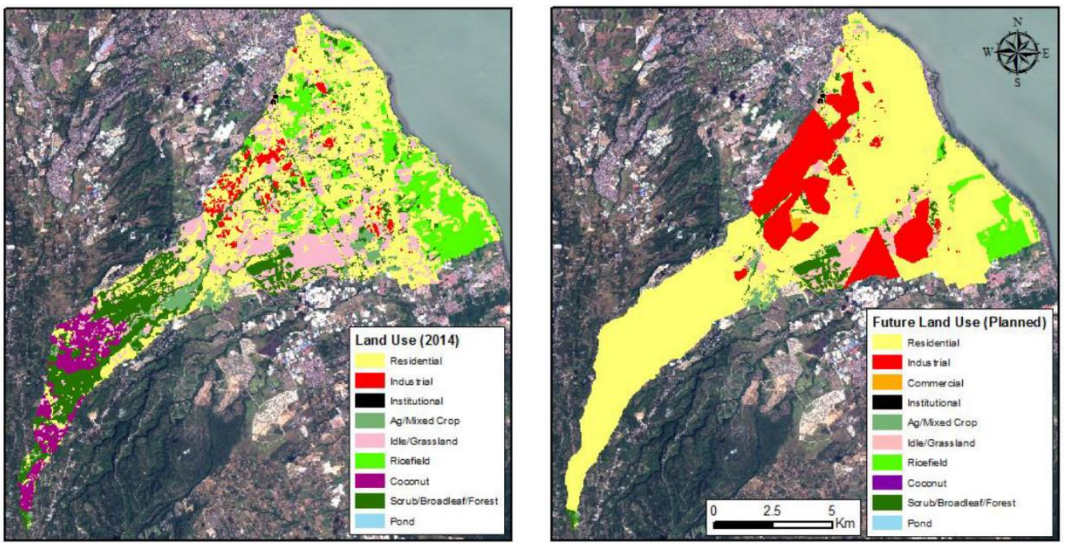


Figure 7.14 Current and future land-use map of the Santa Rosa Watershed.

Source: Developed by IGES/UPLB research project on watershed management

To try to understand the impacts of the future land-use changes on flooding (e.g. due to increased runoff) in the area, IGES and UPLB performed hydrological modelling analysis using the HEC-RAS and HEC-HMS models developed by the U.S. Army Corp of Engineers (www.hec.usace.army.mil/software/hec-hms/). This analysis found that the flood extent of the Santa Rosa Watershed will likely increase by about 22% by 2025 (the case of a 10-year return period storm) (Bragais et al. 2017a). Climate change is also expected to bring more rainfall events to the area, which will also contribute to more frequent flooding (Bragais et al. 2017b).

7.4.3 Way forward

Countermeasures identified by local governments: To alleviate this increase in flooding in the future due to land-use change and climate change, the local governments identified several countermeasures in a workshop held as part of the IGES/UPLB project, including the following three priority measures:

i. Zoning enhancement to avoid and alleviate climate impact, e.g. strengthening building codes in flood-prone areas and mandating runoff mitigation measures (e.g. tree planting, water-permeable paving) in new developments;
ii. River rehabilitation to increase the surface water flow and surface water quality (e.g. protecting and improving areas along riverbanks through replanting of native trees); and
iii. Capacity development to build and strengthen the ability of local government to design and implement climate actions.

Based on the IGES/UPLB risk assessment and the countermeasures identified by the local governments during the workshop, the City of Santa Rosa updated its Comprehensive Land-use Plans (CLUP) and developed its Local Climate Change Action Plan (LCCAP) to make them more climate resilient, and efforts are being made by the other municipalities to do the same.

Making full use of the Santa Rosa Watershed Management Council: In addition to strengthening the plans of the existing jurisdictions, effective mitigation of flood risk requires collaboration across the local governments in the watershed. Recognising this, the four local governments, with support from the Laguna Lake Development Authority (LLDA; a national government agency charged with managing the lake), established the Santa Rosa Watershed Management Council (SRWMC) in 2015 with the aim of creating and implementing a watershed management plan (Figure 7.15). Given how critical coordinated planning at the watershed level is, it is important that full use is made of the SRWMC and that its ability to improve coordination across jurisdictions is closely monitored.

(a)

(b)

Figure 7.15 Santa Rosa Watershed Management Council

Note: (a) logo, (b) a photo of the council meeting with participation of Hon. Jaime "Joey" C. Medina, General Manager of Laguna Lake Development Authority (seated front row centre) and Hon. Danilo "Dan" Ramos S. Fernandez, City Mayor of Santa Rosa (seated front row right) who serve as Co-Chairs of the Council.

These actions show that the local governments in the watershed have become aware of the negative impacts of unplanned/unregulated land-use change and are trying to address them. However, as already described in this chapter, land-use change is a complex issue involving many economic, social, and legal (e.g. land owner and tenant rights) dimensions, and it remains to be seen how successful their efforts will be in managing the trade-offs between the positive and negative impacts of land-use changes. The process of performing risk assessments and developing inter-municipality cooperation mechanisms could be a useful model for other watersheds to consider for making better-informed and more collective land-use plans.

7.5 Concluding discussion

The case studies of the Dhaka Metropolitan Area and the Santa Rosa Watershed point out local specificities associated with unplanned and uncoordinated urban development in terms of drivers, their consequences and possible solutions. The case studies show that the two areas have much in common, and illustrate broader trends and challenges that rapidly urbanising areas are facing across the Asia-Pacific region. Urban growth, not only in these two areas but in Asia-Pacific developing countries as a whole, has largely been unplanned and disconnected from rural planning. Many cities exhibit lack of well-directed land-use change, unsustainable consumption and production patterns, growing pollution and growing demands for energy and materials, all of which have contributed to the degradation of natural resources and loss of environmental quality in cities and their surrounds. Cities are not only the region's growth centres, they are also its centres for various social ills and the origin of many of its environmental problems. They are areas where residents are becoming increasingly exposed to natural hazards and the impacts of climate change. Inclusive and sustainable cities are not an outcome of unplanned urban growth.

As seen in the case study of Dhaka, unplanned urbanisation has led to the uncontrolled conversion of agricultural lands, water bodies and vegetation to built-up areas. This has increased flood risk in Dhaka city and surrounding areas. In the case of Santa Rosa Watershed, unplanned conversion of forests, agroforestry areas and agricultural lands to built-up areas in the upstream parts of the watershed has raised the flood risk in downstream cities. Other cities in the region have similar experiences. Major flood events in urban centres include Mumbai in 2017, Karachi in 2017, Bangkok in 2011, and Jakarta in 2007. Unplanned urban development bears much of the blame for the increasing flood risks in the region (Singh 2012).

Industrialisation has been a national priority and has led to rapid urbanisation in both case study areas. While the industrial sector provides significant economic benefits, industry is one of the region's main sources of urban environmental pollution. Industrial clusters are often placed in cities or their surrounding areas without careful planning and without strong environmental controls. The negative environmental and socio-economic impacts of this unregulated industrial development can extend well beyond the city areas because of the growing demand for energy and materials to serve industrial needs and the improper management of industrial waste.

Developing the right policies for controlled urban growth and to promote beneficial linkages between urban and rural areas is a challenging task. To be effective, policies must reflect local contexts, which can be very diverse. "One-size fits all" policy interventions will not provide sustainable solutions. Sets of coherent policy actions tailored to local conditions will be required. The following approaches can be considered when developing these policy mixes.

Nature-based solutions for sustainable urban development: Nature-based solutions (NBS) are being increasingly implemented in urban areas to address social, economic and environmental challenges caused by rapid urbanisation and urban expansion. NBS include urban greenspaces, greenbelts, and wetlands. These areas serve multiple functions that contribute to urban resilience, development and quality of life. Carefully designed NBS can protect and enhance urban biodiversity as well as mitigate water pollution, soil erosion, flood risk and urban heat island effects (Lee and Maheswaran 2011; Lovell and Taylor 2013; Adinolfi, Suárez-Cáceres, and Cariñanos 2014; Huang et al. 2018) (see Chapter 2 for further discussion on types of NBS). TDR and revision of property taxes could support NBS for mitigating water pollution, increasing groundwater recharge and decreasing flood risks in the Dhaka Metropolitan Area and its surrounds. In the Santa Rosa Watershed, several different types of NBS were identified by local governments to reduce the negative impacts of future land-use changes, including requiring tree planting (or the preservation of existing vegetation) and permeable pavements in new developments to reduce flood risks, and replanting native trees along river banks to reduce erosion and siltation.

Investing in urban development outside the megacities: Uncontrolled and unplanned urbanisation are partially a result of "centralised" urban development policies, which emphasise the development of existing major urban centres, paying less attention to other potential areas for urban development. The large politically-favoured urban centres are often equipped with better roads, transportation systems, as well as education, sanitation, healthcare and welfare services than other secondary cities and towns. This makes them more attractive for investors, job seekers and other migrants, resulting in further urban expansion, overcrowding and environmental degradation. There is a strong need to move away from politically-biased centralised development plans, as observed in Dhaka, towards decentralised urban development strategies, supported with proportionate allocation of the national budget and adequate investment in public services. A national urban development plan can be created to direct strategic investment in services and infrastructure towards small and medium-sized cities, which continue to house most of the region's urban population. This could play a significant role in decreasing rural-urban migration to the megacities and bring opportunities for economic development to other parts of the country.

Incentive-based mechanisms to prevent the conversion of farmland or forestlands to residential or commercial uses: Incentive-based mechanisms can be introduced to control unplanned urbanisation. Tax incentives, e.g. taxing land at a lower value for agriculture or forestry uses than for residential or commercial uses, can provide owners of farmland, forestland or other types of undeveloped land with an incentive to keep it in its current use, rather selling the land to urban developers for conversion into residential or commercial uses (Bengston, Fletcher, and Nelson 2004). This type of incentive-based policy measure could help reduce unplanned conversion of farmlands, forest lands and water bodies to built-up areas.

Investment in programmes to promote rural-urban partnerships: Urban governance conventionally focuses on issues and challenges within city boundaries, paying less attention to the importance of peri-urban and rural landscapes for sustainable urban development. However, as peri-urban and rural areas provide materials and energy critical for urban development, for cities to be resilient, urban planning must consider how natural resources can be managed at a regional level. That urban and rural administrative units are fragmented poses a major governance challenge. This fragmentation results in gaps in political objectives, policies, accountability, financial capability and capacity, and information sharing. Creative rural-urban governance solutions are required to overcome the fragmentation that characterises urban and rural policymaking and planning.

The necessity of investing in urban-rural linkages for sustainable and inclusive cities has already been recognised in some parts of the world. For instance, the European Parliament agreed on the partnership for sustainable urban-rural development (RURBAN) in 2010. This partnership provides support for urban-rural partnerships through the European Regional Development Fund and the European Agricultural Fund for Rural Development (European Comission n.d.). Some good cases of building urban-rural linkages can also be found in the Asia-Pacific region. For example, inter-local government cooperation between city and rural governments in the greater Yogyakarta area of Indonesia achieved success in effective regional infrastructure provisioning and rural environmental protection (Hudalah et.al. 2013). The Fifth Basic Environmental Plan of Japan also highlighted the importance of urban-rural collaboration to sustainable development by introducing the concept of the “Regional Circular and Ecological Sphere” (MOEJ 2018).

Creative solutions tailored to local contexts will be needed for greater collaboration between jurisdictions to realise constructive urban-rural linkages. Coordination bodies, which could take various forms, can help in linking the land-use planning and management of adjacent local governments. The Santa Rosa Watershed Management Council (SRWMC) is a local initiative that provides a useful example of one such coordination body. The SRWMC involves all four local governments of the Santa Rosa Watershed as well as the national government agency, the LLDA, responsible for the management of the lake basin that the watershed is located within. Together, these bodies are working on creating and implementing a watershed management plan that will benefit all of them. For coordination bodies to be effective, resources can be invested in developing common visions at landscape and other appropriate scales across jurisdictions, building leadership skills and facilitating horizontal dialogues (see Chapter 8 for further elaboration on landscape and other integrated approaches to land and natural resource management).

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CHAPTER 8

Integrative approaches: Bridging scales, sectors, levels and stakeholders for sustainable land management

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Key messages

- *Integrative approaches to land and resource management emphasise the importance of horizontal coordination across sectors and administrations, vertical coordination across the different tiers of government, effective engagement of stakeholders, strong government, and a well-coordinated public service.*
- *Approaches and concepts that hold promise for contributing to integrated land management include the landscape approach, REDD+ (reducing emissions from deforestation, forest degradation and enhancing forest carbon stocks), integrated water resources management (IWRM) and the water-energy-food nexus (WEFN).*
- *The challenges to implementing integrative approaches include competition between departments over budgets, sectoral differences in objectives for land management, low levels of stakeholder engagement, mismatches between the scale of the problem and existing scales of management, lack of incentives for integration, lack of data, data sharing and technical skills, and lack of capacity to deal with the speed of change.*
- *Positive trends supporting integrative approaches include the creation of coordination bodies, the use of multistakeholder processes, the introduction of co-management approaches, technical advances, and improved communications enabling greater stakeholder participation.*
- *Ways forward include building awareness of the value of integrative approaches, establishing integrative institutions at all levels, and building capacities and providing resources and incentives for integration.*

8.1 Introduction

The landscape transformations taking place across the Asia-Pacific region are profound and complex. As demonstrated in the earlier case studies, their complexity is associated with the multiple interacting drivers behind the land changes, the wide range of impacts that land change can have on human wellbeing and security, as well as the feedback effects of these impacts on the drivers, and the manifold expectations that are placed on the land. In areas where pressures on

land are increasing, conventional single-sector strategies for land management cannot address this complexity; they usually result in some gains for some sectors at the expense of considerable losses for others. Biodiversity and ecosystem services are not valued by markets and thus, in the pursuit of economic gains, they tend to lose out, as can be widely observed in the region.

The preceding case studies and earlier chapters providing regional overviews all conclude that integrative approaches are needed to address the drivers responsible for biodiversity and ecosystem services loss and to achieve sustainable land management, i.e. land management that provides optimal outcomes for the SDGs. The SDGs themselves are integrated and indivisible (United Nations General Assembly 2015), so land management cannot just focus on one or two SDGs and ignore impacts on others.

The call for integrative approaches can be seen increasingly in the literature on rural and urban development and on the urban-rural continuum. Some of this literature is purely of a promotional nature, arguing for one approach or another without assessing the obstacles to its implementation. The understanding of unsustainable landscape transformations as a "wicked problem" presented in this report draws attention to the importance of laying out the challenges facing the realisation of any proposed solution. There is a need to go beyond simply espousing the potential benefits of integrative approaches to consider the practical challenges they face and how these might be met.

Other literature on integrative approaches does identify challenges, but this literature typically focuses just on one approach, e.g. on the landscape approach or the water-energy-food nexus approach. The case studies and review chapters in this report underscore the need for integration at all levels, from transnational to national to local levels. For this, a variety of complementary approaches to advance integration is needed.

The aim of this chapter is to identify and compare several useful integrative approaches and practical ideas for moving forward with them. It introduces and discusses four integrative approaches: the landscape approach, REDD+ (reducing emissions from deforestation, forest degradation and enhancing forest carbon stocks), integrated water resources management (IWRM), and the water-energy-food nexus (WEFN).

Table 8.1 provides a basic breakdown of these four approaches across the essential dimensions of policy integration, i.e. substantive, practical, structural and procedural dimensions (Briassoulis 2004). The substantive cluster encompasses the thematic, conceptual and value dimensions that relate to the constitution of the policy goals and objects that are to be integrated. The practical dimension of policy integration refers to the availability, compatibility, consistency and congruence of policy and financial instruments. The structural dimension refers to the involvement of common formal and informal actors at and across various spatial/organisational levels. The procedural dimension comprises the coordination and cooperation within and between horizontal administrative and vertical departmentalised structures, i.e. forms of both formal/institutionalised and informal interaction among policy actors and actor networks. With respect to the procedural dimension, the table points to how coordination and cooperation could be or is being achieved. As can be seen from Table 8.1, the four integrative approaches share some similarities yet each is distinct. These points are elaborated in separate sections that discuss each integrative approach.

What makes these four integrative approaches complementary rather than competitive? At the national level, the water-energy-food nexus approach supports the alignment of sectoral policies and target setting for water, energy and food. At the local level it can also serve as a concept for dialogue between line agencies and for engaging with stakeholders on interlinked water, energy and

food issues. The landscape approach complements the water-energy-food nexus approach by providing an explicit framework for resolving competing interests over land use at the landscape scale. Water, energy and food are amongst these interests, though they do not comprise the whole range of interests for land management. REDD+, on the other hand, is an approach to promote climate change mitigation by protecting and enhancing forest carbon stocks. How REDD+ is to be implemented is left up to each country to decide. However, regardless of national approaches, REDD+ requires integration of policies at national level and an integrated strategy to combat the drivers of deforestation and forest degradation at the local level. On this latter point, many deforestation drivers lie outside the forest sector, e.g. drivers that increase demand for agricultural land. This means that a spatial approach to land-use planning and management that extends beyond forest boundaries is needed to address them. Here, a landscape approach is useful, as it coordinates land-use planning and management across interlinked ecosystems / land uses. IWRM, like the landscape approach, is a spatially explicit approach that can also assist with the goals of REDD+ and WEFN. IWRM is concerned with water management at the watershed level, and for this must engage with a wide range of issues including energy and food security, sustainable land use, forest conservation and health and sanitation. IWRM is an older concept than the landscape approach, but the landscape approach does not set out to replace IWRM. Rather, the landscape approach recognises the critical role that IWRM plays in coordinating land-use planning at watershed level and encourages coordination across watersheds within the landscape.

This chapter discusses the four integrative approaches separately. The discussion covers aims and key features of each approach, their actual implementation, their relevance to the SDGs, the barriers they face, and how these might be overcome. This is followed by a concluding discussion, which identifies common messages from the four approaches for integrated land management.

Table 8.1 Substantive, practical, structural and procedural dimensions of selective integrative approaches

Approach	Dimension							
	Substantive		Practical		Structural		Procedural	
	Goal	Objectives/ values	Policy instruments	Financial instruments & sources	Main actors/actors network	Main level of governance	Vertical coordination/ cooperation	Horizontal coordination/ cooperation
Landscape approach	Conservation & enhancement of multiple landscape functions	Objectives: Biodiversity & ecosystem protection, food, water & energy security, job creation, disaster risk reduction, climate change adaptation & mitigation, organised human settlement Values: participation, learning & adaptive management, knowledge from multiple sources	National instruments for landscape management Instruments allowing landscape-level projects	National budgets, donors, NGOs	Farmers & other local land users, local & central governments, conservation organisations, research institutes, FAO & other international agencies, donors	Scale determined by management objectives Not restricted to jurisdictional boundaries	Implemented through decentralised structures at landscape scale with institutional support at national level	Management at landscape scale through mechanisms involving all relevant sectors and stakeholders
REDD+	Climate change mitigation	Forest carbon sequestration & enhancement,	NDC, National REDD+ Strategies, Safeguard information system;	For readiness: World Bank, UN, bilateral donors, NGOs	Lead: National government. Others: Subnational governments	Global, national, subnational, local (project level)	Implemented through hierarchy of jurisdictions Local governments	Inter-sectoral coordination bodies (task forces, etc.) led by environment

Approach	Dimension							
	Substantive		Practical		Structural		Procedural	
	Goal	Objectives/ values	Policy instruments	Financial instruments & sources	Main actors/actors network	Main level of governance	Vertical coordination/ cooperation	Horizontal coordination/ cooperation
		biodiversity conservation, livelihoods, local rights & knowledge, governance	Project level activities	Results-based payments: World Bank, bilateral donors, carbon market	. NGOs, private sector, donors, local communities		may develop climate plans	al & forest sectors, and involving other sectors such as finance and land use planning
Integrated Water Resources Management (IWRM)	Coordinated development & management of water, land & related resources for economic & social welfare without compromising sustainability	Water sector: water security, water reuse, flood management, ecosystem maintenance Other sectors: energy and food security, sustainable land use, health & sanitation.	National plans; economic instruments including payment for hydrological ecosystem services (PHES)	National, provincial & local government budgets, donors, NGOs	National, provincial & local governments, communities, donor agencies, NGOs	Local: river basin National & regional: transboundary basin	River basin perspective Mechanism for coordination across tiers of government Functions placed at appropriate levels	Common vision and strategy on water use and management Central committee or coordinating agency Integration within water sector (water resources and water treatment) and with other sectors
Water-energy-food nexus (WEFN)	Realise the interconnections between water, energy, and food security and	Maximise synergies and minimise trade-offs across the water,	National strategies for implementing nexus approach, enabling	National budget, donors, investors / private sector	National and local governments, scientific community, donors,	Regional, national and local	High level agency to promote WEFN Umbrella strategic	High level agency to promote WEFN Umbrella strategic

Approach	Dimension							
	Substantive		Practical		Structural		Procedural	
	Goal	Objectives/ values	Policy instruments	Financial instruments & sources	Main actors/actors network	Main level of governance	Vertical coordination/ cooperation	Horizontal coordination/ cooperation
	achieve system efficiency	energy and food systems by implementing integrated policy measures, strengthening cross-sectoral collaboration and encouraging win-win actions	institutional arrangement, appropriate mixes of regulatory measures and incentives		investors, private sector, civil society		plans and guidance Mechanism for coordination across tiers of government	plans and guidance

8.2 The landscape approach

8.2.1 Aims and key features

The landscape approach aims to mediate and integrate the many and diverse interests in land with a view to securing the best outcomes for sustainable development. More specifically, it aims to avoid the loss of biodiversity and degradation of ecosystem services, or restore degraded ecosystems, while contributing to inclusive economic development. The landscape approach can be applied to areas with high conservation values that are increasingly under threat as well as to heavily degraded areas where ecosystem functions need to be restored. These expectations are reflected in a growing number of global initiatives promoting the landscape approach, including the International Partnership for the Satoyama Initiative (http://satoyama-initiative.org/), the Global Landscapes Forum (http://www.globallandscapesforum.org/), FAO's forest landscape restoration mechanism (http://www.fao.org/climate-change/programs-and-projects/detail/en/c/328989/), and the Global Partnership on Forest and Landscape Restoration (http://www.forestlandscaperestoration.org/).

The idea of a landscape approach has evolved over time. The early attempts at landscape management in developing countries tended to be rather top-down, focusing on government land-use planning for biodiversity conservation. The integrated conservation and development initiatives to reduce poverty and protect biodiversity that emerged in the 1980s reflected evolution in landscape thinking, but under these initiatives integration remained rather limited; the focus was on biodiversity conservation and the concern was primarily to address the social and economic needs of communities who might threaten biodiversity (Sayer et al. 2013). More recent efforts to elaborate the concept of the landscape approach have stressed the importance of stakeholder participation and multi-actor decision-making (Deneir et al. 2015; Kozar et al. 2014; Scheyvens et al. 2017; Sayer et al. 2013).

The landscape approach establishes processes for stakeholders with diverse interests, worldviews and capacities to work collectively on landscape management towards a shared vision of sustainable development (van der Horn and Meijer 2015). Under the landscape approach, the integration of sectoral interests takes place through land users, managers and other stakeholders in the landscape working together to forge solutions for sustainability. Collaborative planning and action at the landscape scale provides a means to work through trade-offs and take advantage of synergies across sectors, as well as to harmonise planning, implementation and monitoring processes.

Recent conceptual works have highlighted two major characteristics of the landscape approach. First, with respect to boundary setting, the landscape is understood as the spatial scale at which stakeholders from global to local levels with their diverse interests must co-operate on managing the land and its resources for sustainable development (van der Horn and Meijer 2015). Second, a key feature of landscape governance is that it employs multi-actor decision-making across horizontal and vertical dimensions to engage multiple actors, institutions, scales and sectors. Landscape governance involves greater horizontal inclusion and distribution of power among civil society and private sector actors than traditional state-centred governance (Kozar et al. 2014).

8.2.2 Where, to what extent and how the landscape approach is being implemented

A growing number of initiatives on landscape governance can now be found around the world in places facing the triple challenges of increasing food production, improving livelihoods, and protecting biodiversity and ecosystem services (Thaxton et al. 2015). Kozar et al. (2014) reviewed land management systems they consider analogous with landscape governance, and discovered that these can be grouped into the following four types: (1) systems that recognise land-based agriculture or livestock as major components; (2) systems that have forest and biodiversity conservation as major components; (3) systems targeting various water resource units; and (4) systems oriented toward ecosystems that consider systems theory, sustainability, ecosystem science, system science, and cross-sectoral and integrated development approaches. Zanzanaini et al. (2017) identified 161 “integrated landscape initiatives” related to agriculture, livelihoods and ecosystem conservation in South and Southeast Asia. They found that the main motivation for these initiatives was ecosystem conservation, and that investments tended to focus on agricultural practices, natural resource management and community participation. They also found that while donors focused mostly on planning, implementation was left to local groups such as women’s associations (ibid.).

8.2.3 How the landscape approach can contribute to the SDGs

The landscape approach should be viewed as a fundamental means of realising the SDGs (Thaxton et al. 2015). A challenge for the 17 SDGs is to avoid potential competition between individual goals. The landscape approach can contribute to coherency in policies and actions that promote the SDGs and the objectives of other international agreements, such as the Aichi targets for biodiversity conservation and the Paris Agreement on Climate Change, across levels and sectors. Under the landscape approach, the landscape serves multiple functions, meeting the full range of local needs as well as the commitments of governments to global objectives. The landscape approach can contribute to all 17 SDGs and at least 38 of the 169 associated targets (ibid.).

There is strong evidence to support the claim that the landscape approach is fundamental to the SDGs. The Landscapes for People, Food and Nature Initiative surveyed 357 integrated landscape initiatives globally, which reported a wide range of investments and improved outcomes relevant to the SDGs. Of the integrated landscape initiatives surveyed in South and Southeast Asia, 95% reported on investing in one or more areas of institutions, 93% in one or more areas of conservation, 91% in one or more areas of livelihoods, and 89% in one or more areas of agriculture (Thaxton et al. 2015). With respect to outcomes, out of 166 integrated landscape initiatives, 96 reported higher incomes for low-income households, 88 the preservation or use of indigenous and local knowledge, 87 improved biodiversity protection, 83 empowerment of women, and 69 improved food security (ibid.).

8.2.4 Barriers to the landscape approach and how they can be overcome

There are significant challenges that need to be overcome to implement the landscape approach. In many countries, land and resource governance have been decentralised but capacities and resources, particularly for land-use and spatial planning, are often lacking at local levels. The landscape approach requires coordinated policy, planning and interventions across government departments, but this is difficult to achieve when different departments are competing for budgets

and have different mind sets towards land, and when incentives for inter-departmental coordination do not exist. The landscape approach requires not only government departments to work effectively together, but also other stakeholders at different levels to be involved in the key decision-making processes. However, effective multi-stakeholder processes are challenging to implement as actors may distrust each other and have divergent interests. In addition, some stakeholders tend to be more influential and better able to represent their interests than others. Past experience reveals that local farmers, especially women, may not have the confidence to participate actively in deliberation and planning processes and that private sector actors may only be interested in participating if they can dominate the processes (van der Horn and Meijer 2015). That existing policies and institutional arrangements often do not fit well with the boundaries of landscapes poses another set of challenges.

While the challenges facing the landscape approach are considerable, there are positive trends that are supportive of the approach. Many countries have introduced supra-ministerial coordination bodies to promote integration and include public consultation as a formal step in their policy development processes. Stakeholders are gaining experience with, and confidence in, multi-stakeholder processes through various initiatives including the development of voluntary forest certification standards, national timber legality verification schemes and national REDD+ strategies. National programmes involving local communities in the co-management of natural resources can now be found in many of the region's developing countries and these have contributed to the development of more constructive relationships between governments and communities. Decentralisation processes, while still a "work in progress", have brought the administration of land and natural resources closer to the landscape scale. Technical advances in the fields of remote sensing and geographic information systems (GIS), as well as new web-based services and freely available software and satellite imagery, are aiding local governments with their spatial planning. Also, a wide range of organisations are using the "Internet of Things" to enable stakeholders who are physically far removed from the landscape to contribute to its management through "citizen science" and activism. The challenges to landscape approaches described above should thus not be off-putting; rather, they highlight where efforts need to be concentrated.

Table 8.2 lists some of the barriers facing the landscape approach, their causes and possible solutions. The solutions lie in direct actions to implement the landscape approach as well as indirect but nevertheless equally important actions to build enabling mechanisms and a facilitative environment.

A first step for countries where traditional forms of landscape management already exist would be to build the awareness of policymakers on the values of these landscapes and how they can be effectively supported (Box 8.1). Governments tend to view traditional land-use systems as inefficient as their yields are lower than those of chemical-intensive farming and also see them as environmentally destructive because of the cutting and burning of vegetation under shifting agricultural cycles. However, traditional shifting agricultural systems maintain high levels of biodiversity and carbon stocks, are an important element of local culture, and preserve indigenous cultivars (see Chapter 5). Communities can be encouraged to maintain the values provided by their traditional landscape management systems by providing them with secure tenure and supporting the processing and marketing of the goods and services that are unique to their place.

Table 8.2 Barriers, causes and possible solutions for the landscape approach

Barrier	Causes	Possible solutions
• Stakeholders not familiar with landscape approach and its benefits	• Focus of each stakeholder on own narrow objectives • Lack of understanding of potential benefits of landscape approach	• Develop capable facilitators • Participatory scenario development and participatory GIS • Rigorous assessments of existing landscape initiatives
• Lack of collaboration between sectors	• Land management is sectoral-based	• Adopt "whole of government" approach and align policies and plans with SDGs • Adopt landscape approach to achieve SDGs • Intersectoral planning and coordinated decision-making
• Low performance of local governments in landscape management and lack of coordinated planning across local governments	• Lack of capacities – human resources and financial • Lack of experience in and incentives for stakeholder engagement	• Provide place-based budget allocations at landscape level • Build capacities for spatial planning, scenario setting and stakeholder engagement • Support establishment of cross-jurisdiction forums and organisations
• Local communities and farmers / smallholders poorly represented in stakeholder processes and not participating in landscape management	• Lack of resources to participate • Lack of confidence • Unfamiliar with processes • Lack of proper representation • Concerned with day to day survival and have no incentives for landscape management	• Build and empower local institutions • Develop schemes for communities to manage biodiversity and natural resources • Strengthen national rural extension programmes
• Traditional forms of landscape management under threat	• Governments see traditional forms of landscape management as inefficient and destructive • Local communities unable to generate sufficient income from their traditional land management	• Review traditional landscape management systems to identify how they can be strengthened • Build awareness of policymakers • Provide secure tenure and support processing and marketing of goods and services • Protect and promote languages and cultures of minority peoples
• Lack of interest of private sector to participate in landscape management and desire to dominate processes	• May view landscape approach as a threat to immediate interests • See no financial benefit in landscape management	• Support businesses to include landscape management in their corporate social responsibility strategies • Build awareness amongst business of how landscape management can reduce their risks • Provide opportunities and incentives for business participation in landscape management • Support businesses to develop responsible supply chains

• Inadequate finance for landscape management	• Multi-stakeholder processes take time to deliver "concrete" results	• Raise awareness of funders • Identify entry points where funders can target investments • Provide opportunities and incentives for private sector engagement in landscape management

Box 8.1 Supporting socio-ecological production landscapes and seascapes

The notion of an integrated human-nature system is found in traditional societies the world over. In Bali, Indonesia this system is found in the concept of *tri hita karana* ("three causes of wellbeing" – a belief that wellbeing derives form harmony among people and with nature and God) (Hakim, Kim, and Hong 2009) and for the indigenous Quechua people in the Andes, in *sumak kawsay* ("living well" – a notion of collective development that places the individual within his/her social and cultural communities and natural environment) (Girón 2014).

In Japan, the idea of an integrated human-nature system is captured in the concept of *satoyama*. The term *satoyama* is a compound word consisting of "sato" (home village) and "yama" (wooded hills and mountains). In a *satoyama* landscape, landscapes are managed locally as an integrated system to provide a bundle of ecosystem services (Takeuchi, Ichikawa, and Elmqvist 2016). A key feature of *satoyama* landscapes is that they comprise a diversity of different ecosystems within a relatively small area forming a dynamic mosaic. A key feature of their management is the important role that local communities and their institutions play. Similar traditional forms of landscape and seascape management can be found in the uplands and coastal areas of many Asia-Pacific countries. These areas are collectively referred to as socio-ecological production landscapes and seascapes (SEPLS).

As SEPLS are managed landscapes, it is important that they continue to be managed for multiple functions to maintain their high levels of biodiversity and their bundles of ecosystem services. However, while some SEPLS across the region continue to be sustained through traditional institutions based on local and indigenous knowledge, others face overuse or underuse. The main threat facing SEPLS in Asia-Pacific developing countries is their conversion for large-scale intensive agriculture. In contrast, in developed countries the major threats are abandonment of farmland and agricultural facilities as well as underuse of natural resources, due to depopulation, changes in industrial structures and dependency on external agricultural products and energy (Takeuchi 2010). SEPLS are also now facing threats from human-induced climate change and the consequent increase of risks from natural disasters.

The Conference of the Parties of the Convention on Biological Diversity (CBD) adopted the Satoyama Initiative at its 10th meeting in October 2010 (COP 10) with the aim of reversing these trends and rectifying the imbalance of overuse and underuse of natural resources in production landscapes. The International Partnership for the Satoyama Initiative (IPSI), a partnership of about 220 diverse organisations, was created in the same year to undertake and facilitate a broad range of activities to implement the concepts of the Satoyama Initiative. The Satoyama Development Mechanism (SDM) is one of these activities. The SDM was established in 2013 by the Institute for Global Environmental Strategies, the United Nations University Institute for the Advanced Study of Sustainability and the Ministry of the Environment, Japan. As a financing mechanism, the SDM has

provided seed funding to 24 projects from 14 countries, most of which are supporting integrated landscape approaches to sustain and revitalise rural livelihoods and biodiversity in SEPLS.[32]

8.3 Integration through REDD+

8.3.1 Aims and key features

REDD+ refers to activities to reduce emissions from deforestation and forest degradation and other forest activities that conserve or enhance forest carbon stocks. REDD+ is being promoted under an international framework agreed by Parties to the UN Framework Convention on Climate Change (UNFCCC) to reward developing countries for reducing forest-based carbon emissions (Seymour and Busch 2016). In 2015, the Paris Agreement included REDD+ as a strategy to achieve the global climate goal of net-zero emissions in the second half of this century.

The rules and structures of REDD+ are set out in the "Warsaw framework", which was agreed at the 19th Conference of the Parties (COP) of the UNFCCC in 2013. The Warsaw framework requires developing countries to have the following elements in place to access results-based finance for REDD+: a national strategy or action plan for REDD+; a national forest monitoring system; a reference level against which progress on reducing emissions can be measured; and a safeguard information system to report how the REDD+ safeguards are being addressed and respected. Under the framework, REDD+ is to be implemented at a national scale, but sub-national implementation is permitted as an interim measure.

As can be seen from the Warsaw framework, REDD+ is distinguished from traditional approaches to forest management by its financing and scale of application. REDD+ represents a shift from the up-front financing of development assistance to ex-post payments based on results (Pistorius and Kiff 2014). In terms of scale, REDD+ is distinguished by its requirement for a national strategy to address the drivers of deforestation and forest degradation, activities to prevent displacement of the drivers to other areas, and the monitoring of all forest areas within the national territory.

8.3.2 Progress on REDD+ in the Asia-Pacific region

Outside the few REDD+ projects that have been developed in countries such as Indonesia, PNG, Lao PDR, Cambodia, India and China that are targeting the voluntary market, there is little implementation of REDD+ in the region. Indonesia's two-year moratorium on new forest exploitation licenses, which it committed to under an agreement with Norway in 2010 in return for up to USD 1 billion in support (Seymour, Birdsall, and Savedoff 2015), is a rare example of a national REDD+ activity.

Countries have mostly focused on establishing their REDD+ frameworks and it is only recently that some results-based finance for REDD+ has become available. In October 2017, the Green Climate Fund (GCF) approved a pilot programme of USD 500 million to deliver results-based payments in accordance with UNFCCC decisions. The Forest Carbon Partnership Facility (FCPF) of the World Bank provides another source of financing for REDD+ results-based payments. The World Bank has signed "letters of intent" with Indonesia, Lao PDR and Nepal, through which the Bank commits

[32] For more information on the SDM, see https://www.iges.or.jp/en/natural-resource/bd/sdm.html.

to providing results-based financing. REDD+ is slowing moving from the stage of rulemaking towards implementation.

In the Asia-Pacific region, 20 countries are developing their national REDD+ frameworks. Table 8.3 describes the progress of REDD+ readiness of seven of these countries. The REDD+ "readiness" process is proving to be a long one because of the technical challenges associated with establishing a forest reference level, a forest monitoring system and a safeguards information system, and also because integrated approaches requiring extensive consultations are needed to effectively tackle deforestation. While progress on readiness is slow, interest in REDD+ remains strong. Forest-rich developing countries in the Asia-Pacific region have included REDD+ as a strategy to achieve their nationally determined contributions (NDC) to mitigate climate change.

Table 8.3 Progress of REDD+ readiness in selected countries (as of March 2018)

Country	Progress of REDD+ against the Warsaw Framework for REDD+			
	National REDD+ strategy / action plan	**Reference level**	**National forest monitoring system**	**Safeguards information system**
Indonesia	National REDD+ Strategy (2012)	Submitted (Dec, 2015)	Developed	Developed
Cambodia	Draft National REDD+ Strategy 2017-2026 (2017)	Submitted (Jan, 2017), National level	Under development	Under development
Lao PDR	Under development	Submitted （Jan, 2018）National level	Under development	Under development
Viet Nam	Revised National REDD+ Action Plan (NARAP) (Apr, 2017)	Submitted (Jan, 2016) National level	Completed (under improvement)	Under development
Myanmar	Draft completed (2017)	Submitted (Jan, 2018) National level	Under development	To be developed
Papua New Guinea (PNG)	Under development	Submitted (Jan, 2017) National level	Under development	Under development
Philippines	Philippine National REDD+ Strategy (PNRPS) (2010)	Under development	Under development	Under development

Source: Authors

8.3.3 How REDD+ promotes integrated approaches to land management

The core idea of REDD+ is to compensate developing countries for protecting carbon sequestered and stored in forests. However, as negotiations on REDD+ progressed under the UNFCCC, the objectives of REDD+ broadened, reflecting divergent views and interests. Depending on who is promoting it, the objectives now may include protecting biodiversity, reducing poverty and enhancing local livelihoods, strengthening indigenous rights, improving governance, and building adaptive capacity (Angelsen 2015). Based on this broadening of objectives, Nelson (2016) argues that the principles and ideas associated with REDD+ are best captured by what might be termed the "integrated landscape approach".

It is widely understood that to be successful in combating deforestation and forest degradation, REDD+ strategies must promote integrated approaches to land management and must be organised at the national level. Deforestation and forest degradation cannot be framed simply as forestry problems that require local forestry solutions. Forest destruction is mostly a consequence of wider economic forces that lie outside the forestry sector (Saunders and Reeve 2010; Geist and Lambin 2002). Lawson (2014) estimates that commercial agriculture caused nearly 71% of all tropical deforestation between 2000 and 2012. Reducing deforestation requires integrated approaches that harmonise land-use policies and eliminate both public and private incentives that drive deforestation (Corbera and Schroeder 2017).

Integrated approaches to land management are effectively, though not explicitly, demanded by the UNFCCC decisions on REDD+. When countries are developing their REDD+ national strategies or action plans, they are requested to address land tenure issues, forest governance issues, and gender considerations (UNFCCC 2011). This requires a broader perspective and approach than merely focusing on local strategies to stop deforestation and forest degradation.

Integrated approaches to land management are also required to ensure that the social and environmental safeguards for REDD+ agreed by Parties to the UNFCCC are addressed and respected. The seven REDD+ safeguards, known as the "Cancun safeguards" (Box 8.2), include respecting the knowledge and rights of indigenous peoples and local communities, as well as the full and effective participation of relevant stakeholders in REDD+ activities. These safeguards mean that forest and land management must take local livelihoods, knowledge and culture into account. The safeguards also require REDD+ activities to conserve forests and biodiversity, for which integrated approaches to ensure forests continue to serve multiple functions will be needed.

Box 8.2 Cancun safeguards

(a) That actions complement or are consistent with the objectives of national forest programmes and relevant international conventions and agreements;
(b) Transparent and effective national forest governance structures, taking into account national legislation and sovereignty;
(c) Respect for the knowledge and rights of indigenous peoples and members of local communities,
(d) The full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities,
(e) That actions are consistent with the conservation of natural forests and biological diversity,
(f) Actions to address the risks of reversals

Source: UNFCCC (2011)

8.3.4 How REDD+ contributes to the SDGs

REDD+ directly contributes to SDG 13 – Climate Action by reducing emissions from deforestation and forest degradation and enhancing forest carbon stocks. Forest protection and restoration through REDD+ will also clearly contribute to SDG 15 – Life on Land. Other SDGs would be indirectly supported when implementing REDD+, as protecting tropical forests provides a number of benefits including water quality and availability, forest food, pollination and pest control, fisheries, health, medicines, reduced incidence of diseases, and safety associated with soil and watershed protection (Seymour and Busch 2016). In addition, the REDD+ safeguards and the non-carbon objectives that some countries have for REDD+ and as embedded in the UNFCCC decisions are highly relevant to most of the SDGs (Table 8.4).

Table 8.4 Which REDD+ objectives contribute to which SDGs

SDG	REDD+ objectives (as embedded in UNFCCC decisions)
1. No poverty	(REDD+ activities should) be implemented in the context of sustainable development and reducing poverty, while responding to climate change [1/CP.16, Appendix I, 1 (g)]
2. Zero hunger	[1/CP.16, Appendix I, 1 (g)]
5. Gender equality	Agrees that systems for providing information on how the safeguards referred to in appendix I to decision 1/CP.16 are addressed and respected should empower all women and girls, taking into account national circumstances and respective capabilities, and recognising national sovereignty and legislation, and relevant international obligations and agreements, and respecting gender considerations… (12/CP.17, I, 2)
6. Clean water and sanitation	Conservation of ecosystem services (1/CP.16)—indirectly could help countries maintain watershed integrity
7. Affordable and clean energy	Encourages all parties to consider the entire sinks and reservoirs of greenhouse gases while developing the nationally appropriate mitigations actions (1/CP.21). For countries with a significant contribution of forest degradation (and GHG emissions) from wood fuels, this should be considered
10. Reduce inequalities	Urges developed country Parties, to support, through multilateral and bilateral channels, the development of REDD+ national strategies or action plans and implementation (1/ CP.16)
12. Responsible consumption and production	Reduce the human pressure on forests, including actions to address drivers of deforestation (1/CP.16)
13. Climate action	Reduction in emissions from deforestation and forest degradation; enhancement of forest carbon stocks (9/CP.19) Address the drivers of deforestation (15/CP.19)
15. Life on land	Reducing emissions from deforestation in developing countries: approaches to stimulate action (2/CP.13)
16. Peace, justice and strong institutions	Institutional building (National Forest Monitoring Systems, Safeguard Information Systems, etc.), with full and effective participation of all relevant stakeholders (1/CP.16; 11/CP.19)
17. Partnerships for the Goals	To provide finance and technology to developing countries to support emissions reductions (1/CP.16) Be supported by adequate and predictable financial and technology support, including support for capacity-building [1/CP.16, Appendix I, 1 (i)]

Source: Bastos Lima et al. (2017)

8.3.5 Barriers to integration under REDD+ and how they can be overcome

REDD+ requires integrated approaches to address the diverse drivers of deforestation and degradation while addressing and respecting the safeguards and delivering co-benefits. However, National REDD+ Strategies listed in Table 8.3 provide little information on how policy integration across sectors directly affecting land – forestry, agriculture, livestock, extractive industries – is to be achieved. Barriers, their causes and possible solutions for moving forward with REDD+ are presented in Table 8.5.

Historically, there has been little effective cross-sectoral coordination in the forest and environmental policy-making processes of most developing countries (Christy et al. 2007; Geist and Lambin 2002). In PNG and Viet Nam, for example, unclear and overlapping authority over forest lands are found among the different government departments, and this causes a lack of policy consistency (Korhonen-Kurki et al. 2016). In Cambodia, challenges to cross-sectoral coordination include identifying what synergies and trade-offs around REDD+ exist for different policy sectors,

identifying priorities and balancing competing interests, incentivising sectors that drive deforestation towards forest protection, assigning responsibilities and allocating resources for REDD+ actions, and evaluating the impacts of actions from the perspectives of different sectors and levels.[33] Intra-governmental struggles over institutional control of forests and REDD+ make it difficult to put integrated approaches into practice. In the context of such struggles for influence, Korhonen-Kurki et al. (2016) question whether and where REDD+ fits properly within government structures.

Regarding vertical coordination, it is generally understood that REDD+ will be implemented through a hierarchy of jurisdictions, or central bodies with their sub-national branches (Korhonen-Kurki et al. 2016). Coordination across these multiple levels will be challenging. Throughout the Asia-Pacific region, many aspects of land management have been decentralised, but local authorities lack the human and financial resources to fulfil their expanded mandates.

Countries in the region preparing for REDD+ have recognised the need for cross-sectoral and vertical coordination to address the drivers of deforestation. Many have created formal cross-sectoral bodies for ministries and agencies from different policy sectors, as well as non-government stakeholders to collaborate in managing the process of REDD+ readiness. Examples of these include the REDD+ steering committee in Viet Nam, the REDD task forces in Cambodia, Indonesia and Lao PDR, and the technical working groups in PNG. The policy sectors involved in such inter-ministerial REDD bodies include forestry, environment, finance and land-use planning (Fujisaki et al. 2016).

For coordination across different levels, Indonesia, Viet Nam and Lao PDR have developed institutional arrangement between national and sub-national governments. In Indonesia, REDD+ is a national approach with sub-national implementation. Each provincial government has the authority to establish a REDD+ body and to design and implement a regional REDD+ strategy and action plan (Kawai et al. 2017). Viet Nam has adopted a similar approach. In accordance with its National REDD+ Action Plan (NARAP), 17 provincial governments have developed provincial REDD+ action plans (PRAP). In Lao PDR, provincial REDD+ task forces (PRTF) have been established in seven provinces and six provincial REDD+ action plans (PRAPs) were developed under the national strategy (Government of Laos 2018).

As a result of such efforts, the readiness processes have brought different policy sectors together to work on the issue of deforestation and have brought broader social and environmental concerns into the decision-making processes over forests (Corbera and Schroeder 2017). REDD+ has thus provided opportunities for better coordination across different policy sectors and different levels of governments on forest and land management.

One potential way forward for integrated approaches through REDD+ is for each country to position REDD+ within the context of the SDGs. This could provide a clear rationalisation amongst land sectors and assist with working through potential trade-offs (Bastos Lima et al. 2017). Aligning REDD+ with the SDGs could also create institutional synergies, as both the SDGs and REDD+ are monitored and reported by national government bodies. For instance, national forest monitoring systems developed for REDD+ could contribute to reporting on the progress of SDG's 13 and 15, and the REDD+ safeguards information system could provide useful data and information for other SDGs.

[33] Interview: Ministry of Environment and Forestry Administration, Royal Government of Cambodia (21 February 2018).

Table 8.5 Barriers, causes and possible solutions for moving forward with REDD+

Barrier	Cause	Possible solutions
• Lack of department coordination over forest resources • Unclear and overlapping authority over forest lands • New REDD+ institutions causing political tensions • Inconsistency in decision-making and action across multiple levels of governance. • Lack of human and financial resources of local authorities to fulfil their expanded mandates.	• Weak forest governance • Weak leadership and legitimacy of REDD+ institutions • Trade-offs around REDD+ for different policy sectors • Embedded economic interests and politically connected networks in forest management and land use	• Align REDD+ with the SDGs, provide a clear rationalisation amongst land sectors and assist with working through potential trade-offs • Provide appropriate capacity building for local authorities through REDD+ readiness

Source: Authors

8.4 Integrated Water Resource Management

The way that land is used or managed has a significant impact on water resources and vice versa. According to a recent study, over 60% of the global population is negatively affected by the impacts of land-use and land cover change on water resources (Veldkamp et al. 2016). In the Asia-Pacific region, more than 75% of countries are facing water scarcity largely due to rapid urbanisation, economic growth, increasing demand for food and energy and climate change (ADB 2013b). Another challenge is that most of the region's river basins are trans-boundary, meaning that governments must cooperate in managing water to avoid water scarcity (Brears 2014).

Increasing pressure on limited water resources led in the 1980s to development of the concept of integrated water resources management (IWRM). IWRM was given a strong boost by the Agenda 21 process of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. Chapter 18 of Agenda 21 proposed integrated water resources development and management as one of the programme areas for freshwater resources to address the growing scarcity, gradual destruction and aggravated pollution of freshwater (UN Conference on Environment and Development 1992). It viewed the fragmentation of responsibilities for water resources among sectoral agencies as a major impediment to integrated water management and called for a "dynamic, interactive, iterative and multisectoral approach to water resources management" (ibid.). The profile of IWRM was again raised at the World Summit on Sustainable Development (WSSD) in 2002 and at the World Water Forums in The Hague (2000), Kyoto (2003), Mexico (2006), Istanbul (2009), Marseille (2012), Daegu-Gyeongbuk (2015) and Brasilia (2018).

8.4.1 Where, to what extent and how is IWRM being implemented?

IWRM processes have been established or are being established in many parts of the world. In the Asia-Pacific region, the IWRM approach is increasingly being trialled and implemented at the local level (e.g. in China, Republic of Korea, Japan, Mongolia, and the Philippines). The region has made substantial progress, with 31 out of 32 countries reporting data that shows they have been developing water management plans, though only a few have reached the stage of advanced implementation (UN, ADB, and UNDP 2017). The Davao River Basin in the Philippines, Medan city

in Indonesia (Hezri and Dom 2017), Liao River Basin in China (UNESCO 2009) and Lake Biwa in Japan provide good examples of the implementation of IWRM at the river and lake basin levels.

8.4.2 IWRM goal, aim and objectives, and implications for administration

The goal of IWRM is to manage water resources in a harmonious and environmentally sustainable way. Its broader aim is to overcome sector-based policy fragmentation and ineffective governance structures. Critical objectives that countries have set for IWRM at national and local levels include (i) integrating water resource provision and the wastewater treatment systems, (ii) optimising water infrastructure, and (iii) promoting an environmentally-sound water cycle system. Minimising water demand is considered the first step to reduce wastewater. Other important strategies linked to IWRM include water resource conservation, ecosystem maintenance, disaster risk reduction, storm-water or flood management, and effective land use (ESCAP 2012).

The Global Water Partnership's (GWP) definition of IWRM is widely used. It defines IWRM as "a process which promotes the coordinated development and the management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (UNESCO 2009). Defined as such, IWRM is a holistic approach to water resource management that brings together actors from different sectors into water decision-making processes, and this contributes to balancing the interests of different user groups and in doing so avoids conflict.

In addition, IWRM moves beyond integration within natural systems. It helps to bridge natural systems and the human systems that determine demand for water and set development priorities related to water. IWRM involves "horizontal" bridging across spatial scales and "vertical" bridging across levels of decision-making, with actions at one level seeking to reinforce and complement actions at other levels (Global Water Partnership 2009).

IWRM requires that water resources management be placed within a country's overall sustainable development strategy and framework for public administration. Without a robust policy framework at sub-national and national levels, sustainable improvement of water at the local level is difficult. In large river basins, effective governance from local to basin levels is a major challenge, requiring functions to be placed at appropriate levels. A river basin perspective is needed, but it must be supplemented by overarching national policies if water management is to be effective.

As indicated in Figure 8.1, under IWRM, integration takes place vertically and horizontally. Vertical integration means the co-ordination of governance structures across tiers or levels – international (transboundary basins), national and local levels (basins and sub-basins), as well as community level (watersheds). Horizontal integration denotes coordination within the water sector and across sectors such as health and sanitation, land use, agriculture and energy.

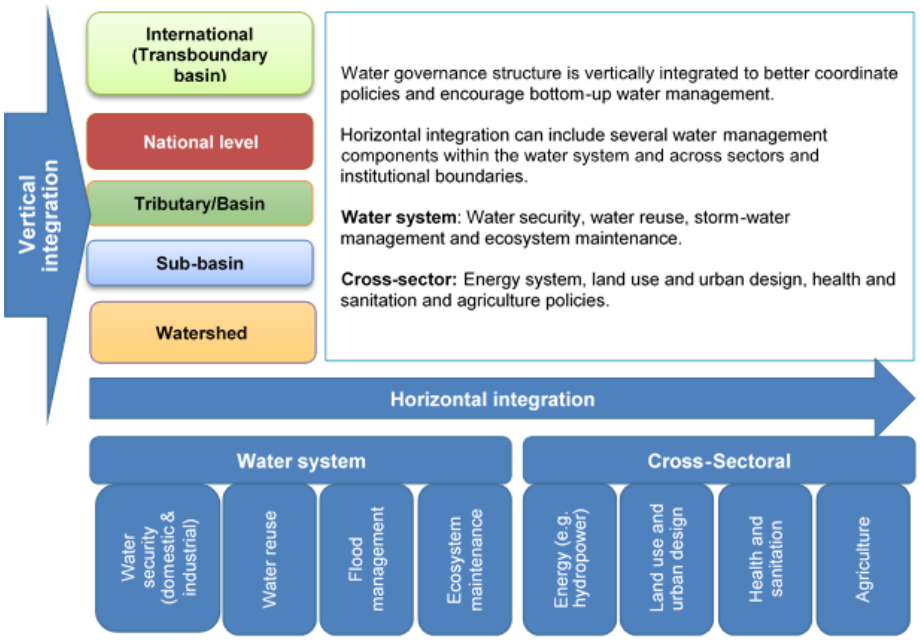

Figure 8.1 Vertical and horizontal integration in water resource management

Source: Adapted by authors from ESCAP (2012)

8.4.3 How can IWRM contribute to achieving the SDGs?

IWRM has been recognised as an important means of achieving the UN SDGs and 59 out of their 169 targets (Smith and Clausen 2018). IWRM is especially important for SDG 6 – Clean Water and Sanitation; SDG Target 6.5 is by 2030, implement integrated water resources management at all levels, including through transboundary cooperation. An often-cited benefit of IWRM is that it brings diverse stakeholders into decision-making processes, which can lead to more equitable water management decisions (UNDP 2006) and prevent conflict (United Nations 1992). IWRM also addresses the issues of fragmentation and overlapping of policies and systems, which create unnecessary costs and trade-offs. For instance, divisions between the wastewater treatment system and the water supply system can lead to higher energy costs for piped water resources (ESCAP 2012). Integrating their management may help to reduce some costs. IWRM also offers several environmental benefits, such as water resource conservation and maintenance of the hydrological cycle. Reduced energy use for water provision can also mean lower CO2 emissions. An integrated approach to water resources management supports cross-cutting policies. Cross-sectoral benefits of IWRM can include better health, gender equity and higher agricultural productivity. Additionally, IWRM can strengthen local social capital as it supports the involvement of communities in water management (ibid.).

These strengths make IWRM indispensable to the SDGs. Goal 7 of the UN Millennium Development Goals (MDGs) was to ensure environmental sustainability. Its Target 7C was to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. SDG 6 – Clean Water and Sanitation builds upon MDG-7C, but is more comprehensive, stressing the importance of holistic management by looking at the entire water cycle from source to end. SDG 6 directs attention at critical aspects of water such as wastewater and excrete/septage

management, integrated resource management, water use efficiency, conservation and ecosystems. The water goal is important not only in its own right, but also because many of the targets across the other SDGs depend on it. IWRM contributes to SDG 6 and through this, to many other SDGs.

Figure 8.2 shows the nature of interlinkages between water targets and other targets under different goals, some of which are mutually reinforcing / positive interdependencies and others which are potentially conflicting. Most of the target-level linkages between Goal 6 and the other SDGs are positive, thus achieving Goal 6 targets will contribute to a large number of other targets, and vice versa. Examples of synergies that can be harnessed include increasing access to water supply, sanitation and hygiene (targets 6.1, 6.2) in homes, healthcare facilities, schools, and workplaces, complemented by appropriate wastewater treatment and safe reuse (target 6.3), as a way to reduce risks of water-borne disease (targets 3.1-3.3, 3.9) and malnutrition (target 2.2); supporting agriculture to achieve zero hunger (SDG 2) and education (targets 4.1-4.5); securing energy needs in general (SDG 7) and ensuring a productive workforce (targets 8.5, 8.8); and addressing poverty (targets 1.1, 1.2, 1.4), gender inequality (targets 5.1, 5.2, 5.4, 5.5) and other aspects of inequality (targets 10.1-10.3). IWRM can help in harnessing the synergies that exist between SDG 6 and other SDGs. This explains why Target 6.5 explicitly calls for the implementation of IWRM at all levels.

Note: Numbers shown on the x-axis indicate target 6.1 (1) …target 6.6 (6). Numbers shown on the y-axis indicate goal 1 (1), goal 2 (2)…, while negative values indicate that these targets may have some potential conflicts with relevant targets in SDG-6.

Figure 8.2 Type and nature of interlinkages between water targets and other SDG targets

Source: Prepared by the authors, based on information from UN Water (2016)

8.4.4 Barriers to the IWRM approach and how they can be overcome

Progress towards implementing IWRM in developed and developing countries is variable. About 25% of countries reporting on constraints to IWRM stated that they faced obstacles associated with legal frameworks and strategic planning (UNEP 2012b). Lack of progress is characteristically associated with the need to improve public awareness and overlapping management institutions. In developing countries, low technical capacity and lack of political interest in and understanding of IWRM concepts and implementation also affect the rate of progress (ibid.). Results from questionnaire surveys conducted in Asian countries by the Network of Asian River Basin Organisations (NARBO) indicated three critical factors that contribute to the success of IWRM implementation at the river basin level: (i) political interest and commitment (44.4%), (ii) basin management plan and clear vision (14.8%), and (iii) participation and coordination mechanisms (18.5%) (Abdullah 2014).

Several other challenges to integrating water resources management during the implementation phase have been identified. These challenges are summarised, and possible solutions are proposed, in Table 8.6.

High-level political commitment is needed to achieve vertical and horizontal integration in water resources management. Government officials within different ministries will need to be given incentives and the authority to coordinate their activities and share information, and to work towards a strong consensus on strategies and coherence among sectoral policies. High-level political commitment is also required to develop the enabling framework for IWRM and to allocate sufficient budget to implement IWRM programmes at both national and local levels.

Where political commitment is lacking, opportunities can be provided and resources made available for ministers and other high-ranking government officials from relevant sectors to discuss water issues, how IWRM can address these, and how they can move forward in a more coordinated and integrated way in their countries. A high-ranking official such as the deputy prime minister could be appointed chairman of the national water committee or a national committee involved in transboundary river basin management. This type of high-ranking person could also be invited to chair a national platform for IWRM. Other methods of motivation appropriate to context could also be considered.

A common vision and strategy on water management and use is a key element of IWRM. The process of developing this vision will require deliberation on trade-offs over water use (e.g. between energy, industry, agriculture and domestic sectors) and how they can be minimised, and also provides an opportunity for exploring and harnessing synergies. The development of this vision and its realisation will be aided by a central committee or coordinating agency (such as the National Water Commissions in Australia and the National Water Resources Board in the Philippines, and the National Committee on Environmental Protection of River Basins in Viet Nam) for harmonising the interests of diverse actors and stakeholders, encouraging their participation in decision-making processes and coordinating different sectoral strategies.

Major challenges to implementing IWRM also include lack of data and information sharing among relevant sectors and stakeholders, as well as lack of practical guidelines and capacity. Investments in all these areas will be needed. As authorities in Asia-Pacific countries have been decentralised to varying extents, particular attention should be paid to capacity building programmes on IWRM for local level actors, especially local governments.

Table 8.6 Common challenges to IWRM and possible solutions

Barrier	Cause	Possible solutions
• No agreement or strong consensus on what should be integrated, how, and by whom	• Different local contexts and priorities • Dependent on the scale of IWRM implementation and level of governance	• Build IWRM principles into specific projects and programmes
• Lack of consideration to local contexts and priorities in planning and implementation processes	• IWRM programmes built and implemented through top-down and centralised government approaches	• Use local laws and customary institutions as an entry point for IWRM • Train policymakers to work adaptively • Build IWRM from the bottom up using participatory approaches and ensure integration into local government planning processes
• Roles and responsibilities of each actor not clearly assigned	• Fragmented jurisdictional responsibility	• Balance management capacity and the level of integration • Establish an appropriate institutional arrangement with clear roles of each actor in accordance with specific needs of each basin
• Weak capacity, of local level actors / governments (human resources, information, water infrastructure)	• Lack of financial resources	• Strengthen capacity building programmes for local level actors, especially local governments • Ensure national and local governments provide appropriate financial support to implement IWRM programmes
• Conflict of interests and views	• Lack of common platform or mechanism to share common visions, policy goals and strategies among relevant sectors	• Establish appropriate mechanisms to develop and share policy goals, common visions and strategies among all key sectors • Give adequate attention to the different interests across sectors and institutions from the planning stage
• Weak cooperation across different sectors and institutions	• Lack of coordinating mechanisms	• Set practical guidelines and create a central committee or coordinating agency for harmonising the interests of diverse actors and to encourage their participation in decision-making processes (both horizontal and vertical integration) • Establish a mechanism for coordinated actions between water and other relevant agencies • Set up appropriate mechanism for monitoring the level of adoption and use of IWRM

Source: ESCAP (2012) modified by authors

8.5 Water-energy-food nexus approach

The water-energy-food nexus (WEFN) approach aims to address the interconnected challenges of water, energy, and food security with the intention of developing and implementing policies and plans to minimise trade-offs and realise synergies for sustainable development across these three sectors. Water, energy and food security are inherently interlinked and interdependent (Box 8.3, Figure 8.3). The water sector requires energy, as about 4% of the world's total energy consumption is accounted for by water delivery (International Energy Agency 2016). Conversely, the energy sector requires water for fuel extraction, cooling of thermal power plants and hydropower generation. Asia's energy sector used 92 billion cubic metres of water in 2014 (ibid.). Food security is dependent on both water and energy. About 83% of water withdraws in Asia are for agriculture (World Bank 2017b). Because of these interlinkages and interdependences, water, energy and food must be managed in an integrated manner.

The risks to the water, energy and food sectors are aggravated when they are not considered together. Uni-sectoral approaches have resulted in incoherent policymaking, contradictory strategies and the inefficient use of natural resources (Foran 2015). In the absence of nexus thinking in planning and policymaking for water, energy and food systems, the interactions between these systems are overlooked. Land provides water, energy and food, but current approaches to land and natural resource development tend to ignore this simple fact. Most land-use policies and plans focus on a narrow range of objectives associated with agriculture, biofuels, forestry, mining, tourism or water services. The failure to integrate these sectoral policies results in large and avoidable trade-offs. For instance, biofuel polices have been adopted in many Asian countries including China, Indonesia and Thailand as a new source of revenue and renewable energy. These policies are good for energy but may act against food and water security. Biofuel policies have resulted in the conversion of agricultural land from food crops to biofuel crops, and this has led to increasing food prices in the global market (Elder et al. 2018). Biofuel feedstocks are often grown on land where forests have been cleared and using the intensive application of chemicals, both of which can have serious detrimental impacts on water quality (as described in chapters 3 and 4).

Recognition of the growing trade-offs for water, energy and food security arising from single sector approaches has elevated nexus thinking in both academic and policy domains. In November 2011, the Bonn Nexus Conference brought together over 500 people from governments, academia, the private sector and financing institutions to discuss the water, energy and food security nexus as a solution for the "green economy". It called for active leadership, enabling frameworks and incentives to encourage nexus thinking at policy, strategy and planning levels to ensure policy coherence (Bonn2011 Conference 2012). Policy forums that followed the Nexus Conference also emphasised the importance of a nexus approach, including the World Water Forum's Ministerial Roundtable on Water, Energy and Food Security in 2012, Stockholm World Water Week in 2012, Mekong2Rio International Conference on Transboundary River Basin Management in 2012, The Water Summit 2013: Bringing WEF Nexus to Life in 2013, and the 14th Delhi Sustainable Development Forum in 2014. The adoption of the UN SDGs in 2015 has given the nexus concept even greater prominence in policymaking agendas (Weitz et al. 2014).

Box 8.3 Water-energy-food nexus in India

Thermal power is a major part of the energy mix in India and is a major user of water. Water use as a coolant in thermal power plants is projected to increase rapidly because of high reliance on water intensive cooling systems, and this will threaten the availability of water to other sectors such as agriculture. If the use of conventional cooling systems for thermal power plants continues, water demand from India's energy sector could reach 85 billion cubic metres (BCM) in 2050, which is about 8% of the country's total usable water (Bhattacharya and Mitra 2013). The agriculture sector consumes 18% of the nation's total electricity, so it is driving water use in the power generation sector, while at the same time competing with the power sector for water. Agriculture is responsible for about 90% of the country's total water withdrawals (Dewan 2017).

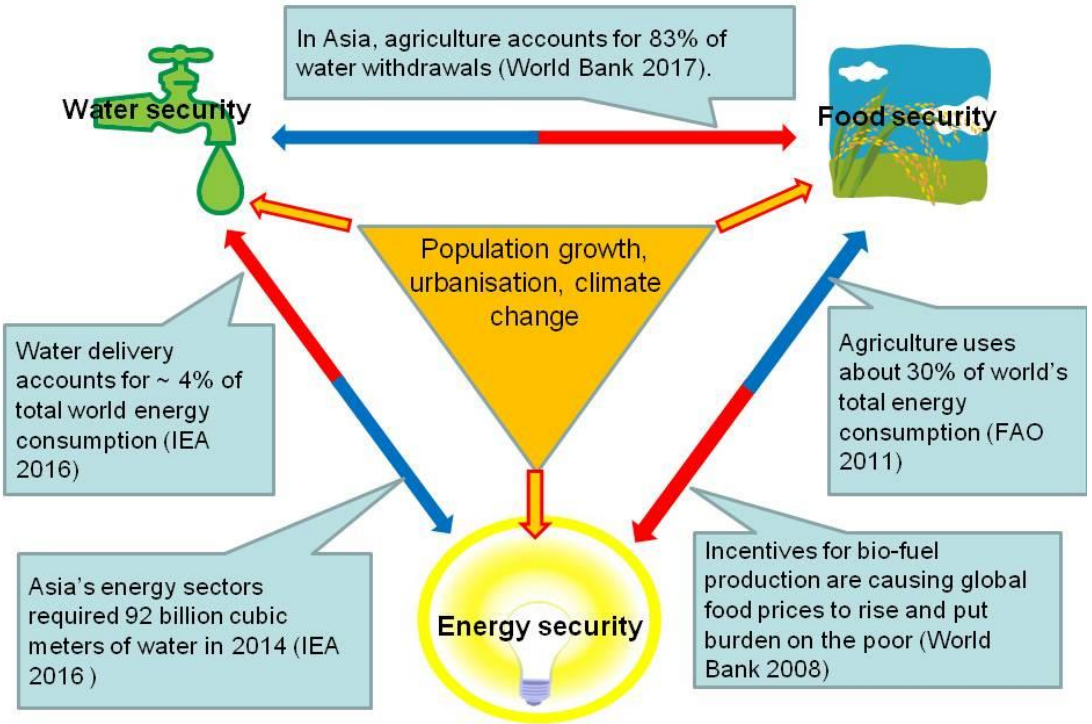

Figure 8.3 Interlinkages and interdependences between water, energy and food security

Source: Figure constructed by authors

8.5.1 Aims and key features

The WEFN approach aims to systematise interconnections and provide tools to assess the use of water, energy and food resources (Hermann et al. 2012). It is a system-wise approach that recognises the inherent interdependencies of the water, energy and food sectors for resource use,

seeks to acknowledge social and environmental consequences, and seeks to minimise trade-offs and harness synergies (Bazilian et al. 2011). The key principles of the nexus approach are:

- Understand the interlinkages among water, energy and food systems in a scientific manner and pay attention to system efficiency rather than the productivity of isolated sectors;
- Acknowledge the interdependent relationships between water, energy and food and support resource efficient and economically rational decision-making;
- Manage trade-offs and create synergies across the water, energy and food systems by identifying integrated policy measures, strengthening cross-sectoral collaboration and encouraging win-win actions;
- Contribute to long-term sustainability by producing more with fewer resources and generating co-benefits;
- Recognise the real value of natural capital including land, water, energy, and ecosystems and motivate the business sector to support the transition to sustainable development (Rasul and Sharma 2016).

8.5.2 Where, to what extent and how is the nexus approach being implemented?

Because of its importance to the UN SDGs and the Paris Agreement, the WEFN approach has received broad attention in international initiatives (e.g. Sustainable Energy for All (SE4All)[34] and World Economic Forum)[35]. As a holistic approach for greater resource coordination and management, WEFN has also been supported by research and academic institutes (e.g. International Food Policy Research Institute (IFPRI)[36], German Development Institute (DIE)[37], Stockholm Environment Institute (SEI)[38]), governments (e.g. German Development Cooperation)[39], the private sector (e.g. World Business Council for Sustainable Development (WBCSD)[40], Royal Dutch Shell[41], Coca Cola[42]), and international agencies and non-governmental organisations (e.g. World Wildlife Fund (WWF)[43], International Union for Conservation of Nature (IUCN)[44], OPEC Fund for International Development (OFID)[45], International Renewable Energy Agency (IRENA)[46], Food and Agriculture Organisation of the United Nations (FAO)[47], and United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)[48]). Examples of the WEFN approach are becoming more widespread, but most are at project level. Two examples are introduced in Box 8.4 and Box 8.5.

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[34] https://www.seforall.org/sites/default/files/SE4ALL_2014_annual_report_final_0.pdf
[35] http://www3.weforum.org/docs/WEF_WI_WaterSecurity_WaterFoodEnergyClimateNexus_2011.pdf
[36] https://www.ifpri.org/project/water-energy-food-nexus
[37] https://www.die-gdi.de/en/nexus/
[38] https://www.sei.org/topic/water-energy-food-nexus/#listing
[39] http://www.bmz.de/de/zentrales_downloadarchiv/web-apps/wasser/Strategiepapier430_01_2018.pdf
[40] https://docs.wbcsd.org/2014/05/WBCSD_Nexus_Challenges.pdf
[41] https://www.prnewswire.com/news-releases/shell-oil-company-president-addresses-nexus-of-water-food-energy-with-texas-top-scientists-137100443.html
[42] https://www.coca-colacompany.com/stories/looking-ahead-the-water-energy-food-nexus
[43] https://www.wwf.org.uk/sites/default/files/2014-24/sab03_01_sab_wwf_project_nexus_final.pdf
[44] https://www.iucn.org/theme/water/our-work/past-projects/nexus
[45] http://www.ofid.org/NewsEvents/ArticleId/2991/Access-to-food-water-energy-is-an-important-factor-for-development-br-em-Al-Herbish-addresses-delegates-at-international-conference-in-Cairo-em
[46] https://www.irena.org/publications/2015/Jan/Renewable-Energy-in-the-Water-Energy--Food-Nexus
[47] http://www.fao.org/3/a-bl496e.pdf
[48] https://www.unescap.org/sites/default/files/Water-Food-Nexus%20Report.pdf

Box 8.4 Using municipal wastewater in a power plant in Delhi, India

Indraprastha Power Generation Co Ltd (IPGCL), the electricity generation company of the Government of Delhi state, is moving towards cleaner and water-smart power generation. The company is using treated municipal wastewater from Delhi Municipal sewage water treatment plant instead of freshwater for its Pragati Combined Cycle Gas Turbine (CCGT) power plant. In exchange for a free daily intake of 20 million litres of treated wastewater from the sewage treatment plants, Pragati Power will operate and maintain the plants as well as cover the cost of their electricity. This model provides ideas for how water and energy infrastructure can be planned in an integrated manner. Its benefits include improved maintenance of the wastewater treatment plants, reliable and continuous cooling water supply to the power plant, which is especially important in the dry season, and reduced conflict with other users over water, especially the agriculture sector, which receives the excess treated water.

Source: Observations from unpublished IGES power plant survey in 2015

Box 8.5 Water-energy-food nexus approach for wastewater management in Da Nang, Viet Nam

Da Nang is the third largest city in Viet Nam. It has the highest urbanisation rate and this is placing great demand on resources. Recognising the growing challenges of meeting the city's resource needs, the city government committed to developing Da Nang as a "green city" by 2025. It adopted the nexus approach to help reach this goal, specifically to provide for the city's wastewater and sanitation needs. The city government has established a nexus task force with representatives from key agencies and stakeholder groups. The Department of Planning and Investment (DPI) and the Department of Natural Resources and Environment (DoNRE) of Da Nang will implement a pilot project on integrated resource management for wastewater and sanitation in An Hai Bac Ward, with funding from the World Bank and technical assistance from GIZ. The pilot project is based on the concept of separate sewerage systems. The kitchen waste from households will be added to wastewater to increase organic load for energy production, the treated wastewater will be used for irrigation, and agricultural residues will be used for urban farming.

Source: Information from UNESCAP (2015)

8.5.3 How can the WEFN approach contribute to achieving the SDGs?

Taking action on the water-energy-food nexus to manage trade-offs, avoid conflicting demands and harness synergies is crucial for the realisation of the UN SDGs. Water, energy and food security are essential to SDG 2 – Zero Hunger, SDG 6 – Clean Water and Sanitation, and SDG 7 – Renewable Energy, and also for achieving other SDGs including SDG 1- No Poverty and SDG 3- Good Health and Wellbeing. The interrelationships between water, energy and food requires that these SDGs are worked on in an integrated manner (Brandi 2013; Weitz et al. 2014). Recognising that water, energy and food policies will result in avoidable trade-offs and unrealised synergies if designed and implemented through single-sector approaches, the Colombian government has begun promoting a nexus approach to the SDGs. In doing so it hopes to encourage dialogue on broad development issues, rather than focusing on sectoral challenges (Weitz et al. 2014).

8.5.4 Barriers to the WEFN approach and how they can be overcome

The barriers and their causes as well as possible solutions for the WEFN approach are laid out in

Table 8.7. The challenges to the WEFN approach differ with context. For low-income countries, access to technologies, knowledge and finance are key challenges. In the case of emerging countries, resource use efficiency and good governance are key challenges. For developed countries, how to reduce footprint is the main challenge in the WEF nexus.

Table 8.7 Barriers, causes and possible solutions for the WEFN approach

Barrier	Cause	Possible solutions
• Lack of sectoral coordination • Insufficient awareness among relevant sector players of win-win solutions offered by the WEFN approach	• Lack of incentive mechanisms to motivate sectorial bodies to collaborate with each other • Lack of adequate financing to promote nexus solutions and access to technologies	• Give a high-level agency the mandate, resources and incentives for sectoral coordination
• Decisions lack strong evidence base	• Conventional decision-making processes are not evidence-based and may not respond to new evidence supporting a nexus approach	• Strengthen science-policy interfaces
• Continued overuse of resources	• High resource use encouraged by current sectoral policies	• Design appropriate mixes of regulatory measures and incentives according to context

Source: Challenges and barriers based partly on FAO (2018b), Scott (2017) and Weitz (2017)

The WEFN approach aims for policy coherence with a view to careful management of resources for people's livelihoods. For this, good governance is essential, especially to ensure that processes are participatory and outcomes equitable. Until very recently, implementation focused primarily on technical solutions, whereas governance, i.e. the institutions and processes governing the WEF sectors, has not received much consideration. Weak governance features among the challenges facing the WEFN approach. An enabling policy framework is required to address these challenges, especially to encourage diverse actors to collaborate and to strengthen the integration of sectoral plans and actions. Some of the possible ways to build an enabling environment for the WEFN approach and to support its implementation include:

Giving a high-level agency the mandate, resources and incentives for sectoral coordination: An agency that has approval authority for sectoral action plans and/or budgets can be tasked with the responsibility of promoting the WEFN approach in the relevant sectors. This high-level agency will be responsible for developing umbrella strategic plans and guidance for operationalisation of the WEFN lens for horizontal and vertical integration of policies and action plans. It may be more realistic and efficient to work with and through existing institutional structures than establishing a new agency for this purpose, though this should be decided on a country-by-country basis.

Strengthening science-policy interfaces: The WEFN approach must have a strong scientific basis, and its scientific foundations must be protected from the vested interests of individual ministries/departments. Strong science-policy interfaces should be developed to ensure that science is informed by the real needs of policymakers, and that the outputs of research include decision support tools that are useful for policymaking.

Designing appropriate mixes of regulatory measures and incentives according to context: Both regulatory controls and incentives will be required to minimise trade-offs and harness potential synergies across the WEF sectors. To be effective, they will have to be designed according to each context where resources are coming under increasing pressure.

A good example of a regulation that provides nexus benefits is The Environmental (Protection) Amendment Rules 2015 introduced by the Ministry of Environment, Forest and Climate Change (MOEFCC) of India. The rules reduce the water use limit from 3.6 m3/MWh to 2.5 m3/MWh for new thermal power plants to be installed after January 2017 (Ministry of Environment Forests and Climate Change 2015). Enforcement of the rules could reduce water use for thermal power generation by 30% as compared to following the existing guideline (Mitra et al. 2016). The development of new cooling technologies means that the new rules do not have to compromise India's energy security, while the saved water can help address the threat of water insecurity faced by the agriculture sector.

Incentives can be provided for "nexus smart infrastructure". This is infrastructure that leads to water and energy saving, while at the same time contributing to water, energy and food security, as well as economic development. An example of how an incentive for nexus smart infrastructure could be created would be to shift the subsidy in South Asian countries for electricity supply to water efficient irrigation technologies. South Asian countries provide large subsidies for electricity to pump irrigation water, which leads to excessive and unsustainable use of groundwater. Shifting the subsidy from electricity supply to water efficient irrigation technology could save 102 billion cubic metres of water and 82,000 GWh of electricity, and reduce CO2 emissions by 72 million tonnes (Mitra et al. 2017).

8.6 Concluding discussion

Land can serve many purposes and many expectations are placed on it. These expectations are laid out in national visions and development plans and are reflected in international agreements, such as the UN SDGs. They include expectations for suitable spaces for settlements, economic investments, agriculture, recreation and relaxation, natural resources, a wide range of ecosystem services, and biodiversity. With so many expectations, and given that population growth and economic development patterns are placing greater pressure on the land in many places, what processes can ensure that any decision on land use is socially optimal? Merely implementing the plans of different government sectors does not produce this result, because a narrow focus on one objective for land use usually leads to serious trade-offs for other objectives. Also, jurisdictions making decisions on land use without considering potential impacts on other jurisdictions can have the same effect.

Land-use development decisions are usually based on a very narrow set of objectives. This reflects the structures of public administration, which in developing countries have been heavily influenced by Western models. The new public management model (NPM) has been particularly influential in public sector reforms and is especially significant to this discussion on integration, as it moved the public sector in the opposite direction towards fragmentation.

NPM argued for a "meaner and leaner" state that would be more efficient, accountable and responsive (Dwivedi 2001). The state was to retreat; the private sector and civil society were to fill the gap. Key prescriptions of NPM included disaggregating large multifunctional public bodies, replacing them with single purpose bodies, and outsourcing tasks to the private and non-for-profit sectors (Groeneveld and Walle 2011). The expectation was that this would lead to greater efficiency, clear lines of control and healthy competition between entities (ibid.).

However, NPM worked against strategic alignment in government and the resulting fragmentation led to a loss of coordination, strategic capacity and institutional memory. Short-term production of outputs and annual actions became the focus of attention, while long-term strategic planning suffered. Steering control was lost as a result of fragmentation and short-term employment contracts. Structural devolution undermined control, while horizontal fragmentation undermined coordination.

From the late 1990s, various countries moved beyond NPM and embraced concepts such as "network governance", "integrated governance", "outcome steering", "joined-up governance", "holistic governance", "public governance", and "whole of government" (ibid.). These concepts directed attention at integrated services and cross-boundary working, and broad societal outcomes rather than outputs. New high-level units were established to promote coordination and investments were made to build loyalty and trust, which had suffered under NPM, back into the public sector (ibid.). The ideas of NPM have not completely gone away, but there is now more emphasis on building strong government with a well-coordinated public service.

Despite clear differences in the integrative approaches described in this chapter, all are complementary. They all recognise the importance of strong government and the need for an effective and well-coordinated public service. All aim to assist with the development of integrated planning and decision-making processes. With respect to governance, they all emphasise the importance of horizontal coordination across sectors and administrations, vertical coordination across the different tiers of government and effective engagement of stakeholders.

Integrative approaches point to the need for action at the national level on sustainable land management. This can start with reviews of the existing administrative approaches to identify where and why disconnects on land issues between sectors and between levels of government exist and how their plans and actions can be better coordinated. Capacity needs for integrative approaches should be identified and budgets made available to meet these. Ways to provide incentives to government departments for coordination could be explored. To initiate and direct these processes, steering mechanisms, such as high-level coordination bodies, should be established. Their main tasks should be to align policies and coordinate sectoral plans and budgets. National directives and support for coordinated plans and decisions on land across administrations at the local level are also needed. Integration will be aided by governments using the SDGs to refine national visions for sustainable development and develop sectoral targets.

The integrative approaches introduced in this chapter all acknowledge that mandates and expectations placed on local governments are growing. In this context, mechanisms need to be established at local levels for integrated land management. Governance arrangements should be created at local levels and effective scales to forge shared visions for land amongst stakeholders. These arrangements are likely to be more successful when they have access to financing for activities that generate outcomes agreed and prioritised by stakeholders for land management. Investments to build the human resource capacities of local governments and predictable financial transfers to them for integrated land management will also be required.

Knowledge gaps are another concern of integrative approaches to land management. Land management choices and practices should be based on all available and relevant knowledge. Science-policy interfaces should be strengthened for evidence-based decision-making and new science-policy interfaces may need to be established on nexus issues. Scientific knowledge should be brought together with local and indigenous knowledge to inform land-use choices and

management practices. Monitoring systems should also be established to monitor the implementation and impacts of integrative approaches for their continual improvement.

Integrative approaches should be introduced in a way that acknowledges and builds on existing reforms. The intention should not be an entire overhaul of the state apparatus. Dwivedi (2001) highlights the harm that frequent public service reorganisations and reforms, as well as frequent paradigm shifts, can do. Efforts towards integration should recognise recent positive reform efforts in the region and focus on the strengthening of public institutions and coordination mechanisms. All countries have experiences with coordination, so lessons can be extracted from these and shared between countries on what is likely to work best. Efforts to improve coordination should not be through the rigid application of generic models; rather, they should be sensitive to the culture and style of governance, local traditions and beliefs, politics and style of doing things of each country (ibid.).

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CHAPTER 9

Using the Sustainable Development Goals to address unsustainable land transformations in the Asia-Pacific region

Binaya Raj Shivakoti

Key messages

- *Inherent complexity in the Sustainable Development Goals (SDGs) is a barrier to their application to land management. A better conceptual understanding can guide governments and other actors in the Asia-Pacific region to develop a coherent view of how the SDGs apply to land.*
- *Reorganisation of the SDGs and their targets related to land into meaningful groupings can be useful for understanding how the SDGs can help to guide sustainable land management.*
- *To address unsustainable land transformation, strategies that promote harmony between nature and people are needed. The interdependent concepts of natural capital and inclusive human wellbeing are proposed to guide the development of such strategies within the framework of socio-ecological systems (SES).*
- *Sustainable land management depends on synergistic interactions between three pillars – governance, natural capital and inclusive wellbeing – within a SES. The SDGs, as a compilation of targets and indicators, can help in assessing progress on achieving these synergies.*

9.1 Introduction

Unsustainable land transformation in the Asia-Pacific region and other parts of the world is an outcome of human interference in an important component of the biosphere in the pursuit of economic development. Human engineered land transformation has endured despite many counter responses at different levels, including environmental protection legislation, treaties, multilateral agreements, and the establishment of specialised ministries, national and international agencies and environmental planning commissions. Various international initiatives promoting sustainable development and addressing major environmental challenges related to natural resources have been formulated since the Stockholm Convention on the Human Environment in 1972 (UN 1972). These include major bilateral and multilateral agreements and conventions such as Agenda 21 and its successors (Johannesburg Plan of Implementation and Rio+20), the United Nations Environmental Assembly (UNEA), the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the United Nations Convention to

Combat Desertification (UNCCD), among others (UN 2012, 2018). Notwithstanding these initiatives, progress on arresting the degradation of the Earth's environmental support system has been reported as disappointing (IPBES 2018, UNEP 2019).

In 2015, the international community agreed on the 2030 Agenda for Sustainable Development (Agenda 2030), which includes a broad set of 17 transformational Sustainable Development Goals (SDGs) and 169 targets that cover prominent sustainability challenges, including those related to land (United Nations General Assembly 2015). Other major agreements that address land issues include the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai DRR), the Paris Agreement on Climate Change, and the Aichi Biodiversity Targets under the Strategic Plan for Biodiversity 2011-2020 (CBD 2010; UNFCCC 2015; UNISDR 2015). "Land degradation neutrality" under the UNCCD, the New York Declaration on Forests, and the New Urban Agenda (Habitat III) are other global aspirations relevant to land (UN 2014, 2016; UNCCD 2015).

There are hopes that the SDGs could permanently transform the world's development paradigm, with environmental and social sustainability, rather than growth, becoming the defining characteristics of economic activities (United Nations General Assembly 2015; Stevens and Kanie 2016). Agenda 2030 envisions that the world will be transformed if all aspirations are met (United Nations General Assembly 2015).

While transformation will be difficult, humans do have transformative capacity. This can be seen in how during the "Anthropocene" human actions have resulted in planetary scale changes, exceeding some "planetary boundaries" (Rockström et al. 2009). Transformations in economic systems are required to ensure critical thresholds of a "safe operating space" are not breached, including thresholds associated with global nitrogen, sulphur, carbon cycles, and natural resource availability (water, land, energy) (Rockström et al. 2009; Westley et al. 2011).

The SDGs, as global goals for sustainable development, provide a broad view of global sustainability aspirations. They aim to trigger changes on a broad range of issues. It is expected that the SDGs can help to move economic systems into a safe operating space. Sustainability requires creating a safe and just space between societal foundations and ecological ceilings (Raworth 2017). This will require paradigm shifts in the prevailing discourses driving land-use decisions. The SDGs can be called upon to assist with these shifts.

This chapter examines the content of SDG targets and assesses them to advance conceptual understanding from the perspective of sustainable land management. Its objective is to make the SDGs, including their 169 targets, more comprehensible for governments and other actors working towards sustainable land management.

After this introduction, this chapter provides further explanation on the need for transformative change. It then groups the targets under SDG 15 – Life on Land into "sustainability", "actions" and "means" groups to aid their interpretation. The chapter next places the other relevant SDGs under five headings based on their primary relationship with SDG 15. It explains that the many and diverse targets related to land are essentially captured by two concepts – natural capital and inclusive human wellbeing – that stakeholders can use to further guide their actions to strengthen sustainable land management. Based on Ostrom's diagnostic framework of a socio-ecological system (SES) (Ostrom 2007), natural capital, inclusive human wellbeing and governance are presented as the three pillars for sustainable land management. Integrative approaches are needed to understand and direct actions to strengthen these pillars and their synergies. This chapter concludes that

strengthening governance is key to the transformations required for moving from a state of a vulnerable SES to a resilient SES, or from unsustainable to sustainable land management.

9.2 Need for and challenges to transformative change

Contemporary policies for improving human wellbeing focus on economic growth, which is mainly founded on resource-intensive production. A dilemma is that while economic growth has contributed to poverty reduction on the one hand, it has also led to resource-intensive lifestyles on the other. The dominant economic strategy found in Asia-Pacific developing countries is to aim for high economic growth, overlooking sustainability concerns during the transition to a "developed" state. The idea is to adjust the strategy later to mitigate negative impacts, such as loss of natural capital and ecosystem services, by progressively toughening the regulatory levers and other policy instruments. However, various regional and global assessment reports such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Regional Assessment Report on Biodiversity and Ecosystem Services for Asia and the Pacific (IPBES-AP), the 6th Global Environmental Outlook-Asia-Pacific Regional Assessment (GEO6-APRA), the Fifth Assessment Report of Intergovernmental Panel on Climate Change (IPCC AR5), as well as case studies in this report, indicate that the environmental externalities of economic growth are placing the region's future peace and prosperity at risk (Hijioka et al. 2014, UNEP 2016, IPBES 2018). Mass production, mass consumption-based economies have led to the net loss of natural capital to the extent that it could ultimately threaten human security (UNCCD 2017). IPBES-AP found that the region's rapid economic growth (annual average of 7.6% between 1990-2010), coupled with the highest global rates of urbanisation (2.0-3.0%/year) and agricultural expansion, has come at a high environmental cost, including accelerated and permanent loss of biodiversity (IPBES 2018). Similarly, GEO6-APRA is unequivocal on intensified land degradation threatening ecosystem integrity and biodiversity, a massive decline in natural forest areas in Southeast Asia and the Pacific, a rise in the number of threatened mammal and plant species, and displacement of indigenous people due to extensive agriculture, oil palm, and rubber plantations (UNEP 2016). Climate change will exacerbate these human stressors and increase vulnerabilities related to land resources, such as decline in agricultural productivity and increased risk of crop failures, and increasing water scarcity, floods and droughts (Hijioka et al. 2014).

Continuing with the current resource-intensive growth patterns is unsustainable. The existing policy narratives to reciprocate between consumption and economic growth cannot continue endlessly without confronting systemic failures (Wijkman and Rockström 2012). Achieving sustainability is possible only by protecting and strengthening the fundamentals of the natural support system that underpin livelihoods, economies, societies and cultures.

The region requires transformative shifts towards sustainable land management. More broadly, this involves moving SES, i.e. coupled ecological and social systems (as described in Chapter 1), to a different, inherently more desirable regime by changing the structures and processes that define the system (Walker et al. 2004). The processes of transformation require introducing drivers that displace entrenched forms of governance and provide space for innovation, thereby fostering fundamental, positive change in the nature of a SES (Chaffin et al. 2016). A shift towards sustainable land management and resilient SESs will require transformation of governance and institutions at all levels (Griggs et al. 2013). The required transformations also include shifts in deeply held values and beliefs and patterns of social behaviour (Westley et al. 2011).

The SDGs are expected to help to achieve these transformations. Management of land and landscapes is essential for many SDGs, especially those pertaining to the state of natural capital and nature's contributions to people (NCP) (Pascual et al. 2017; Díaz et al. 2018).

However, the SDGs are very complex, and in the land management community, the role of the SDGs may not always be clear. Moreover, there is a danger that countries and actors using the SDGs will focus on collecting data and reporting on indicators, rather than using them for transformational change (Elder and King 2018). There is also a risk that countries may cherry-pick high priority targets while overlooking others to suit their short-term development and political objectives. Another risk is that with 17 SDGs and 169 associated targets, countries may fail to fully appreciate how the SDGs other than SDG 15 relate to land.

To assist governments and other stakeholders develop a coherent view of how the SDGs apply to land, the following section introduces a framework and concepts that can make it easier for them to recognise land-relevant targets and understand their interlinkages.

9.3 Conceptualisation of the SDGs for sustainable land management

The SDGs were developed through a unique and inclusive goal-setting process. They are characterised by their voluntary nature, comprehensiveness and flexibility for national choices and preferences (Biermann, Kanie, and Kim 2017). Capitalising on opportunities that could be provided by an agreed set of development goals for both developing and developed countries is important for shaping the future governance regime, including for land use and management.

However, there are many challenges to realising the SDGs (Stevens and Kanie 2016; Biermann, Kanie, and Kim 2017). A complex web of interlinkages is one of the trademarks of global goals and many of the SDG targets are vague and difficult to quantify. Moreover, Elder and Olsen (2019) argue that the indicators tend to exclude the environmental dimensions of the targets. SDGs are ambiguous on, and lack guidelines for, the entry points for their implementation, means and ends are mixed, and how to evaluate cause-effect relationships between goals or targets is not clear. There are also numerous "blind spots", i.e. targets that countries have limited knowledge on in their national contexts (UNESCAP, ADB, and UNDP 2018). The SDGs, as a compilation of sustainability issues and challenges, could serve as a reference to determine whether some synergies or trade-offs have been overlooked to realise sustainable development, but they provide few clues on how this should be done.

In principle, the SDGs are universal, applying to all countries, but in practice, some SDG targets are more relevant to some countries than others. Several SDG targets (e.g. 1.a, 2.a, 7.b, 8.a, 9.2, 9.b, 10.b, 14.7, 17.2, 17.3, 17.4, 17.11, 17.12 and 17.18) pay special attention to the problems and issues of developing or least developed countries (LDCs), small island developing states (SIDS), and Land-Locked Developing States (LLDCs), many of which are located in the Asia-Pacific region. Some SDG targets (e.g. Targets 1.4, 1.5, 1.b, 2.1, 2.3, 4.7, 6.2, 8.5, 11.2, 11.5, 13.b and targets under SDG 5) are directed at people experiencing poverty and vulnerability, including women, indigenous peoples, persons with disabilities, children and youth, and older persons. Such vulnerable groups account for many people in the Asia-Pacific region, so for the region "no one is left behind" (United Nations General Assembly 2015) means addressing the concerns of these groups, including improving living standards, building resilience and securing rights.

The SDGs address issues highly relevant to land governance, including institutions and processes, participation, gender and equity, management, partnership, finances and resource mobilisation. There are many targets relevant to land, and these are found under many of the SDGs, not just SDG 15 – Life on Land. The following section examines and reorganises the contents of the SDGs relevant to land in a way that can help stakeholders develop a coherent understanding of them, which is important because of strong interlinkages between many of the land-related targets. It does this by examining SDG 15 and interlinkages between its targets and with targets of the other SDGs.

9.1.1 Reorganising the SDGs to guide sustainable land management

SDG 15, along with its 14 targets, is dedicated to land. SDG 15 aims to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss." The SDG 15 targets are broad in scope, and it can be helpful to dissect them in terms of sustainability aspirations, actions to promote sustainability, and means to implement the actions. In Figure 9.1, the key issues covered under SDG 15 and its targets are arranged into these three groups.

The "sustainability" group refers to sustainable and healthy ecosystems, including forests, water (river, lakes and wetlands), drylands, mountains and others (such as grasslands). These sustainability objectives can also be found in various other international agreements. SDG 15 consolidates them in one place.

"Actions" refers to broad and general actions to achieve the objectives in the "sustainability" group, managing ecosystems and mitigating threats to sustainability, such as actions to halt deforestation, restore degraded forests, increase reforestation and afforestation, combat desertification, etc. (e.g. Targets 15.2, 15.3, 15.5 and 15.7) and to prevent the introduction and significantly reduce the impact of invasive alien species (Target 15.8). The actions also include designing plans and activities to reduce, restore, preserve/conserve or improve the state of land, mountain ecosystems, forests and biodiversity (e.g. Targets 15.1, 15.3, 15.4). They also include actions to achieve land degradation neutrality (Target 15.3). The underlying issues that these actions address are major concerns for land governance and pose an imminent risk to the stability of land resource systems.

"Means" are resources, institutional arrangements, planning and policy frameworks, and international cooperation. SDG 15 targets finance and resource mobilisation (Targets 15.a and 15.b) and international support (Targets 15.b and 15.c). These resources and processes to mobilise them are the means to implement the "actions" in order to achieve the objectives of the targets under SDG 15.

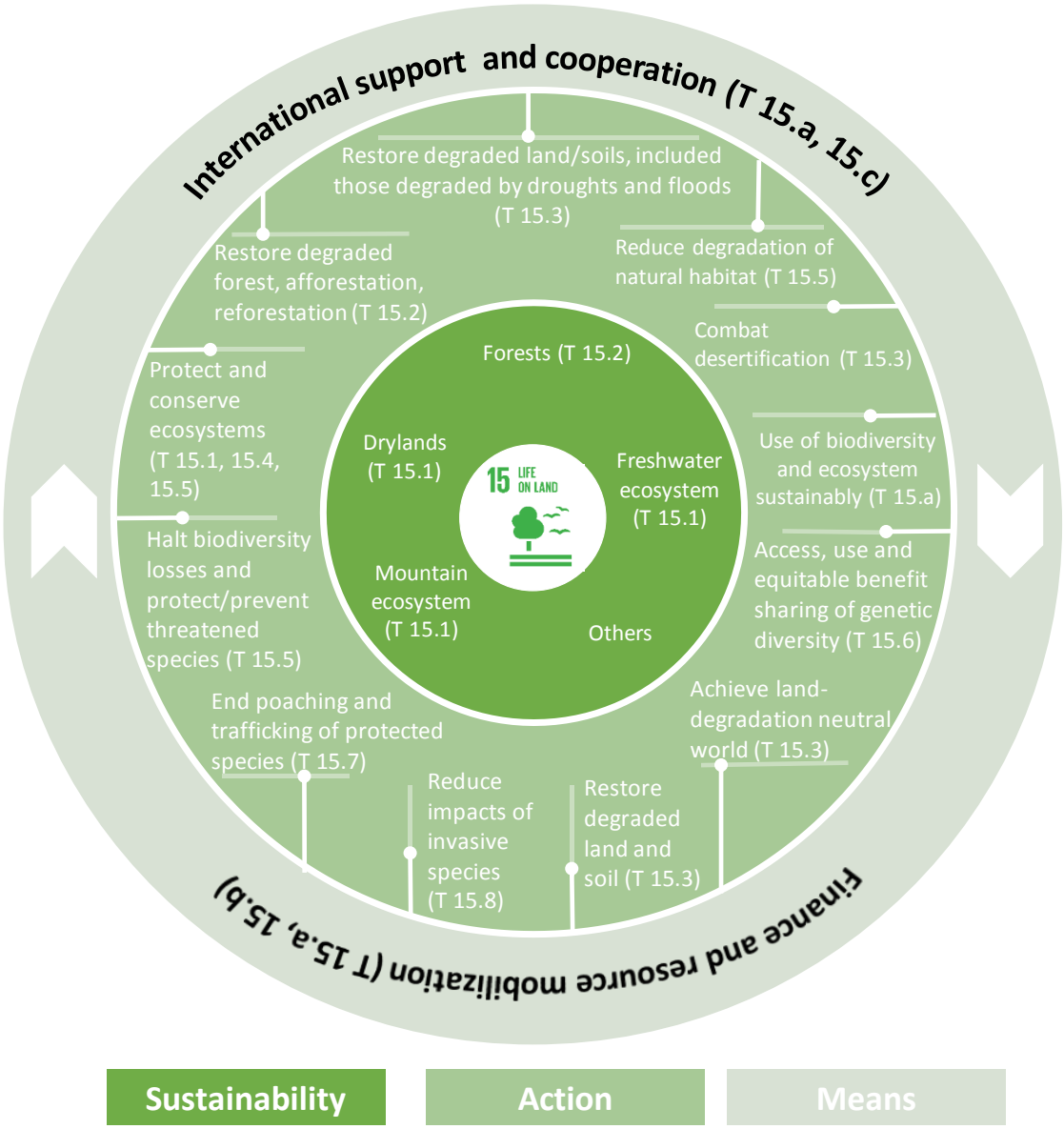

Figure 9.1 Issues under SDG 15 arranged into sustainability, action and means groups

Note: The numbering in the parenthesis (T #.#) refers to the target number. Source: Author

There are targets under other SDGs that are also highly relevant to land. Understanding how these various land-related targets are interlinked can help in developing a holistic approach to land management. Figure 9.2 attempts to connect Goal 15 and its targets with relevant targets under the other 16 SDGs. It distinguishes two types of linkages between targets – direct and indirect. Direct linkages are linkages where terms immediately relevant to land, such as land resources, ecosystem, nature, agriculture, rural, urban and peri-urban, are specifically mentioned in the targets and there is clear interdependency or overlaps between these targets and targets under SDG 15. A direct linkage, for example, exists between SDG 15 and "land and resources access/ownership" (Targets

1.4, 2.3, 5.a) as land and resource access/ownership regimes can have a significant and obvious impact on the health of terrestrial ecosystems. Another example is the obvious overlap between Target 6.6 and Target 15.1, which both mention "protection and restoration of freshwater ecosystems". Yet other examples of direct linkages are those between SDG 15 and food production (Target 2.3) and SDG 15 and agricultural productivity (Target 2.4). Indirect linkages, on the other hand, do not include terms related to land, are less obvious and are characterised by various process nodes. Despite the less clear and more difficult to measure relationships of these targets with land, they are critical to achieving SDG 15. For instance, decoupling economic growth from environmental degradation (Target 8.4) would contribute to reducing pressure on land, though it does not explicitly refer to land. To visualise how this would be possible requires thinking on a suite of actions. Other examples are Targets 7.2 and 7.a, which promote the use of renewable energy, such as wind, hydropower, solar and biogas. While they do not mention land, they could reduce reliance on fuelwood for cooking, thereby contributing to SDG 15 (as well as SDG 3 on human health).

Based on careful examination of the contents and scope of relevant targets in each SDG, the SDGs are grouped below under five headings to distinguish their linkages with SDG 15. The five headings are (i) basic needs, wellbeing, and poverty reduction cluster; (ii) economy and livelihood support cluster; (iii) enabling cluster; (iv) climate change action; and (v) life below water (Figure 9.2).

"Basic needs, wellbeing and poverty reduction" cluster

The "basic needs, wellbeing and poverty reduction" cluster comprises six SDGs (#1, 2, 3, 4, 6 and 7). While the scope of each SDG is wide, the clustering concentrates on the central theme of each SDG, that is ending poverty (SDG 1), food security (SDG 2), healthy lives and wellbeing (SDG 3), quality education (SDG 4), water and sanitation (SDG 6), and affordable and clean energy (SDG 7). The aspirations under these SDGs are at the core of modern development challenges. To meet these challenges poses a dilemma, as the strategies that are most easily adopted can result in unsustainable land transformation. For instance, "access to and ownership of land and resources" (Targets 1.4, 2.3) is highly significant for poverty reduction and food security. However, access to land and resources can be organised in ways that contribute to poverty reduction and food security in the short term but incur significant environmental trade-offs. To counter this likelihood, targets for sustainability have been included under the SDGs in this cluster. These include "improved land and soil quality" (Target 2.4), "maintenance of ecosystems" (Target 2.4), "efficient use of water" (Target 6.4, 6.a), "improved water quality and pollution control" (Target 6.3), "improved access, use and management of genetic diversity" (Target 2.5), and "education for sustainable lifestyles" (Target 4.7). SDGs under this cluster could serve as reference points to evaluate the relative contribution of sustainable land management practices to poverty reduction, improvement in access to basic services, and human wellbeing vis-à-vis impacts on land resources and ecosystems.

"Economy and livelihood support" cluster

The "economy and livelihood support" cluster is a set of four SDGs (# 8, 9, 11 and 12) that address a range of sustainability issues involving processes and practices related to business, manufacturing, infrastructure, markets and supply chains, jobs, human habitats, consumption and lifestyles. Economy and livelihood actions are both underlying drivers and proximate causes shaping patterns of land use. At the same time as contributing to SDGs under the "basic needs, wellbeing and poverty reduction" cluster, they can act against SDG 15 by, for example, generating waste and pollutants, and degrading land. For this reason, a key sustainability target and condition

set by the SDGs under this cluster is “decoupling of economic activities from environmental degradation” (Target 8.4). A major shift away from resource intensive consumption patterns, such as reduction in “food loss and food wastage” (Target 12.3) at each point from “field to plate”, towards a closed resource cycle is stressed. This cluster promotes a range of actions directly supportive of SDG 15, including “sustainable tourism” (Target 8.9), which can provide incentives for maintaining and restoring landscapes, “sustainable natural resources management and resource efficiency” (Target 12.2), “sustainable infrastructure” (Target 9.1), and “sustainable natural and cultural heritage” (Target 11.4).

“Enabling” cluster

The “enabling” cluster comprises four SDGs (#5, 10, 16, and 17), which mostly share indirect but nevertheless highly significant linkages with land management issues. They are the means and enablers for facilitating actions to achieve sustainability. This cluster collectively covers institutions, accountability, participation, leadership, reducing inequality, transparency and gender empowerment, all of which are enabling factors for improving land governance and sustainable land management. Financial flows through different channels, including private, public, or international sources (Targets 17.1, 17.2, 17.3), are vital to all targets, including those under the “action” group of SDG 15. Co-operation across sectors, administrative levels, and beyond national boundaries is necessary for co-ordinated action on the SDGs. Co-operation in the form of “North-South, South-South and triangular regional and international cooperation” (Target 17.6) would help in addressing issues relevant to SDG 15, such as the illegal wildlife trade and trade in illegally harvested timber. “Developing effective, accountable and transparent institutions at all levels” (Target 16.6) is also highly relevant to SDG 15, as weak governance has long been recognised as an underlying driver of unsustainable natural resource exploitation (Chapter 2).

“Climate action”

SDG 13 − Climate Action stands alone and is not clustered with any of the other SDGs. It has significant links with SDG 15. Land-based production systems, such as agriculture and forestry, and ecosystems are highly sensitive to climate change. Land (land cover and land use) also impacts climate in various ways, especially as a source and sink of greenhouse gases. Moreover, SDG 13 and SDG 15 can interact in various ways to impact other SDGs. For example, the way land is managed under altered climate conditions is significant to resilient agriculture, buildings and infrastructure, and enhanced resilience against disaster and natural shocks (e.g. Targets 1.5, 2.4, 9.1, 9.a and 11.b).

People relying on land-based production systems, especially subsistence farmers, smallholders and indigenous people, are particularly vulnerable to climate change impacts on land. It is anticipated that in many areas climate change will expose economies, cities and communities to more frequent and intense natural hazards such as tropical storms, floods, sea surge and droughts (Hijioka et al. 2014). Reducing exposure and vulnerability to natural hazards induced by extreme weather events and enhancing disaster risk reduction (DRR) are included among the SDG 13 targets as well as those of other SDGs (e.g. Targets 1.5, 2.4, 11.5, 11.b and 11.c). SDG 15 contributes substantially to these targets, as when land is managed well soil is protected, which reduces the risk of landslides, and run-off is reduced and delayed, reducing flood risk.

In terms of climate change mitigation (Targets 13.2 and 13.3), SDG 15 can make important contributions through sustainable agriculture and improvements in forestry.

"Life below water"

SDG 14 − Life below Water is to conserve and sustainably use oceans, seas and marine resources for sustainable development. Although oceans/seas and land are two distinct systems, they are highly interdependent. For example, changes in ocean circulation and temperature variability are responsible for El Niño and La Niña, which are increasingly associated with the rise in high intensity water-related disasters on land such as droughts, floods and cyclones. Also, sea level rise due to climate change will expose coastal communities to inundation and storm surge. Conversely, terrestrial activities impact ocean systems. For example, improper disposal of wastewater, solid wastes, especially plastics, agricultural run-off and over-fishing are severely degrading ocean systems (UNEP 2017). SDG 14 touches on two issues relevant to land – pollution from land and food supply.

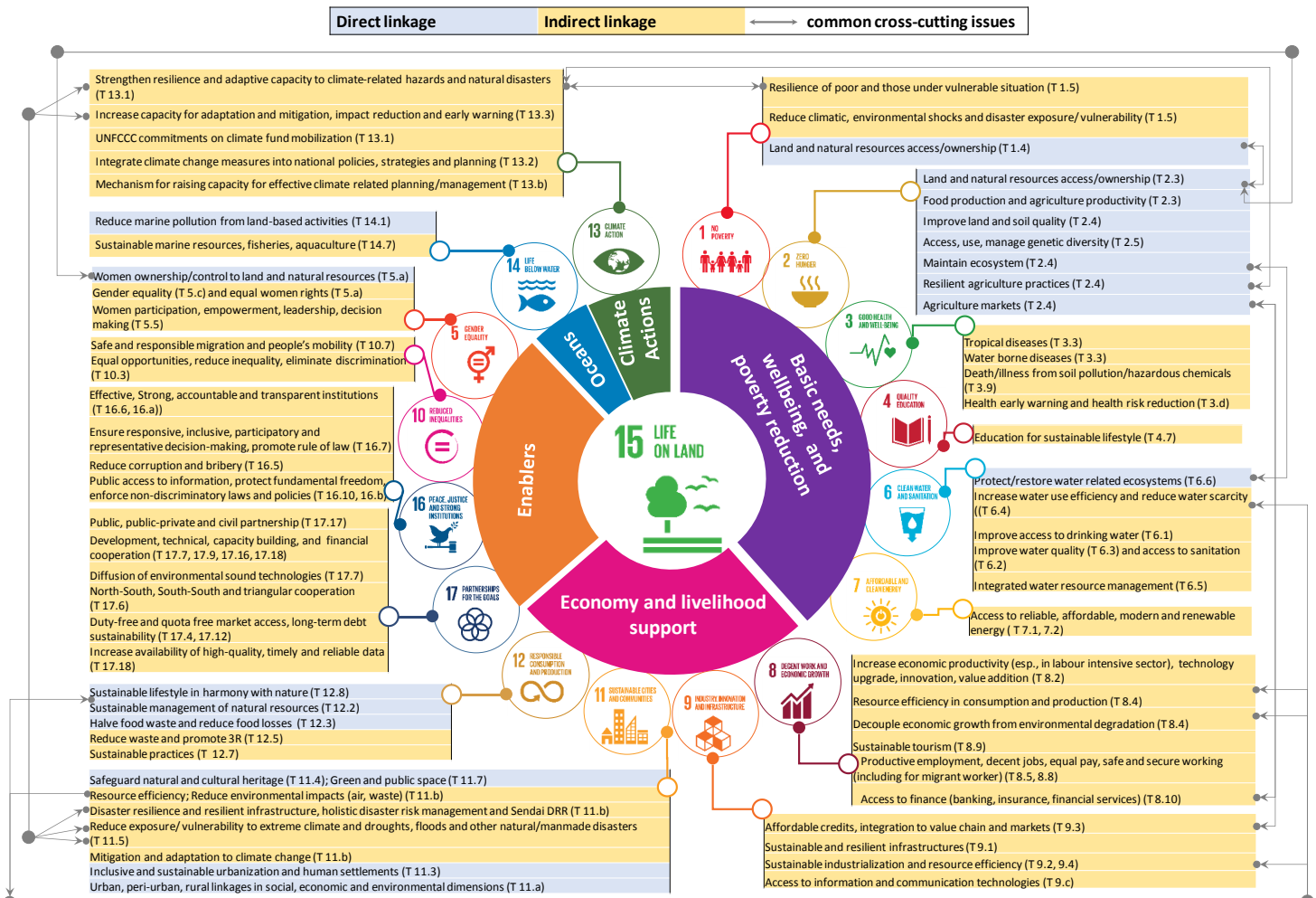

Figure 9.2 SDG 15 and its direct and indirect interlinkage with other SDGs grouped under five headings.

Note: The numbering in the parenthesis (T #.#) refer to the SDG target number. Source: Author.

9.1.2 A conceptual guide to the SDGs for sustainable land management

This grouping of the SDGs could be used as a guide to leverage synergies between the ecological and social dimensions of land use and management and visualise their interdependency clearly. Maximising the synergies is necessary to address the core problem of unsustainable land transformation, which is the exploitation of ecology to achieve economic development. Calls for action on targets under SDG 15, such as restoring degraded forests, halting biodiversity losses, combating desertification, and conserving ecosystems, reflect the need for greater efforts to strengthen the ecological dimension (Fig 9.1).

The reorganisation of the SDGs and their targets in Figure 9.2 helps to make them more useful as an overarching guide for those working on sustainable land management. Nevertheless, the sheer number of targets makes coordinated action on them challenging, and it may be useful to identify existing general concepts that capture the essence of the SDG targets related to land management that stakeholders can use. The interdependent concepts of natural capital (representing the ecological dimension) and inclusive human wellbeing (representing the social dimension) are proposed to guide sustainable land management within the framework of SES.

9.3.1 Natural capital and inclusive wellbeing as concepts for guiding strategies and actions on sustainable land management

Natural capital describes the stock of renewable natural resources, habitats or ecosystems that generate a flow of benefits or ecosystem services (NCC 2018). Natural capital is an extension of the economic idea of manufactured capital and includes environmental goods and services, both renewable and non-renewable. Renewable natural capital refers to “stocks of natural assets (e.g. soils, forests, water bodies) that yield a flow of valuable ecosystem goods or services into the future” (Dominati, Patterson, and Mackay 2010, NCC 2018). In a broad sense, renewable natural capital can be understood as the state and quality of ecosystems and their goods and services (Pascual et al. 2017; Díaz et al. 2018). Natural capital is vital for national wealth, economic development and human wellbeing (ADB 2015). A World Bank assessment found that natural capital constituted 47% of assets for low-income countries and 27% for lower-middle-income countries in 2014 (Lange, Wodon, and Carey 2018). Natural capital is thus an important metric to evaluate progress towards sustainable land management.

Efforts to enhance natural capital, including stocks and productivity, are indispensable to progress on the SDGs. Monitoring and measuring changes in natural capital is an urgent concern for all countries in the region to ensure that use of natural capital to build other assets will not compromise prospects for maintaining renewability of the resource system over the long term (Lange, Wodon, and Carey 2018). Some governments in the region have made efforts to generate natural capital accounts over the last two decades, however, such efforts are undertaken by line agencies and are not well-coordinated across government departments (SANDEE 2014).

Indicators for assessing natural capital could be useful to assess the progress on the SDG targets relevant to land in addition to the official indicators. The existing indicators are rather narrow (focused only on the target itself) and do not directly contribute to an integrated approach linking the targets in SDG 15 with related economic and social targets under other SDGs. In some cases, the indicators only include part of the target and exclude others.

Different indicators are being used for defining and measuring changes in natural capital. The World Bank's Wealth of the Nation report uses agricultural land (cropland and pastureland), forests (timber and some non-timber forest products), and protected areas to assess renewable natural capital. Lusardi et al. (2018) have suggested a short and long list of indicators and potential data sets to measure natural capital. The Natural Capital Coalition has issued "the Natural Capital Protocol" to help generate trusted, credible, and actionable information to inform business decisions, and this also outlines how to measure changes in natural capital (NCC 2016). The Natural Capital Project, a global partnership, has developed the Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) tool, which has models for mapping and valuing ecosystem services (Ehrlich et al. 2012, NCP 2018). Agreeing and establishing a system to monitor and evaluate the state of natural capital using these various initiatives as a reference would be useful for many of the SDG targets.

The concept of inclusive human wellbeing can also facilitate the implementation of SDGs in an integrated manner. Inclusive human wellbeing refers to wellbeing that is shared equitably within and across generations. Inclusive human wellbeing is at the core of several SDGs. Improvements in natural capital should go hand-in-hand with progress towards inclusive human wellbeing as part of efforts to build resilient SESs. Efforts to realise society in harmony with nature while progressing on inclusive human wellbeing can be guided by the concepts of "sustainable lifestyle" and "resilient lifestyle", which are both highly relevant to the SDGs.

Sustainable lifestyle stresses the need to sustain NCPs such as provisioning, regulating, supporting and cultural services. The SDG targets that contribute goods and services for sustainable lifestyles include "sustainable industrialisation" and "sustainable practices" by companies, "resource efficiency", "decoupling economic growth from environmental degradation", and "sustainable agriculture". Progress on these targets are closely linked with targets relevant to natural capital, including those related to natural resources, ecosystems and biodiversity, and for "sustainable forest management".

Resilient lifestyles are connected to the resilience of SESs. A resilient SES, as a complex adaptive system, is able to remain within a stability domain, continually changing, adapting and transforming yet remaining within critical thresholds (Folke et al. 2010; IPCC 2014). Resilience to climate or disaster risks has been highlighted in the targets of several SDGs (e.g. #1, 2, 11 and 13). In a resilient SES, vulnerability is reduced, including that of vulnerable groups identified in the SDGs, e.g. indigenous people, smallholders, internally displaced people and migrants, dwellers in slums and other informal settlements, low income earners, women, disabled, elderly, and children.

Figure 9.3 shows how the concepts of natural capital and inclusive human wellbeing can link the SDGs together, thereby facilitating a more integrated approach to the SDGs by making it easier to see the economic and social benefits of actions to implement the targets under SDG 15.

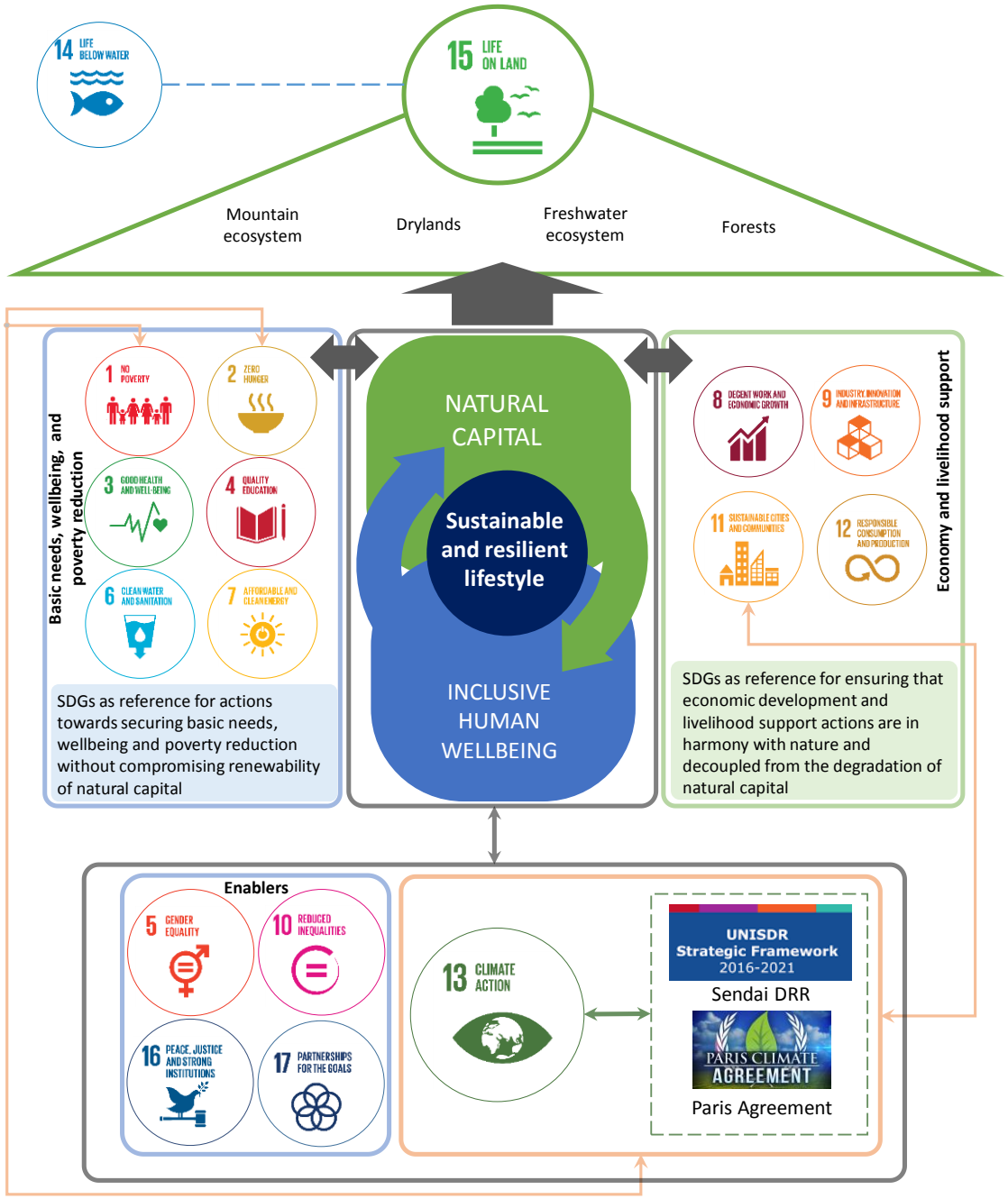

Figure 9.3 Reorganising relevant SDGs and identifying their relationship with natural capital and inclusive human wellbeing as a reference for decisions on sustainable land management

Source: Author.

The interdependence between natural capital and inclusive human being is shown in the middle of the figure. The left side of the figure shows SDGs that emphasise securing basic needs, wellbeing

and poverty reduction. Linking these with natural capital will help ensure that they are achieved without compromising the renewability of natural capital. The right side shows SDGs emphasising economic development and livelihood support actions. Linking these with natural capital will help ensure that actions taken to implement these SDGs are in harmony with nature and decoupled from the degradation of natural capital. In the lower part of the figure, SDG 13 − Climate Action, together with the goals of relevant global agreements (the Paris Agreement and the Sendai Framework for Disaster Risk Reduction), interact directly with natural capital and inclusive human wellbeing and indirectly vis-à-vis their impacts on other SDGs. Actions to address climate change contribute to both natural capital as well as inclusive wellbeing. The SDGs that act as enablers of resilient and sustainable livelihoods are also placed at the bottom of the figure. Inclusive human wellbeing and natural capital are interconnected and contribute to SDG 15 sustainability aspirations, as shown at the top of the figure. Implementing SDG 15 also enhances natural capital as well as inclusive wellbeing. At the top of the figure, SDGs 14 and 15 are seen to interact, as explained above.

9.4 Strengthening the pillars of sustainable land management

Natural capital and inclusive human wellbeing are two pillars of sustainable land management. Governance is a third. Each of these pillars can reinforce or act against others. This notion is drawn from Ostrom's proposed diagnostic framework showing how "attributes of a resource system, the resource units generated by that system, the users of that system, and the governance system jointly affect, and are indirectly affected by, interactions and resulting outcomes achieved at a particular time and place" (Ostrom 2007).

As apparent from earlier chapters, without adequate and appropriate governance, land will be managed for a limited set of interests (or SDG targets) at the expense of others. Decisions to enhance human wellbeing primarily focusing on wealth creation through economic growth usually involve unsustainable exploitation of land and thus carry high externalities for natural capital. Lack of progress on SDG 15 illustrates this fact, as forests and other natural habitats have declined in area and quality at regional level since 2015 (UNESCAP 2018).

Disconnects between the three pillars, as depicted in the left side of Figure 9.4, are characteristic of a vulnerable SES, with unsustainable land management being an outcome. The reasons for the disconnects include little incentive for the governance of natural capital, unprepared institutions and governance structures, and a focus on wealth creation. Over the long term, weak governance and degraded natural capital places human wellbeing at risk. Weak and unresponsive governance results in externalities, contributes to unbalanced access to land and its resources, and increases vulnerability. Strengthening governance is thus key to addressing the disconnects between the three pillars.[49]

Transformational change is required to move towards a resilient SES, which is depicted on the right side of the figure. In a resilient SES, synergies between governance, natural capital and inclusive

[49] As explained in Chapter 1, governance, as one pillar of sustainable land management, consists of "rules, processes and structures through which decisions are made about access to land and its use, the manner in which the decisions are implemented and enforced, and the way that competing interests in land are managed" (Palmer et al. 2009). The governance system within the diagnostic framework of SES jointly affects and is indirectly affected by interactions (between users of the system and attributes of resources systems, and generated resource units) and resulting outcomes (Ostrom 2007).

human wellbeing are realised, providing the foundations for sustainable land management (an outcome).

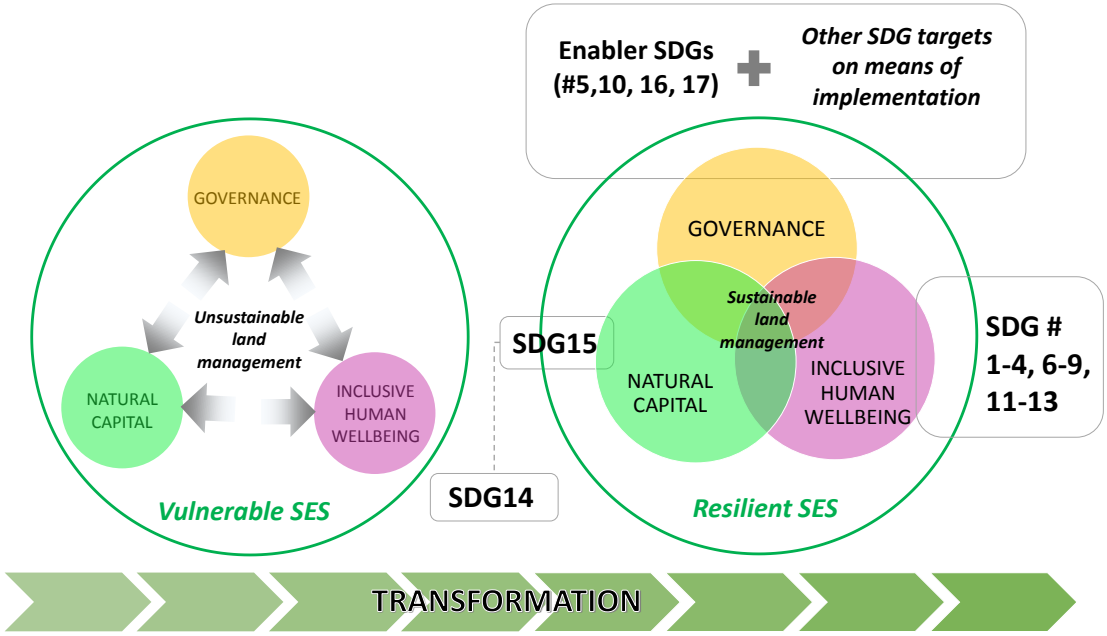

Figure 9.4 Relationship between pillars of sustainable land management within vulnerable and resilient SES and their outcomes for land management

Source: Author.

To address the disconnects between the three pillars of sustainable land management, a comprehensive understanding of causal interactions between them is required. An integrated approach is needed to provide this understanding and ensure better resource mobilisation, meaningful stakeholder participation, and equitable access to opportunities, resources and services. This is also in line with the need to follow an integrated approach for the implementation of the SDGs. The SES provides a systemic concept for understanding and monitoring the interaction and outcomes resulting from policies and actions supporting the SDGs (Selomane et al. 2019). SDG 15 and relevant indicators of natural capital could be used to examine the outcomes on natural capital. Several targets within the SDGs, in particular targets under the enablers (Figure 9.2), as well as targets from other SDGs that provide means of implementation, serve as references to assess the intended as well as unintended outcomes on the other two pillars. Other SDGs could help in assessing the outcomes on improving inclusive human wellbeing and resultant impacts on natural capital due to the interactions between these two pillars within a SES.

Several integrative approaches were discussed in Chapter 8, including the challenges they face and possible ways forward. Although the design of integrative approaches will be influenced by specific features of the SES, an overriding aim of integration is generating synergies between governance, inclusive human wellbeing and natural capital. The strength of these three pillars and their synergistic interactions are what makes a SES resilient and provides the basis for sustainable land management. Over the long term, the success of integration can be evaluated against the

interactions between the three pillars and their non-counteracting outcomes. The SDGs as a compilation of targets and indicators could help in assessing the progress on sustainable land management over time as well as across scales.

A resilient SES is a complex adaptive system that needs constant nurturing. Moving a SES from a state of vulnerability to a state of resilience will take time. Strengthening the pillars and building synergies between them is a continuous process involving experimentation, adaptation and transformation. In complex systems, learning comes from experimentation and "tinkering" (Elmqvist et al. 2018). The case studies and reviews of regional trends and their consequences in this report indicate that efforts to strengthen governance for land management should focus on meaningful participation, transparency and accountability, horizontal and vertical coordination, and institutional stability/functioning.

9.5 Conclusion

The SDGs, as a compilation of goals supplemented with targets to realise sustainability, can serve as a reference for assessing progress on sustainable land management and formulating approaches for transformative changes. With 169 diverse targets under 17 SDGs, making sense of these for sustainable land management is challenging. The targets relevant to land management must somehow be brought together to ensure they are tackled in a holistic manner that minimises trade-offs, maximises synergies and ultimately drive transformative change. This chapter aimed to assist with this challenge by reorganising the SDGs into meaningful groups, identifying some basic concepts that capture their essence, and setting out the pillars of sustainable land management.

The task of reorganising the SDGs for sustainable land management began with SDG 15 − Life on Land. To make sense of them, the SDG 15 targets were broken down and their elements were placed in "sustainability", "actions" and "means" groups. To capture the relationships between SDG 15 and targets relevant to land under other SDGs, a distinction between direct and indirect interactions was made and the SDGs were grouped under five headings: basic needs, wellbeing, and poverty reduction cluster; economy and livelihood support cluster; enabling cluster; climate change action; and life below water. The many and diverse targets related to land were found to be essentially captured by two concepts – natural capital and inclusive human wellbeing.

Based on Ostrom's diagnostic framework (Ostrom 2007), natural capital, inclusive human wellbeing and governance were identified as the three pillars of sustainable land management. Integrative approaches are needed to understand and direct actions to strengthen these pillars and achieve synergistic interactions between them. In a vulnerable SES, these pillars are weak and unsustainable land management is a likely outcome. Transformation to a resilient SES and, as a corollary, sustainable land management, requires continuous efforts to strengthen governance, which underpins the state of natural capital and progress on inclusive human wellbeing. As SESs are complex systems, experimentation and learning are vital to strengthening governance. The SDGs as a compilation of targets and indicators can help in assessing progress on sustainable land management in terms of the strengthening of its three pillars and synergistic interactions between them.

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CHAPTER 10

Concluding discussion: Making sustainable landscapes the norm in the Asia-Pacific region

Henry Scheyvens and Binaya Raj Shivakoti

Key messages

- *If current processes impacting land continue, the region risks transgressing the boundaries of a "safe operating space".*
- *A vision of sustainable landscapes can guide policymaking and administration from regional to local levels towards more effective cross-boundary management of interdependent ecosystems.*
- *Priorities for sustainable land management include mainstreaming biodiversity and ecosystem services into policy at all levels, bringing sustainability into governance, promoting landscape approaches within regional planning frameworks that span urban and rural divides, promoting local innovations and solutions for sustainable rural and urban landscapes, and market reform.*
- *Achievement of these priorities would be facilitated by a regional "landscape observatory" acting as a science-policy interface.*

10.1 Introduction

This report set out to provide a regional understanding of landscape transformations that captures the broad trends and their drivers, while also being sensitive to complexities and how the drivers manifest from place to place. It is based on a review of literature and secondary data as well as in-depth case studies that represent several of the major types of transformations taking place. This concluding discussion reflects on the review and case studies to draw out general observations and recommendations.

10.2 Unsustainable land use is a priority regional issue

In this report, land is understood as the Earth's surface, i.e. the physical land, as well as its resources, including forests, fisheries and water. The motivation for this report was the concern that while the unsustainable use of land has underpinned the region's economic growth in recent decades, if current processes impacting land continue, the region risks transgressing the boundaries of a "safe operating space" (Rockström et al. 2009) and eroding the resilience of major

components of Earth-system functioning. In other words, the Asia-Pacific region is risking functional collapses within Earth systems (ibid.).

Land exploitation has been instrumental in the region's integration with the regional and global economy, which has generated many benefits, but is also responsible for loss of biodiversity (genetic, species and ecosystems diversity) and the degradation and loss of ecosystem services. Poor land management is leading to land degradation and in some cases land abandonment. The harvesting of (potentially) renewable resources such as tropical timber has contributed to economic growth, but resources have been left depleted and landscapes heavily degraded across millions of hectares (Chapter 2). Some of the dominant patterns of resource extraction are characterised by inequity, with local communities losing access to the land and being directly exposed to the consequences of the resultant environmental harm. Urbanisation and industrialisation have contributed to greater labour productivity, but at the expense of biodiversity and ecosystem services (Chapter 2), and in some cases have increased the risk of natural hazards such as floods (Chapter 7). Through their growing demand for water, food, energy and materials, cities are indirectly contributing to resource depletion and the destruction of natural ecosystems in far-off places. Land and water bodies are being degraded by the region's massive and growing volumes of urban waste, which is still mostly disposed using open dumping and uncontrolled landfilling (Chapter 2). In rural areas, standardised high-input, high-output farming has greatly contributed to food security, but at the expense of crop genetic diversity, soil health, water quality and the health of adjacent ecosystems (Chapter 3). Traditional agrobiodiversity, and the rich biocultural diversity that goes with it, is in decline (Chapter 5). As pointed out in Chapter 1, the following figures provide an indication of the environmental damage done: 2,500 million ha of land is degraded (Gibbs and Salmon 2015); four fifths of the region's rivers are polluted or compromised (ADB and Asia Pacific Water Forum 2011); almost 25% of endemic species are threatened and the region could lose 45% of its biodiversity by 2050 (IPBES 2018); between 2001 and 2011, Asia was responsible for 44% of global emissions from agriculture and 22% of global emissions from forestry and other land use (Tubiello et al. 2014).

While perhaps not yet so apparent in GDP growth rates, the economic and social impacts of this environmental harm are already being felt by the region's population, for example through air and water pollution, natural disasters such as floods and landslides, and through a decline in land fertility over extensive areas. The loss of ecosystem services is especially felt by low income rural communities, who directly depend on them to meet their daily needs and rely on them as a safety net in times of crisis.

For many who are enjoying the benefits of economic growth, these impacts have not been so readily observable, but they will be felt more acutely over time. Unsustainable land use is contributing to climate change while also increasingly vulnerability to it through the loss of natural capital. Environmental harm and the exploitation of resources beyond sustainable rates will reduce opportunities for prosperity, increase exposure to risks and limit capacity to adapt to climate change (Chapter 1).

10.3 Major types of landscape transformations

This report has identified several major types of landscape transformations taking place across the region. The major landscape transformations identified are:

- Expansion of agriculture into areas once occupied by natural ecosystems;

- Agricultural intensification, including on fertile lowland plains and upland areas where traditional shifting agriculture characterised by high crop diversity is being replaced by intensive cultivation of a few commercial crops;
- A “greying” of landscapes around cities, coastal areas and major transportation links, where urban boundaries are expanding over farms, wetlands and coastal ecosystems;
- The transformation of mostly farmlands and natural ecosystems around the cities to a fickle mosaic of urban and rural uses that is highly susceptible to change;
- A “greening” of landscapes, especially where governments have invested in national afforestation/reforestation programmes to restore ecosystem functions.

The last type of transformation indicates that it is not all bad. Efforts are underway to protect high conservation value areas and restore degraded land. In some cities and rural areas greening programmes have been successful in establishing healthy tree cover, which is providing both habitats for wildlife as well as important ecosystem services. Examples include the landscape greening that has taken place under Nepal’s community-based forest management programme and the woodlots established by households that now dominate the landscape in some parts of Java, Indonesia. These positive examples provide reason for hope, even though they are contrary to the overall regional trend, which is one of declining natural capital and ecosystems resilience.

10.4 Root causes of unsustainable land transformation

This report identifies economic growth, market failure, technological advances, development policies, weak governance, demographic factors (population growth and migration), urbanisation, poverty, insecure tenure and lifestyle changes as the major underlying drivers of unsustainable land use and land-use change. These drivers interact in complex ways and evolve in response to the feedback effects of changes in land use. The regional overview and case studies suggest two root causes for landscape transformation in the Asia-Pacific region. These are:

Unprepared institutions and weak governance: Unprepared institutions and governance failures constitute a major cause of unsustainable landscape transformations in the region. On the one hand, governments have introduced policies that have exposed land to powerful economic forces in the name of development, e.g. through concessions, agricultural development policies and policies supporting the liberalisation of trade and investment, and on the other they have failed to ensure that sufficient institutions are in place for sustainability. Governments are unable to keep up with the rapidity of change and find themselves forever trying to “catch up”, creating new institutions to accommodate current realities. Over recent decades, countries have made progress on environmental legislation, but implementation is stymied by weak governance, which results in inadequate resourcing of regulatory frameworks to ensure they are fully enforced. As noted in Chapter 9, progress on arresting the degradation of the Earth’s environmental support system has been disappointing.

The consequences of unprepared institutions and weak governance are clearly evident in the environmental impacts of urban growth. Urban areas have expanded physically, often outside of planning processes, at the expense of fertile agricultural land and areas with high conservation values (Chapters 2 and 7). Of even greater significance than this spatial growth are the impacts of urban consumption and production patterns on natural resources, biodiversity and ecosystem services (Chapter 2). Planning systems to coordinate urban and rural development are largely absent.

Priority given to economic values and less on natural capital: Of the many different values that land holds, economic values have for the most part been placed above other values in decisions over land use. The reasons for this differ between stakeholder groups, but it is clear that many, from local communities to transnational corporations, have an economic interest in land. From colonial times and earlier, there has been a strong interest in increasing economic returns from land, but it is the technological advances, development of infrastructure and economic integration and growth of more recent decades that have really made rapid landscape-scale transformations possible (Chapters 2 and 3). Technological advances enabled mechanisation of agriculture, the construction of transportation and communications infrastructure that facilitated the flow of people, information and money, and the exploitation of all types of natural resources. The means and incentives for landscape transformation increased greatly as a result of governments opening up their economies to international trade and investment. Regional integration and regional economic growth have had particularly significant impacts on land use within the past several decades. Land has been increasingly transformed by domestic finance and foreign direct investment from within the region to produce materials and products for processing and consumption by the region.

This root cause of landscape transformation is well illustrated in the case studies. It can be seen in the logging and later conversion of forests to oil palm plantations in PNG (Chapter 4), a pattern also evident in East Kalimantan, Indonesia (Chapter 6), and in the conversion of traditional rotational agricultural systems to intensive monocropping in Karen landscapes in northern Thailand (Chapter 5). In the Santa Rosa Watershed in the Philippines (Chapter 7), the pattern of transformation is different, from land mostly under agriculture to the chaotic development of commercial and residential areas, but the root cause of prioritising economic values is nevertheless evident.

10.5 Solutions for sustainable land management

Unsustainable land use is a “wicked” problem, meaning it is complex and difficult to resolve (Chapter 1). Effective solutions will not be single interventions; rather, they will consist of carefully synchronised suites of policies and measures. They will contribute to the SDGs in a holistic manner, i.e. they will not only contribute to poverty reduction, food security and other SDGs that have an immediate link with wellbeing, they will also contribute to the wise use of natural resources, biodiversity conservation and the protection and enhancement of ecosystem services.

A key to achieving the SDGs is to bring prosperity and environmental conservation and restoration together. How might this be possible? A suite of policies and measures for the forestry sector that could contribute to these outcomes is suggested as an example.

Unsustainable logging of natural production forests is a problem that many countries are facing (Chapter 2). This threatens the sustainability of the industry, harms biodiversity and diminishes ecosystem services. To stop unsustainable logging by placing all forests allocated for production under protection could be proposed, but this would not win wide support. Logging provides employment, generates foreign revenues, provides local infrastructure and supports domestic wood industries, and the gains from protecting all production forests would not counterbalance the loss of these benefits for some key stakeholders, including, in some cases, local communities.

An option that stakeholders are more likely to agree on would be to allow logging to continue, but at higher levels of environmental and social performance. This would require strengthening and/or reform of governance, administration and institutions, including markets. In terms of governance and administration, budgets could first be increased to ensure sufficient monitoring of existing

forestry operations. This could be timed with the introduction of measures to ensure the forestry department is free of political interference to act on violations. If lacking, transparency and anti-corruption mechanisms could be introduced. The strengthening of institutions could start with a national review of the forestry regulatory framework, with the aim of ensuring it supports sustainability of the industry and fully takes account of biodiversity and ecosystem services. To strengthen markets so that they provide signals for sustainability to forest managers, processors and traders, consideration could be given to initiatives to put environmental labels on products, educate consumers, block illegally harvested timber from entering markets and assist companies to develop corporate social responsibility strategies, including sustainable sourcing policies. Inclusive community-based forest management regimes and partnerships between communities and companies could be supported to give communities a direct stake in forestry. Through these policies and measures, production forests would provide a sustainable flow of economic benefits to key stakeholders, while hosting high levels of biodiversity and providing important ecosystem services. Similarly, suites of policies and measures that contribute to the SDGs in a holistic sense with carefully staged implementation are needed to address other major land issues the region is facing, such as lack of controls on and overharvesting of other natural resources, unsustainable agriculture, urban sprawl, dumping of waste, and inequity in access to land and its benefits.

Effective solutions to the problem of unsustainable land use will include a policy mix that provides tangible outcomes in the short term and delivers transformational change over the long term. Short-term results are needed on immediate pressing concerns, such as the harvesting of natural resources above replenishment rates, the illegal dumping of waste, food security and income generation, to send signals that change is possible. If the focus is solely on transformational change and results are slow to appear, some stakeholders could lose interest in the processes. Combinations of policies and measures delivering early gains and transformational change over the long term are therefore needed. For example, to combat land degradation in farming areas through sustainable agriculture practices, relatively quick results might be achieved by strengthening rural extension and credit services for agroecological approaches in areas where farmers are already familiar with the basic elements of the concept (Chapters 2, 3 and 5). At the same time, processes to substantially reform agricultural policy involving multistakeholder dialogues could be introduced. These would require more time than the usual expert-led processes, but could encourage transformational change by increasing accountability and opening discussion on a wide range of interests in land.

Reflecting on the discussion in the preceding chapters, actions that could contribute solutions for sustainable land management are summarised below, including what can be done at local/subnational, national and regional/international levels.

Policy integration and coherence for land

Simple technical fixes and sectoral approaches are unable to address the region's complex land issues. The water-energy-food nexus approach discussed in Chapter 8 highlights the necessity of policy coherence across sectors for the achievement of the SDGs as a whole, and, more specifically, for sustainable land management. For this, integration of all policies that impact land across sectors is needed. Policies that need to be integrated for sustainable land management include policies for natural resources, biodiversity, agriculture, banking and investment, water, energy, industry, infrastructure, urban development, trade and foreign affairs. Central governments can ensure their SDG processes identify, assess and take action on trade-offs and synergies associated with decisions affecting land across these policies. Local governments can use the SDGs as a broad

framework to ensure their visions for sustainability are comprehensive and that their land-use plans are aligned with these visions. Central and local governments can use the reorganisation of SDGs in Chapter 9 to better understand SDG interlinkages relevant to land. International and regional organisations should promote a holistic approach to SDG interpretation and implementation, where environmental targets in SDG 15 and other SDGs are not considered secondary (Chapter 9).

Where environmental trade-offs occur, existing policies should be strengthened or new policies introduced to ensure that biodiversity and ecosystem services are fully mainstreamed across all relevant sectors. For example, national agricultural policies should be reviewed to ensure they promote sustainable agriculture and not just focus on annual crop production targets.

Bringing sustainability into governance

Bringing sustainability into decisions is key to achieving sustainable land management. Governance of matters impacting land has largely been characterised by centralised, state-led decision-making in which directives come from the top down and involve little engagement of stakeholders. This form of governance is mostly unable to respond to highly contextualised situations and has largely been unsuccessful in organising the coordinated management of large ecosystems or landscapes that cut across jurisdictional boundaries (Chaffin, Gosnell, and Cosens 2014). Forms of governance that are able to address landscape-scale issues in a flexible, dynamic and responsive manner are needed (ibid.). "Whole of government" approaches are required for coherence in policy content and implementation (Chapter 8). Efforts to strengthen governance should focus on innovations in decision-making that open space for stakeholder participation, innovations in administration that provide structures for land management at the most effective scales, and the strengthening of linkages between higher and lower levels of government (Chapters 1, 2 and 8). Effective forms of governance are likely to be adaptive, inclusive/collaborative, multilevel and multi-scalar.

Adaptive governance: As land-use change is complex and uncertain, governance of issues affecting land should be adaptive. As noted in several chapters, conventional forms of governance are unable to keep abreast of rapidly evolving contexts. Land planners and administrators struggle to cope with the scale, speed and consequences of the land changes taking place. When governance is adaptive, it includes learning mechanisms that accumulate knowledge on the effectiveness of governance structures and processes in an evolving context, and governance is modified as lessons are learned. Adaptive governance monitors and is responsive to the emergence of new environmental threats and opportunities associated with economic development, technological advances and the rise of new stakeholders, stakeholder networks and social practices. This is especially important in fast-growing cities and mixed-used areas susceptible to rapid change, and is also relevant to rural areas exposed to strong land-use change drivers.

Inclusive and collaborative governance: Governance that is inclusive and collaborative can be expected to benefit policy design by bringing a wider range of concerns, views and knowledge into processes than conventional state-centered forms of governance. This means higher likelihood of equity in outcomes and of policies matching realities. They may also contribute to implementation, as stakeholders are likely to feel more committed to environmental policies when they have been involved in policy formulation processes. National, city and local governments can innovate with and monitor the performance of inclusive and collaborative forms of governance. International and regional organisations can contribute by supporting and documenting governance innovations, monitoring and assessing outcomes, and sharing experiences across countries.

Collaborative governance includes community-based natural resource management regimes under which communities accept responsibilities for managing natural resources in return for use rights. Such models have been widely adopted in the region, especially for the management and restoration of degraded forest areas, and have contributed to landscape greening, livelihood diversification and the enhancement of ecosystem services. National governments can ensure that community-based natural resource management regimes include processes for the meaningful participation of women and groups with low economic and social status. Lessons can be extracted from existing regimes to apply this collaborative approach to other types of ecosystems and natural resources.

Multilevel governance: Asia-Pacific countries have decentralised many key elements of natural resource management, meaning that management of these resources now depends heavily upon effective governance at various levels (Chapters 1, 2 and 4). Multilevel governance of natural resources necessitates vertical coordination of the various levels of decision-making – local, regional and national, as well as metropolitan and district. Decentralisation can be achieved quickly through policy and administrative changes, but effective vertical coordination processes require time to build and necessitate continual monitoring. Coordination mechanisms are also needed to link initiatives on integrated landscape management at local levels, such as villages, towns and cities, with national plans for SDG targets relevant to land. Central governments can create mechanisms to strengthen and monitor vertical coordination, as well as provide technical training and adequate and predictable financial transfers to the lowest tiers of government for sustainable land management. Capacity building and resourcing of local governments for spatial planning and stakeholder engagement are priorities.

Multi-scalar governance: Disparity between the scale of governance and landscapes/ecosystems can be avoided through multi-scalar governance. Governance at transboundary scales is important for effective management of the region's major river basins and habitat connectivity. The unbalanced and spontaneous integration of urban and rural areas necessitates governance at regional/territorial scales to provide coordinated planning and management of the urban-rural continuum. Closely interlinked ecosystems demand governance at the landscape scale.

Landscapes/ecosystems are not constrained by jurisdictional boundaries, necessitating governance arrangements that reach over these boundaries. Governance across jurisdictions can be achieved by mechanisms that coordinate existing policies and administrations and/or by establishing new governance structures at effective scales for reconciling economic development and conservation. National governments can start by establishing cross-sectoral steering mechanisms, such as high-level coordination bodies, to facilitate policy coordination for sustainable land management. They can tackle the unbalanced and spontaneous integration of urban and rural areas by introducing regional/territorial planning and establishing governance structures that span urban and rural divides, as well as coordinate district- and provincial-level planning where landscapes and large ecosystems cut across jurisdictional boundaries. Support can be provided for landscape approaches (Chapter 8) by providing access to financing for activities that generate outcomes agreed and prioritised through multi-stakeholder processes for land management. International and regional organisations can encourage and support the transboundary management of river basins, landscapes and ecosystems, drawing on the experiences of existing transboundary management regimes.

Local innovations and solutions for sustainable management of rural landscapes

Landscapes and economy are interdependent. In a sustainable landscape, land contributes to the economy while the economy provides resources for sustainable land management. Sustainable rural landscapes are likely to be areas not only where there is stewardship of biodiversity and ecosystem services, but also where economic productivity is increasing without compromising land quality, and where the economy is diversified and has a strong competitive base.

As threats and opportunities associated with land are highly contextualised, local innovation is important to landscapes and the economies they host. The innovations can be in the type of governance regimes, as described above, and economic activities tied directly or indirectly to land. As a result of decentralisation and economic integration, opportunities for livelihood and business innovation at local levels have increased. Various forms of assistance can be provided to local households and communities to build their capacities to use these opportunities, with a view to them generating a strong interest in sustainable land management. This assistance can include awareness, training and extension on sustainable forms of agriculture and sustainable harvesting of natural resources, financial and technical services for production and value-added processing, and support for marketing of sustainable products (Chapter 3).

The potential to develop new markets tied to sustainable land management can be explored, tapping into the Asia-Pacific's growing middle-class, which includes health-conscious consumers, people searching for new experiences, and people interested in alternative medicines, etc. In socio-ecological production landscapes, local communities can be assisted with developing community enterprises that utilise their local and indigenous knowledge, traditional agricultural products, cultures (in positive ways), and unique landscape points of attraction (Chapter 5). Partnerships between local governments, private sector actors, communities, non-governmental organisations and research institutes can be encouraged to promote sustainable agriculture and locally-based forestry, local businesses that add value to local products including sustainably harvested natural resources, and farmer's markets for sustainable produce. Partnerships will be key to tapping new sources of finance that can support sustainable rural landscapes, such as REDD+ (Chapter 8) and other payment for ecosystem services schemes.

Healthy living within sustainable urban landscapes

As centres of high productivity and innovation, cities can contribute solutions for sustainable land management both within and outside metropolitan boundaries. To increase the quality of urban living and to give urban dwellers daily opportunities to experience nature, city governments can include the protection of urban biodiversity and the creation of green spaces using native plants in their master plans and designs. Cities can consist of compact forms with mixed-use areas, pedestrian-friendly environments and well-developed public transportation infrastructure. These design elements help avoid the low-density sprawl that results from car-dependent development, while also making cities liveable (Chapter 2).

Metropolitan spatial strategies can ensure that sensitive areas, the best agricultural lands and natural assets are protected from urban sprawl. Where formal planning is difficult, city governments can employ action-planning processes, focusing on critical problems and demonstrable benefits. Cities can reduce their material and environmental footprints through waste reduction, recycling, efficient transport infrastructure and services, the use of renewable energy, green building codes and other initiatives that reduce greenhouse gas emissions. Innovative means of food production such as urban and vertical farming (Chapter 3), and initiatives to change food habits towards

healthy and sustainable choices can be considered. National urban policies informed by a vision of sustainable and inclusive cities can guide city development towards these solutions. Regional/international organisations can promote city-to-city cooperation between Asia-Pacific cities sharing similar challenges and trying out various solutions to bring new ideas on sustainability to city governments (Chapter 2).

Reforming markets

Fundamental economic reforms are central to the transformational changes required for sustainable landscapes to become the norm across the Asia-Pacific region. Without fundamental economic reforms, land managers will continue to receive market signals that encourage the unsustainable conversion of natural ecosystems, the overharvesting of natural resources and intensive use of chemicals and irrigation systems that degrade the quality of agricultural land. Sub-regional and global organisations promoting economic integration can provide support for the necessary reforms (IGES 2015). Through the market liberalisation processes they have promoted, land has been exposed to market forces unconstrained by environmental conditionalities. Sub-regional, regional and international organisations can develop management and product standards for sustainability and facilitate their uptake, encourage the development of public and private sector procurement policies, support "green" building, and promote sustainability certification incorporating eco-labelling. Efforts to reduce environmental externalities should target all major commodities with high environmental risks and engage as many countries and companies as possible to ensure their positive actions do not merely result in a shift in the flow of commodities to less responsible buyers and markets (Chapter 2).

Regional landscape observatory

As a "wicked" problem, unsustainable land use can only be resolved through a comprehensive understanding of its drivers. The drivers are complex, existing at various scales and evolving over time, so the study of drivers is neither a simple nor once-off exercise. In an increasingly interconnected world, drivers can spring up from unexpected places and at unexpected moments, such as "land grabbing" in the wake of the 2007/2008 global financial crisis. They also emerge from local cultural, social, economic, institutional and biophysical factors, and their interactions, which can vary widely from one place to another. As land use changes over time, the drivers that impact land also change, and this too needs to be monitored. The urban periphery, peri-urban areas and the growing mixed-use areas ("desakota") around the region's megacities are especially vulnerable to rapid use change, the drivers and consequences of which require regular reassessment.

The major landscape transformation types identified in this report could also be further broken down into sub-types. For example, the greening of landscapes could be classified in terms of greening as an outcome of national landscape restoration programmes and greening resulting from woodlots and plantations established to supply timber to markets. There are likely to be other types of transformations that are less obvious in terms of scale but nevertheless significant. Research to further elaborate the types of landscape transformations would help create a more detailed regional picture of the transformations taking place. This would be useful for initiating and informing a regional dialogue on land.

A regional "landscape observatory" is suggested as a science-policy interface to support these processes. The observatory would make an important contribution to sustainable land management by monitoring and analysing landscape transformations in terms of their major features, drivers and

impacts, and extracting lessons from initiatives to strengthen land governance. Drawing on the experiences of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, it would bring together scientific and indigenous and local knowledge for monitoring and assessing land cover and land-use change. The regional landscape observatory would be a key source of data and analysis for periodic regional environmental assessments as well as for monitoring progress on the SDGs relevant to land.

10.6 Conclusion

If current processes impacting land continue, the Asia-Pacific region risks transgressing the boundaries of a "safe operating space". Certainly, there have been enormous economic gains associated with landscape transformation, but over 2.5 billion hectares of the region's land is now degraded, most of its rivers are heavily polluted, biodiversity is being lost at a rate comparable to that of the mass extinctions in Earth's history, ecosystems are losing resilience, which is exposing Earth systems to the risk of functional collapse, and land use and land-use change are driving global climate change. Growth in the region is undermining itself. Without transformational changes in economic production systems, consumption patterns and values, the region will continue heading towards a future of greater risk and uncertainty for human security.

While the task is immense, positive experiences and developments in the region provide reason for hope. Governments have introduced and strengthened regulatory controls and incentives for improved environmental performance, planning processes are increasingly addressing environmental issues, decentralisation and economic reforms have opened spaces for economic innovation, and the Asia-Pacific region has a rapidly growing middle-class able to pay more attention to environmental issues.

This report has highlighted some of the policies and measures that can make sustainable landscapes a regional norm. It argues that a vision of sustainable landscapes can guide policymaking and administration from regional to local levels towards more effective cross-boundary management of interdependent ecosystems. Policy priorities include mainstreaming biodiversity and ecosystem services into policy at all levels, bringing sustainability into governance, promoting landscape approaches within regional planning frameworks that span urban and rural divides, promoting local innovations and solutions for sustainable rural and urban landscapes, and market reform. Achievement of these priorities would be facilitated by a regional "landscape observatory" that serves as a science-policy interface for monitoring and analysing land-use change as well as for extracting and sharing lessons from initiatives to strengthen land governance.

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ISBN: 978-4-88788-210-2

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