INEQUALITY

in Asia and the Pacific in the era of the 2030 Agenda for Sustainable Development

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

74th COMMISSION SESSION
INEQUALITY
in the era of the 2030 Agenda
for Sustainable Development

The shaded areas of the map indicate ESCAP members and associate members.

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FOREWORD

The Asia-Pacific region has experienced a remarkable economic transformation over the past two decades. Entirely new cities have sprouted from fields and forests, linked to each other and the rest of the world by gleaming high-speed rail lines, internet connections, cavernous airports and sprawling industrial zones. Hundreds of millions of people have also had unprecedented opportunities to improve their standard of living. Yet, the proceeds of this progress have not been spread evenly. Indeed, inequality is on the rise across the region, including in countries that have been held up as models of dynamism and prosperity. Market-led growth alone, it seems, is simply not able to deliver a prosperous, sustainable future for all.

Between the 1990s and 2010s, the market income Gini coefficient increased in four of the five most populous countries in the region, representing over 70 per cent of the Asia-Pacific population. China, for example, saw its income inequality soar by close to 10 percentage points, Indonesia's rose by over 8 percentage points, and Bangladesh and India saw their levels increase by 4 and 5 percentage points respectively.

ESCAP research shows that these increases come with enormous costs. In fact, estimates suggest that a 1 percentage point increase in the Gini coefficient reduces GDP per capita by, on average, US$154 for countries in the Asia-Pacific region.

While the aggregate costs of inequality of outcome can be high, the impact of inequality is perhaps more corrosive at the individual or the household level. In fact, close to 153 million more people could have been lifted out of poverty in the Asia-Pacific region had inequality not increased in 10 countries in the past decade. More women could have been given the opportunity to attend school. It is striking to note that in many countries only 5 out of every 100 women from poor, rural households complete secondary education, compared with one out of two women in richer urban households.

Indoor air pollution causes more than 4 million deaths per year globally, of which more than half occur in China and India alone. A strong contributor for this is that close to half of all people in Asia and the Pacific still rely on traditional and inefficient fuels for cooking and heating. Meanwhile, less than 40 per cent of all people in the region have access to health-care services.

Increasingly, authorities are recognizing just how pernicious sharp differences in income and opportunity can be for society. Inequality causes a weakening of social bonds and an erosion of public trust in institutions, which can raise social and political tensions and even lead to radicalization and crime. Unequal patterns of land ownership in turn lead to worsening environmental conditions for people who live there – the poor farmers or miners, for example, who are all too often left behind from both socioeconomic development gains and technological progress.

Dovetailing into the 2030 Agenda for Sustainable Development, and its powerful pledge to "leave no one behind", this report explores the impact that inequality is having on people and communities across the region. It examines why inequalities of income and wealth can be so persistent and analyses how new digital technologies may affect people's employment prospects in the future.

It concludes with powerful evidence that investment in education, social protection, urban planning and conservation of the environment are effective instruments for reducing inequalities.

I am confident that the analysis, findings and the policy agenda contained in this publication will provide member States and other stakeholders with a solid foundation to pursue evidence-based policies that reduce social vulnerabilities, build resilience, promote more inclusive and equitable societies in Asia and the Pacific.

I am happy to commend it to ESCAP member States, policymakers and development practitioners in the region and beyond.

Shamshad Akhtar
Under-Secretary-General of the United Nations and
Executive Secretary, United Nations Economic and
Social Commission for Asia and the Pacific

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EXPLANATORY NOTES

ESCAP groupings of countries

South and South-West Asia (SSWA): Afghanistan; Bangladesh; Bhutan; India; Iran (Islamic Republic of); Maldives; Nepal; Pakistan; Sri Lanka; Turkey

North and Central Asia (NCA): Armenia; Azerbaijan; Georgia; Kazakhstan; Kyrgyzstan; Russian Federation; Tajikistan; Turkmenistan; Uzbekistan

South-East Asia (SEA): Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; Timor-Leste; Viet Nam

East and North-East Asia (ENEA): China; Democratic People's Republic of Korea; Hong Kong, China; Japan; Macao, China; Mongolia; and the Republic of Korea

Pacific: American Samoa; Australia; Cook Islands; Fiji; French Polynesia; Guam; Kiribati; Marshall Islands; Micronesia (Federated States of); Nauru; New Caledonia; New Zealand; Niue; Northern Mariana Islands; Palau; Papua New Guinea; Samoa; Solomon Islands; Tonga; Tuvalu; Vanuatu

Country abbreviations

Afghanistan	AFG
Armenia	ARM
Australia	AUS
Azerbaijan	AZE
Bangladesh	BGD
Bhutan	BTN
Brunei Darussalam	BRN
Cambodia	KHM
China	CHN
Fiji	FJI
French Polynesia	PYF
Georgia	GEO
Guam	GUM
Hong Kong, China	HKG
India	IND
Indonesia	IDN
Iran (Islamic Republic of)	IRN
Japan	JPN
Kazakhstan	KAZ
Korea, Democratic People's Republic of	PRK
Republic of Korea	KOR
Kyrgyzstan	KGZ
Lao PDR	LAO
Macao, China	MAC

Malaysia	MYS
Maldives	MDV
Mongolia	MNG
Myanmar	MMR
Nepal	NPL
New Caledonia	NCL
New Zealand	NZL
Pakistan	PAK
Papua New Guinea	PNG
Philippines	PHL
Russian Federation	RUS
Samoa	WSM
Singapore	SGP
Solomon Islands	SLB
Sri Lanka	LKA
Tajikistan	TJK
Thailand	THA
Timor-Leste	TLS
Tonga	TON
Turkey	TUR
Turkmenistan	TKM
Uzbekistan	UZB
Vanuatu	VUT
Viet Nam	VNM

ACRONYMS

ADB	Asian Development Bank
AI	artificial intelligence
AP-IS	Asia-Pacific Information Superhighway
DESA	Department of Economic and Social Affairs
DHS	Demographic and Health Surveys
D-index	Dissimilarity index
ESCAP	Economic and Social Commission for Asia and the Pacific
ETR	effective tax rate
FDI	foreign direct investment
GDP	gross domestic product
GII	Global Innovation Index
GNI	gross national income
G7	Group of Seven
G20	Group of Twenty
ICT	information and communication technology
IHL	institutes of higher learning
ILO	International Labour Organization
IMF	International Monetary Fund
IoT	internet of things
IP	intellectual property
IPCC	Intergovernmental Panel on Climate Change
ITU	International Telecommunications Union
LDC	least developed country
MAS	marker-assisted selection
MICS	Multiple Indicator Cluster Surveys
MHT	medium- and high-technology
MNC	multinational corporation
MOOCs	massive open online courses
PM	particulate matter
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
RESAP	Regional Space Applications Programme
SDGs	Sustainable Development Goals
SMEs	small and medium-sized enterprises
TFP	total factor productivity
TVET	technical and vocational education and training
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
V20	The Vulnerable 20 Group
WTO	World Trade Organization

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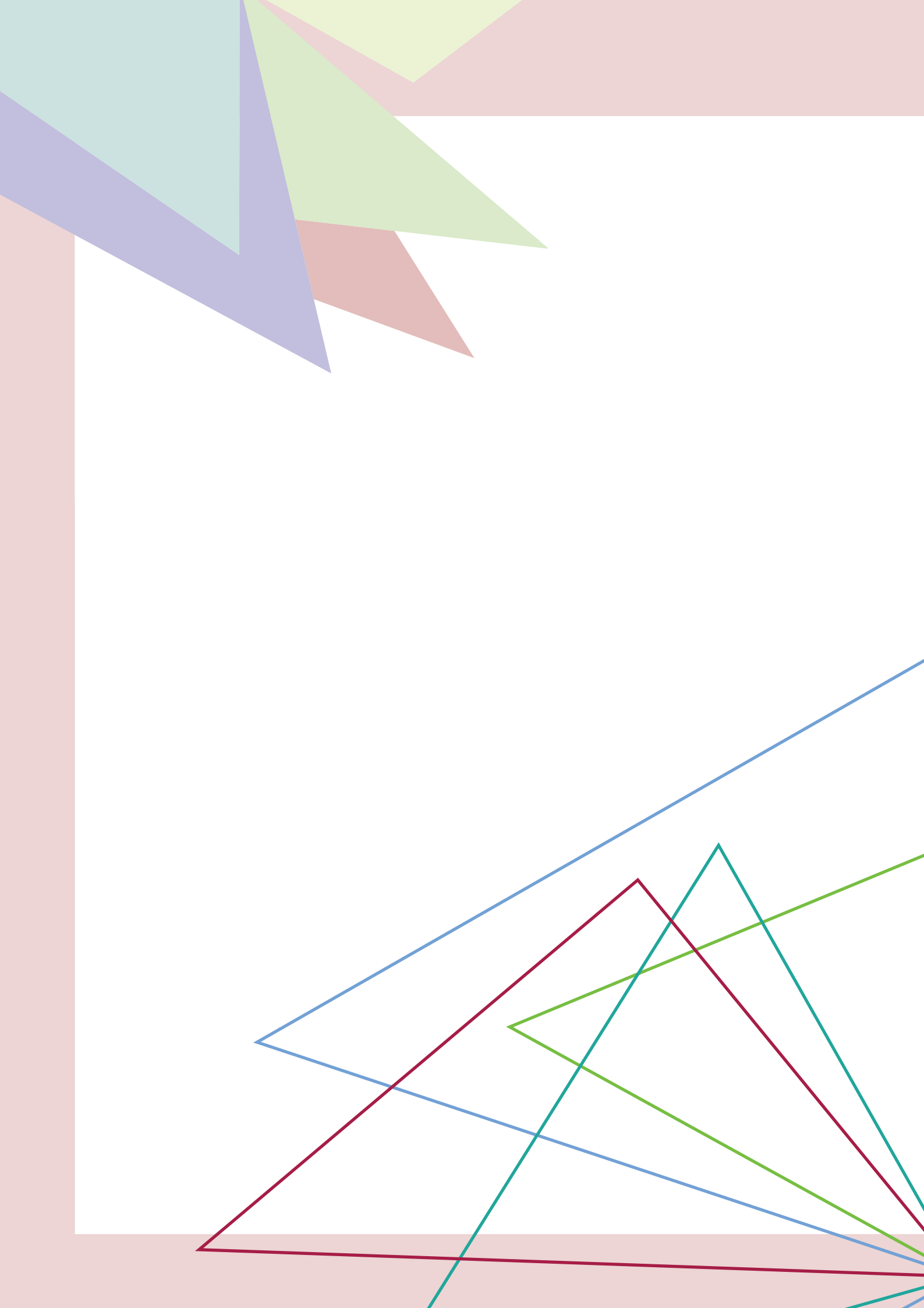


EXECUTIVE SUMMARY

"A rising tide lifts all boats" they say. It is a neat aphorism – build up the economic engine, and everyone will benefit. But a closer inspection of facts and historical evidence across economies reveals large variations in the tidal range – some boats, probably yachts, have indeed been lifted but others languish on the mudflats. While economic growth and productivity increases bring great rewards, they have by no means been evenly distributed – and this comes at a significant cost for people, prosperity and the planet.

Inequality stifles economic growth by lowering growth rates and shortening the duration of growth spells. It hampers the effectiveness of poverty reduction by excluding large segments of the population from development gains. Inequality also undermines social cohesion and stability by weakening social bonds and public trust in institutions, which can raise social and political tensions and even lead to radicalization and crime. Inequality also negatively impacts the environment. When ownership of land and natural resources is concentrated in the hands of a few, it provides unchecked freedom to cut, mine and farm lands in ecologically unsustainable ways – often with a disproportional impact on the poor and marginalized.

Understanding the drivers and consequences of inequality and how policies can help in shaping a more inclusive, prosperous and sustainable future across the Asia-Pacific region is the purpose of this report. Written against the backdrop of the 2030 Agenda for Sustainable Development and its pledge to "leave no one behind", the report presents a convincing case for reducing inequality, drawing on a wide range of data sources, backed up with evidence-based studies. It does so by exploring inequality in three interdependent and mutually reinforcing forms: (i) inequality of outcome (disparities in material dimensions of income and wealth); (ii) inequality of opportunity (disparities in access to basic opportunities and services, such as education, health care and clean energy); and (iii) inequality of impact (disparities between groups with shared circumstances and the asymmetric impact of external shocks, primarily in relation to the environment). It also discusses how frontier technologies and the incipient Fourth Industrial Revolution may affect inequality trajectories – now and in the future.

Inequality in the Asia-Pacific region

Since the early 1990s, the Asia-Pacific region has experienced a tremendous socioeconomic transformation, facilitated by strong and sustained economic growth. Unfortunately, the gains from this remarkable performance have not always benefited those most in need. For example, nearly half of all people in Asia and the Pacific still rely on traditional and inefficient fuels for cooking and heating. As a result, many countries in the region have experienced a widening of existing inequalities, accompanied by environmental degradation.

Income and wealth inequalities are on the rise …

The region's combined income inequality, measured by the Gini coefficient, has increased by over 5 percentage points in the last 20 years. This goes contrary to almost all other regions.

Income inequalities grew in almost 40 per cent of all countries. China, Indonesia, Papua New Guinea and Singapore experienced sharp increases. In countries where inequalities fell, they often did so from relatively higher levels. For instance, inequality decreased sharply in Azerbaijan, Kyrgyzstan, the Maldives and Georgia. By subregion, the average population-weighted Gini coefficient increased the most in East and North-East Asia.

Steep increases in the incomes of the richest have often coincided with an increased concentration of wealth. For instance, the wealth share held by the top 1 per cent doubled in both China and the Russian Federation

between 1995 and 2015, from 15 to 30 per cent and from 22 to 43 per cent respectively. In 2017, the net worth of the region's billionaires was more than seven times the combined GDP of the region's least developed countries (LDCs).

… access to basic opportunities are unevenly shared …

Income and wealth inequalities are strongly linked to other dimensions of development, with obvious impact on opportunities such as access to education, health care, finance, clean energy and water and sanitation. While some level of income inequality is both acceptable and expected to reflect differing levels of individual effort and talent, no inequality in access to opportunities should be permissible in countries aspiring to the commitments and implementation of the 2030 Agenda.

Yet, a comparison of country-specific dissimilarity indices (D-indices) for 13 core opportunities and one multiple deprivation indicator across 21 countries reveals large inequalities, particularly in educational attainment, ownership of a bank account, access to clean fuels and basic sanitation. The highest overall D-index is found in South and South-West Asian countries, followed closely by South-East Asian nations.

The countries that stand out as particularly unequal with respect to core opportunities are Afghanistan, Bangladesh, Cambodia, Lao People's Democratic Republic, Myanmar, Timor-Leste and Vanuatu. Conversely, Armenia, Kazakhstan, Kyrgyzstan, the Maldives, Tajikistan, Thailand and Turkmenistan, have on average significantly lower inequalities in access to the same opportunities.

… and environmental degradation and disasters are impacting the poorest

Environmental degradation is closely linked to inequality and low-income countries of the region are more exposed to environmental degradation. Compared with 1990, exposure to air pollution is on the rise in the region, with the sharpest increases observed in Bangladesh, Bhutan, China, India, Mongolia and Nepal.

Air pollution is estimated to claim over 4 million lives per year, mainly in developing countries in the region. In addition to the detrimental impact this has on families and communities, it also undermines economic performance, causing a reduction of around 0.8 per cent of GDP in India and Pakistan, up to 1.5 per cent in Afghanistan. Hence, reducing pollution is critical for reducing inequalities both within and among countries.

Poor and disadvantaged groups are also disproportionally impacted by pollution. As a result, deaths from cardiorespiratory diseases are more likely among residents with a lower level of education.

Natural disasters also cause disproportionately greater impacts on poorer countries and households and therefore exacerbate inequalities among countries, but also between the rich and the poor. Mortality rates from disasters in low- and middle-income countries are four to five times higher than those in high-income countries. Climate change also magnifies the risk of disasters and increases their costs. As the climate system has warmed, the number of weather-related hazards globally has tripled, and the number of people living in flood-prone areas and cyclone-exposed coastlines has doubled – a trend that is expected to intensify.

What can be done?

Economic growth alone is not sufficient to reduce inequalities. Tackling high inequalities will require fiscal policy interventions to support progressive investment in essential public programmes, such as health care and education.

Employment policies that encourage decent job creation also need to be in place in countries where labour market informality is high. This would not only build a more productive and healthy workforce – critical

for economic growth and closing development gaps – but also support economic and social stability. The abundance of vulnerable and low-skilled occupations is a manifestation of existing inequality and contributes to discouragement, social exclusion and marginalization.

Inequalities in opportunities undermine human dignity and social justice and bring questions of human rights to the forefront of the 2030 Agenda. Overall improvements in access to basic services must therefore reach everyone, particularly groups identified as being the furthest behind.

Environmental degradation, urbanization and climate-induced disasters are often missing from the policy debate on fighting inequality. Reducing inequality of both income and opportunity also requires better conservation of natural capital. Bringing national policymaking on inequality into an overarching framework that includes environmental considerations will therefore be paramount.

To an increasing extent, technologies can either exacerbate or curb inequalities. More advanced countries, often early adopters of frontier technologies, must focus on managing the impact of technological transitions on inequality. Middle-income countries should focus on upgrading technological skills and ensuring that technological progress is inclusive. The priority for low-income economies is to build their technological capabilities, focusing on the adoption, adaptation and diffusion of existing technologies. Particularly important is the development of broadband infrastructure for both technological development and bridging of the digital divide.

In a region as diverse as Asia and the Pacific, there is no single solution to curb high and increasing inequalities. Because of the complexity and interlinkages of inequalities and the diverse impact these have on people, society and the planet, policy reforms need to be guided by multisectoral and multi-stakeholder involvement at all stages from development and design to implementation and monitoring. This report puts forward an eight-point broad policy agenda for building more equitable and inclusive societies in the Asia-Pacific region:

1. Strengthen social protection

Social protection policies, including access to health-care services, are central to closing the gaps in access to most opportunities, while also increasing prosperity, resilience and empowerment. Expanding social protection to low-income families through cash transfers, or other income-support mechanisms also tends to have strong multiplier effects, as these groups typically spend their extra income on domestic goods and services.

2. Prioritize education

A well-educated population is fundamental for all spheres of development. It is therefore critical for national education systems to encourage higher educational attainment and at the minimum improve secondary completion rates by ensuring that it is accessible and affordable for all, including girls and for those living in rural areas. Countries where the gap in educational attainment has narrowed, and where overall access is high, should instead focus on strengthening the quality of education by investing in teachers' education and training, school equipment and infrastructure and making sure that current curricula correspond to future labour-market needs to facilitate the school-to-work transition. High-quality higher education is also critical for harnessing the potential of technology for inclusive development.

3. Protect the poor and disadvantaged from disproportionate impact of environmental hazards

Targeted policy measures that reduce exposure of the poor and disadvantaged to environmental hazards are important to close inequalities within countries. Such measures could include better urban planning, establishing green corridors and regular health check-ups in schools in poorer neighbourhoods. This is especially relevant in countries with a higher risk of pollution, natural disasters, overexploitation of natural capital and natural resource-related conflicts.

4. Address the digital divide and ICT infrastructure

Information and Communication Technology (ICT) is a development enabler and a growth sector on its own. The development, application and adaptation of frontier technologies rely largely on the availability of ICT infrastructure and access to it. Thus, addressing the digital divide and developing affordable, resilient and reliable broadband infrastructure is a development priority in Asia and the Pacific. If left unaddressed, inequality could become unbridgeable, with implications for many other areas of development. As broadband development is geography-dependent, regional and subregional cooperation is key to addressing the challenge.

5. Address persistent inequalities in technological capabilities among and within countries

To catch up with more advanced economies, countries with low technological capabilities should consider strengthening technological learning through public policies that focus on the adoption, adaptation and diffusion of existing technologies. To ensure technology does not further exacerbate inequalities within countries, ESCAP member States will need to anticipate the impact of technologies on jobs, wages and markets; and introduce inclusive technology and innovation policies that enable low-income and vulnerable populations to benefit from technology and to participate in innovation activities.

6. Increase effectiveness of fiscal policies

An effective tax system enhances public revenues and facilitates increasing investments in essential services, such as health care, education and social protection. To this end, better and effective governance will be needed to boost overall tax compliance and improve composition and efficiency of public expenditure. Similarly, reforming tax structures to reduce their adverse effects on the poor through progressive taxes on personal income, property and wealth can help prevent excessive concentration of wealth and power in the hands of a few, ensuring greater equality of opportunity within and across generations.

7. Improve data collection to identify and address inequality

To identify those at risk of being left behind and to direct policymaking at certain population groups, national data collection needs to allow for better disaggregation. It also needs to capture how unequal opportunities impact individual aspirations and household decisions and why certain individuals, for example, take their children out of school or continue using unclean energy options, while others do not.

8. Deepen regional cooperation

Regional cooperation can be fruitful for narrowing inequalities within and among countries. Regional economic cooperation and integration can help the lesser developed countries grow faster by leveraging the dynamism of more developed economies and by exploiting the complementarities in a mutually beneficial manner. Regional cooperation can also help in addressing common challenges, such as shared vulnerabilities to natural disasters and climate change, or in supporting common objectives, such as the extension of broadband networks, as highlighted in the report. In addition, regional platforms for sharing good practices in addressing inequalities and extending social protection coverage can be fruitful. Member States of ESCAP have adopted a number of resolutions for strengthening regional cooperation and integration, as well as the Regional Roadmap for Implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific, which also outlines opportunities for regional cooperation in different thematic areas including on inequality. As their regional commission, ESCAP stands ready to support the member States in implementing the Roadmap and in strengthening regional cooperation for addressing inequalities.


for Healthy & Beautiful Life

Introduction

A. INEQUALITY IN THE ERA OF THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

In September 2015 the world's leaders gathered in New York to adopt the 2030 Agenda for Sustainable Development, pledging to "leave no one behind." The backdrop was mounting disquiet about inequality, which had stirred in the global financial crisis of 2007/08 and grew wings through the Occupy protests and during the Arab Spring, propelled by a young generation that increasingly felt marginalized and shut out.

In early 2014, Thomas Piketty's monumental book on wealth and inequality was published, and swiftly topped best-seller lists around the world. With carefully amassed evidence showing why inequality was rising and what could be done about it, *Capital in the Twenty-First Century* made substantial waves in the economic discourse. The impact is still rippling through universities, international organizations, think tanks, NGOs and businesses – and will continue to do so. In our region, ESCAP contributed to the discourse through its publication *Time for Equality*.[1]

Fast-forward a couple of years, and the trickle of articles and books on inequality has become a deluge. Inequality is now central to the policy agenda, but there is still much to debate and understand about it – particularly on how to balance peoples' livelihoods, income and wealth at a time of unprecedented technological advances and environmental degradation.

B. INEQUALITY: CORE CONCEPTS

Inequality can be defined as the difference in social status, wealth or opportunity between people or groups. This report makes the distinction between three broad types of inequality, all of which can be damaging: inequality of outcome, inequality of opportunity and inequality of impact.

Inequality of outcome references disparities in the material dimensions of human wellbeing among individuals, such as the level of income and wealth. Inequality of outcomes primarily concerns economic inequality and is usually measured by either income or consumption metrics. The allocation of wealth impacts households across generations, often rises more rapidly than income and is closely associated with political power and influence.

Inequality of opportunity references unequal access to fundamental rights and services required for individuals to sustain and improve their livelihoods. These opportunities include access to basic services and productive resources such as education, health care and nutrition, water and sanitation, energy, information and communications technology, as well as finance and

credit. Equal access to these opportunities levels the proverbial playing field, and ensures that outcomes are more a reflection of effort and choices made by individuals.

Inequality of impact references the asymmetric impact external shocks, such as natural disasters, have on different groups of people. This asymmetry usually is associated with systemic disparities between groups with shared identities. Also referred to as group-based inequality or horizontal inequality, this type of inequality is often historically rooted and persists over generations because of entrenched deprivation or advantage.

A more recent concern is that technological progress and frontier technologies – leading to the Fourth Industrial Revolution – could magnify inequalities by, for example, generating significant job losses among certain lower-skilled groups of people.

Inequality of outcomes, opportunities and impact are interdependent and mutually reinforcing. An unequal playing field inevitably leads to disparate outcomes. Unequal outcomes in terms of income and wealth aggravate disparities in access to basic services, resources and decent jobs. Prejudice, discrimination and social exclusion further reinforce inequalities of outcomes and opportunities by preventing people from leading empowered lives. For example, disparities in accessing education, health care and technology are often caused by economic inequalities and lead to far-reaching development gaps. These gaps, in turn, result in deepening income disparities.

This multidimensional and mutually reinforcing nature produces inequality traps that can persist through generations. In a majority of countries in South-East Asia and South Asia, less than 5 per cent of women from poor, rural households complete secondary education, compared with 50 per cent of women in richer urban households. These gaps create a direct, intergenerational advantage or disadvantage because a mother's education, along with household wealth, are the two most significant circumstances associated with higher prevalence of stunted children.[2] Stunting directly influences school attendance, results and future earnings potential.

C. WHY IS INEQUALITY BAD?

Inequalities matter for intrinsic reasons – they undermine human dignity and social justice, the principles upon which human rights are grounded. They also matter for instrumental reasons – they undermine the three dimensions of sustainable development by stifling economic growth, weakening social cohesion and solidarity and hampering environmental governance.

Inequalities stifle economic growth and poverty reduction. The economic cost of ignoring inequality is significant. Research demonstrates that countries with high rates of inequality have lower growth rates and shorter growth spells.[3] In addition, inequality reduces the impact of growth on poverty reduction. In other words, poverty alleviation efforts are more effective in countries with more equitable growth-distributions.[4]

Inequalities undermine social cohesion and stability. High inequality is a key factor in rising levels of social tension and even crime because it weakens the social compact and undermines public trust in institutions. A weak social compact, in turn, reduces the willingness to pay taxes, thereby leading to further deterioration in basic public services and resources to marginalized groups. Where group-based inequalities are high or rising, so is the likelihood of violence and unrest. This is particularly true when coupled with a lack of opportunity for upward social mobility and the absence of recourse.[5]

Inequalities negatively impact the environment. Inequality and environmental sustainability are deeply interlinked. Generally, societies with higher levels of inequality show less public support for policies protecting the environment and regulating common goods. Furthermore, inequality in the ownership of land and natural resources provides unchecked freedom for the advantaged to cut, mine and farm lands in ecologically unsustainable ways.[6] For the disadvantaged, social resentment and lack of education can then lead to widespread free-riding and the overuse of natural resources.[7] Environmental degradation also impacts the poor and marginalized the hardest, going against the concept of "environmental justice". As a consequence, vulnerable socioeconomic or ethnic minority groups are disproportionately exposed to and affected by environmental hazards. They are also more exposed to air and water pollution, while being least prepared to soften and withstand the shocks from extreme events, such as natural or man-made disasters.

Research also finds that an individual's experience and even expectations of inequality negatively affect attitudes, reduce individual aspirations and lead to the acceptance and internalization of a lower status, all while reinforcing pre-existing inequalities. The aspirations affected range from educational and occupational goals to broader decisions around consumption or social identity.[8]

The sense of unfair allocation of gains and resources has serious repercussions on personal efforts towards work, but also on investment in education, nutrition and health. The psychological impact of inequality has drawn increasing attention among scholars and, while evidence

is still thin, the impact appears more complex and more corrosive than poverty itself. Rather than being poor, it is the notion of feeling poor that has the gravest impact on life satisfaction.[9] The reaction to this feeling is a personal one, but for most people it is easier and perhaps more rewarding to focus on what is achievable, and expected for one's social and economic circle, while observing from afar the lives of billionaires.

D. WHY THIS STUDY?

The Asia-Pacific regions has for several decades witnessed extraordinary development. This includes the reduction in the number of people living in extreme poverty, and significant improvements in food security, access to health care, education, water and sanitation, and energy, along with other basic services fundamental for overall socioeconomic development. Unfortunately, these noticeable improvements in basic services often benefitted the already privileged rather than the poor, marginalized and vulnerable.

In places, gaps between the rich and the poor, and access to services such as health care and education, have continued to grow. The lives and livelihoods of vulnerable communities are also disproportionately affected by the increased frequency and intensity of extreme weather events and environmental degradation, including increased pollution levels, which have accompanied economic development.

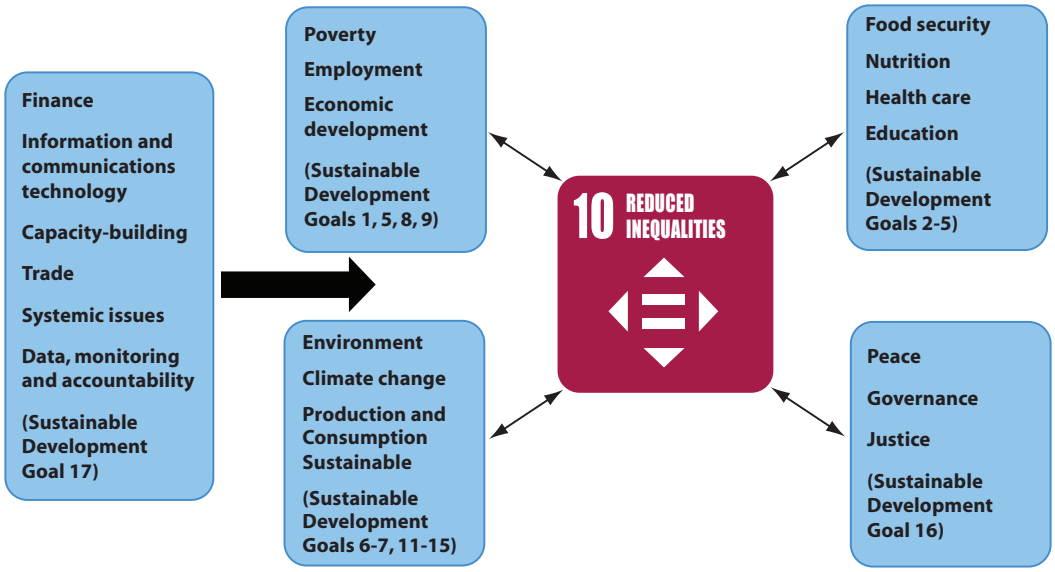
For all segments of society to benefit in a fair and just way from economic and other development gains, those most in need must be fully included in current and future development plans. Achieving the Sustainable Development Goals (SDGs) by 2030 means placing people at the centre of the development agenda, and better balancing investments in, for example, infrastructure with investments in people and the planet. The pledge by world leaders to "leave no one behind" and "reach the furthest behind first" strongly carries the spirit of inclusion and a people-centred approach.

Given its commitment to leaving no one behind, reducing inequality is at the heart of the 2030 Agenda for Sustainable Development. Reducing inequality is emphasized in the stand-alone SDG 10 "Reduce inequality within and among countries" but is also a fundamental component to reach almost all other Goals.

This report, prepared as an input to the 74th Commission Session, aims to shed light on the latest trends in inequality, building on evidence from across the region, using the most authoritative data sources, while relying on innovative analytical methods, to distil clear policy messages for the governments of the Asia-Pacific region.

The broad themes analysed in the report are as follows: chapter 1 discusses inequality of outcome (e.g. income and wealth); chapter 2 focuses on inequality of opportunity (e.g. access to education, health care, decent jobs, water and sanitation, and electricity); chapter 3 explores the interplay between the environment and the inequality of impact (e.g., environmental degradation and natural disasters); chapter 4 recognizes the prominence new technologies have on inequality in all its forms, as well as the possible impact of the Fourth Industrial Revolution on jobs, incomes, opportunities and policy options; and chapter 5 concludes the report and proposes a set of recommendations for the consideration of policymakers in their efforts to reduce inequalities and thereby facilitate the achievement of the SDGs.

Inequality in the 2030 Agenda expands beyond Goal 10



ENDNOTES

[1] Other notable contributions also included the ADB-published book, "Inequality in Asia and the Pacific: Trends, Drivers and Policy Implications", edited by Kanbur et al. (2014).

[2] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018c) (forthcoming).

[3] Bénabou (1996).

[4] Fosu (2006).

[5] Stewart (2016).

[6] Gaventa (2016).

[7] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2015a).

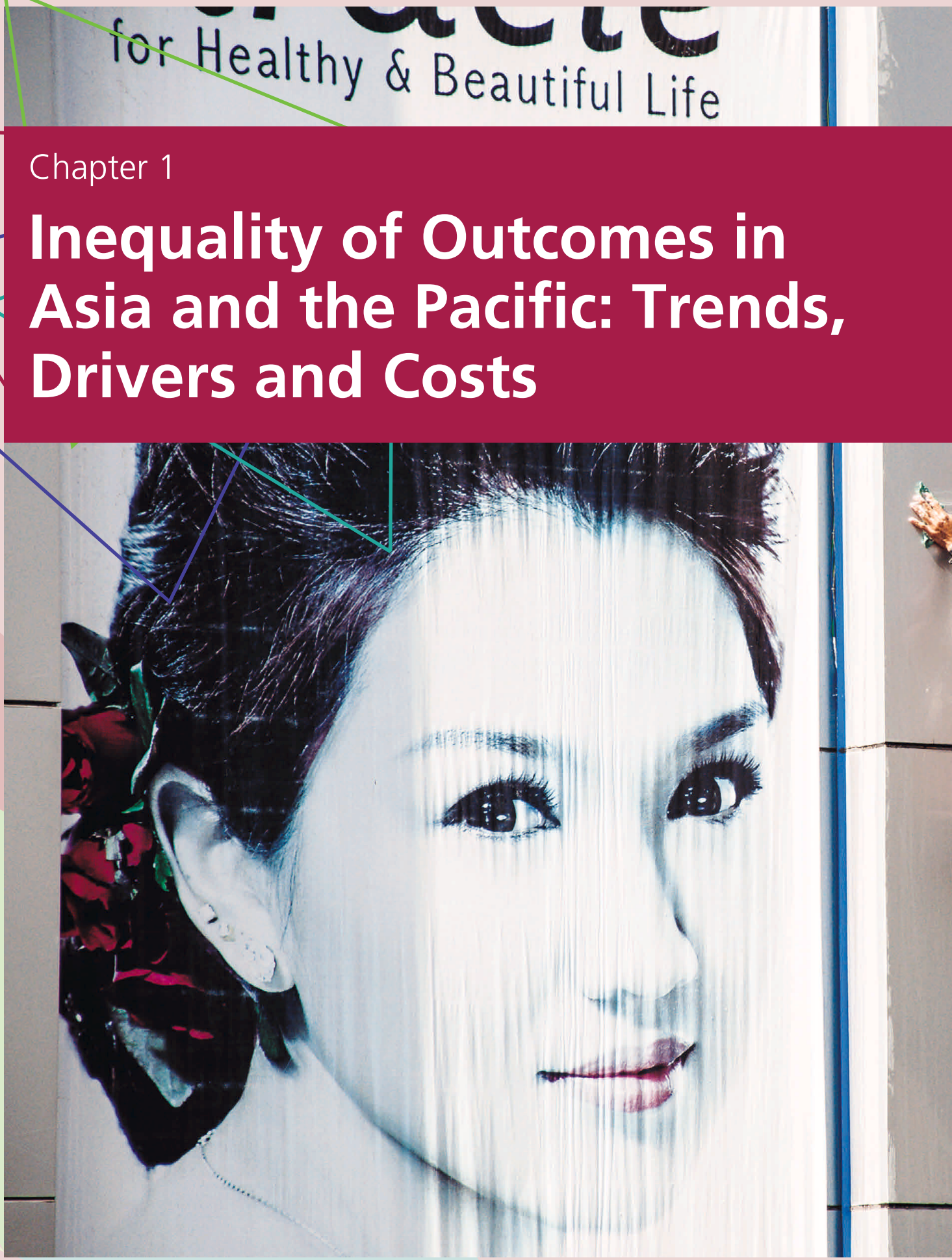
[8] See Pasquier-Doumer (2016); Baillergeau et al. (2016).

[9] Payne (2017).


for Healthy & Beautiful Life

Chapter 1

Inequality of Outcomes in Asia and the Pacific: Trends, Drivers and Costs



High and persistent inequalities of outcome are a source of concern because they undermine the implementation of the 2030 Agenda for Sustainable Development and the associated Sustainable Development Goals (SDGs).[1] Among several adverse implications, they can lead to a deceleration of economic growth, hamper efforts aimed at eliminating extreme poverty and hunger, and weaken bonds of solidarity at the community level. Inequalities of outcome also correlate with political capture, especially by vested interest groups. A disproportionate political influence of the rich over policymaking increases rent-seeking activities at the expense of the broader society, hence undermining the global aspiration of "leaving no one behind". Addressing deepening and persisting inequalities is also important to foster peace and prevent within-country conflicts.[2]

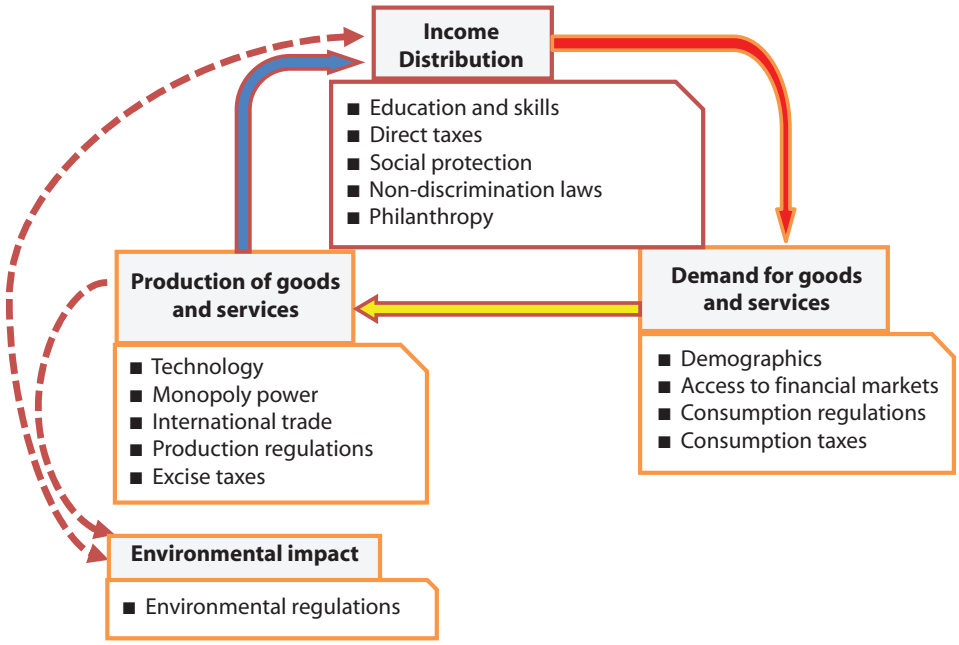
This chapter builds on previous literature and evidence on inequality of outcome, including work done by the ESCAP, and aims to further examine recent trends in inequality of outcome in the region. The chapter presents new research on the drivers and costs of income inequality in the region.[3] Owing to data constraints, the chapter primarily focuses on income inequality at the regional and country levels.

1.1 A CONCEPTUAL FRAMEWORK FOR UNDERSTANDING INEQUALITY OF OUTCOME

At a basic level, income inequality refers to the variation in how income generated in the production of goods and services is distributed across a population. The extent of this variation depends on a three-way relationship between the demand for goods and services, how they are produced and how people are remunerated for their work. Owners of assets that support productive activities, such as land, financial assets or shares of corporations, also receive income in the form of rent, interest or dividends. Each of the three elements of an economy are themselves dependent on a host of factors such as access to education, markets and the extent of regulations and taxes – as illustrated in Figure 1.1.

The figure shows that the way production is organized in a country depends on its level of technology, its degree of engagement in international trade and investment and its policies on regulations and taxation. These factors determine the share of income distributed in the form of wages and salaries *vis-a-vis* profits and rents. In addition, income distribution depends on access to (and the quality of) education, tax policies, social protection, non-discrimination laws and philanthropy. As discussed in the next section of this chapter, direct taxes and social protection can play a powerful role in ameliorating market income inequality.

Figure 1.1 Conceptual framework for income inequality



Source: ESCAP.

The production of goods and services and the payments it generates is not the sole driver of income distribution. Production is also driven by the demand for a country's goods and services, which are in turn affected by demographic factors, access to financial services and policies such as consumption taxes and other fiscal measures. The demand for goods and services in an economy is also influenced by the distribution of income. The figure also shows the relationship between economic activity, the distribution of income and environmental impacts. Policymakers increasingly recognize the importance of taking a system-wide approach that considers these interlinked and complex elements for an appropriate diagnosis of the causes of economic inequality.

The booming real estate prices experienced by many cities across the Asia-Pacific region in recent years provide a powerful example of how changes in the interaction between demand and the production of goods and services can result in changes in income distribution. Spiralling prices tend to reflect rising demand for housing, which has partly been caused by factors such as the expansion of the middle class and low levels of financial-market development.[4] While rising purchasing power makes housing increasingly affordable for the middle classes, a lack of opportunities for financial investment is also leading to additional demand for housing units for investment purposes by wealthy individuals. As demand for housing increases, the production side of the economy responds through an increase in the business activities of developers, constructors, producers of construction materials, realtors and banks. Rapid increases in real-estate prices feed into rising income for companies in these sectors, along with landowners and real-estate speculators, leading in turn to a more unequal distribution of income.[5]

Technological progress is an important driver of changes in income distribution.[6] While it facilitates the expansion of production by lowering production costs and increasing productivity, it also leads to a concentration of income in the hands of the most innovative businesses. Technological progress tends to favour capital over labour and skilled labour over unskilled labour, which can exacerbate differences in rates of economic growth among countries and within them.[7] Advances in information and communication technology, along with the emergence of social media and information and communication technologies (ICT), for example, have spawned a new cadre of billionaires across developed countries and emerging economies. The enormous wealth of technology giants such as Apple, Google, Facebook, Amazon or Ali Baba is related to both the major technological breakthroughs and innovations they have stirred and to the monopoly power they enjoy as "first movers" in a vibrant new technological landscape.[8]

A major factor affecting the distribution of income in developing countries, including in the least developed countries (LDCs), is the unequal distribution of human capital – the value of individuals' skills, knowledge, abilities and social attributes. Through the process of development, the production of goods and services

tends to become more sophisticated, which requires an increasingly well-educated and skilled workforce. Achieving this depends on sustained public investment, and arguably the participation of the private sector in education systems including technical and vocational education and training (TVET).[9] Without a substantial increase in public investment in education, as well as in other social policies such as health care and social protection, a share of the population is likely to remain excluded from the benefits of technology-led economic growth, perpetuating a skewed distribution of income. These issues are discussed at length in chapter 2 and chapter 4.

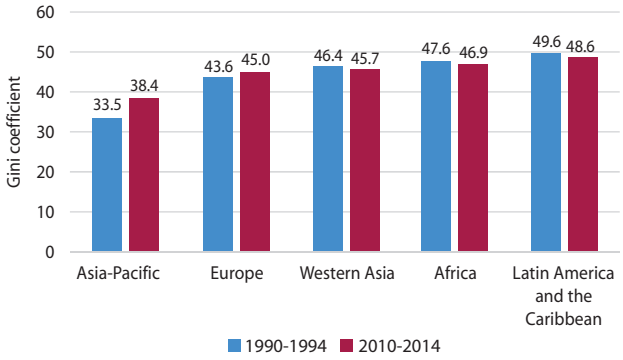
1.2 TRENDS IN ECONOMIC INEQUALITY IN THE ASIA-PACIFIC REGION

Economic inequality can be measured in several ways. One approach is to compare the income of a swathe of affluent people, say the top 10 per cent of the income distribution in a country, with the national average. Other approaches focus on the gap between the poorest in a society and the median household. The best-known way of measuring income inequality is the Gini coefficient, named after the Italian statistician Corrado Gini. It aggregates the gaps between people's incomes into a single measure. If everyone in a group has the same income, the Gini coefficient is 0; if all income goes to one person, it is 1.[10] Most of the analysis in this chapter is based on the Gini coefficient, using data gathered from countries across the Asia-Pacific region since the early 1990s. Most of the analysis is carried out by using gross (or market) income, which does not reflect government policies to redistribute income, for instance through direct taxes, social security contributions and cash transfers. Annex 1.1 provides a brief description of the data set on the Gini coefficient used in the analysis.

The data present a mixed picture – several economies in the Asia-Pacific region experienced a considerable rise in income inequality between the early 1990s and the 2010s, while many other nations saw declines during this period. On average, according to data from 46 countries, the region's inequality increased by close to 5 percentage points during this period; from 33.5 in 1990-1994 to 38.4 in 2010-2014 (Figure 1.2).[11]

Figure 1.2 also shows the population-weighted income Gini coefficient of Europe, Western Asia, Africa and Latin America and the Caribbean. Despite a significant increase in income inequality in the Asia-Pacific region, its population-weighed Gini coefficient is still about 7 percentage points lower than that of Europe and more than 10 percentage points lower than that of Latin America and the Caribbean.[12] Nevertheless, the rising trend in Asia-Pacific is contrary to most other regions.

Figure 1.2 Income inequality by region, changes between early 1990s and early 2010s



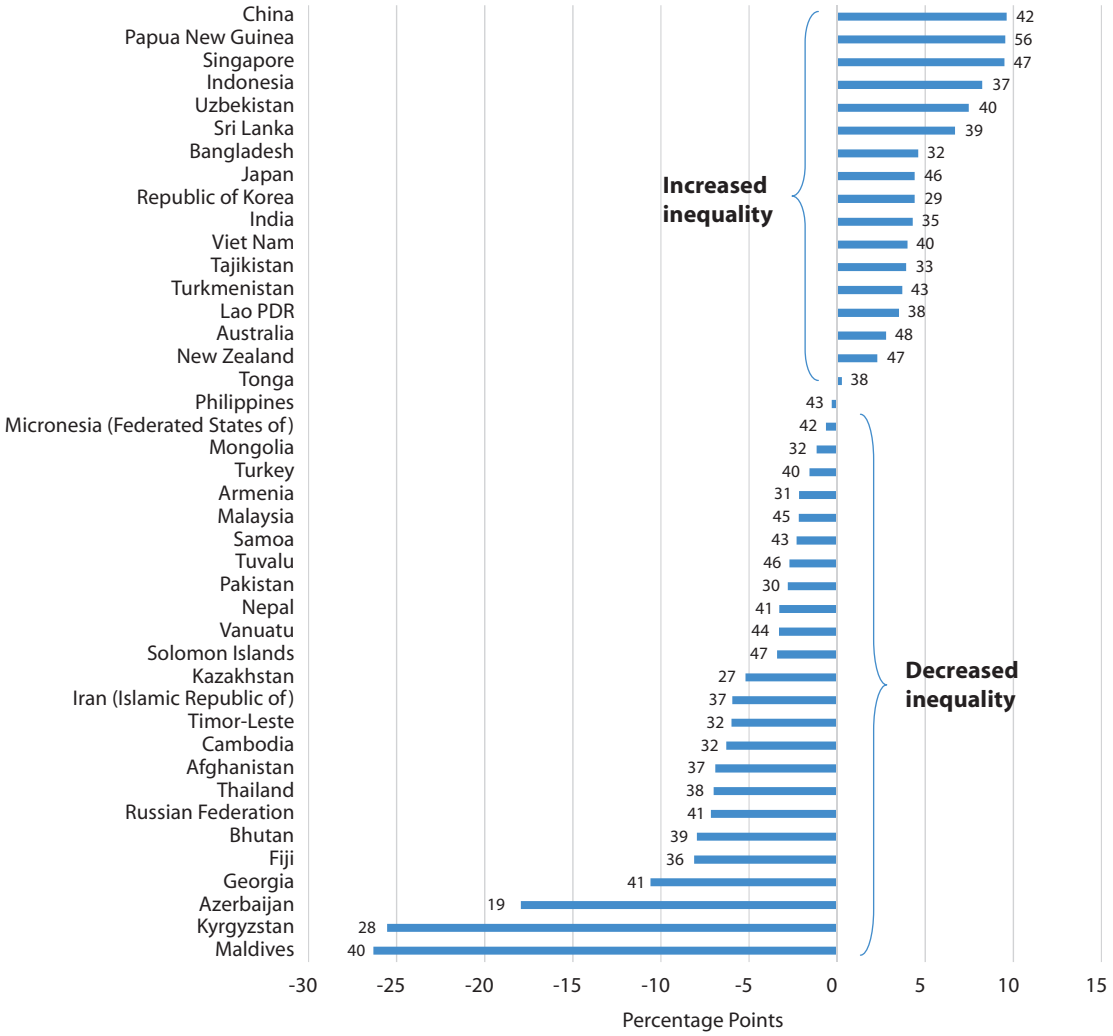
Source: ESCAP. See Annex 1.1 for data sources.
Notes: The regional classification is based on the United Nations regional commissions. The Gini coefficient of each country was calculated as the simple average of the available Gini coefficients within each 5-year period (1990-1994 and 2010-2014). Each region's Gini coefficient is calculated as the weighted average of the Gini coefficients of the countries in the region using population weights.

This overall rise in income inequality is mostly due to sharp increases in the region's most dynamic and populous countries. Between 1990-1994 and 2010-2014 the market income Gini coefficient soared by 9.6 percentage points in China, 8.2 percentage points in Indonesia, 4.6 percentage points in Bangladesh and 4.3 percentage points in India. These four countries are among the five most populous countries in the region, representing over 70 per cent of the population in 2015.[13] The overall picture, however, is mixed. In 60 per cent of the Asian and Pacific countries, income inequality declined (Figure 1.3), often from very high levels. The sharpest fall in inequality occurred in the Maldives, followed by Kyrgyzstan, Azerbaijan and Georgia, reflecting the recovery of those countries from the economic crisis that followed the breakup of the Soviet Union.[14]

In terms of changes in income inequality by subregions, North and Central Asia experienced a sharp decline with the Gini coefficient dropping on average 11.4 percentage points for six of the nine countries for which data are available (Figure 1.4). As a result, during 2010-14, this subregion had an average Gini coefficient of 38.3, similar to the region's average. In South-East Asia, the picture is mixed, with Indonesia and Singapore experiencing increases in income inequality and others including Malaysia and Thailand seeing declines. On average, however, the population-weighted Gini coefficient rose from 32.6 to 39.1, a similar increase in magnitude to that seen across the entire region.

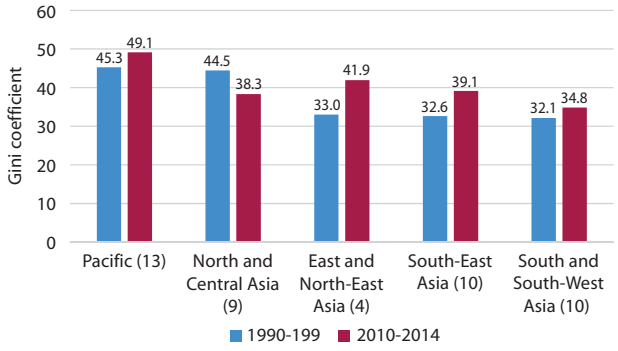
South and South-West Asia also saw mixed developments, with Bangladesh, India and Sri Lanka experiencing increases in income inequality, while the Islamic Republic of Iran, Pakistan and Turkey experienced decreases, with an average increase from 32.1 to 34.8.

Figure 1.3 Changes in income inequality by country, 1990 and 2014



Source: ESCAP. See Annex 1.1.
Note: Labels next to each bar show each country's average market income Gini coefficient for 2010-2014. The Gini coefficient of each country was calculated as the simple average of the available Gini coefficients within each 5-year period (1990-1994 and 2010-2014).

Figure 1.4 Changes in income inequality by subregions, 1990 and 2014

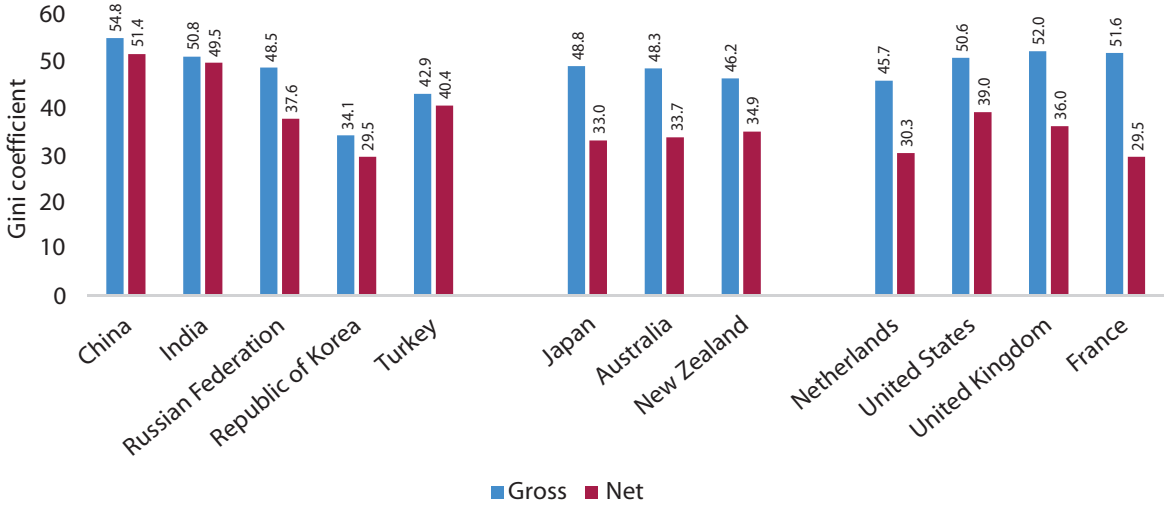


Source: ESCAP. See Annex 1.1.
Notes: The subregional classification is based on the United Nations ESCAP's classification of Asia and the Pacific. The Gini coefficient of each country for each of the subregions was calculated as the simple average of the available Gini coefficients within each 5-year period (1990-94 and 2010-14). Each subregion's Gini coefficient is calculated as a weighted average of the Gini coefficients of the countries in the subregion using population weights. The number of countries with available data on the Gini coefficient in each subregion is noted in parentheses.

In East and North-East Asia inequality rose in China, Japan and the Republic of Korea, but decreased in Mongolia, with the subregional average increasing from 33 to 41.9. In the Pacific, 6 of the 13 countries for which data are available experienced an average drop in the Gini coefficient of 3.4 percentage points; however, income inequality increased in the subregion's most populous countries, Australia, New Zealand and Papua New Guinea, and the average Gini coefficient for the subregion edged up from 45.3 to 49.1.

In interpreting these trends, it is important to keep in mind that the measure of income utilized excludes the effect of taxes and transfers, which can contribute significantly to ameliorating income inequalities. OECD data shows that the average Gini coefficient after taxes and transfers is considerably smaller than the gross

Figure 1.5 Inequality, gross versus disposable income, in selected countries, 2014 or latest available years



Source: ESCAP, based on OECD Income Distribution Database, available from http://www.oecd.org/social/income-distribution-database.htm (accessed 9 March 2018).

income Gini coefficient in developed countries. As shown in Figure 1.5, the Gini coefficient of net (or after-tax) income for seven developed countries, which are members of ESCAP, was 33.8 compared with 49 when income is measured on a gross or market basis.

Similarly, the average Gini coefficients for five countries in the region included in the OECD database – China, India, Republic of Korea, Russian Federation and Turkey – were 41.7 for net income, compared with 46.2 for gross income. These findings highlight the important role fiscal policies can play in redistributing incomes through taxes and transfers and their potential to play a larger role in reducing inequality of outcomes in the region.[15]

1.2.1 Trends in consumption inequality

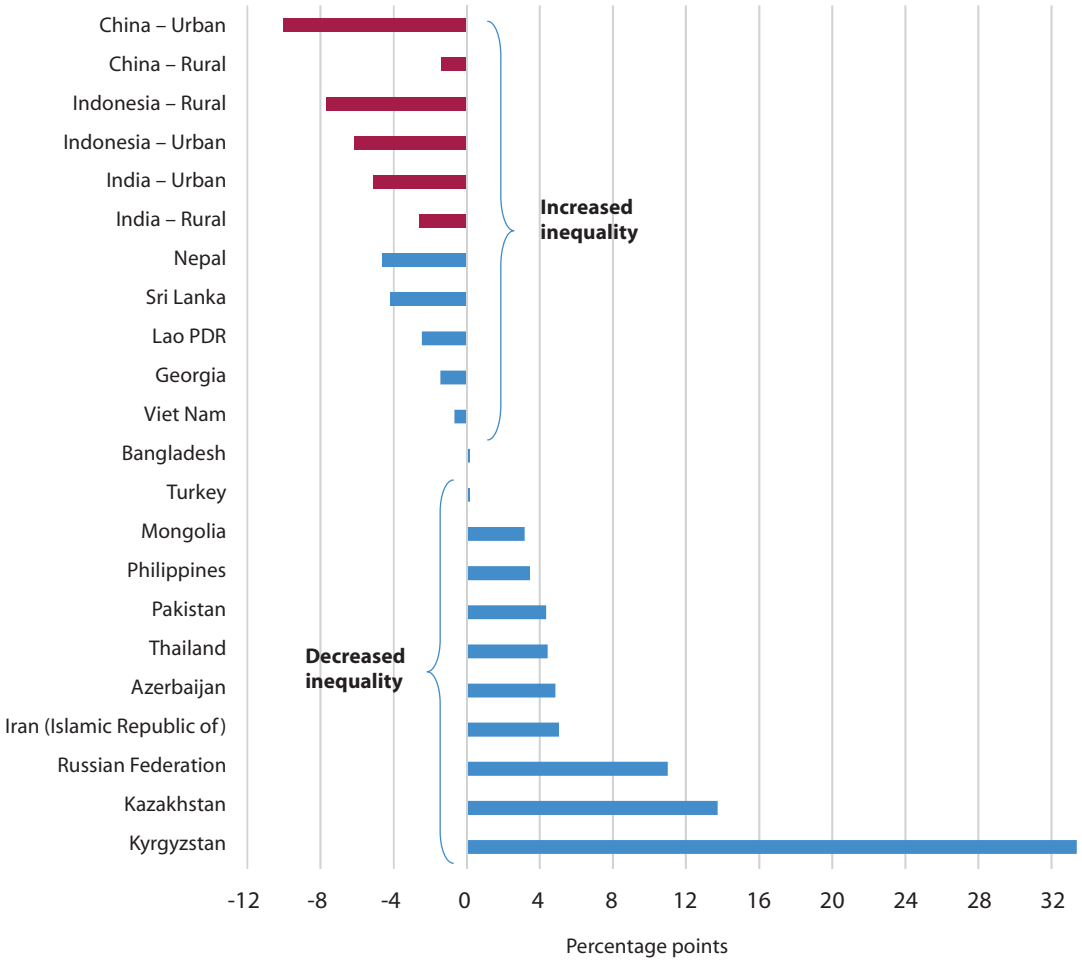
Inequality of outcome can be gauged using other economic measures besides income. One option is to consider inequality in the consumption of goods and services. Compared with income, this measure excludes savings, which are higher for richer households. As such, inequality in consumption is expected to be lower than inequality in income. In fact, using data for 20 countries, representing 90 per cent of the Asia-Pacific population, we find that the average population-weighted Gini coefficient increased by just 1.7 percentage points: from 33.2 in the mid-1990s to 34.9 in the mid-2010s. As noted above, this increase also reflects the weight of countries such as China, India and Indonesia.

A related measure of interest is the ratio of the average consumption of the poorest 40 per cent of the population over the average consumption for all the population. If this indicator increases over time, it will contribute to meeting Target 10.1 of the Sustainable Development Goals: "By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average." Changes in this indicator between the early 1990s and the early 2000s are shown in Figure 1.6, confirming the finding that inequality increased most sharply in the region's most populous countries – China, India and Indonesia. Overall, the ratio of the average consumption of the bottom 40 per cent of the population over the average consumption for the whole population declined from 50.3 per cent to 48 per cent. Nevertheless, inequality decreased significantly in some North and Central Asian countries, consistently with the findings shown in Figures 1.3 and 1.4.

A feature of interest in Figure 1.6 is that data for China, India and Indonesia are broken down for the urban and rural populations. In China and India, inequality increased more in urban areas than in rural areas, but the opposite is true for Indonesia.

It is also possible to use the Lorenz curve to illustrate the distribution of income or consumption in a country or region. Figure 1.7 shows two Lorenz curves for per capita household consumption in Asia and the Pacific, one for the early 1990s and another for the early 2010s. The vertical axis shows the cumulative share of consumption, and the horizontal axis shows that cumulative share of population. Both the horizontal and vertical axes are normalized between 0 and 100. Because the curves are constructed using data on household consumption per capita by decile from 20 Asia-Pacific countries, they reflect both within- and between-country inequality.

Figure 1.6 Changes in the ratio of average consumption of the bottom 40 per cent to the average total consumption in the Asia-Pacific region, early 1990s and early 2010s

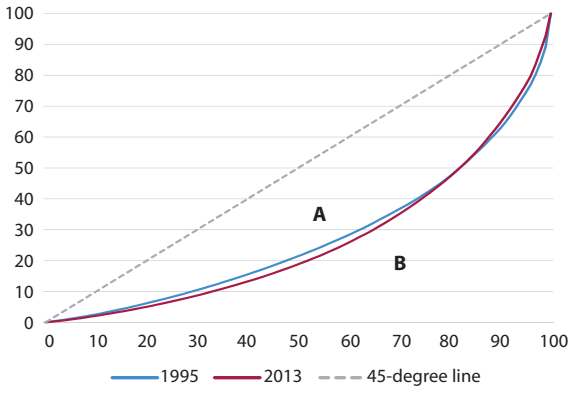


Source: ESCAP based on data from World Bank's PovcalNet database.
Notes: Three countries, China, India and Indonesia, have separate data for rural and urban populations. They are noted in red. Data for the early 1990s and the early 2010s for each country are based on the most recent Gini coefficient available, respectively, for 1990-1996 and 2010-2016.

The Gini coefficient can be estimated from a Lorenz curve as the ratio of the area between the 45-degree line and the blue or orange line in the figure (area A in the figure) and the total area between the 45-degree line and the horizontal axis (areas A + B in the figure).[16] The Gini coefficients calculated from the Lorenz curves in Figure 1.7 are 44.7 for the early 1990s and 46.6 for the early 2010s.

Another advantage of estimating Lorenz curves for different periods is that they provide information on changes in inequality for different segments of the population. For instance, in Figure 1.7, the two curves cross at around the 85th consumption percentile. Below that threshold, the early 2010s curve is below the early 1990s curve. This means that inequality rose for the poorest 85 per cent of the population, but it declined for the richest 15 per cent of the population. This pattern reflects the rapid rise in purchasing power of richer segments of the population in large countries.

Figure 1.7 Lorenz curves for per capita household consumption in the Asia-Pacific region, early 1990s and early 2010s

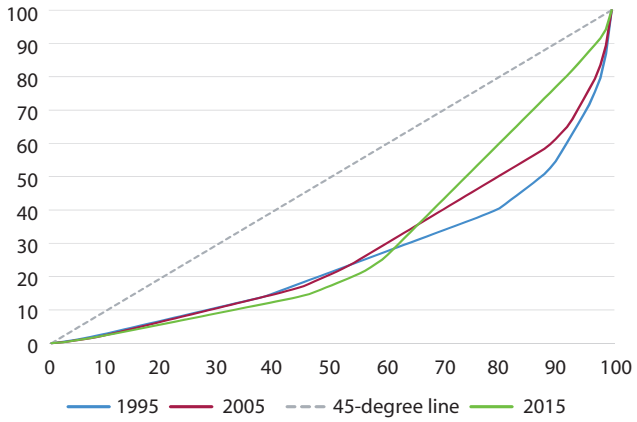


Source: ESCAP based on data from World Bank's PovcalNet database.
Notes: The curve was obtained by combining data on consumption per decile for 20 countries of the region representing 90 percent of the population. Three of them, China, India and Indonesia, have consumption decile data for both rural and urban populations. The data for all countries is adjusted for country differences in purchasing power using PPP exchange rates. Data for the early 1990s and the early 2010s for each country are based on the most recent Gini coefficient available, respectively, for 1990-1996 and 2010-2016. The Gini coefficient is defined as the ratio of the area A over the area (A + B) in the figure.

1.2.2 Trends in between-country income inequality

To further explore changes in inequality among countries, Figure 1.8 shows three Lorenz curves based on gross national income (GNI) per capita in current US dollars for three years: 1995, 2005 and 2015. These Lorenz curves capture exclusively the between-country dimension of inequality in the region because their construction assumes that all persons in a country earn the average income in that country.[17] The Gini coefficients based on these Lorenz curves show a clear decline in overall between-country inequality, from 48.3 in 1995 to 43.5 in 2005 and 39.5 in 2015. However, a closer look at the lower half of the distribution, below the 65th percentile, reveals an increase in inequality between 2005 and 2015, as the Lorenz curve for the latter year is lower. In contrast, the 2015 curve is higher than both the 1995 and the 2005 curves above the 65th percentile. This means that all the reduction of between-country inequality in the region is entirely due to a less concentrated distribution of income in the top third of it. These results are consistent with those presented in Figure 1.6 and are largely explained by the rise of the middle class in China over the last two decades.

Figure 1.8 Lorenz curves for GNI per capita, Asia-Pacific region developing countries, 1995, 2005 and 2015



Source: ESCAP based on data from United Nations' National Accounts Main Aggregates database.
Notes: The figure excludes high-income economies with per capita GNI of US$15,000 or more in 1995: Australia; Brunei Darussalam; French Polynesia; Hong Kong, China; Japan; Macao, China; New Caledonia; New Zealand; and Singapore.

In 1995 China was a low-income country, with a GNI per capita of US$585. Ten years later it had more than tripled to US$1,735 per capita, and by 2015 it had soared to US$8,000. This shift of hundreds of millions of people from low-income to high- and middle-income status explains the reduction of between-country inequality at the top third of the distribution. However, other low- and low-middle-income countries grew at a much slower pace than China, especially during the past decade. This explains the worsening of the income distribution at the bottom two-thirds of the distribution.

1.2.3 Trends in wealth inequality

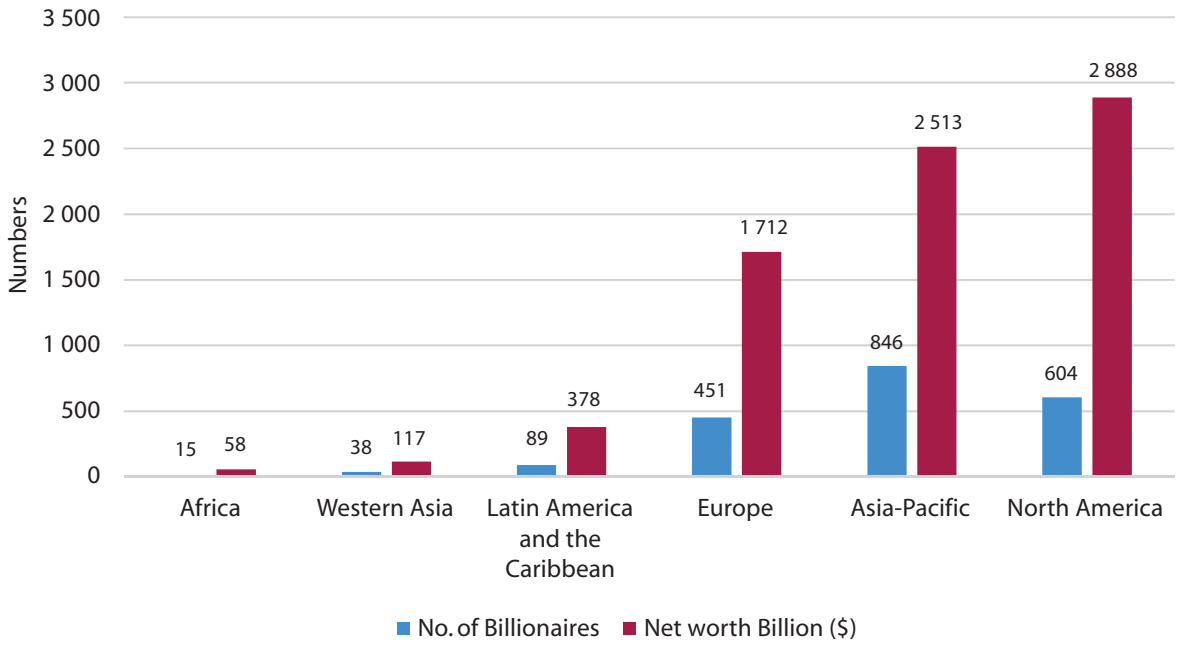
Besides income and consumption, inequality can also be measured on the basis of wealth. Income and wealth inequality are related and reinforce each other. Increases in income inequality tend to lead to even larger increases in wealth inequality because wealth is based on the accumulation of past savings and because the rich typically save more than the poor. Concentration of wealth, in turn, can lead to a disproportionate political influence of the rich in policymaking, reducing the likelihood of adopting policies such as taxation or social security to mitigate inequalities. Thus, wealth inequality can contribute to perpetuating income inequality.

Although systematic data on wealth inequality are scarce, some clues can be obtained through publicly available information on the net worth of the world's billionaires. Forbes' billionaires list, for instance, shows that the aggregate net worth of the world's 2,043 billionaires for which information is available amounted to US$7.7 trillion in 2017.[18] This is well above the total gross domestic product of the world's least developed countries, landlocked developing and small island developing states in 2017. These data also show that in several countries in the Asia-Pacific region, the billionaires' combined net worth amounted to more than half of those nations' entire economic output (GDP) in 2017. Figure 1.9 shows that Asia and the Pacific has more billionaires (846 in 2017) than any other region, with an aggregate net worth second only to that of billionaires in the United States. In 2017, their combined net worth of more than US$2.5 trillion was more than seven times higher than the combined economic output of the region's least developed countries.

Research by Thomas Piketty and his collaborators is feeding into new and hopefully more accurate measures of wealth and income inequality, based on combined data from national accounts, survey data, fiscal data and wealth rankings. Figure 1.10 shows the share of total national income accounted for by the top 10 per cent of earners in three large Asia-Pacific countries in 2016.

Of the three Asia-Pacific countries shown, India is the most unequal, with the top 10 per cent of earners receiving 54.2 per cent of the total national income. The figures for Africa and Brazil are similar (54 and 55 per cent respectively). In the Russian Federation, the share of the top 10 per cent of earners is 45.5 per cent, slightly below the United States and Canada (47 per cent). In

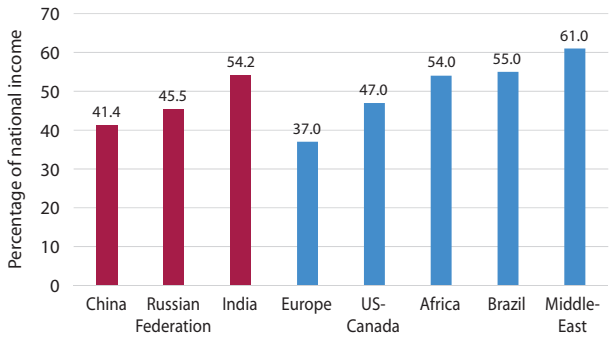
Figure 1.9 Comparing billionaires' net worth in Asia-Pacific and other regions, 2017



Source: ESCAP, based on Forbes online (accessed on 9 January 2018).

China the top 10 per cent of earners received 41.4 per cent of total income, exceeding the 37 per cent received by the top 10 per cent of earners in Europe.[19]

Figure 1.10 Top 10 per cent share of national income, China, India, the Russian Federation and other major economies, 2016



Source: ESCAP, based on World Inequality Report 2018.

1.3 A DISAGGREGATED ANALYSIS OF BETWEEN-COUNTRY INCOME INEQUALITY

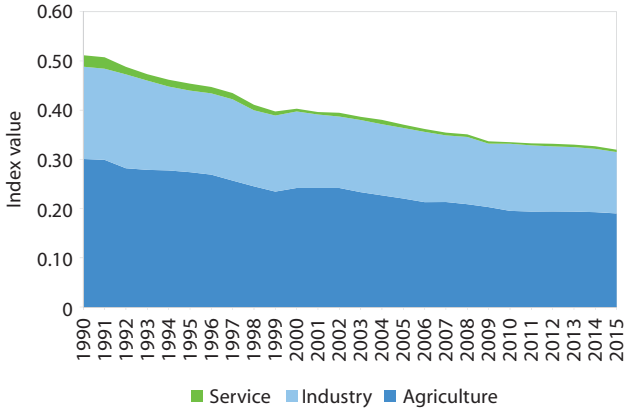
In the previous section, we found that between-country inequality has fallen over the past 20 years in the Asia-Pacific region. This section explores the reasons for this reduction by considering the role of structural and long-run changes, both in the structure of production and that of aggregate demand. The methodology disaggregates changes in inequality in GDP per capita among countries into 1) the share of the components of GDP per capita and 2) changes in inequality within each component (See Annex 1.2 for details). The analysis is conducted year-by-year between 1990 and 2015.

First, the impact of the three productive sectors, agriculture, manufacturing and services, on income inequality among countries, as measured by GDP per capita, is examined. While the share of the manufacturing sector in the GDP grew from 18.5 per cent in 2000 to 23.6 per cent in 2015, the share of the agriculture sector in GDP remained at about 7 per cent, on average, in the period. The service sector therefore accounts for the bulk of the region's GDP.

The findings indicate that the services sector accounted for more than half of the total income inequality throughout the period of analysis (Figure 1.11). The contribution of both services and industry to inequality has declined over time, while the contribution of the agricultural sector to inequality was negligible during the period of analysis. This suggests that the services sector is the dominant driver of between-country inequality in the Asia-Pacific region.

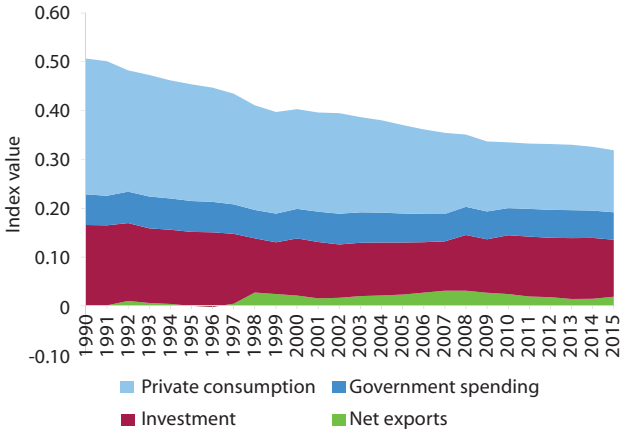
Next, we examine the impact on GDP per capita inequality of its demand-side components: private consumption, government spending, investment and net exports. In recent years, GDP growth has relied more on domestic demand because of weakening global trade and investment flows. Between 2000 and 2015 private consumption was the dominant component of

Figure 1.11 Sector contributions to between-country income inequality in Asia-Pacific countries, 1990-2015



Source: ESCAP.

Figure 1.12 Contribution of expenditure components to between-country income inequality in Asia-Pacific countries, 1990-2015



Source: ESCAP.

aggregate demand, representing around half of the total, followed by investment, which contributed more than one-third of GDP (Figure 1.12).

The analysis shows that private consumption is the dominant contributor to GDP per capita inequality from the demand side – on average it accounted for nearly half of income inequality in 1990-2015. The second largest contributor is investment, which accounted for around 37 per cent of income inequality. While the contribution of consumption to inequality has declined markedly, the contribution of investment decreased from 1990 to 2007 and then displayed a rising trend. Government spending is the third largest contributor to inequality – it increased from 12 per cent in 1990 to 18 per cent in 2015. Finally, the contribution of net exports has been quite small, averaging about 4 per cent over the past two decades.

1.4 DRIVERS OF INCOME INEQUALITY

This section examines the role of various drivers of income inequality at the country level, including the way aggregate income per capita is generated: the stock of physical capital, the skillset of the labour force, the sectoral composition of GDP, the use of fiscal instruments, trade and global economic integration, the level of technology and environmental indicators. Furthermore, the analysis considers the impact of governance and institutional frameworks, and tries to account for the possibility of capture of power by vested-interest groups and political elites, which can potentially limit the implementation of policies to reduce income inequality.[20]

The way aggregate income per capita is generated in a country is a traditional determinant of income inequality. According to the Kuznets hypothesis, income inequality rises in the early stages of industrialization as people leave the land, become more productive and earn more in factories. Once industrialization is complete, better-educated citizens demand redistribution and inequality falls, illustrated by the famous inverted U-shaped curve.[21] However, attributing rising income inequality to only economic growth can be misleading because of factors that drive both economic growth and income distribution. For example, while globalization may promote overall economic growth, it may also be a cause of rising inequality in countries. The past 30 years has shown that the Kuznets curve no longer necessarily holds sway – an upper-case *N*-shaped graph, often referred to as the "elephant curve", has become more common. Understanding this change requires taking into account globalization-related measures such as trade, investment and technology.

The accumulation of physical capital or investment in new technology is associated with economic growth but may also contribute to rising income inequality. The reason, as argued by Piketty, is that capital accumulation is usually associated with a faster expansion of capital income compared with labour income, and the former is more unequally distributed across the population than the latter.[22] Furthermore, technological progress can lead to labour-saving production techniques, which can feed into rising income inequality. Technologies such as the internet and mobile phones can provide new opportunities for income-generating activities to a broad segment of the population. These issues are further discussed in chapter 4. However, accessing these opportunities requires access to these technologies as well as a certain level of education, skills and training to take advantage of them, which, as discussed in chapter 2, cannot be taken for granted. In all, it is important that both capital accumulation and technological change be accounted for in the analysis.

In addition, given the role of human capital in facilitating access to opportunities arising from the dissemination of new technologies, an index of human capital needs to be considered.

As mentioned above, fiscal policy instruments, including direct taxes and transfers, play a very important role as a tool for redistributing income. In addition, tax revenue, from both direct and indirect taxes, provides a primary source of financing of public expenditure on various social services including education, health care and vocational training support. These investments enable disadvantaged and marginalized groups in a society to improve their skills and access better-paying jobs. Therefore, it is also necessary to account for fiscal policy in general and tax policy in particular in the analysis of the drivers of income inequality.

Environmental degradation, including pollution and the depletion of the natural resource base, tend to have a disproportionately higher impact on the poor and disadvantaged, thus exacerbating income inequality. For example, medical costs and lost days of work caused by health problems associated with particulate emissions can affect disproportionately workers who work outside or people who lack modern cooking facilities at home, who tend to be poor. In addition, the depletion of a country's natural capital can deprive farmers and fisherfolk from their sources of income, also leading to a worsening of income inequality.[23] Environmental indicators, which are further discussed in chapter 3, are therefore included in the analysis.

Among the various other factors determining income inequality, the rule of law and good governance cannot be overemphasized. Strong, efficient and transparent institutions are essential for maintaining environmental standards, tax collection and ensuring that basic public services are shared and delivered. These factors are thus also considered in the analysis.

The empirical analysis is based on cross-country, time-series regressions, and the dependent variable is the Gini coefficient. Further details on the variables, data sources, and results are included in Annex 1.3. The regression results seem to support the Kuznets hypothesis, with inequality initially growing and subsequently decreasing as per capita income grows - exhibiting the classic inverted U-shaped relationship.

The findings provide strong support for policies that enhance human capital development as a means to reduce income inequality. The analysis also finds that capital accumulation, technological growth and trade openness all have significantly positive coefficients in the regressions, indicating that these factors have contributed to an increase in income inequality, on average, in Asia and the Pacific.

Changes in the structure of production as the economies of the region move from primary to secondary and/or tertiary sectors – captured by the ratio of manufacturing value added to agriculture value added – contribute to decreasing income inequality. This can be explained by the so-called Lewis model of development economics, where labour shifts from agriculture to manufacturing.[24] Initially, this process leads to rising income inequality because the supply of agricultural labour is very large and real wages are close to subsistence. However, as more and more opportunities arise in the manufacturing or service sectors, labour becomes scarce and wages start to rise, with a related fall in inequality.

The analysis suggests fiscal policies may not initially be effective but that they may help reduce income inequality above a certain threshold. This could reflect the substantial investment required to expand access to high quality education and health services.

The empirical evidence further shows that environmental damage, measured as airborne pollution, has a U-shaped relationship with income inequality. At low levels of pollution, its increases are associated with decreases in inequality, but at higher levels, they are associated with increases in the level of inequality. Reducing pollution benefits both health and inequality. In addition, the analysis shows that there is a negative association between the stock of natural capital and income inequality, supporting the hypothesis that the depletion of a country's natural capital has adverse consequences for low-income economic groups such as farming and fishing communities.

Finally, two measures of governance considered in the analysis, i.e. political stability and regulatory quality, have a statistically significant inverted-U relation with the Gini coefficient, meaning that inequality increases at low levels of these measures but decreases at high levels. This result is similar to the finding that tax revenues contribute to reducing inequality only at high levels of tax revenues. They suggest that only at high levels of regulatory quality and political stability further improvements in these governance indicators can contribute to decreasing inequality.

1.5 COSTS OF INCOME INEQUALITY

High and persistent income and wealth inequalities stifle economic growth and progress towards further reduction in poverty. The economic cost of ignoring income inequality is large and significant. A burgeoning number of studies suggests that countries with high income inequality may experience both lower economic growth and a reduced effectiveness of economic growth in lifting people out of poverty.[25] This section reviews the literature on the impact of income inequality on GDP

per capita and poverty reduction and presents new empirical evidence for Asia and the Pacific based on cross-country, time-series regression analyses.

1.5.1 Inequality and growth

Barro (2000) suggests three reasons why inequality can negatively impact economic growth. First, underdeveloped capital markets constrain investment by entrepreneurs with limited income and wealth. In this context, the more unequally distributed income and wealth are, the less opportunities people will have to invest in entrepreneurial activities, limiting economic growth.[26] Second, high inequality may lead to political pressures for the implementation of populist redistributive policies, which may lead to macroeconomic instability and adversely affect investment.[27] Third, high-levels of income inequality may result in an increase in criminal activities and political unrest, reducing incentives for investment.[28] More recently, Rajan (2010) and Acemoglu (2011) suggested that income inequality may also adversely affect economic growth by increasing the likelihood of financial crises in the event of loose monetary and regulatory policies leading to over-indebtedness of low-income, credit-constrained households.

High and persistent income inequality may lead to equally high and persistent inequality of opportunities, as discussed in chapter 2. For instance, De La Croix and Doepke (2004) find that income inequality reduces investment in human capital and increases the fertility rate among the poor. Evidence from various country studies in the Asia-Pacific region indicates that rising income inequality impairs both the quantity and the quality of education of individuals living in poor households and adversely affects intergenerational mobility.[29]The strong relationship between inequality of outcomes and inequality of opportunities can be explained by the power held by economic elites in highly unequal societies, which tend to oppose expanding the provision of public goods.[30] This may further intensify income inequality because the poor tend to benefit more than the rich from public goods provision.[31]

With regards to recent econometric evidence, Dabla-Norris and others (2015) investigate the effect of an increase in the shares of different income quintiles on economic growth. They find that while a 1 percentage point increase in the income share of the top 20 per cent is associated with a lower GDP growth by 0.08 percentage points in the following five years, a 1 percentage point increase in the income share of the bottom 20 percent leads to a 0.38 percentage point rise in economic growth. Cingano (2014) comes to a similar conclusion, arguing that income inequality has a negative and statistically significant effect on subsequent growth prospects.[32]

The adverse impact of inequality on economic growth is confirmed in the regression results reported in Annex 1.4. The estimates of the Gini coefficient in the regressions are significantly negative. It suggests that a 1 percentage point increase in the Gini coefficient reduces the GDP per capita, on average, by US$154 for the countries in Asia and the Pacific region. This statistical relationship is robust to different specifications of the regression model.

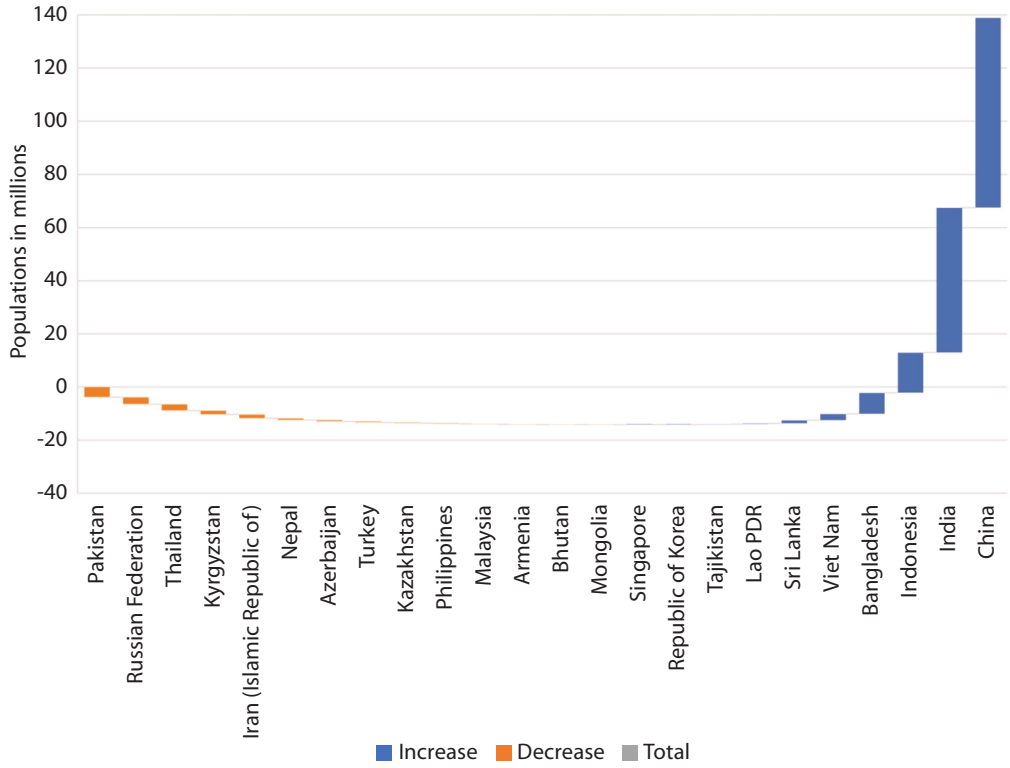
While the adverse impact of inequality on economic growth is an important reason on itself to promote policies to reduce inequality, lower economic growth also harms efforts to reduce poverty. Countries are most successful in reducing income poverty when they generate earnings opportunities through the expansion of employment and businesses for those at the bottom of the income distribution.[33] The inequality-poverty nexus is further discussed below.

1.5.2 Inequality and poverty

The growth-poverty-inequality nexus has been studied by Bourguignon (2004) and others. An important result is that if economic growth is held constant, poverty reduction is negatively affected by increases in inequality.[34] Understanding this relationship is important for assessing the prospects and pace of poverty reduction in the region.

Following a methodology proposed by Zhang and Wan (2006) described in Annex 1.5, we estimate the impact of changes in inequality on extreme poverty in 24 selected countries between 1990 and 2014. We find that in ten countries of the region for which inequality increased over the period studied – Bangladesh, China, India, Indonesia, Lao People's Democratic Republic, Republic of Korea, Singapore, Sri Lanka, Tajikistan and Viet Nam – an additional 153 million, representing about 5 per cent of their combined population, could have been lifted out of poverty if inequality had not increased. On the other hand, in 14 countries – Armenia, Azerbaijan, Bhutan, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Russian Federation, Thailand, and Turkey – in which income inequality declined during the period, the improvement in income distribution helped 14 million people come out of extreme poverty. In sum, the region could have at least lifted around 139 million people out of poverty if inequality had not changed during the past decade (Figure 1.13).

Figure 1.13 Poverty impact of income inequality, selected Asia-Pacific countries, 1990-2014



Source: ESCAP.

1.6 CONCLUSIONS AND RECOMMENDATIONS

This chapter had set out to better understand the trends of income and wealth inequality in the Asia-Pacific region. It has also examined the sources of regional income inequality at the disaggregated level. Furthermore, the discussion explored ways to illustrate the various drivers of the income inequality, along with implications for growth and extreme poverty during the past two decades.

Income and wealth inequality are growing and remain at an all-time high in the Asia-Pacific region

- Measured by the population-weighted market income Gini coefficient, the region's average inequality increased from 32.7 in the early 1990s to 38.1 in the early 2010s.
- In China, India and the Russian Federation, three major developing countries that constitute 62 per cent of the regional population, the top 10 per cent of the population accounts for 47 per cent of their national income, on average.

Economic growth has not been inclusive, leaving millions of people in a disadvantaged and precarious situation

- The ratio of the average consumption of the poorest 40 per cent of the population over the average consumption for the whole population dropped from 50.8 per cent to 48.5 per cent between 1995 and 2013.
- In many of these countries, the increase in income inequality has been coupled with a higher concentration of wealth among the already rich, or the top 10 per cent of the population.

Income and wealth inequality vary across subregions and countries

- Subregions presented a more mixed picture. Within South and South-West Asia, inequality increased in Bangladesh, India, Nepal and Sri Lanka and decreased in the Islamic Republic of Iran, Pakistan and Turkey. Within South-East Asia, inequality increased in Indonesia, Lao People's Democratic Republic and Viet Nam and decreased in Cambodia, Malaysia and Thailand.
- In China, India and Indonesia the Gini coefficient increased by about 10, 8 and 4 percentage points respectively over the past decade.

The services sector is a major contributor to income inequality across the countries in the region

- Evidence suggests that the service sector has accounted for more than half of total income inequality.

- The industrial sector's contribution to income inequality has declined, while the contribution of the agricultural sector has been negligible in the past two decades.

Government policies to promote productive investment, particularly in the least developed countries, help to reduce regional income inequality

- Domestic private consumption accounted for nearly half of income inequality on average, but its proportion is falling. In 2015, the second largest contributor (around 37 per cent) was investment.

Globalization played a role in increasing income inequality in the region

- While globalization may promote economic growth, it may also cause income inequality to rise at the country level.
- Policymakers need to account for the economy-wide implications of unabated globalization-related policies on trade, investment and technology.

Governments need to significantly scale-up investment in education and skills and in environmental sustainability

- Public-sector investment in human capital development, along with health and labour-market institutions are critical policy tools.

To finance the above investments, governments need to mobilize significantly larger fiscal resources and strengthen governance frameworks

- Initially, fiscal policies may not be effective in reducing income inequality, but after a threshold level, higher tax revenue may help in reducing income inequality. The same is also true in the case of governance issues such as political stability and regulatory quality.

Reducing income inequality can play a pivotal role in shaping *inclusive* economic growth

- A 1 percentage point increase in the Gini coefficient reduces GDP per capita, on average, by US$154 for countries in the Asia-Pacific region.
- This potential loss is huge given that several developing and least developed countries in the region already witnessed an increasing level of income inequality.

High levels of income and wealth inequality inhibit poverty reduction efforts

- The Asia-Pacific region could have lifted around 153 million more people out of poverty if income inequality had not increased in 10 countries during the past decade.

ENDNOTES

[1] The 2030 Agenda for Sustainable Development is available online from https://sustainabledevelopment.un.org/ post2015/ transformingourworld.

[2] United Nations System Chief Executives Board for Coordination (2017).

[3] See, e.g. United Nations System Chief Executives Board for Coordination (2017); IMF (2017); World Bank (2018); UNDP (2013); ADB (2012); ESCAP (2015a).

[4] Different researchers have used different criteria to define the middle class. ESCAP (2016, p. 40), for instance, defines the middle class as individuals with incomes of between US$10 and US$20 per day in international dollars of 2005 (US dollars of 2005 adjusted for differences in purchasing power parity across countries). The share of the Asia-Pacific population that is middle class remains small, but it is growing quickly. In China it increased from less than 1 per cent in 1993 to 20.6 per cent in 2012 (ESCAP, 2016, p. 41).

[5] Yoshino and Helble (2016).

[6] Boushey, DeLong and Steinbaum (2017).

[7] Basu and Das (2012).

[8] The founders of four of the five companies mentioned in this sentence are among the top-20 world's billionaires, with net worth ranging between US$39 billion and US$112 billion. See www.forbes.com/billionaires/ list/ (accessed 7 March 2018).

[9] See Isgut and Weller (2016) for an analysis of recent experiences in Latin America and Asia in developing labour market institutions for both TVET and unemployment protection.

[10] For clarity of exposition, the Gini coefficient is normalized to the 0-100 range in this report.

[11] The usual data source for income distribution measures, such as the Gini coefficient, is household surveys, which often do not capture high-income individuals thus underestimating inequality. Recent research by Thomas Piketty and his collaborators is attempting to overcome the limitations of household surveys through the World Wealth and Income Database by combining different data sources, such as national accounts, survey data, fiscal data, and wealth rankings, to obtain more accurate measures of inequality. See http://wid.world/.

[12] See Basu (2017).

[13] In 2015, the population of China, India, Indonesia and Bangladesh was 3.1 billion, compared with a population of 4.4 billion for the whole Asia-Pacific region.

[14] See, e.g. Ivaschenko (2002); Slay (2009).

[15] For further argumentation along these lines, see ESCAP and Oxfam (2017).

[16] If the distribution was totally equal, the Lorenz curve would coincide with the 45-degree line and the Gini coefficient would be 0. If the distribution was totally unequal, with only one individual receiving all the income or consumption and the rest receiving nothing, the Lorenz curve would coincide with the horizontal axis and join vertically the 45-degree line for the richest individual, in which case the Gini coefficient would be 1.

[17] This assumption is required due to the lack of distributional data for GNI in most countries. The lack of within-country distributional data implies that these Lorenz curves capture only income inequality between countries.

[18] Available from: http://www.forbes.com/billionaires/list/.

[19] World Inequality Lab (2018, p. 12).

[20] The importance of governance and institutional factors in explaining inequality was highlighted, among others, by Stiglitz (2012); DESA (2016a); and UNESCO (2016).

[21] See Kuznets (1955).

[22] See, e.g. Piketty (2014).

[23] See chapter 3 for further analysis on this topic.

[24] Lewis (1954).

[25] See ESCAP (2015a).

[26] See Galor and Zeira (1993) and Fishman and Simhon (2002)

[27] See Alesina and Rodrik (1994). Similarly, Berg and Ostry (2011) find that while increased income inequality may shorten the duration of economic growth spurts, poorly designed efforts to lower inequality could distort incentives and undermine economic growth.

[28] See Gupta (1990).

[29] See, e.g. the studies included in Kanbur, Rhee and Zhuang (2014).

[30] See for instance, ESCAP (2013).

[31] See, e.g. Bourguignon and Dessus (2009); World Bank (2018); ESCAP, ADB and UNDP (2013; 2017).

[32] Wan, Lu and Chen (2006).

[33] ESCAP (2015b; 2017b).

[34] See also Banerjee and Duflo (2003).


for Healthy & Beautiful Life

Chapter 2

Addressing Inequality of Opportunity in Asia and the Pacific

While the aggregate costs of inequality of outcome can be high, the impact of inequality is perhaps more corrosive at the individual or the household level. So far, research and headlines on inequality have emphasized the most glaring contrasts: the lavish lives of billionaires compared with the uncertainty, stagnant wages and exploitation that are often experienced by the poorest people in society. Global analysts have tended to overlook the impact of income and wealth inequality on accessing basic opportunities, including quality education and health care, meaningful work and decent living conditions.

Inequality in access to opportunities has gone particularly unnoticed in the fast-growing economies of the Asia-Pacific region, where many people have been able to improve their quality of life. There are more schools and health clinics than ever, water supplies and treatment works have come on stream and electricity grids and telecommunications systems have sprouted. The Millennium Development Goals (MDGs) played their part in broadening access to essential services, but many of these achievements were not been evenly distributed.

Inclusion is at the core of the 2030 Agenda for Sustainable Development, reflected in the pledge to leave no one behind and in the vision of a "just, equitable, tolerant, open and socially inclusive world in which the needs of the most vulnerable are met." This chapter goes beyond the debate of an ideal level of income or wealth and examines the extent to which people from different circumstances and backgrounds across the Asia-Pacific region have equal chances to fulfil their potential.

The chapter begins by exploring the levels of inequality of opportunity people in Asia and the Pacific face on aggregate levels and how each of the opportunities presented is linked to the Agenda for Sustainable Development. It measures inequality of opportunity using the dissimilarity index (D-index), which allows a comparison of inequality levels among countries as well as a further decomposition of the observed inequality into those circumstances that contribute mostly to it.

The analysis then delves deeper to determine those households and individuals that lack access to opportunities. Using an algorithm that produces country- and opportunity-specific classification trees for 21 countries in the Asia-Pacific region, it reveals the circumstances shared by those most disadvantaged and the most advantaged groups in each country. The chapter concludes by discussing trends and whether policies have been effective in influencing access to opportunity.

2.1 WHAT DOES INEQUALITY OF OPPORTUNITY MEAN IN THE CONTEXT OF THE 2030 AGENDA?

Inequality of opportunity is concerned with access to key dimensions necessary for meeting aspirations regarding quality of life. It has *economic dimensions* (e.g. unequal access to decent work, financial services, land ownership, etc.), *social dimensions* (e.g. unequal access to health care, education, nutrition, etc.) and *environmental dimensions* (e.g. unequal access to water, sanitation, clean fuels, electricity, access to land and natural resources, etc.).

To gain an understanding of inequality of opportunity across the Asia-Pacific region, 14 categories or indicators have been selected that encompass basic, yet critical opportunities for individuals and households. The eight indicators of opportunities for individuals are: secondary education, higher education, modern contraceptives, professional help during childbirth, decent work and (absence of) stunting, wasting and overweight among children. The five indicators of opportunities for households are: access to basic drinking water, basic sanitation, electricity and clean fuels, and ownership of a bank account. To summarize the opportunities for households, an additional indicator combines these five categories.

Inequality of opportunity is here defined as the gaps in access to each of these opportunities that depend on circumstances beyond a person's control. The concept of inequality of opportunity has previously been used to distinguish between personal responsibility and circumstances for *economic* outcomes in life. The philosophical foundations of this approach to income distribution lie in the work of John Rawls and Amartya Sen. Rawls was among the first modern political philosophers who articulated the importance of balancing personal liberties with distributive justice and fair options for all, arguing that public policy choices should focus on raising the welfare of the poorest people.[1] Rawls argued that a set of primary goods should be made available for everyone, so that she or he would be able to realize their life plan. Sen, later, argued that inequality could be re-examined from the perspective of human capability, looking at the means rather than the ends of development, since without equal opportunity, equitable outcomes could not be secured.

Focusing on inequality of opportunity also serves as a reminder that inequality is not a static phenomenon, but rather is transmitted to children, creating intergenerational inequality of opportunity traps that reproduce and magnify income inequality.[2] Inequality of opportunity therefore combines issues of both equity and efficiency. The equity argument calls for levelling the playing field, in accordance with international agreements and with established human rights. The efficiency argument motivates policymaking that equalizes opportunities at the top level, meaning that everyone should have access, rather than reducing access for those who already have it.[3]

Target 10.3 of SDG 10 calls for ensuring equal opportunity and reducing inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action. Officially reported numbers of incidents of discrimination may underestimate the real experience of those most marginalized. Reported data may also not reveal the daily experience of women, men and children who lack access to basic opportunities because of entrenched poverty and institutional failure.

Target 10.3, however, is not the only one in the 2030 Agenda that relates to inequality of opportunity. The indictors of opportunities presented in this chapter refer to specific SDGs and most of them also directly respond to established indicators. Of them, five are examined in detail: secondary educational attainment, stunting among children (used as a proxy for adequate nutrition), professional help during childbirth, full-time employment (used as a proxy for decent work in developing country contexts) and a group of basic household services (Table 2.1). To identify the patterns of advantage or disadvantage, we have referred to data available in *Demographic and Health Surveys* (DHS) and *Multiple Indicator Cluster Surveys* (MICS) and the latest *World Gallup Survey*.

2.2 WHY INEQUALITY IN ACCESS TO OPPORTUNITIES MATTERS

Equity in opportunity can be described as a level playing field on which all households enjoy the same access to basic services, such as clean water, sanitation, electricity and clean fuels; where all children have adequate nutritious food and complete education; where everyone has access to health care services when needed, at affordable prices; and where those who want to work can find a decent job. These rights are enshrined in various Conventions of the United Nations, including the Convention on the Rights of the Child, the Convention on the Rights of Persons with Disabilities and, certainly, the Universal Declaration of Human Rights. They are also enshrined in Constitutions and other legislation across the region and are what drove leaders of 193 countries to adopt the SDGs in 2015.

Although the Asia-Pacific region has experienced significant advances in many development indicators, the playing field is not levelled. Enrolment rates in primary

Table 2.1 Links between opportunities, circumstances and the SDGs

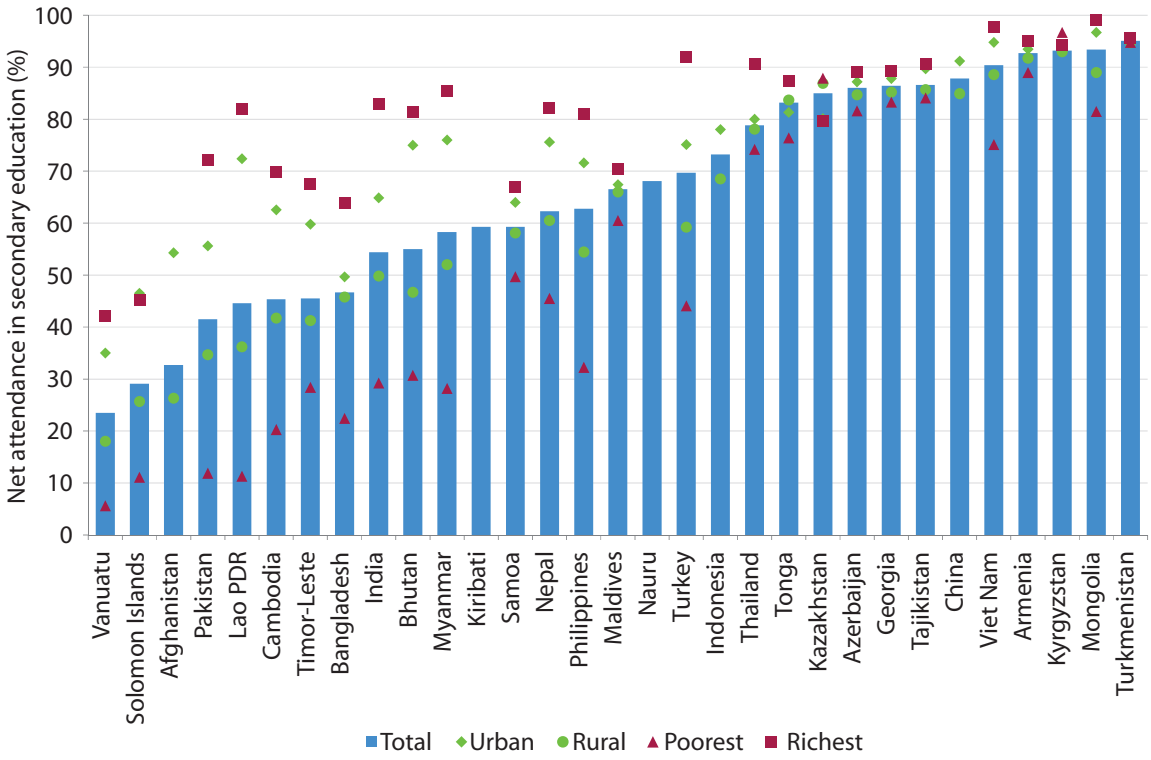
Opportunity				Circumstances used to determine groups of the furthest behind/ahead						Closest SDG indicator reference
	Opportunity	Survey used	Reference group in survey	Wealth: Bottom 40-Top 60*	Residence: Urban-Rural	Education: No/Primary-Secondery-Higher	Sex: Male-Female	Children: Yes-No, Number	Age: 15-24, 25-49, 50-64	Related SDG Indicator
1	Secondary education	DHS/ MICS	Household member aged 20-35	Wealth	Residence	n/a	Woman/ Man	n/a	n/a	4.1.1 Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex
2	Higher education	DHS/ MICS	Household member aged 25-35	Wealth	Residence	n/a	Woman/ Man	n/a	n/a	4.3.1 Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex
3	Stunting	DHS/ MICS	Child aged 0-5 who has been measured	Wealth	Residence	Mother's Education	Boy/Girl	Number of children <5	n/a	2.2.1 Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age
4	Overweight	DHS/ MICS	Child aged 0-5 who has been measured	Wealth	Residence	Mother's Education	Boy/Girl	Number of children <5	n/a	2.2.2 Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)
5	Wasting	DHS/ MICS	Child aged 0-5 who has been measured	Wealth	Residence	Mother's Education	Boy/Girl	Number of children <5	n/a	2.2.2 Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)
6	Use of modern contraceptive	DHS/ MICS	Women between 15-49 currently in union	Wealth	Residence	Respondee's education	n/a	Number of children <5	15-24, 25-49	3.7.1 Proportion of women aged 15-49 years who have their need for family planning satisfied with modern methods
7	Professional help in birth	DHS/ MICS	Women between 15-49 ever given birth in the last 5 years	Wealth	Residence	Respondee's education		Number of children <5	15-24, 25-49	3.1.2 Proportion of births attended by skilled health personnel
8	Full-time employment	Gallup World Poll	All men and women 15-64 who are in the workforce	Marital status (see Note 3)	Residence	Respondee's education	Woman/ Man	Have children	15-24, 25-49, 50-64	8.3.1 Proportion of informal employment in non-agriculture employment, by sex (proxy)
9	Basic drinking water	DHS/ MICS	All households	Wealth	Residence	Highest Education in household (hh)	n/a	n/a	n/a	6.1.1 Proportion of population using safely managed* drinking water services
10	Basic sanitation services	DHS/ MICS	All households	Wealth	Residence	Highest Education in hh	n/a	n/a	n/a	6.2.1 Proportion of population using safely managed* sanitation services, including a hand-washing facility with soap and water
11	Electricity	DHS/ MICS	All households	Wealth	Residence	Highest Education in hh	n/a	n/a	n/a	7.1.1 Proportion of population with access to electricity
12	Clean fuels	DHS/ MICS	All households	Wealth	Residence	Highest Education in hh	n/a	n/a	n/a	7.1.2 Proportion of population with primary reliance on clean fuels and technology
13	Bank account	DHS/ MICS	All households	Wealth	Residence	Highest Education in hh	n/a	n/a	n/a	8.10.2 Proportion of adults (15 years and older) with an account at a bank or other financial institution or with a mobile money-service provider
14	Household services (Opportunities 9-13 combined)	DHS/ MICS	All households	Wealth	Residence	Highest Education in hh	n/a	n/a	n/a	1.4.1 Proportion of population living in households with access to basic services

Note: For all opportunities, except No. 8 (full-time employment) the data used are from DHS and MICS, earliest and latest surveys available (36 surveys in total), while for opportunity No. 8 the data used are from the *Gallup World Poll,* latest year.
Note 2: In orange are those opportunities that are the focus of this chapter.
Note 3: For opportunity 8, which is based on a different survey, the person's place in the wealth distribution was not used for the analysis. Marital status (divorced, married, separated, single) was used as an additional circumstance (not as a replacement for wealth).

education, for example, now average around 95 per cent. But this achievement has been offset by low attendance and high dropout rates in secondary education in the region's poorer countries. Net attendance in secondary education remains below 35 per cent, for example, in Afghanistan, the Solomon Islands and Vanuatu (see Figure 2.1). Poorer households struggle to keep their children in school because of the costs or the potential loss of immediate income. In rural areas the returns of an additional year of schooling tend to be low, especially for girls.

Inequality in access to education has a significant impact on the economic, social and environmental dimensions of sustainable development. Fewer years spent in school with lower-quality education not surprisingly affect productivity and the potential for economic growth. Lower overall educational attainment in a household is also linked to inequality in accessing other key opportunities including adequate nutrition for children, clean water and basic sanitation, clean fuels and electricity.[4]

Figure 2.1 Secondary school attendance gaps in Asia-Pacific countries, latest year



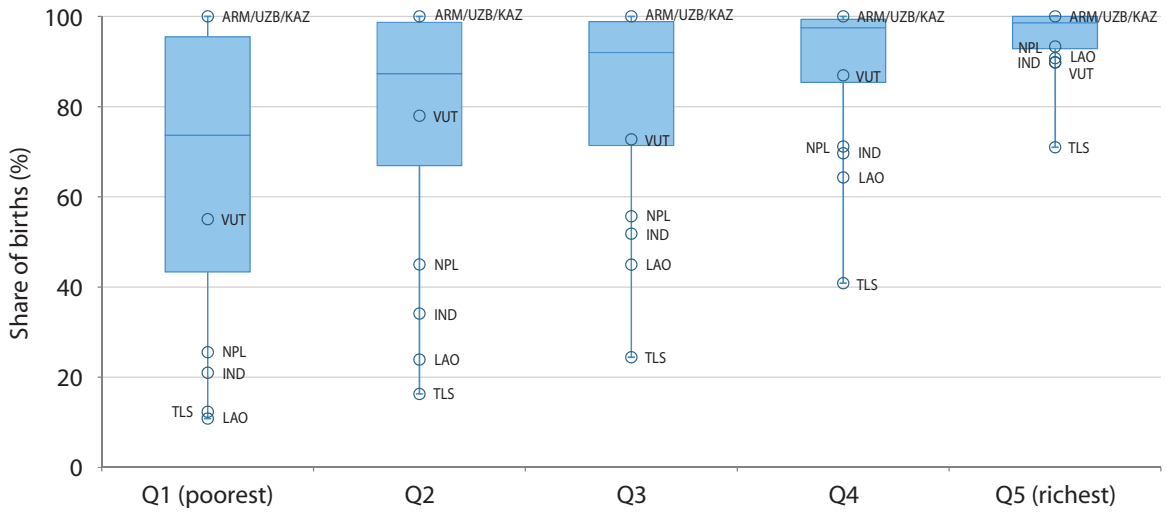
Source: ESCAP, 2017. *Sustainable Social Development in Asia and the Pacific: Towards a people-centred transformation.*
Note: Secondary net attendance ratio data were disaggregated by wealth quintiles and location of residence. For countries in the Asia and Pacific region, the most recent data were used.

Inequality in access to health care is also damaging from both an equity and an efficiency perspective. Yet, there is ample evidence of persisting health-care-related inequalities across the Asia-Pacific region. One example is the proportion of births attended by skilled personnel, a critical factor for reducing neonatal and maternal mortality. The divide in skilled birth attendance between rich and poor segments within many countries is enormous, although there is a much lower variation among wealthier groups between countries (Figure 2.2). The richest citizens in all countries, with the exception of Timor-Leste, enjoy a similarly high level of access to skilled personnel when giving birth. Conversely, the poorest citizens have the lowest level of access to skilled personnel when giving birth. Armenia, Kazakhstan and Uzbekistan are exceptions, where nearly all births are attended by skilled personnel.

Inequality in access to health care often has long-term health implications for women and children, with a negative impact on educational attainment and future labour force participation rates. Improvements in reproductive health services are associated with reduced fertility rates among poorer women, which, in turn, not only increase their chances of survival, but may also boost their earning potential.[5] Inequality in access to health care can also have a broader economic impact. As health-care costs and out-of-pocket health-related expenditures are particularly high in the Asia-Pacific region, families tend to save to guard against the risk of unexpected or unplanned needs.[6] This higher savings rate can result in lower domestic consumption and slower economic growth.

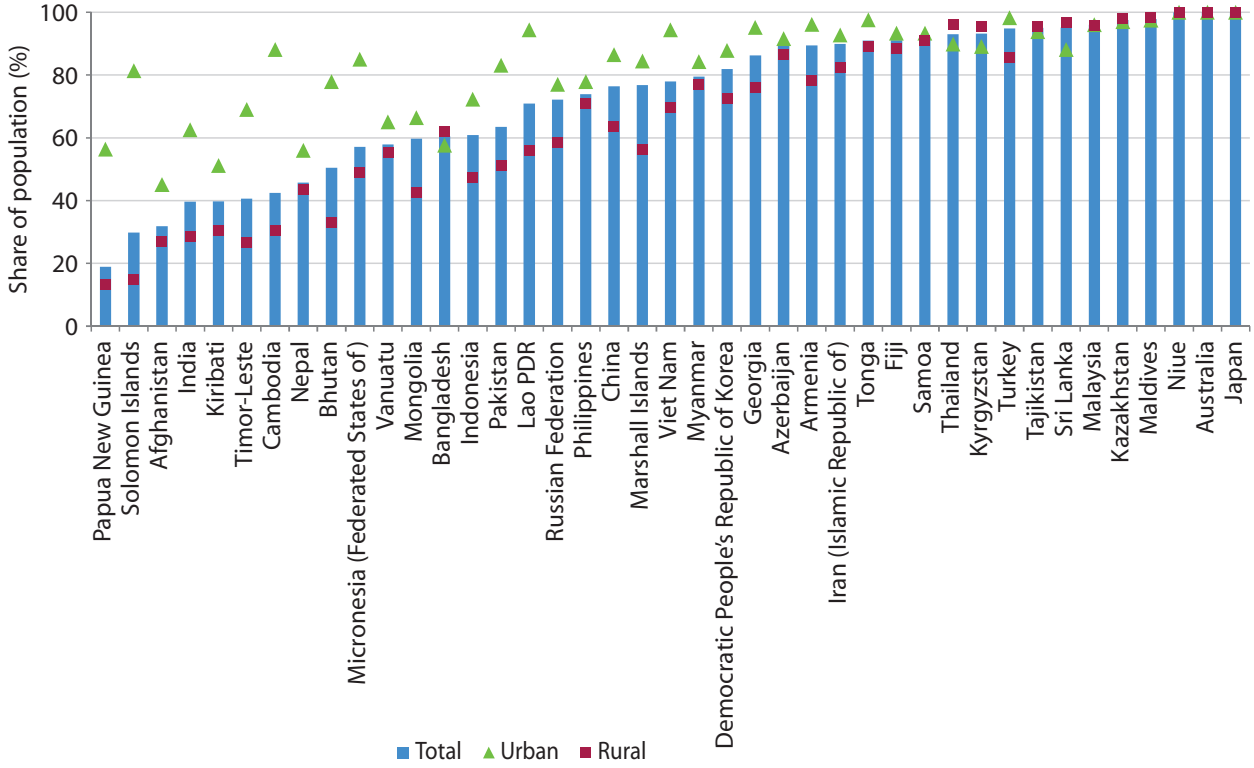
Being excluded from basic household services can exact a high cost. For example, contaminated water and poor sanitation cause diarrhoea that, if untreated, can lead to long-term cognitive and developmental impacts and even death through dehydration. The World Health Organization (WHO) has estimated that, in 2012, diarrhoea resulting from a lack of clean water and poor sanitation was responsible for more than 800,000 deaths globally and for 1.5 per cent of the global burden of disease.[7] A lack of sanitation costs the world an estimated US$260 billion every year in terms of lower productivity, sickness and loss of revenue from unrealized investment in sectors such as tourism.[8] While substantial progress has been made across the Asia-Pacific region in the past two decades, access to improved sanitation facilities remains low in rural areas of several countries. Fewer than 20 per cent of Papua New Guinea's citizens, for example, have access to improved sanitation facilities, and the figure is lower than 40 per cent in Afghanistan, India, Kiribati, Papua New Guinea, Solomon Islands and Timor-Leste (Figure 2.3).

Figure 2.2 Births attended by skilled personnel in Asia-Pacific countries, by wealth quintile



Source: ESCAP, 2017. *Sustainable Social Development in Asia and the Pacific: Towards a people-centred transformation.*
Note: Data refers to the most recent year between 2003 and 2014.

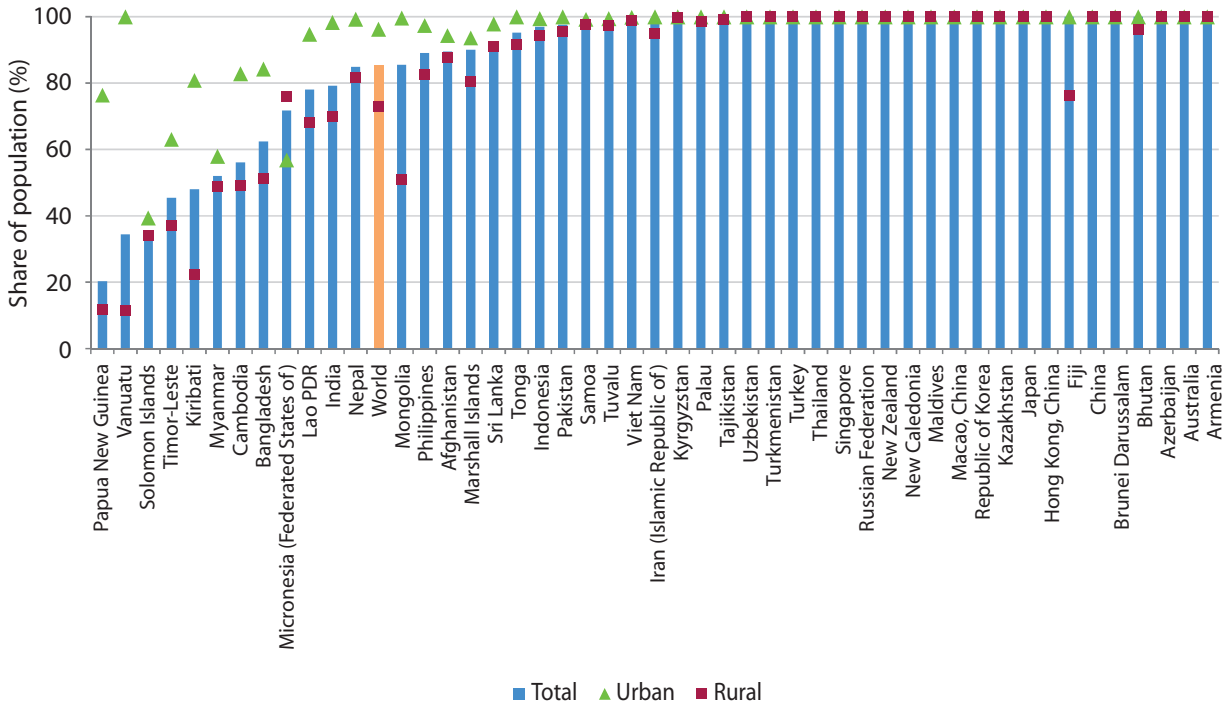
Figure 2.3 Availability of improved sanitation facilities, Asia-Pacific region



Source: ESCAP, 2017. *Sustainable Social Development in Asia and the Pacific: Towards a people-centred transformation.*
Note: Data refers to the most recent year between 2003 and 2014.

Inequality in access to clean energy, i.e. electricity and clean fuels, also weighs on the efficiency of an economy. Households without electricity, for example, devote less time to study, work or leisure, which can result in fewer opportunities for career development and earning potential. As a result, inequality in access to electricity and clean fuels can create and reinforce inequality gaps in skills and productivity. It also perpetuates disparities in health outcomes among and within countries. Burning dirty fuels affects air quality in homes and in the community. Globally, indoor air pollution causes more than 4 million deaths per year, more than half of which occur in China and India alone.[9] Despite economic progress and greater awareness, close to half of all people in Asia and the Pacific still rely on traditional and inefficient fuels for cooking and heating.[10] There are still

Figure 2.4 Access to electricity, Asia-Pacific region



Source: ESCAP based on World Bank, Sustainable Energy for All Database, SE4ALL Global Tracking Framework, 2017.

marked gaps in access to electricity, notably in rural areas of Papua New Guinea, Solomon Islands, Timor-Leste and Vanuatu (Figure 2.4).

Inequalities in access to services such as an electricity supply, clean cooking fuels, drinking water and sanitation disproportionately affect women, who bear the brunt of household work and caretaker tasks.[11] They also suffer more from the health consequences associated with indoor air pollution, while foregoing the opportunity to earn their own income.[12]

2.3 WHY AVERAGE PROGRESS IS NOT ENOUGH

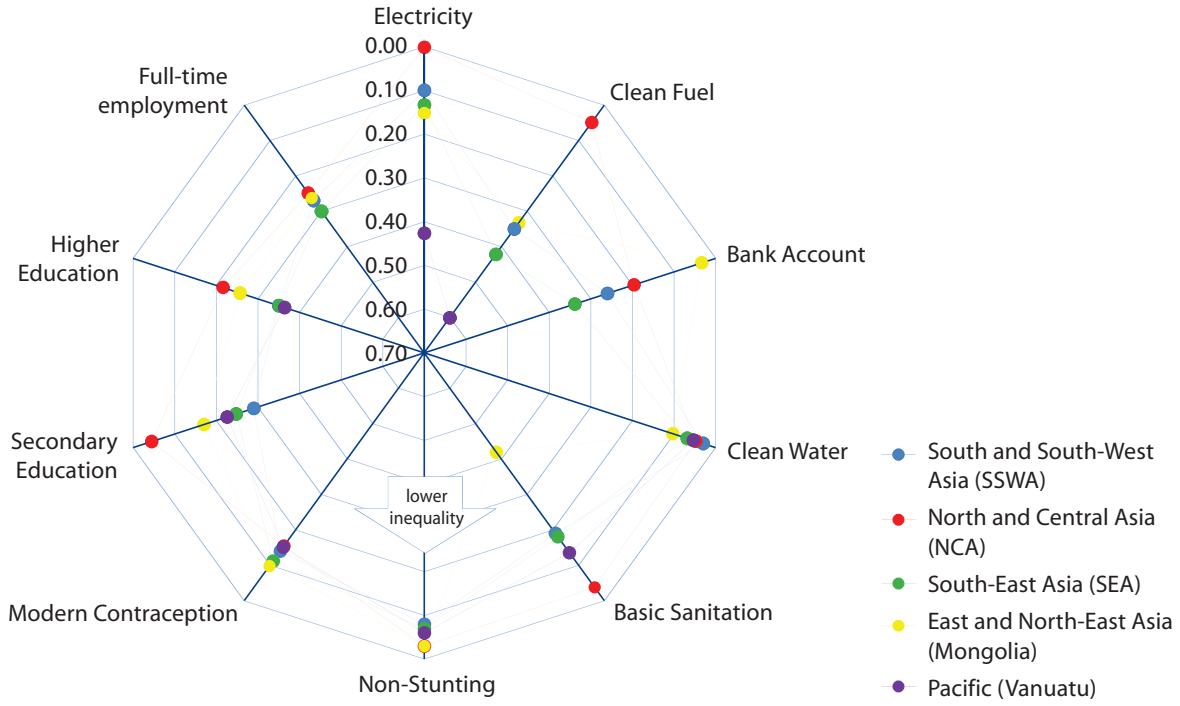
The evidence is clear that a rising tide has so far failed to lift all boats. The remainder of this chapter will analyse data from three types of household surveys: *Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS)* and the latest *World Gallup Survey,* to better understand the circumstances of those left behind in Asia-Pacific countries.

The D-index is a useful tool for measuring the distribution of access to a certain opportunity across societies. It is calculated for 14 individual or household-based indicators of opportunities critical for human wellbeing (Table 2.1): 1) attainment of secondary education for 20-35 year-olds; 2) attainment of higher education for 25-35 year-olds; 3) prevalence of stunting (0-5 year-olds); 4) prevalence of wasting (0-5 year-olds); 5) prevalence of overweight (0-5 year-olds); 6) women's access to modern contraception; 7) women's access to professional help during childbirth; 8) access to full-time employment;[13] and 9) household's access to safe drinking water; 10) household's access to basic sanitation; 11) household's access to electricity; 12) household's access to clean fuels; 13) household's ownership of a bank account; and 14) household's access to all of the basic services opportunities for households (9-13), or "multiple deprivation".

The D-index measures how all population groups fare in terms of access to a certain opportunity. For example, two countries with identical secondary education attainment rates may have a different D-index if the distribution of attainment in one country excludes certain groups. Like the Gini coefficient, the D-index takes values from 0 to 1, 0 meaning no inequality, and 1 maximum inequality (Annex 2.1). Unlike the Gini coefficient, the ideal level of a D-index is 0, whereby everyone has access to an opportunity.

The highest D-indices are found in South and South-West Asia, followed closely by South-East Asia (Figure 2.5). In both subregions, the opportunities that stand out as most unequally distributed are access to clean fuels, higher and secondary education and ownership of a bank account. South-East Asia also has the highest average D-index for access to full-time employment, although there is no significant variation across subregions. In East and North-East Asia, data for the majority of opportunities are only available for Mongolia, with safe sanitation the most unequally distributed opportunity, followed by access to clean

Figure 2.5 D-indices for 10 basic opportunities, by subregion



Source: ESCAP calculations using data from the latest Gallup, DHS and MICS surveys for countries in Asia-Pacific.
Note: The closest a country is the to centre of the graph, the higher the D-index and higher the inequality. The furthest away from the centre, the lower the D-index and lower the inequality.
Note 2: This figure only depicts selected average subregional D-Indices (covering 10 out of 14 opportunities) for clarity.

fuels. In the Pacific, data were only available for Vanuatu, where access to electricity and clean fuels were particularly unequally distributed.

Zooming further into each individual country, the subregional messages are repeated. The most unequal opportunities are higher educational attainment and access to clean fuels, followed by ownership of a bank account (Table 2.2). The countries where inequality in access is large in a wide range of opportunities are: Afghanistan, Bhutan, Lao People's Democratic Republic, Pakistan and Timor-Leste.

Lao People's Democratic Republic has the highest inequality of all countries in three opportunities: professional help in childbirth, secondary and higher educational attainment. Timor-Leste also tops the inequality list for three opportunities: access to clean fuels, ownership of a bank account and access to modern contraceptives. Afghanistan exhibits the highest inequality in terms of access to full-time employment and in access to clean water. Pakistan experiences the highest inequality in terms of children's nutrition (prevalence of stunting and wasting).

On the other hand, almost all North and Central-Asian countries have low inequality in access to opportunities, thanks to a tradition of a large state that ensures universal provision of basic services. Kazakhstan has the lowest inequality in three opportunities (basic sanitation, non-stunted children and secondary education), and below-average inequality in all other opportunities. Turkmenistan is in a similar category, with the lowest inequality in terms of electricity and clean fuels access, as well as professional help during childbirth.

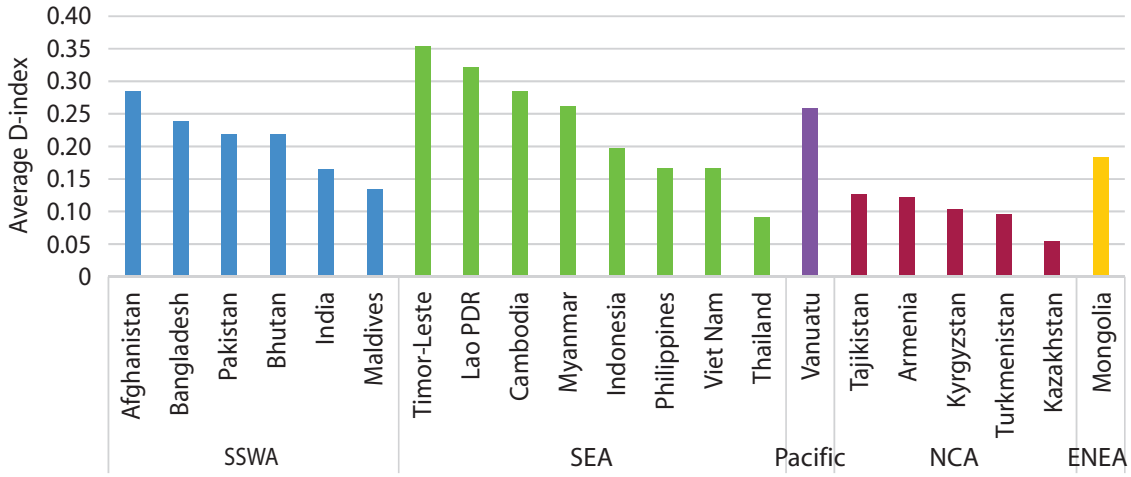
Averaging the D-indices for individuals and households by country confirms the patterns described earlier, but also highlights which countries have relatively higher inequality across all opportunities (Figure 2.6). In addition to Afghanistan, Lao People's Democratic Republic, Pakistan and Timor-Leste, which had the highest inequality in individual opportunities, Cambodia, Myanmar and Vanuatu also appear as particularly unequal across the board of opportunities. At the other end of the scale, Maldives and Thailand stand out, together with several North and Central Asian countries as having achieved a relatively equal distribution of opportunities across various population groups for most opportunities. In the middle of the distribution are some of the region's most rapidly developing countries, including India, Indonesia, Philippines and Viet Nam. India, in particular, made tremendous progress over the past few years in achieving almost universal access to financial services for all households (see Box 4.2 in chapter 4), as well as in increasing women's access to professional help during childbirth (see Figure 2.17).

Table 2.2 Calculated D-indices for all opportunities, Asia-Pacific countries

Calculated D-indices														
	Household-based						Individual-based							
	Energy		Financial inclusion	WASH		Multiple	Child Nutrition (0-5 years)			Women's Health (15-49 years)		Education		Employment
Country	Electricity	Clean fuels	Bank account	Basic drinking water	Basic sanitation	Multiple deprivation	Not stunted	Not wasted	Not overweight	Professional help in childbirth	Modern con-traception	Secondary education	Higher education	Full-time employment
Afghanistan	0.09	0.42	0.41	0.14	0.29	0.65				0.15	0.18	0.28	0.35	0.55
Armenia	0.00	0.01	0.26	0.03	0.15	0.36	0.04	0.02	0.04	0.00	0.21	0.02	0.22	0.31
Bangladesh	0.19	0.55	0.34	0.01	0.20	0.58	0.09	0.02	0.01	0.22	0.11	0.26	0.33	0.19
Bhutan	0.19	0.28	0.35	0.01	0.13	0.43	0.05	0.01	0.02	0.17	0.06	0.31	0.37	0.31
Cambodia	0.27	0.46	0.44	0.11	0.30	0.68	0.06	0.01	0.01	0.04	0.12	0.35	0.45	0.33
India	0.07	0.36	0.04	0.01	0.28	0.41	0.08	0.01	0.00	0.06	0.15	0.23	0.32	0.12
Indonesia	0.02	0.28	0.32	0.09	0.19					0.22	0.10	0.20	0.30	0.25
Kazakhstan	0.00	0.01	0.07	0.02	0.00	0.09	0.02	0.01	0.02	0.00	0.08	0.02	0.18	0.15
Kyrgyzstan	0.00	0.09	0.27	0.04	0.01	0.30	0.04	0.01	0.02	0.00	0.13	0.03	0.14	0.32
Lao PDR	0.17	0.63	0.37	0.08	0.23	0.66	0.12	0.01	0.01	0.34	0.12	0.39	0.50	0.37
Maldives	0.00	0.04	0.08	0.01	0.02	0.14	0.04	0.02	0.02	0.11	0.18	0.37	0.41	
Mongolia	0.15	0.33	0.03	0.10	0.42	0.44	0.03	0.00	0.02	0.01	0.10	0.17	0.26	0.26
Myanmar				0.07	0.19		0.07	0.01	0.01			0.33	0.41	0.30
Pakistan	0.04	0.45	0.35	0.03	0.22	0.53	0.13	0.03	0.01	0.16	0.18	0.25	0.34	0.17
Philippines	0.08	0.39		0.03	0.11			0.00	0.00	0.10	0.10	0.13	0.24	0.30
Tajikistan	0.01	0.14	0.16	0.07	0.01	0.41	0.05	0.02	0.02	0.04	0.20	0.10	0.25	0.30
Thailand	0.00	0.18	0.05	0.01	0.01	0.23	0.03	0.01	0.02	0.00	0.05	0.14	0.21	0.27
Timor-Leste	0.38	0.71	0.52	0.12	0.28	0.75				0.29	0.22	0.24	0.42	
Turkmenistan	0.00	0.00	0.22	0.08	0.01	0.25	0.02	0.01	0.01	0.00	0.15	0.05	0.29	0.16
Vanuatu	0.43	0.60		0.05	0.14		0.06	0.02	0.02	0.11	0.15	0.23	0.36	
Viet Nam	0.00	0.30	0.33	0.04	0.13	0.45	0.09	0.02	0.01	0.05	0.07	0.21	0.28	0.27

Source: ESCAP calculations using data from the latest DHS and MICS surveys for countries in Asia-Pacific. Additional countries from the *Gallup World Poll* are not included as D-index was available for one opportunity only, "Full-time employment."
Note: The green light is given to the values that are in the lowest third (from zero to 33th percentile), yellow to the middle third (33-67th) and red for the highest third. The split into percentiles is done based on all opportunities together, hence most of the Asia-Pacific countries listed here belong to the lowest third for child nutrition and to the highest third for education and employment. Additionally, the best and the worst performer in each opportunity are highlighted with green/red shading.

Figure 2.6 Average D-indices in Asia-Pacific countries, grouped by subregion



Source: ESCAP calculations using data from the latest DHS and MICS surveys for countries in Asia-Pacific.

2.4 WHAT DRIVES INEQUALITY OF OPPORTUNITY…

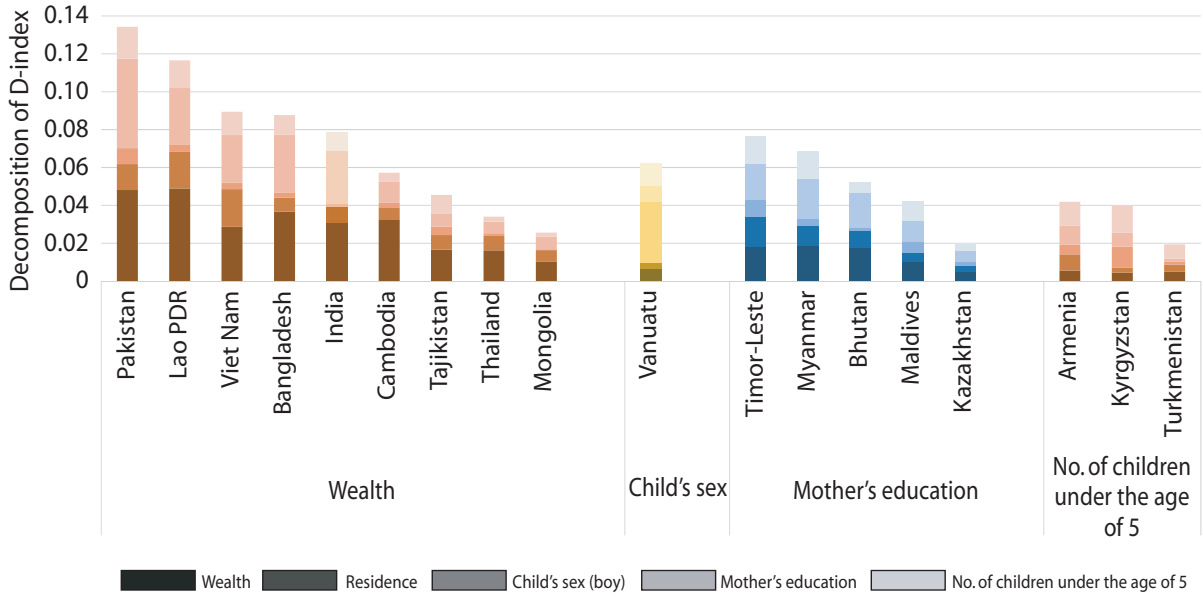
The contribution of each of the circumstances to inequality measured in terms of the D-index can be estimated using a methodology called the Shapley decomposition (Annex 2.2). The decomposition results show that different circumstances weigh differently in shaping inequality for each opportunity and country, although common threads can be found. This section first reviews the drivers of inequality in three key opportunities: secondary educational attainment, access to adequate nutrition among children and access to decent work. It then takes a bird's-eye view to spot the most important drivers of inequality across all countries and opportunities.[14] Identifying these common drivers reveals not only that inequality of opportunity is tightly linked with inequality of outcome (wealth and income), but also that it is easily transmitted across generations.

2.4.1 …in stunting

Stunting in children is associated with poorer school performance and lower future earnings potential. The circumstances that underpin observed inequality in stunting levels among children vary.[15] In 9 out of 18

countries, the child's household wealth status is what determines most of the inequality (Figure 2.7). Among those countries, Lao People's Democratic Republic and Pakistan stand out as the countries with the highest inequality, as measured by the D-index. The second most important circumstance is a mother's education, which is driving most of the inequality in 5 out of the 18 countries. In three countries, Armenia, Kyrgyzstan and Turkmenistan, inequality is mostly associated with the size of the household, and less so by wealth, residence, or the child's sex.

Figure 2.7 Inequality in adequate nutrition among children (non-stunted) and its decomposition for selected countries, grouped by the most important circumstance in shaping inequality, latest year



Source: ESCAP, using data from the latest DHS and MICS surveys for Asia-Pacific countries.

These results are also confirmed through country-specific logistic regressions (Figure 2.8, Panel 1).[16] A mother's education is prominent in determining her child's nutrition status in most South Asian countries, including Bangladesh, Bhutan and Pakistan, indicating that women have a strong role in determining their children's nutrition status, despite marginalization and persistent inequalities in other aspects of social and economic life. A child whose mother has completed secondary education has between 20 per cent (Timor-Leste) and 110 per cent (Pakistan) higher chances of being non-stunted. Investing in the education of girls, particularly in South Asian countries, could therefore help disrupt the cycle of intergenerational disadvantage that is transmitted across generations through inadequate nutrition.

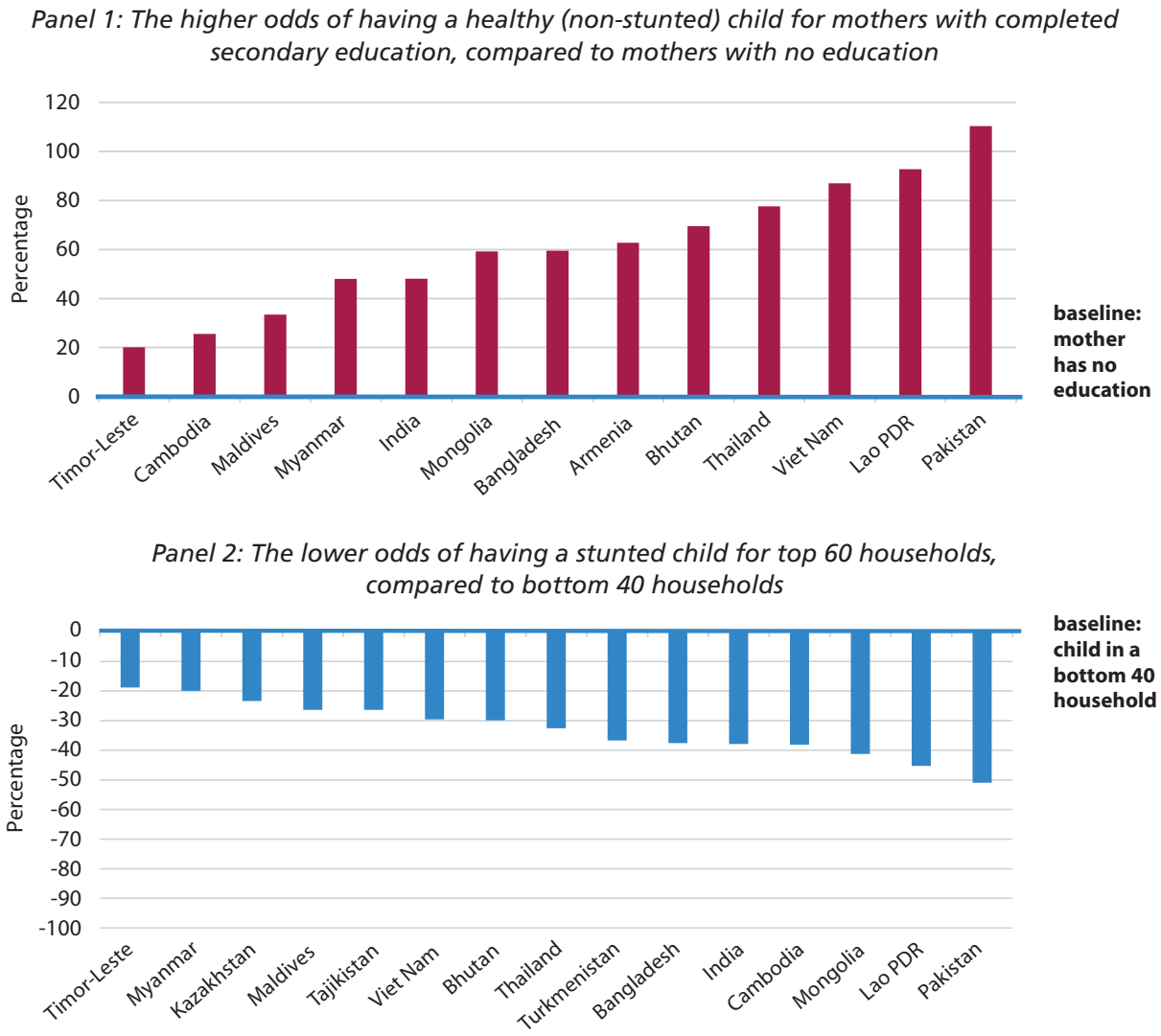
Family (household) wealth is also startlingly important in shaping a child's risk of being stunted. In Pakistan, children from households in the top 60 per cent of the wealth distribution are half as likely to be stunted (Figure 2.8, Panel 2). In most of the remaining countries, belonging to the top 60 reduces the risk of children being stunted by between 20 and 40 per cent, a significant impact.

2.4.2 …in education

Wealth is, in turn, a critical factor for accessing secondary education in 12 out of 21 countries (Figure 2.9). The contribution of wealth in shaping inequality is shown by the light-shaded colour in each bar. Wealth makes up for a higher share of the D-index in countries marked in green, which includes very different countries: from Bangladesh and Pakistan, with higher inequality, to Armenia and Kazakhstan, with much lower inequality levels. The importance of an individual's wealth level in driving inequality in education also emphasizes the vicious cycle between inequality of outcome and inequality of opportunity, whereby poorer young men and women join the labour force with less formal education and possibly fewer skills.

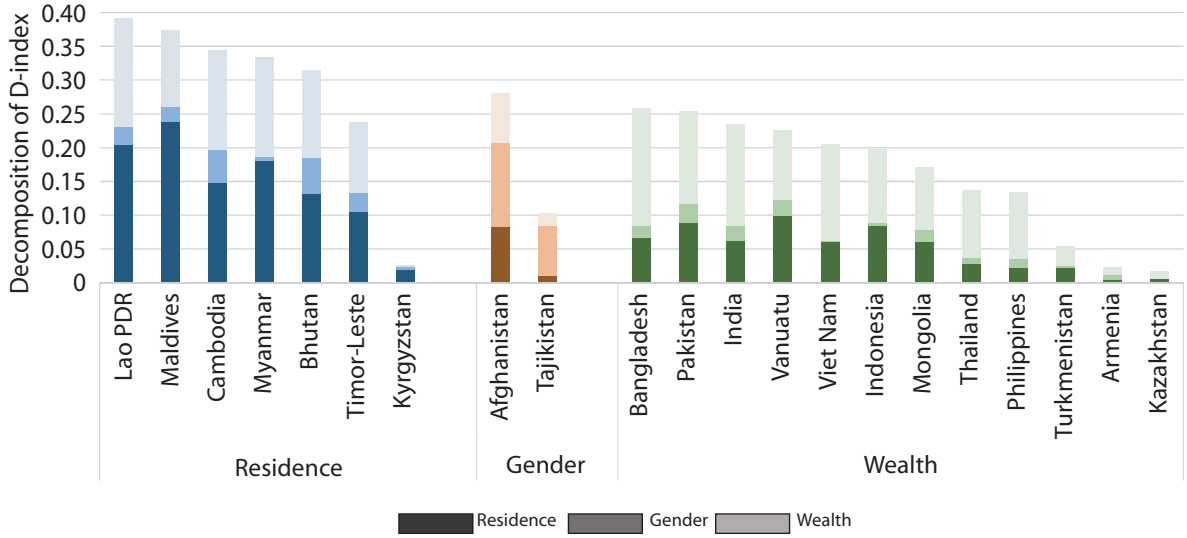
The second most prevalent circumstance is residence in a rural area, highlighting the urban-rural divide in the availability of quality schools and opportunities in 7 out of 21 countries. In two countries, Afghanistan and Tajikistan, gender matters most. A closer look at the groups of those being left behind (Annex 2.3: Who are the furthest behind?) confirms that in both countries women are mostly excluded from secondary education.

Figure 2.8 Impact of mother's education and household wealth in reducing stunting among children, selected Asia-Pacific countries



Source: DHS and MICS surveys, latest data.
Note: Results are based on country-specific logistic regressions. Only countries with statistically significant coefficients and odds-ratios are shown.

Figure 2.9 Inequality in secondary educational attainment among 20-35-year olds and its decomposition, countries grouped by most important circumstance, latest year



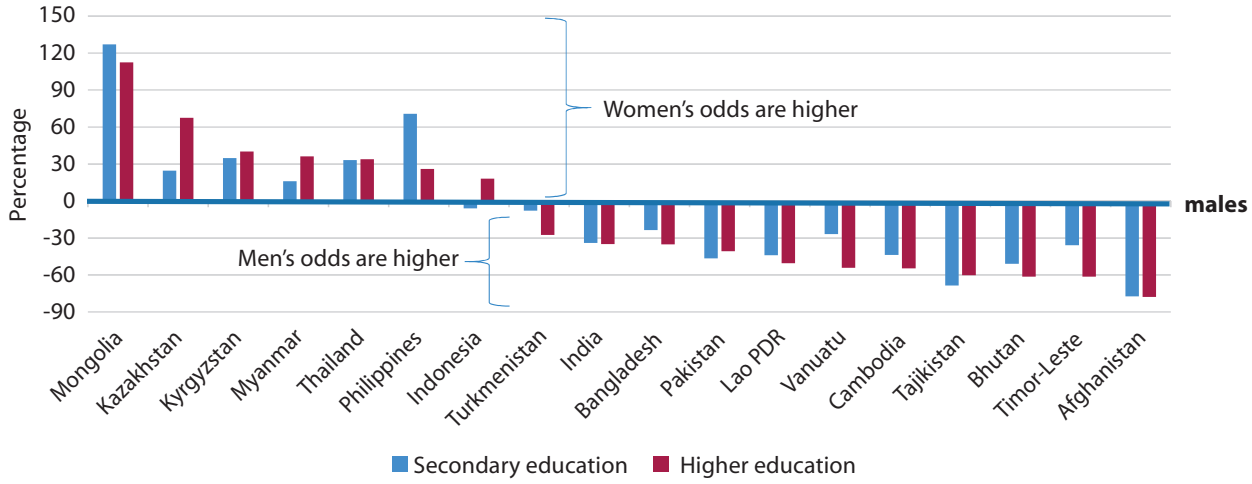
Source: ESCAP calculations, using data from DHS and MICS surveys for Asia-Pacific countries.

While these findings do not indicate causality (living in rural areas does not cause people to drop out of secondary education), the strong association indicates an underlying relationship worth exploring. Indeed, regression analysis shows that in Afghanistan and in Tajikistan women have up to a 60 per cent less chance than men to complete secondary education (Figure 2.10, Panel 2).[17] The chances of women completing secondary education are also lower in the less developed South-East Asian countries and in most of South Asia. Overall, however, the gender impact is mixed. In many North and Central Asian countries, as well as in some South-East Asian countries (Myanmar, Philippines and Thailand), women have higher chances of completing secondary and higher education than men, all else being equal. In Mongolia, their chances are twice as high as for men.

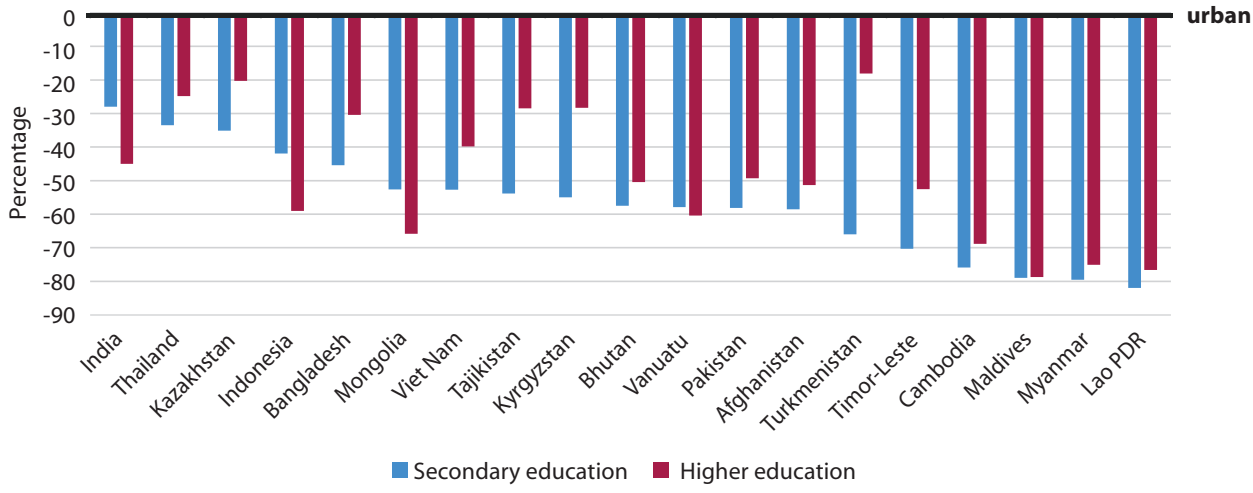
The impact of rural residence, on the other hand, always goes in one direction, limiting the chances of individuals completing secondary or higher education. In the majority of countries, residing in a rural area is associated with lower chances of obtaining a secondary education by 50 per cent or more. In certain South-East Asian countries, including Cambodia, Lao People's Democratic Republic, Myanmar and Timor-Leste, the chances of a rural resident completing a secondary or higher education are up to 80 per cent lower than those of an urban resident. The impact of residence is less pronounced in upper-middle income countries, such as Thailand and Kazakhstan, but also in Indonesia, a result that could be attributed to decentralization and prioritization of investments in schools in rural areas in that country.

Figure 2.10 Impact of gender and residence in completing secondary and higher education, selected Asia-Pacific countries

Panel 1: The odds of women completing secondary and higher education, compared with men



Panel 2: The lower odds of rural residents completing secondary and higher education, compared to urban residents



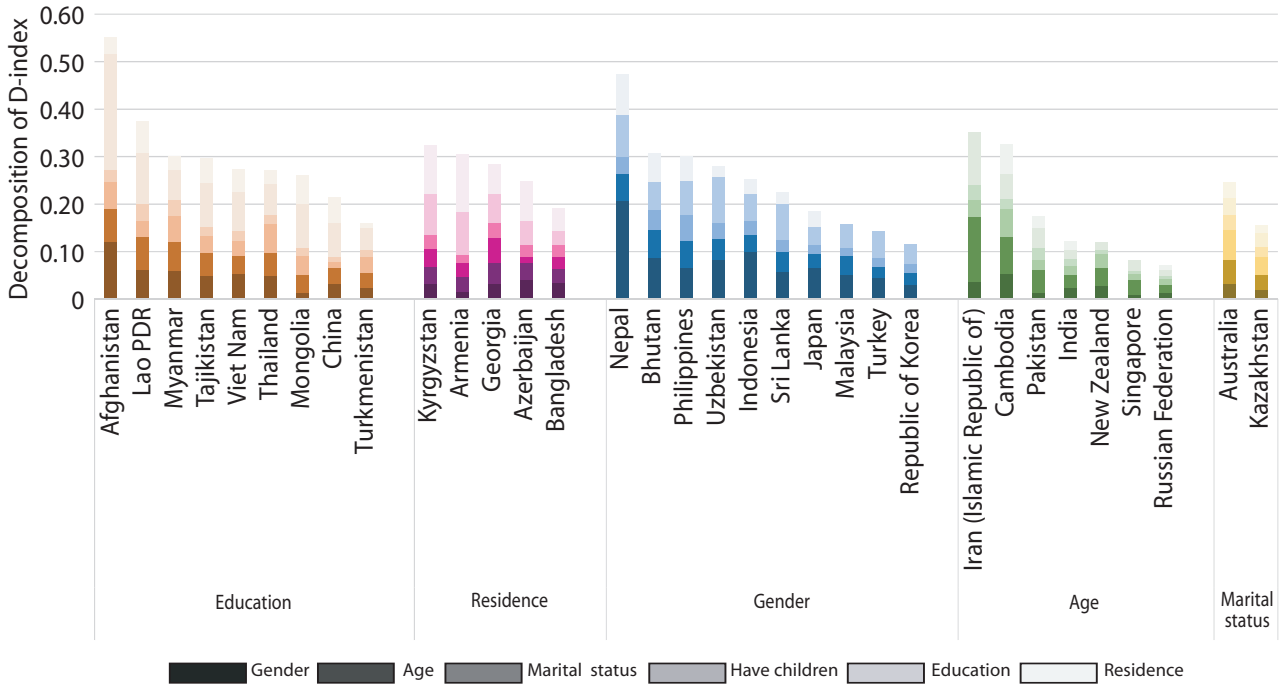
Source: Latest DHS and MICS surveys.
Note: Results are based on country-specific logistic regressions. Only countries with statistically significant coefficients and odds-ratios are shown.

2.4.3 …in decent work

Beyond adequate nutrition and 12 completed years of education, the most direct determinant of future outcomes is the opportunity to access decent work. Decent work is characterized by four main components: employment, social protection, rights at work and social dialogue. While it is not possible to review all components through available survey data, a proxy used in this analysis is being a full-time employee for a company or employer. Given the large scale of labour market informality and underemployment in most developing countries in the region, access to full-time employment is used to proxy the conditions of decent work.

Among all circumstances, gender explains the bulk of inequality in access to full-time employment more frequently than any other factor, including education (Figure 2.11). It is the most prominent circumstance in 10 out of the 33 countries studied, including Nepal and the Republic of Korea. The second most important circumstance is the level of education, followed by the age group. Age group matters most in several more advanced countries such as New Zealand, the Russian Federation and Singapore, but also in Cambodia, India, the Islamic Republic of Iran and Pakistan. Marital status is generally less associated with high inequality, except in the cases of Australia and Kazakhstan.

Figure 2.11 Inequality in access to full-time employment and its decomposition in selected countries, grouped by the most important circumstance, latest year



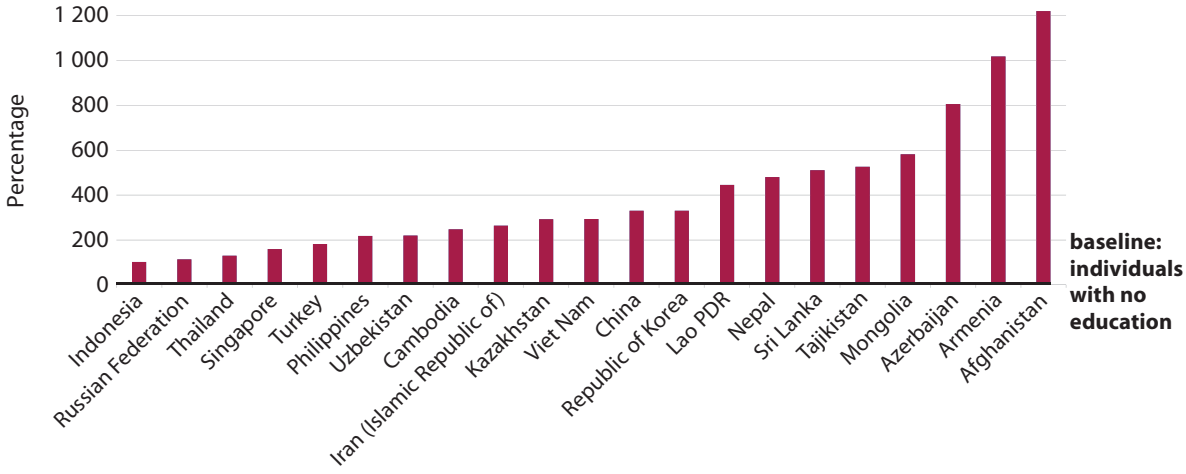
Source: ESCAP calculations, prepared with the help of ILO and using data from the Gallup World Poll.
Note: In more advanced countries, being in full-time employment could also reflect personal choice to work part-time. For the definition of full-time employment, see relevant endnote (No.13).

These results are confirmed through regression analysis of survey data.[18] Completing higher education increases the odds of being a full-time employee by a staggering 11 times (1,200 per cent) in Afghanistan, 9 times in Armenia and 7 in Azerbaijan. Even in countries where the impact is smaller, like in Indonesia, the Russian Federation and Thailand, having completed higher education still doubles the chances of being a full-time employee (Figure 2.12, Panel 1). The scale of importance of higher education in creating an advantage in the labour market is beyond any other seen in the regression analyses conducted for this report.

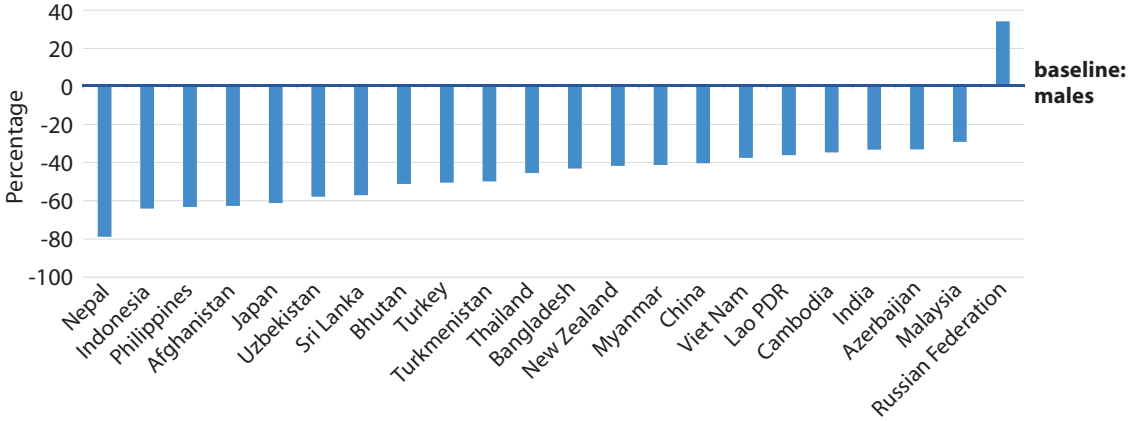
Women are less likely than men to be in full-time employment in all countries studied apart from Russian Federation. In Nepal, women are almost 80 per cent less likely to be in full-time work than their male counterparts, all else being equal – the largest gap in the region – followed by Indonesia, Philippines and Afghanistan (Figure 2.12, Panel 2).

Figure 2.12 Impact of education and gender in getting full-time employment

Panel 1: The higher odds for individuals with completed higher education to be in full-time employment, compared with those with no education



Panel 2: The odds of women being in full-time employment, compared with men



Source: Results are based on country-specific logistic regressions. Only countries with statistically significant coefficients and odds-ratios are shown. Analysis conducted with the help of ILO and using data from the Gallup World Poll.
Note on Panel 2: In developed countries, the level of full-time employment may reflect a personal choice, rather than an access issue.

2.4.4 Overall determinants

These decompositions point to the important links between a mother's education, children's nutrition, school completion and employment prospects, particularly for the region's developing countries. These patterns are repeated across all opportunities studied and sketch an image of the following four most important drivers of inequality in access to opportunities in Asia and the Pacific:

- **Education has a prominent role in shaping inequality in access to all opportunities.** Education, when viewed as a "circumstance," matters in different ways depending on the opportunity: for children's nutrition, it is the education of a mother; and for securing full-time employment, it is the individual's own level of education. The highest education level in the household is also important for determining access to all basic household-level services, but mostly associated with ownership of a bank account.[19] Given that basic literacy is necessary for accessing, understanding and operating banking services, this association is not surprising.

- **The rural-urban divide is behind much of the observed inequality in access to opportunities.** Together with education, the rural-urban divide is among the most prevalent circumstances in determining inequality in access to various household-based opportunities, particularly basic water and sanitation, electricity and clean fuels, but also individual-based opportunities like secondary and higher education attainment. Interestingly, across all household-related opportunities, countries

with higher D-indices (hence higher inequality) are also those where the rural-urban divide is most important.

- **Gender is an important determinant of inequality in education and full-time employment.** Being a woman explains the bulk of inequality in access to full-time employment more frequently than any other factor, including education. The impact of being a woman or a man with respect to secondary and higher educational attainment is interesting because it goes both ways, depending on the country.

- **Wealth is overall the most common driver of inequality of opportunity in all countries.** It is the most important circumstance with respect to inequality in secondary and higher education attainment, stunting levels, but also in access to most household-related opportunities.[20] While being a proxy for many social, economic and environmental disadvantages, its importance in determining inequality of opportunity is striking and confirms the expectation and intuition that disadvantages are intertwined. The prominent role of wealth in shaping these inequalities further emphasizes the intergenerational inequality trap, where inequality of outcome (wealth) has a direct bearing on inequality of opportunity, transmitted across generations.

2.5 WINNERS AND LOSERS – IDENTIFYING THOSE FURTHEST BEHIND

Knowing that inequality of opportunity is broadly associated with these four circumstances opens the door to deeper exploration of the data to see exactly which groups are the most marginalized and which groups have benefitted most from development. Identifying these two sets of groups could help policymakers better focus policy and programmes to tackle inequality, particularly with regards to the provision of basic services.

Using the *classification tree approach*, a methodology commonly used in data mining and popular in machine learning, this section identifies the common circumstances shared by those who are most likely to lack access to the selected opportunities.[21] In this new methodological approach, an algorithm splits the value for each variable (access rate to an opportunity) into significantly different population groups based on shared predetermined circumstances.

These circumstances vary by opportunity, following different paths for household-based opportunities and individual-based opportunities. In each iteration, the classification tree ascertains groups that are most and least advantaged. The final groups could, for example, share the circumstances of belonging to the bottom 40 per cent of the wealth distribution and residing in a rural area. The circumstances used for identifying those furthest ahead or behind for each opportunity are summarized in Table 2.1 and are broadly the same as those used in the decomposition analysis of key drivers (previous section).

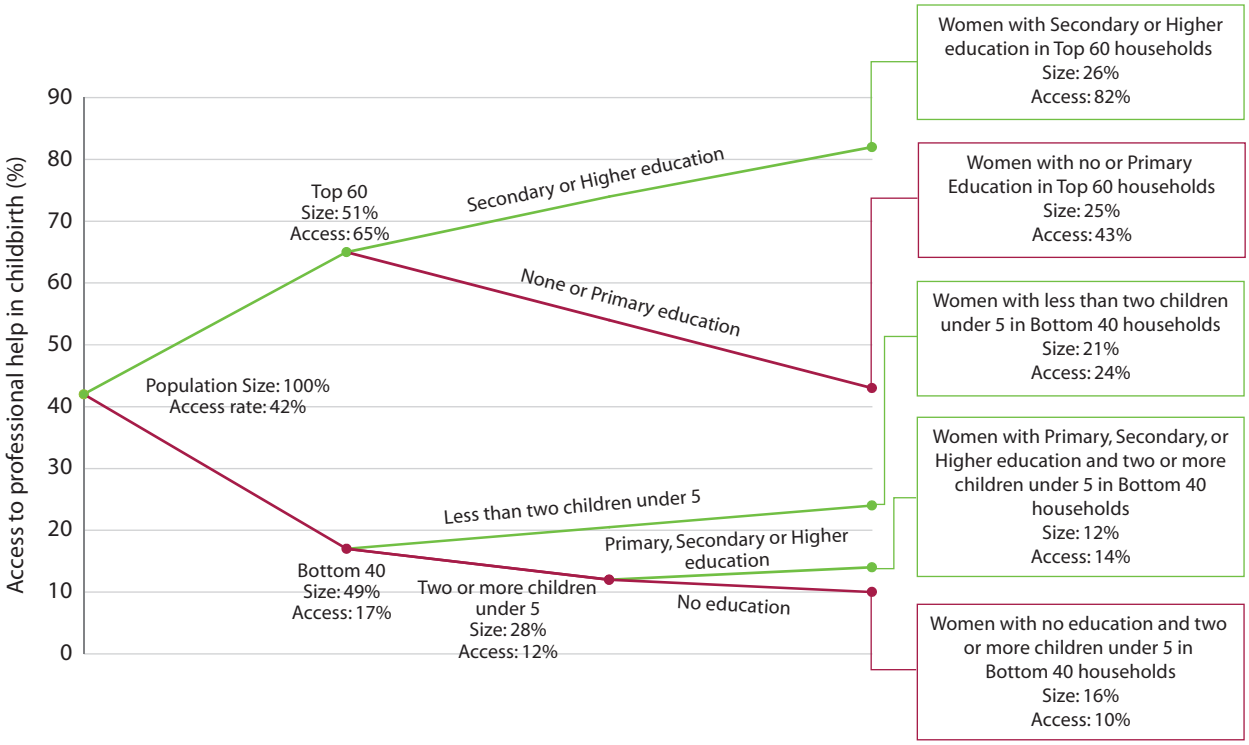
To illustrate how the classification tree identifies the most disadvantaged or advantaged groups, the example of access to professional help during childbirth in Lao People's Democratic Republic is used (Figure 2.13). The classification tree starts at the average access rate of 42 per cent. The algorithm determines that the first split into branches should be wealth, specifically where in the wealth distribution a woman belongs: the top 60 per cent or the bottom 40 per cent. Women belonging to the top 60 per cent group have 65 per cent access rate to professional help in childbirth, compared with only 17 per cent for those in the bottom 40 group.

In the same example, the algorithm determines a second split for the less advantaged (bottom 40 group) around the number of children a woman has had. For their first childbirth, one in four women in the bottom 40 group uses professional help. That rate falls to one in nine for subsequent childbirths or for women with more than one child. The rate of access to professional help also varies for women with more than one child: only one in ten women with no education get professional help, while one in eight of those with completed primary, secondary or higher education do. Among the women belonging to the top 60 group, the only further split is based on education. Half of the women with primary or no education access professional help, compared with eight out of ten of those with secondary or higher education.

The group with the highest access to professional help in childbirth is women with secondary or higher education in households belonging to the top 60 of the wealth distribution. They have an access rate of 82 per cent and represent 26 per cent of Laotian women in union who have given birth in the past five years. Conversely, only one in ten women in the bottom 40 group with no education and two or more children under 5 years of age use professional help during childbirth. The total gap between the groups with the highest and the lowest access is a staggering 72 percentage points.

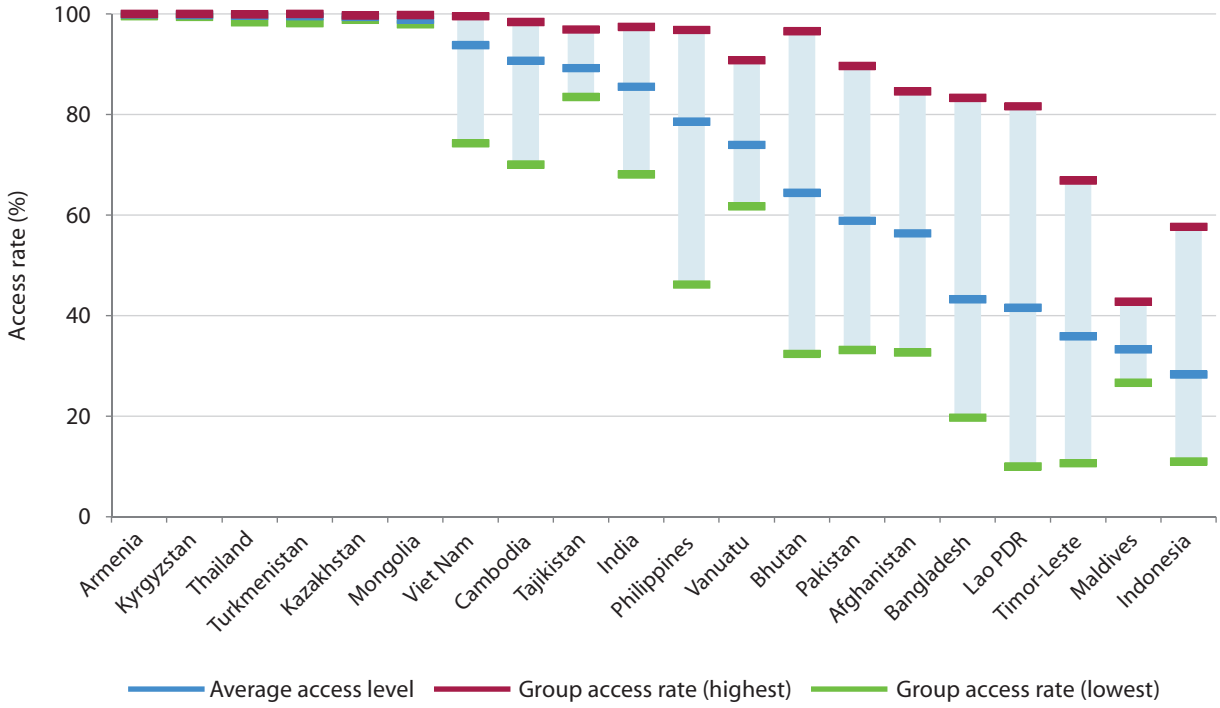
The uniqueness of the classification tree approach is that it becomes very clear where policies should, or should not, be focused to reach those furthest behind. Repeating and summarizing classification tree results for 21 countries is visualized in Figure 2.14. The upper lines

Figure 2.13 Classification tree highlighting differences in women's access to professional help in childbirth in Lao People's Democratic Republic, 2011 (15-49 years of age)



Source: ESCAP calculations, using data from the latest DHS and MICS surveys for countries in Asia-Pacific.

Figure 2.14 Access to professional help during childbirth, Asia-Pacific countries, latest year



Source: ESCAP calculations, using data from the latest DHS and MICS surveys for countries in Asia-Pacific, latest years.
Note: Data for Myanmar not available for this indicator.

of each bar represent the access rate of the most advantaged groups in each country. The lower lines represent those with lowest access rates and the middle line shows the average access rate, by which countries are also sorted. Countries in North and Central Asia and Thailand fare the best with almost universal access and no substantial gaps between population groups. By contrast, Indonesia, the Maldives and Timor-Leste have the lowest average access of below 40 per cent. The largest gaps are not found in the countries with the lowest access but in Lao People's Democratic Republic (72 percentage points), Bhutan and Bangladesh (64 percentage points).

Overall, wealth and education levels strongly impact access to professional care during childbirth, where women from the bottom 40 with lower levels of education appear frequently among the most disadvantaged. In some countries age also matters, with older women being less likely to obtain skilled personnel attendance during childbirth. Lastly, having more children also plays a role, suggesting either lack of resources or awareness in the household of the importance of professional attendance for all births. Annex 2.3 lists the circumstances of groups with lowest access rates.[22]

Identifying the furthest behind in all opportunities for each of the 21 countries (33 countries for access to full-time employment) generates over 500 classification trees (like the one in Figure 2.13). Each tree reveals an individual, community- or country-based story, of success among urban educated elites, of catching-up among rural communities through education, but also of marginalization, mostly in remote, minority communities. The more nuanced, country-based stories need to be explored by policymakers and researchers working in specific sectors in individual countries.

Summarizing the findings from the classification trees for all opportunities, however, yields some general patterns (Table 2.3). The most common shared circumstance of the most disadvantaged households and individuals is a low level of education (primary or below). The second most common circumstance is belonging to the poorest 40 per cent of the national wealth distribution. Households in rural areas are also more likely to be in the most marginalized groups with lower access to basic services. Women are more likely to be in the furthest behind groups, as are younger people and those over 50 years of age.

On the contrary, the profiles of the most advantaged groups in terms of access to basic household services is, expectedly, belonging to the richest 60 per cent of the distribution, having a family member with at least secondary education in the household and living in urban areas. For individuals, the most common circumstance is again being among the wealthiest 60 per cent, having secondary or higher education and being male.

Table 2.3 Shared circumstances of the worst-off and best-off groups in access to opportunities

Common Circumstances: HOUSEHOLDS THAT ARE…

FURTHEST BEHIND		FURTHEST AHEAD	
Circumstances	Count (times)	Circumstances	Count (times)
Lower and primary education	130	Top 60	80
Bottom 40	107	Secondary and higher education	73
Rural	43	Urban	69

Common Circumstances: INDIVIDUALS WHO ARE…

FURTHEST BEHIND		FURTHEST AHEAD	
Circumstances	Count (times)	Circumstances	Count (times)
Bottom 40 of wealth distribution	80	Top 60 of wealth distribution	69
Lower and primary education	74	Secondary and higher education	53
Female	63	Male	50
Living in a rural area	42	Living in an urban area	46
Age 15-24	33	Age 25-49	28
Male	16	Female	17
Age 50-64	14	Age 15-24	9

Source: ESCAP calculations using data from the latest DHS and MICS surveys for countries in Asia-Pacific, latest years

2.6 PROGRESS OVER TIME: WHY POLICY MATTERS

With an overall increase in access to opportunities in recent years, the groups of households and individuals that are furthest behind have experienced some progress. Comparing results from earlier and later surveys reveals that the most marginalized groups represent smaller sections of society but also that their access rates to most opportunities have improved.

This analysis isolates four core opportunities to review progress over time: secondary educational attainment (Figure 2.15), child stunting (Figure 2.16), access to professional help during childbirth (Figure 2.17), and full-time employment (Figure 2.18). It finds that in some countries, despite economic growth and improvements in average access, sizeable groups are being excluded. Countries that increased their investment in social protection, particularly in education and health care, were more successful in closing the gaps compared with those that did not.

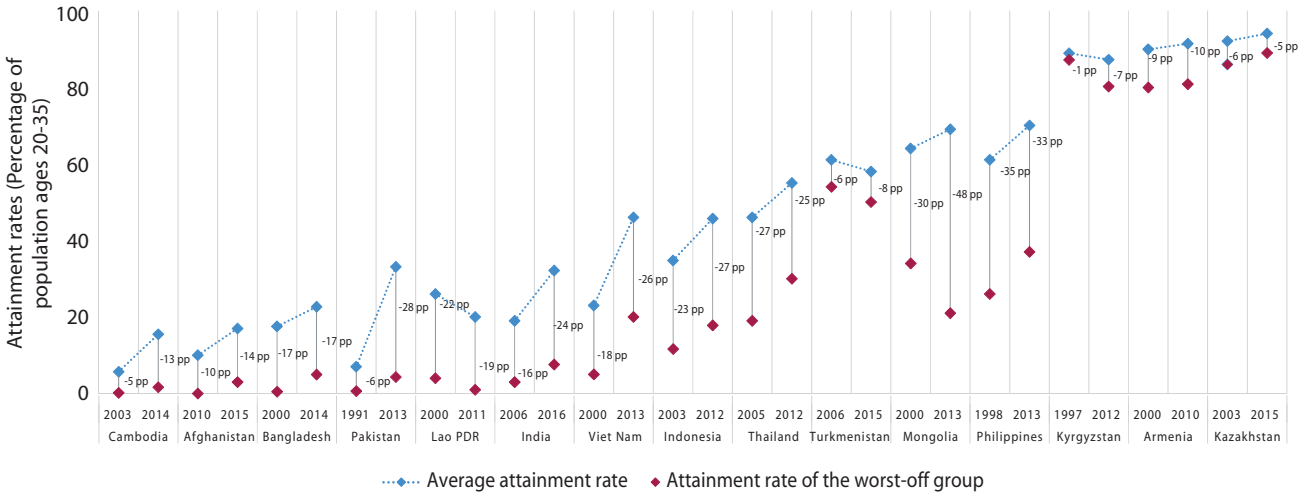
In all countries except Kyrgyzstan, Lao People's Democratic Republic and Turkmenistan, average attainment rates for secondary education increased in the period between the two surveys (Figure 2.15). However, it is only in Kazakhstan, the Philippines and Thailand that the distance of the most marginalized group from the average fell. In the remaining 12 countries, the gap, in percentage point (pp) difference from the mean, grew between the two surveys in time; revealing exclusion of certain groups from the countries' general upward trends.

In the three countries where the gaps from the mean closed, education had been a strong policy priority. In Thailand, the introduction of the 1999 National Education Act guarantees nine years of compulsory education (from six to 15 years of age) and 12 years of free basic education. The free education policy was extended to 15 years in 2009. Kazakhstan's Constitution of 1995 also states that the citizens shall be guaranteed free secondary education in state educational establishments and that secondary education is obligatory. In the Philippines, social protection programmes have prioritized education, at both the primary and secondary levels.[23]

Progress has been more equitably shared with respect to children's nutrition (Figure 2.16). Average stunting rates fell in all countries except Armenia and Thailand. Thailand also saw an increase in the average rate of overweight children, from 10 per cent in 2005 to 12 per cent in 2012.[24] This finding for Thailand, an upper-middle income country, suggests that ensuring children's access to the right nutrition is a complex economic, social and cultural issue. In Bangladesh, Lao People's Democratic Republic, Pakistan and Thailand the gaps of the most disadvantaged groups (the groups with the highest prevalence of stunting) from the average increased, suggesting that some children were being left behind from overall progress.

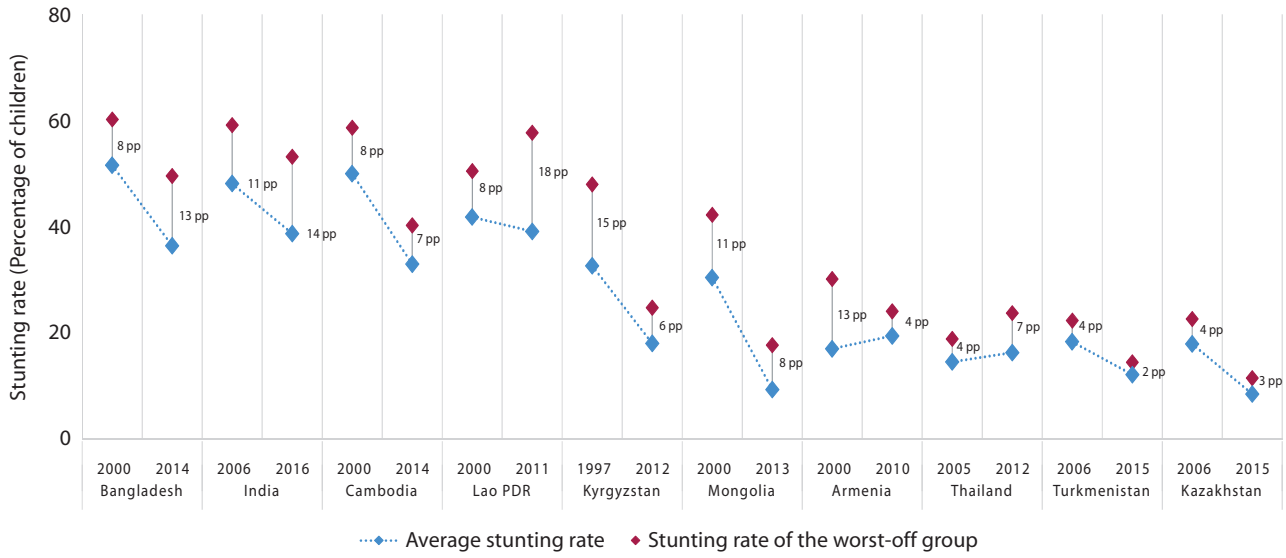
The most successful countries in reducing stunting rates for all were Cambodia, Kazakhstan, Kyrgyzstan, Mongolia and Turkmenistan. In Mongolia, the universal and unconditional Child Money Programme (initially a targeted and conditional programme) is considered to

Figure 2.15 Distance between the worst-off groups and average attainment of secondary education for individuals 20 to 35 years of age, earliest and latest



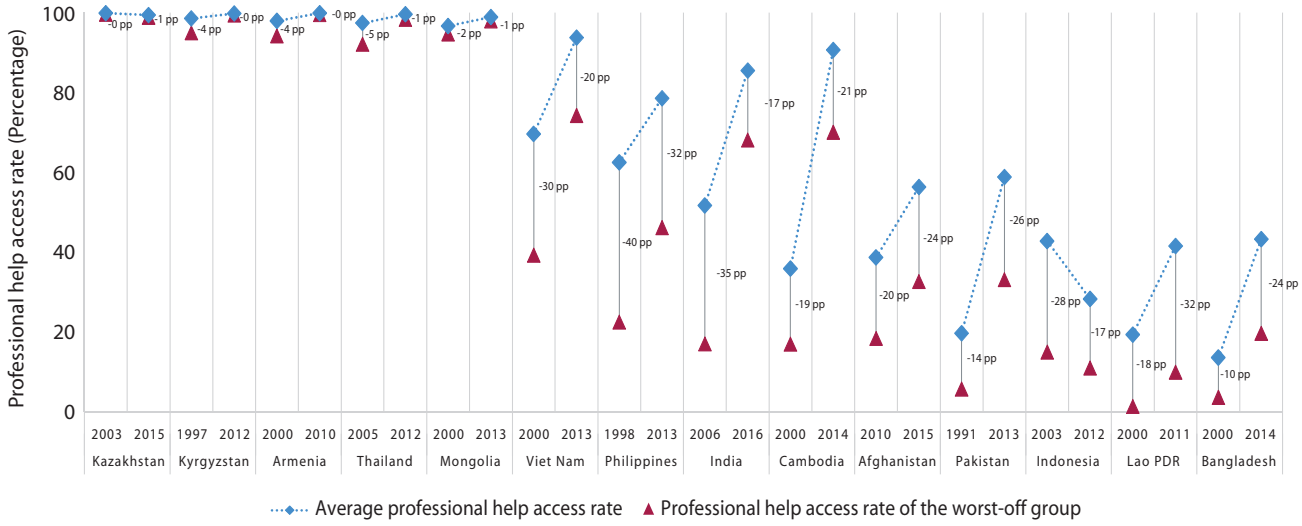
Source: ESCAP calculations, using data from the latest DHS and MICS surveys for countries in Asia-Pacific.
Note: The disadvantaged groups may not have the exact same composition in both surveys. However, the most disadvantaged groups always represent at least 10 per cent of the population and have at least one common circumstance.
Note 2: pp stands for percentage points.

Figure 2.16 Distance between the worst-off groups and the average in stunting for children 0 to 5 years of age, earliest and latest



Source: ESCAP calculations, using data from the latest DHS and MICS surveys for countries in Asia-Pacific.
Note: The disadvantaged groups may not have the exact same composition in both surveys. However, the most disadvantaged groups always represent at least 10 per cent of the population and have at least one common circumstance.
Note 2: pp stands for percentage points.

Figure 2.17 Distance between the worst-off groups and the average in access to professional help during childbirth for women aged 15 to 49, Asia-Pacific countries, earliest and latest



Source: ESCAP calculations, using data from the latest DHS and MICS surveys for countries in Asia-Pacific.
Note: The disadvantaged groups may not have the exact same composition in both surveys. However, the most disadvantaged groups always represent at least 10 per cent of the population and have at least one common circumstance.
Note 2: pp stands for percentage points.

have had an important contribution to this development. In Cambodia, public health initiatives focusing on increasing the interval between births and reducing use of tobacco during pregnancy have contributed to the reduction in stunting.[25]

Average rates of access to professional help during childbirth have increased in most countries (Figure 2.17). However, in most countries in South-East and South and South-West Asia, the distance between groups with the lowest access and the average increased. On the other hand, Armenia, India, Kyrgyzstan, the Philippines and Viet Nam saw impressive increases, both in terms of average access and in closing the gaps with the most marginalized groups.

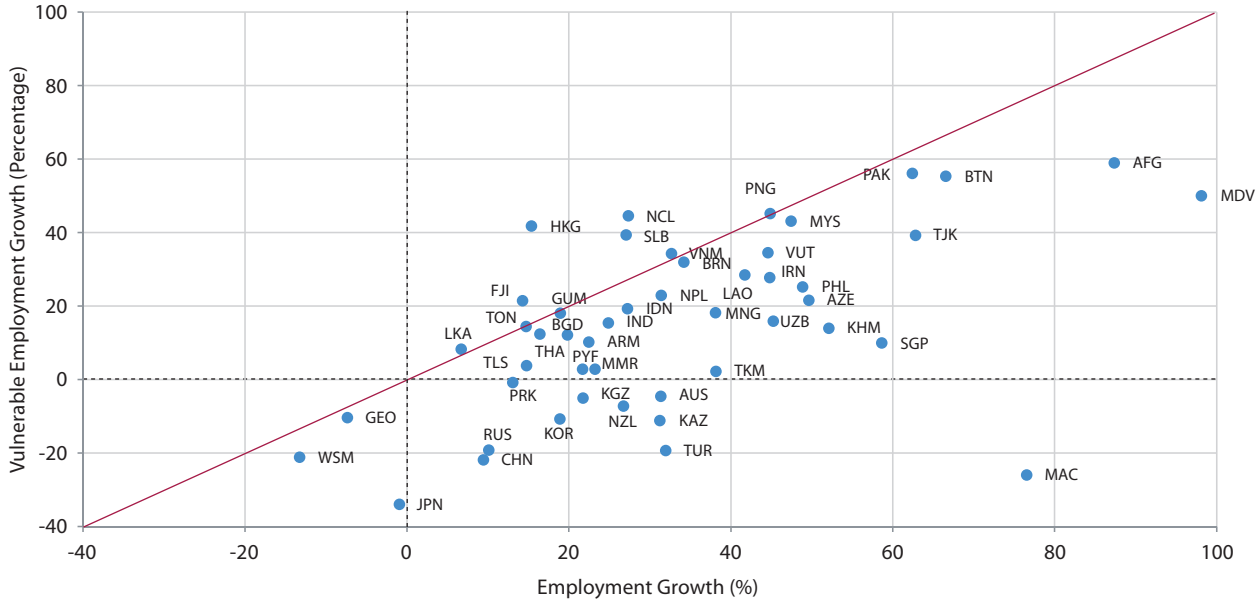
Viet Nam, for example, prioritized reducing maternal mortality (MDG 5) through the Strategy for Protection and Care of the People's Health 2001-2010, as well as the Reproductive Health Strategy 2001-2010. In the Philippines, the Philhealth programme introduced in 1997 was designed to provide access to health care for

the underprivileged, the sick, older persons, persons with disabilities and women and children. The continuous expansion and strengthening of Philhealth may have contributed to the observed progress.[26]

Based on alternative data sources, access to a decent job reveals a disconnect between overall employment growth and decent job growth. Behind this disconnect is the nature of economic growth.[27] As populations continue to expand in many countries in the region, creation of decent jobs has failed to meet the rising numbers of new labour market entrants. With no alternative, people are forced to accept whatever jobs are available.

The extent of vulnerable employment is illustrated for the period 2000-2015 in Figure 2.18. In countries above the diagonal line, such as Fiji, Papua New Guinea and Sri Lanka, vulnerable employment increased faster than overall employment. In countries below the diagonal line, but above the horizontal dotted line, which is the majority of the region's developing countries, overall employment increased faster than vulnerable employment, indicating a falling share of vulnerable jobs. Nevertheless, there was still an increase in the absolute number of vulnerable workers. In Afghanistan, Bhutan and Pakistan, for example, the overall employment increase of 60 to 80 per cent was accompanied by a 50 per cent increase in vulnerable employment. Only in a few countries, located below the dotted line, did the absolute number of vulnerable workers fall — as in China, the Russian Federation and some OECD members.[28]

Figure 2.18 Change in total employment and in vulnerable employment, 2000-2015



Source: ESCAP calculation using ILO (2017), KILM (9th edition).

While not all workers in the informal economy are poor, there is a frequent overlap; trapped in hazardous, low-paid jobs without any protection or security, these workers have few opportunities to escape poverty.[29] Meanwhile, wages in Asia-Pacific are growing faster than in any other region, and grew by 4 per cent in 2015, suggesting a widening gap between those benefiting from economic growth and productivity increases and those left behind.[30]

2.7 CONCLUSIONS AND RECOMMENDATIONS

Positive progress in reducing the gaps between those furthest behind and an average household is mostly seen in countries that have prioritized investments in the social sector, including through social protection. The level of economic development, whether a country is in the low, lower-middle or upper-middle income bracket, has a bearing on inequality of opportunity, but not as much as its social development policies.

The superior performance of many lower-middle income countries from North and Central Asia, but also Bhutan, India, Mongolia, the Philippines and Viet Nam, particularly in education and health, point to that finding. For household-based opportunities, prioritization of investments in basic water and sanitation, energy and financial services has been stronger in upper-middle income countries. However, certain lower-middle income countries also stand out, including most North and Central Asian countries, India, Viet Nam and some Pacific Islands.

These findings suggest that certain policies and institutions can help close the gaps in terms of access to opportunities.

Broaden social protection coverage

- Social protection policies are key to reducing inequality, increasing prosperity, resilience and empowerment and ensuring that "no one is left behind". Expanding social protection to all supports low-income families through cash transfers, or other income-support mechanisms with strong multiplier effects on the economy as these groups tend to spend the extra income on domestic goods and services. It also insures against risks such as disasters, illness and unemployment, impacts of which can be life-threatening, particularly for vulnerable groups with no financial reserves.

Make education affordable, accessible, and relevant for all

- A well-educated population is fundamental for all spheres of development. National education systems should therefore encourage and facilitate higher education attainment and at the minimum improve secondary completion rates for all population groups. This is particularly important for those living in rural areas. The quality of education also needs to be strengthened by investing in teachers' education and training, school equipment and infrastructure. It is finally critical that current curricula correspond to future labour market needs and smoothen the school-to-work transition.

Ensure that health-care services are affordable, accessible and universal for life

- Access to affordable essential health care is central to leading healthy lives and a key determinant of equality. Poor access to affordable health-care services, often combined with material deprivation and social exclusion, creates or perpetuates inequality traps. As a core component of building national social protection floors, countries need to invest in universal access to a nationally defined set of goods and services, constituting essential health care, including maternity care, that meets the criteria of availability, accessibility, affordability, acceptability and quality. As health challenges vary throughout the life cycle, services need to cater to the health-care needs of all ages and all parts of the country including rural areas. Health care should also be complemented by access to other services required to sustain the basic living conditions for good health, such as sufficient nutrition, clean drinking water, sanitation, electricity and clean fuels, as well as basic shelter.

Protect and promote the rights of women

- Women and girls are excluded from mainstream development more often than men and boys. It is therefore paramount that their rights and participation be placed at the centre of all policymaking. Gender equality is not only a fundamental principle of human rights, but is also a vital component to effectively meet future needs and challenges in Asia and the Pacific. Public policies should uphold and mainstream gender equality in all spheres of life.

Closing rural-urban gaps in public service delivery

- Physical access and mobility constraints compound inequality of opportunities. For example, access to health care, education and decent jobs in rural areas are often constrained by a lack of infrastructure, including transport connections. Removing these bottlenecks can also encourage labour mobility and create opportunities for income-generating activities.

Improve effective service delivery

- Strong political commitment, broad public support as well as capable and accountable institutions governed by transparent regulatory frameworks are prerequisites for effective service delivery. Ineffective administration, weak rule of law, corruption, and lack of regulatory frameworks influence operational capacity to generate change and disproportionally harm the poorest and most vulnerable segments of society.[31] Simply allocating more public resources without reforming governing principles may therefore not have the desired impact.

Encourage multi-sectorial and multi-stakeholder collaboration

- To reach population groups at the highest risk of being left behind, policy reforms need to be underpinned by multisectoral and multi-stakeholder involvement at all stages, from development and design to implementation and monitoring. Given the diversity of circumstances impacting individual and household decisions and opportunities, such involvement and coordination are imperative for creating opportunities and incentives for households.

Improve the quality of services and opportunities provided

- An underexplored area is the importance of ensuring the quality of services. Even when education and health services are publicly provided, they may not be of adequate quality, pushing wealthier individuals to seek private options. Those who can afford to pay privately for better health-care or education services will do so. Those who cannot are left with no option,

but the publicly available service and they may have to settle for a lower-quality job, a disadvantaged location for their home and the prospect of unclean fuels and poor sanitation solutions. Inequality of opportunity, and gaps in the quality of opportunities afforded, often result from income and wealth inequality and become a driving force for intergenerational inequality and for trapping people and communities in a vicious cycle of persisting poverty and exclusion.

Bolster capabilities to understand inequality of opportunity through disaggregated data analysis

- To identify those at risk of being left behind and to direct policymaking at certain population groups, national data collection needs to allow for better disaggregation. Additional research also needs to capture how unequal opportunities impact individual aspirations and household possibilities and why certain individuals and households may, for example, take their children out of school or continue using unclean energy options, while other, sometimes neighbouring households will not. This chapter has used innovative analytical methods to analyse available surveys. However, the number of countries with available surveys were limited and the surveys did not provide answers to important questions, such as the quality of education or the perception of inequality. With the availability of more and better data, countries will be better placed to take advantage of the wide array of analytical tools available to them.

Inequality of opportunity and gaps in quality are not limited to services provided by the State. It expands to daily choices around what transportation means to use, what phone device to buy and what news sources to rely on. Increasingly, these services are provided by the private sector. As chapter 4 will show, the incredible technological progress that has underpinned growth over the past decades has afforded people in Asia and the Pacific a vast choice of products and services to choose from. Yet, what is affordable for those earning around US$1.90 a day is not comparable with what the elites or the growing middle class across the region can enjoy.

Before exploring the interaction of technology with inequality, chapter 3 analyses in more depth inequalities in the quality of the environment people live in or access to meet basic needs and generate livelihoods. It describes how disadvantaged groups are often disproportionately exposed to the hazards of environmental degradation and less able to protect themselves and recover from various environmental impacts.

ENDNOTES

[1] See Ravallion, (2016).

[2] United Nations Development Programme (UNDP) (2013).

[3] Ravallion, (2016).

[4] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018a) (forthcoming).

[5] Canning and Schultz (2012).

[6] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018d) (forthcoming).

[7] See World Health Organization (WHO) (2018), available at: http://www.who.int/gho/phe/water_sanitation/burden_text/en/

[8] See World Bank (2013), available at: http://www.worldbank.org/en/news/feature/2013/08/30/whats-a-toilet-worth-infographic

[9] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017a).

[10] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017a) Available from https://www.adb.org/sectors/energy/issues/access-energy.

[11] Habtezion, (2013).

[12] Sovacool, (2013).

[13] Access to full-time employment is used as a proxy for decent work in this paper. Decent work is not easy to measure. To identify gaps in the labour force in terms of access to decent work, this analysis uses the "employed full-time for an employer index" in the Gallup survey as a proxy. In practice, this index is a subset of the ILO's 'non-vulnerable' employment classification, which includes wage and salaried workers together with employers. The 'vulnerable,' on the other hand, are own account workers and contributing family members. For more information, please see United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018b) (forthcoming).

[14] The decomposition of other opportunities can be found in a series of policy papers available here: http://www.unescap.org/our-work/social-development/poverty-and-inequality/resources

[15] The D-index for stunting measures the inequality in distribution of non-stunted children among all groups of children.

[16] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018c) (forthcoming).

[17] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018a) (forthcoming).

[18] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018b) (forthcoming).

[19] Data on the D-index decomposition is available upon request.

[20] The wealth index, which has been used for this analysis, is a composite index reflecting a household's cumulative living standard that is developed by the DHS and MICS researchers and combines a wide range of household assets and characteristics.

[21] A full description of the methodology and algorithm is available in the Annex of the relevant Policy Paper series, such as ESCAP (2018a).

[22] The Annex 2.3 tables do not show the composition of the most advantage group (highest attainment rate), but this information is available upon request.

[23] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018e) http://www.socialprotection-toolbox.org/practice/philippines-conditional-cash-transfer-families

[24] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018c) (forthcoming).

[25] Ikeda et.al (2013).

[26] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018e). http://www.socialprotection-toolbox.org/practice/philippines-health-care-programme

[27] International Labour Organization (ILO) (2009). http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/publication/wcms_115087.pdf

[28] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017b).

[29] International Labour Organization (ILO) http://www.ilo.org/wcmsp5/groups/public/—ed_emp/—emp_policy/documents/publication/wcms_212689.pdf

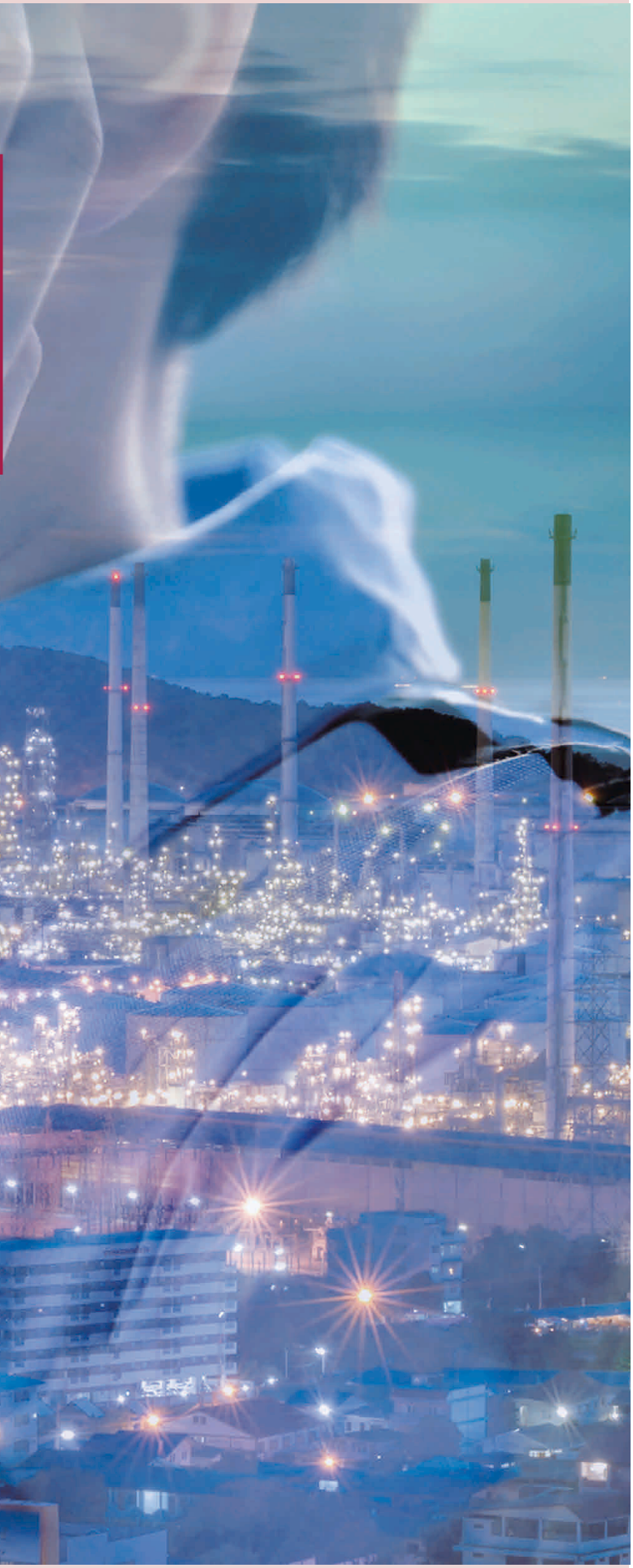
[30] International Labour Organization (2016).

[31] United Nations, Department of Economic and Social Affairs (DESA), United Nations Development Programme (UNDP), United Nations Educational, Scientific and Cultural Organization (UNESCO) (2012).


for Healthy & Beautiful Life

Chapter 3

Inequality of Impact: Environment and Inequality



3.1 WHAT IS INEQUALITY OF IMPACT?

Leading on from the discussion of inequality of income and of opportunity, this chapter explores linkages between inequality and the natural environment, at a time when a clean and healthy environment is increasingly regarded as a human right. Firstly, the analysis looks at where inequalities of income and opportunity appear to coincide with damage to the natural environment. The second part is structured around the question of why and how human-induced environmental degradation tends to worsen socioeconomic inequality by having disproportionate impacts on poor and vulnerable groups and on low-income countries. The empirical analyses ask whether i) air-pollution is a factor that drives up inequality within countries; ii) conservation of natural capital can help reduce inequality within countries; and iii) climate change and natural disasters widen income inequality within countries?

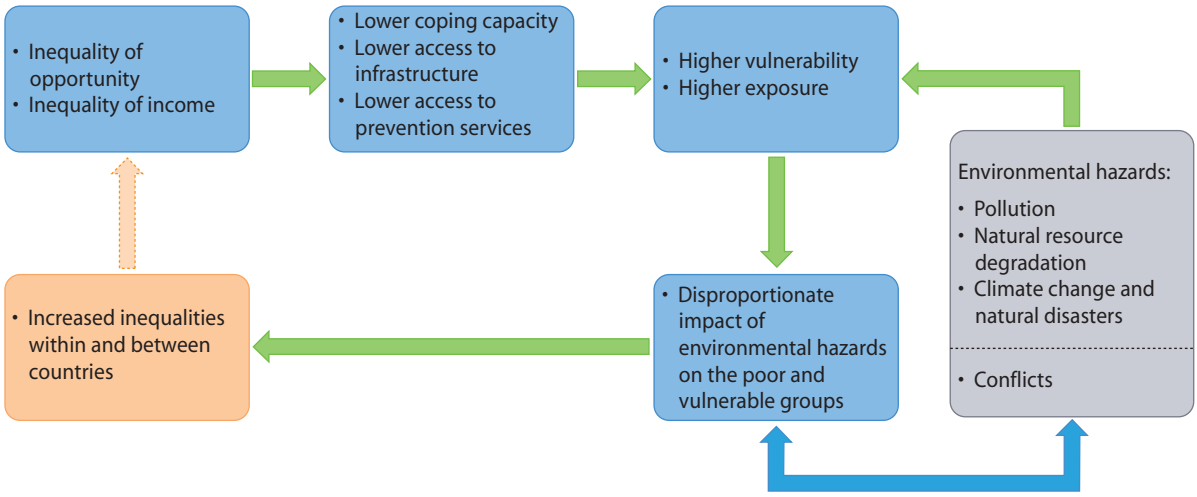
Figure 3.1 illustrates the relationship between inequality and the environment explored in this chapter. It summarizes the key driving mechanism of the unequal impact of natural hazards on poor and the marginalized communities. The inequality of income and opportunities discussed in chapters 1 and 2 identifies several groups of people that are "left behind". These groups of people are often confronted with the following situations: i) low capacity to cope with environmental hazards; ii) inadequate access to infrastructure to protect themselves from environmental hazards; and iii) absence or low level of prevention services to environmental hazards.

As a result, they become highly vulnerable and disproportionately exposed to environmental hazards. Exposure and vulnerability are two main factors of risk and therefore environmental hazards can have a bigger impact on these groups. A degraded environment threatens the health, livelihoods and wellbeing of disadvantaged groups and this, in turn, further affects the inequality of opportunities and outcome- creating a vicious cycle. To add to this complexity, conflicts arising from natural-resource use and management can reverse gains made on human development and mostly impact the poor.

The question of whether higher levels of inequality are associated with environmental damage is not a new one. For more than 20 years researchers have sought to understand if there is a relationship between them, and, if so, what the causes might be. The conclusions have been mixed, but a degree of empirical consensus has emerged in three broad areas:

- Several cross-country comparisons have indicated a relationship between inequality and deforestation/ biodiversity loss, where more equal countries tend

Figure 3.1 Inequality and environmental impact



Source: ESCAP.

to have lower rates of deforestation and impacts on biodiversity.[1]

- Some studies have found that countries with higher levels of inequality tend to consume relatively high levels of energy and carbon-intensive products, such as meat, use more water and generate more waste.[2]
- The quality of governance seems to play a role for moderating environmental pressure and degradation. However, there is no strong agreement on what aspect of governance – such as whether a country is a formal democracy, the existence of active civil society organizations, or the level of corruption – is most important.

Inequality of impact among countries

Further studies have looked at unequal relationships among countries and the implications for the natural environment. Wealthier countries, with their superior economic status and geopolitical power, can consume more natural resources than they have available domestically and outsource polluting and resource-intensive production processes to less prosperous nations.[3]

Inequality of impact within countries

The relationship between socioeconomic status and unequal exposure to environmental risk factors within countries has been intensively studied, especially in developed country contexts. Often labelled "environmental justice", it emerged as a scholarly discourse in the United States in the 1980s and has since then evolved into a well-established academic field. It is concerned with how different groups in society are exposed to and harmed by pollution and other environmental risk factors, especially how certain socioeconomic or ethnic minority groups are disproportionately exposed to and affected by such hazards. In high-income countries, an extensive literature confirms the inequalities associated with environmental hazards.[4] However, despite the dire environmental conditions in many low- and middle-income countries, systematic empirical studies on the links with inequality, including causes and effects, remain limited.[5]

By studying the disproportionate impact of environmental hazards both between and within countries, this chapter adds to the existing literature and derives some key environment-related policies that can help in reducing inequality.

3.2 UNEQUAL IMPACTS OF AIR POLLUTION

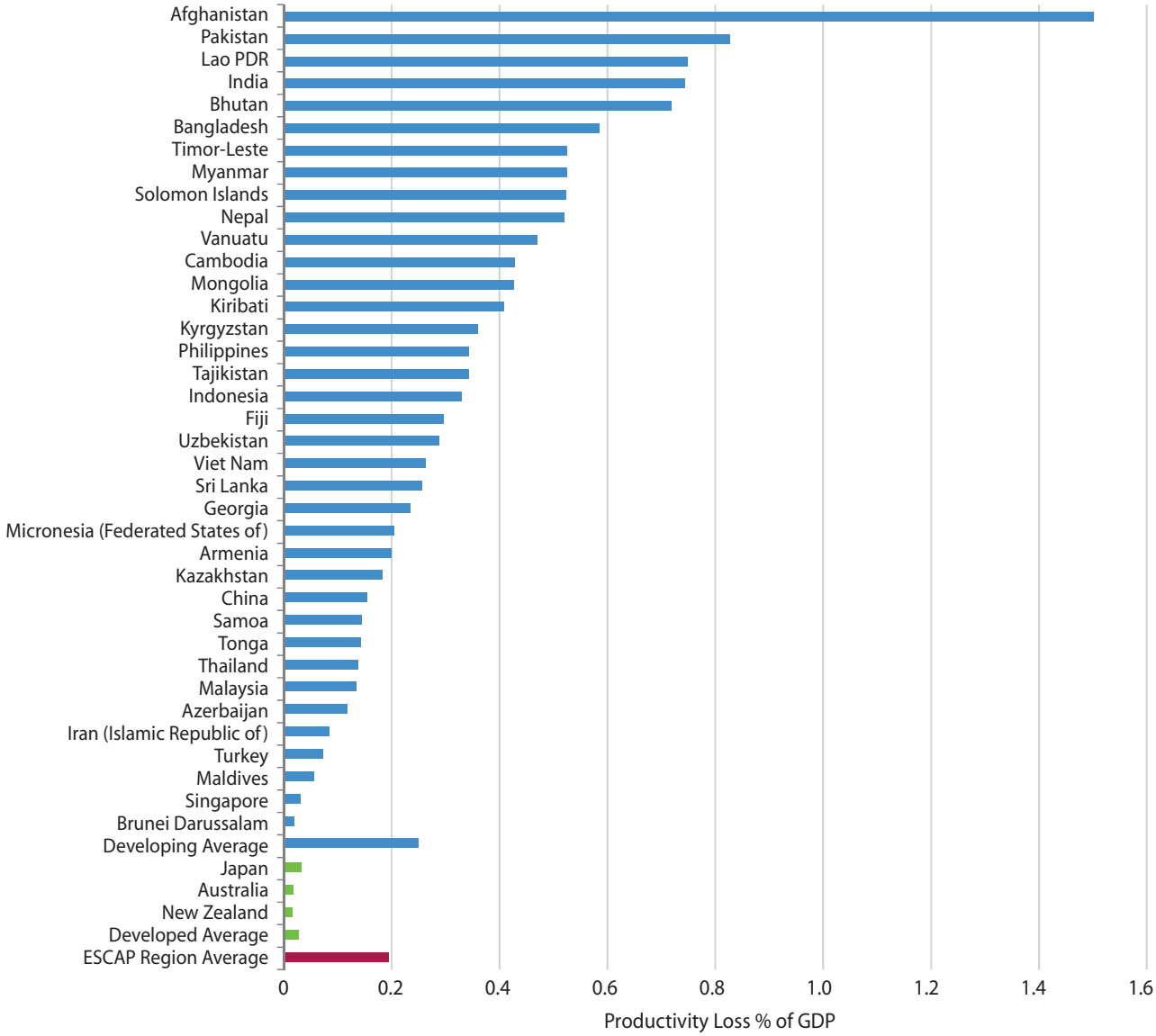
Air pollution is a growing threat to the wellbeing of people in the Asia-Pacific region, especially in China, India and South-East Asia. The region's rapid industrialization, urbanization and rising vehicle ownership is driving this upward trend.[6] Some cities have become notorious for smog and highly detrimental health impacts, including premature death.[7] Indoor air pollution is also a serious health issue in the region's poorer areas, both rural and urban. In South-East Asia, 62 per cent of households use wood or charcoal for cooking, while 32 per cent of households rely on highly polluting kerosene and oil lamps.[8]

3.2.1 Inequality among countries

Around 92 per cent of pollution-related deaths occur in low- and middle-income countries. Asia and the Pacific countries fare poorly – more than 5 million lives are lost on average across the region as a result of pollution (including ambient and household air pollution, unsafe water and unsafe sanitation, and exposure to lead pollution).[9] To evaluate the role of pollution in

exacerbating inequality among countries in the region we have focused on productivity losses as a percentage of GDP arising from excessive levels of pollution. ESCAP analysis shows that the average loss in productivity as a percentage of GDP due to the aforementioned pollution sources is more than eight times higher in developing countries (0.25 per cent of GDP) than in industrialized countries (0.03 per cent of GDP) in the region. The analysis also indicates a clear disparity between developing and industrialized countries with regards to the consequences of pollution (Figure 3.2). Developing countries account for around 96 per cent of the region's annual productivity loss that is caused by pollution. This implies that pollution can exacerbate income inequality between the region's developed and developing countries.

Figure 3.2 Productivity loss due to pollution, percentage of GDP



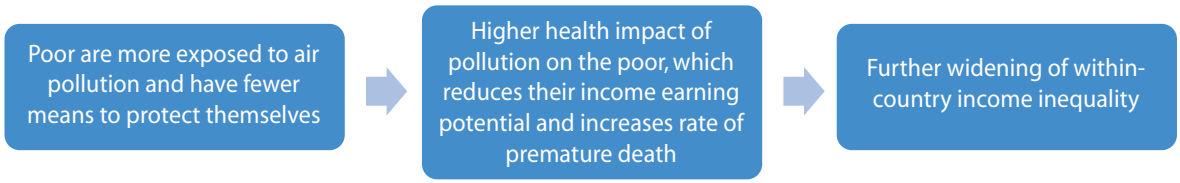
Source: ESCAP calculation using data appendix from Landrigan et al. (2018).
Note: Group averages are GDP weighted.

3.2.2 Inequality within countries

Studying the impact of air pollution on inequality within countries ideally requires disaggregated data on the differential exposure of pollution on subregions and sub-groups within a population. Given the paucity of such data in most countries, we have used a proxy measure of air pollution damage and a regression analysis that strongly suggests pollution can be an important driver of inequality within countries.

This section posits that when damage from air pollution in a country crosses a certain threshold, the increase in damage is associated with an increase in income inequality within countries. This relationship is described in Figure 3.3. The transmission mechanism is supported

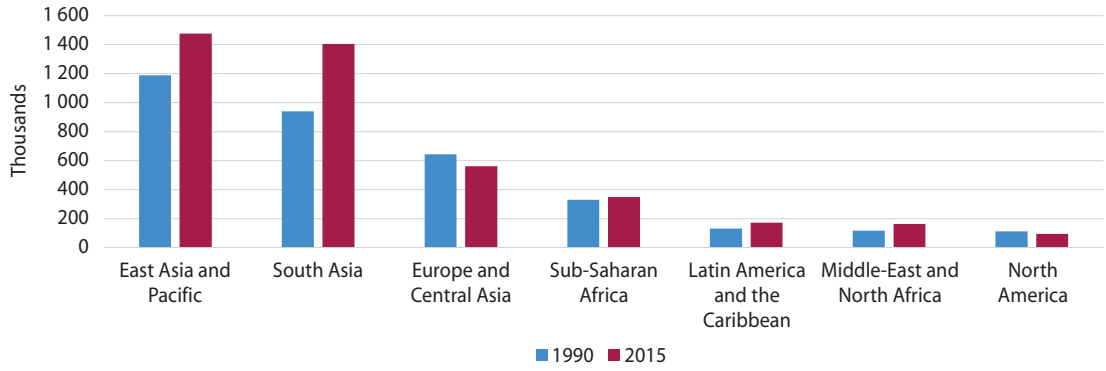
Figure 3.3 Mechanism of transmission of the impact of air pollution on inequality within countries



by existing qualitative data from the region, which confirms that poor and disadvantaged people are more exposed and vulnerable to the pernicious impact of pollution. Because they are less able to protect themselves from pollution, their health and productivity suffer disproportionately.

To confirm this relationship, air pollution has been selected as a measure of environmental impact and introduced in the regression framework summarized in chapter 1 (see Annex Table A1). Associated with sickness and premature death, air pollution clearly undermines productivity and participation in the workforce. Damage from particulate emissions provides a good proxy variable to measure the aggregate damage caused by air pollution. It is defined here as "damage from ultra-fine particles – particulate matter with a diameter of less than 2.5 microns (PM2.5)".[10] Figure 3.4 shows that the Asia-Pacific region (especially East Asia and Pacific and South Asia) experienced the world's sharpest rise in premature deaths as a result of ambient air pollution (PM2.5) between 1990 and 2015.

Figure 3.4 Premature deaths from ambient air pollution (PM2.5), by region, 1990 and 2015

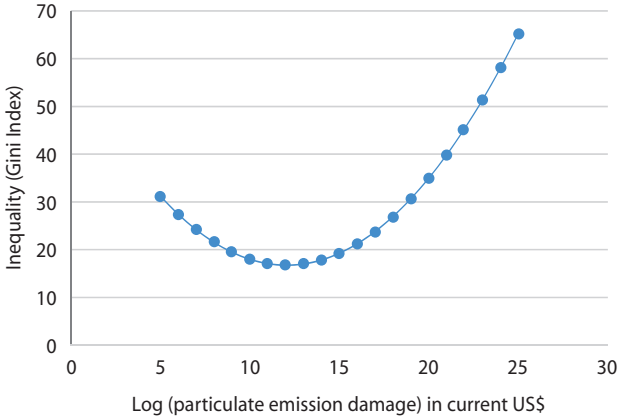


Source: Lange, Wodon and Carey eds. (2018).

The regression analysis builds on studies such as the Lancet Commission on pollution and health.[11] High levels of particulate emission damage imply that air quality has worsened beyond an acceptable threshold, indicating that air pollution is fast becoming a major environmental problem within countries.[12] The results clearly show that as air pollution exceeds certain thresholds it significantly increases levels of inequality within countries.

The relationship between the two variables is illustrated in Figure 3.5. The U-shaped curve suggests that at lower levels of particulate emissions damages inequality falls with a rise in pollution. However, this relationship turns out to be positive once aggregate PM2.5 emissions cross a threshold, suggesting a sharp rise in inequality is associated with increases in damage from particulate emissions.

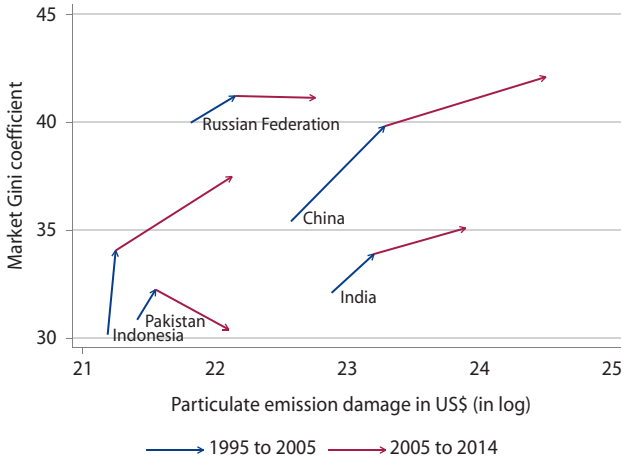
Figure 3.5 Inequality and environmental degradation, within countries



Source: ESCAP illustration of relationship between inequality and particulate emission damage, as shown in the regression analysis in Annex 1.3.

Figure 3.6 plots the observed variations in the Gini coefficient and particulate emission damage between 1995 and 2005 and from 2005 to 2014 in the five countries that experienced the highest damage from particulate emissions in the Asia-Pacific region in 2014. As predicted by the regression results, spikes in particulate emission damage were associated with increases in income inequality, with the exception of Pakistan and the Russian Federation between 2005 and 2014.

Figure 3.6 Income inequality and particulate emission damage in selected Asia-Pacific countries, 1995-2005 and 2005-2014



Source: ESCAP calculation using data sources described in Annex 1.3.
Note: These five countries experienced the highest level of particulate emission damage in 2014, among Asia-Pacific countries for which Gini coefficients were also available.

Further disaggregated evidence from within countries supports the transmission mechanism mentioned earlier; that poor and disadvantaged groups are the most exposed to environmental degradation. A study in Shanghai examined the causes of mortality in different socioeconomic groups and found that death from cardiorespiratory diseases, which are closely linked with exposure to air pollution, was more likely among residents with low educational attainment (illiterate or only educated to primary school level) compared with those with high educational attainment (having attended middle school or above).[13] A recent review of air pollution assessments in India showed several examples of higher levels of exposure for low-income households compared with those with higher median incomes.[14]

Studies in cities in Viet Nam found that respiratory illnesses were twice as common in low-income households as in high-income ones.[15] A study of China's Jiangsu province found that townships with a higher percentage of rural migrants (a disadvantaged group due to their lack of formal residency in urban areas) are more likely to be exposed to higher levels of air pollution.[16] This adds another dimension to the findings of chapter 2, where access to various opportunities was positively associated with educational attainment in the household. It confirms that circumstances (such as the educational attainment of a parent) over which one has no control often determine opportunities, as well as outcomes.

Apart from differences in exposure to pollution, there is also a disparity in peoples' ability to protect themselves. Studies in China of households' demand for face masks and air purifiers (which have become status symbols in some places) have confirmed these differences: high-income groups are much more likely to own air purifiers, which are more expensive than masks and much more effective.[17]

The analysis underscores the need to systematically study the impact of pollution on low-income households and to identify ways to reduce their exposure. The 2018 Asia Pacific Clean Air Partnership Joint Forum highlighted several solutions to improve air quality in the region ranging from technological solutions to regulatory reforms involving diverse stakeholders.[18] The findings of this section imply that these solutions to tackle air pollution can have the co-benefit of reducing inequalities, providing additional incentives for their implementation.

3.3 UNEQUAL IMPACTS OF NATURAL RESOURCE DEGRADATION

All societies are inextricably linked to the natural world, but the connections are deepest and most obvious for rural households, smallholders, forest-dependent communities and artisanal fishing villages. There is evidence that income inequality between households is lower among rural households that rely on income derived from forests and agricultural land.[19] Marine and coastal ecosystems in the Asia-Pacific region have also traditionally provided economic, social, environmental and cultural value to society and played a part in maintaining income inequality at relatively low levels. However, patterns of natural resource use are changing drastically due to urbanization, industrialization and changes in consumption choices. For example, calculations show that urban expansion will result in a 1.8-2.4 per cent loss of croplands by 2030, with Asia suffering the highest absolute loss of cropland area.[20] This section explores how overuse and degradation of natural resources can have significant implications for inequality among countries and within them.

3.3.1 Natural capital and inequality among countries

The "natural capital" of a country is the value of its stock of natural resources, which underpins development and survival. Various attempts have been made to measure natural and human capital, which arguably provide a richer account of the true wealth of nations than that of traditional GDP. This section uses the measure of natural capital estimated by the World Bank,[21] which provides an internationally comparable measure of natural capital of countries from 1995 to 2014.[22] Specifically, the focus is on the renewable component of natural capital, namely, forests, agriculture land and protected areas. This renewable component of natural capital can be increased in value by measures such as increasing the forest cover, protected areas, promoting alternate higher value of existing forests in the form of eco-tourism, improving of crop-yield and bringing more land into productive use.

Natural capital comprises of close to 47 per cent of the asset of low-income countries, and even in low-middle income countries it comprises of about 27 per cent.[23] How countries use their natural capital and transform it into other forms of capital such as human capital and created capital, and the rate at which this happens determines their development pathway.

Researchers have been able to more comprehensively map the flow of natural resources across the world economy to determine the true "material footprint" of countries. In the Asia-Pacific region, high-income countries have a material footprint more than double the size of their low-income counterparts.[24] This alludes to the fact that the over-exploitation of natural resources in developing countries is often driven by consumption demand in richer countries. Some resource-rich developing countries are also forced by market pressure to use their natural capital at a much faster rate than can be supported by their macroeconomic and institutional capacity.[25] As a result, developing countries often bear the disproportionate negative externalities of natural resource use and over-exploitation. This can lead to conflicts related to control and management of resources, which can further weigh on economic growth and worsen between-country inequality.

3.3.2 Natural capital and inequality within countries

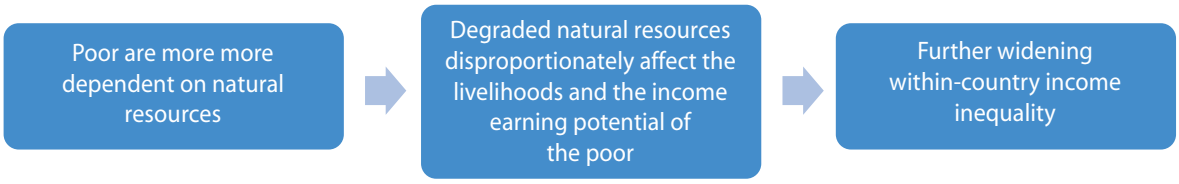
When natural resources are over-exploited, poor people who depend on them for their livelihood are usually disproportionately affected. The loss of earnings and opportunities feeds into rising inequality within countries, as illustrated by Figure 3.7. Overall, as the value of renewable natural capital available per capita declines it can contribute to an increase in income inequality within countries.

The cross-country regression model in Annex Table A.1 is also used to estimate how natural resource degradation affects inequality. The results show that as the availability of renewable natural capital expands in countries, income inequality seems to decrease. Conversely, income inequality rises within countries as their natural capital is exploited.

As shown by the case study from Indonesia (Box 3.1), the ecological impacts of loss of natural capital such as forests can be extensive. Figure 3.8 contrasts the variation in forest capital (a component of renewable natural capital) in Indonesia, along with variation in the Gini coefficient during 1995-2014. There were significant losses in renewable natural capital per capita arising from forests in the periods from 1995 to 2005 and from 2005 to 2014, with a total reduction amounting to 22 per cent of the value of forest capital in 1995. The fall in forest capital per capita was associated with a substantial increase in the Gini coefficient in this period, as predicted by the regression analysis.

The empirical analysis underscores that in countries that experience a high rate of reduction of different components of natural capital, the resulting natural resource degradation and subsequent loss of ecosystem services can be an important mechanism that

Figure 3.7 Mechanism of transmission of impact of natural resource degradation on inequality within countries



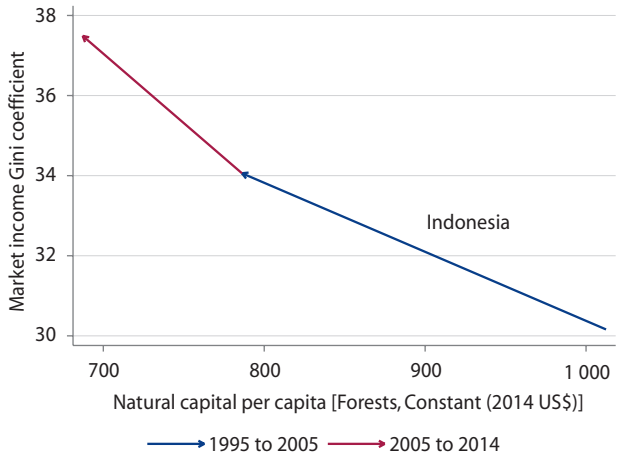
Box 3.1 Ecological impacts of palm oil expansion in Indonesia

The expansion of palm oil cultivation in Indonesia provides a sobering example. Between 2000 and 2012 the country lost an estimated 0.84 Mha of primary forest each year, amounting to more than 6Mha, and significantly outpacing deforestation rates in Brazil; half of this forest loss has been attributed to palm oil expansion. The loss to biodiversity has been devastating, as a single hectare of rainforest harbours more than 200 species of plant, more than 60 per cent of which are endemic. Converting forests to palm oil plantations results in the loss of large amounts of carbon from biomass and from the disturbed soil. In particular, drainage of peat swamps for oil palm establishment is associated with extremely high CO2 emissions when organic matter that has accumulated over millennia is allowed to decompose.

Wildfire smoke is a major source of air pollution that adversely affects human health and productivity in South-East Asia. Despite regulations against land-clearing fires, "slash and burn" agriculture is a common occurrence in the dry season. Wildfire smoke can cause respiratory and cardiovascular disease and even death. In addition to devastating health effects, wildfires have adverse economic effects. Closed businesses, schools and limited transportation can bring economies to a halt, and the effects of fires spread far beyond the geographic region where they originate. Pollutants from agrochemicals associated with palm oil production (fertilizers, pesticides, and rodenticides) have harmful impacts on terrestrial and aquatic ecosystems. Palm oil mill effluent, which is microbially digested in open ponds, often overflows into waterways during heavy rains. The use of dangerous herbicides and pesticides also directly affects the health of workers who handle these chemicals.

Source: Petrenko et al (2016)

Figure 3.8 Transition of value of natural capital per capita (from forests) and market Gini in Indonesia, 1995-2014



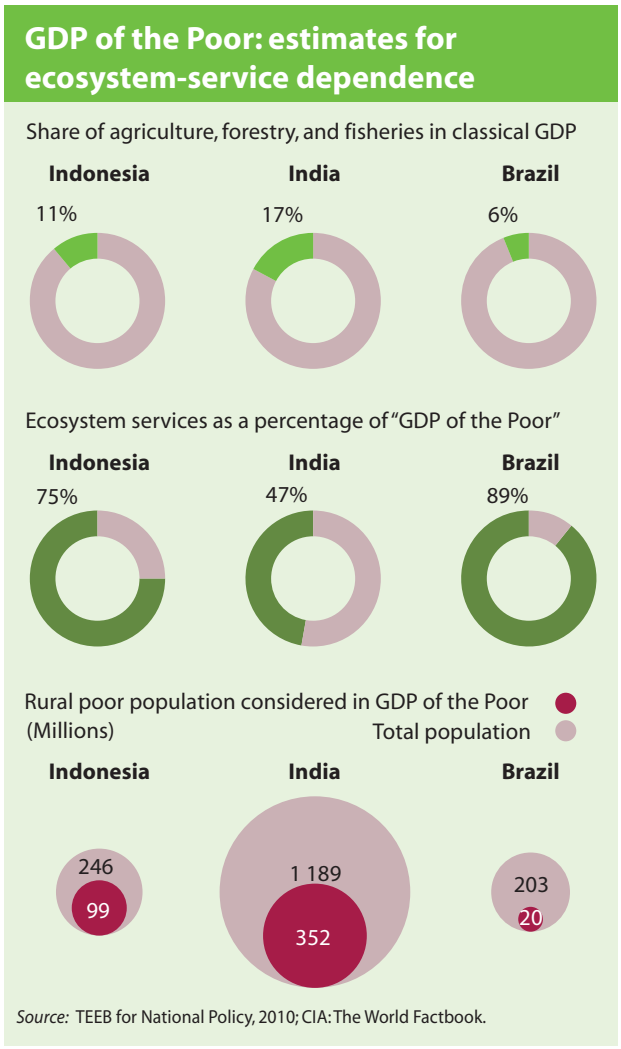
Source: ESCAP calculation using data sources described in Annex 1.3.

exacerbates inequality within countries. However, the existing measures of natural capital management of countries are rather incomplete. For example, as of now they do not capture the value of marine/fishery resources or the value of numerous other ecosystem services such as protection from natural hazards, ensuring water cycles, preserving biodiversity and ensuring carbon storage. We do not yet have accounts of ecosystem services that low-income rural households often depend on in practice, and there is also a scarcity of studies looking at multidimensional poverty and ecosystem services.[26]

Ample evidence supports the transmission mechanism presented earlier in this section. The 2005 Millennium Ecosystem Assessment pointed out that resource exploitation, such as deforestation, often has skewed distributional effects – benefiting certain groups while leaving the rural poor worse off. Indigenous peoples are a particularly vulnerable group, as their traditional ways of life are completely entangled with their natural environment. An estimated 481 to 579 million people in Asia and the Pacific are considered forest peoples.[27] Traditional indigenous territories, which contain around 80 per cent of the planet's biodiversity, even though they encompass up to 22 per cent of the world's land surface, are under serious threat of deforestation, agricultural and industrial expansion and uncontrolled fires.[28]

The unequal distribution of land further contributes to the vulnerability of many households and communities across the region. For example, around 55 per cent of Indonesia's farmers rely on less than half a hectare, while less than a quarter of small-scale farmers in Cambodia have land titles.[29] In Bangladesh, around 75 per cent of the rural population consists of landless labourers or marginal farmers owning less than 0.2 ha of land.[30] Estimates suggest that ecosystem services and other non-marketed goods make up between 50 and 90 per cent of the total source of livelihoods among poor rural and forest-dwelling households, which can be termed as the "GDP of the poor" (Figure 3.9). Natural resources and associated ecosystem services therefore have significant implications for the reduction of multi-dimensional poverty and inequality.[31]

Figure 3.9 Estimates for ecosystem-service dependence



Note: Created by GRID-Arendal, available at: http://www.grida.no/resources/8133

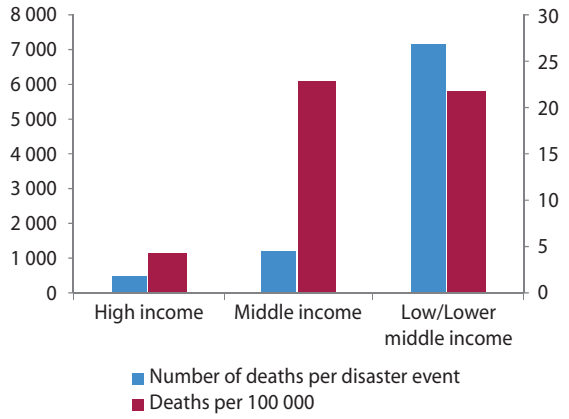
3.4 UNEQUAL IMPACTS OF CLIMATE CHANGE AND NATURAL DISASTERS

From shifting weather patterns that threaten food production and livelihoods, to rising sea levels, the impacts of climate change are already being felt across the Asia-Pacific region. Often the poorest and most disadvantaged communities face the greatest impacts, which adds to the urgency of introducing policies that drastically reduce greenhouse gas emissions. The section below discusses the implications of climate change and natural disasters to both inequalities between and within countries.

3.4.1 Climate change, natural disasters and inequality among countries

The Asia-Pacific region is more exposed to the impacts of climate change than other world regions. Six of the 10 countries most affected by climate change in 1996-2015 are in Asia.[32] Furthermore, in 2017 the region accounted for 43 per cent of all registered disaster events and 68 per cent of all fatalities.[33] The impact of disasters on human lives is very unevenly distributed, with mortality rates from "disaster events" four to five times higher in low- and middle-income countries than in high-income countries (Figure 3.10).

Figure 3.10 Deaths per disaster event and per 100,000 inhabitants, by country income group, 2000-2015



Source: ESCAP (2017g) based on data from EM-DAT database.

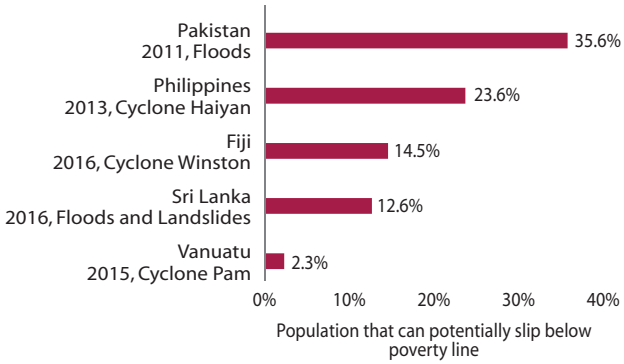
While the estimated economic losses from climate hazards in rich countries are much higher than in poorer ones in absolute numbers, the relative economic impact on low-income countries is dramatically higher – losses representing 5 per cent of GDP in low-income countries compared with 0.2 per cent in high-income ones.[34] This disproportional economic damage is clearly hampering development efforts in low-income countries, especially in sectors such as agriculture and marine resources. Other climate impacts, such as water scarcity, severe heat waves and increased incidence of malaria and dengue fever, also affect low- and middle-income countries disproportionately, worsening inequality among countries.

3.4.2 Climate change, natural disasters and inequality within countries

Disasters can lead to widening disparities in income. Data from 19 countries in the Asia-Pacific region point to a positive relationship between the number of disasters a country has faced and its income inequality levels.[35]

Figure 3.11 shows that up to 35 per cent of the population in the affected areas was likely to fall below the poverty line as a result of the disaster. These findings highlight the vulnerable situation of the large numbers of people in the Asia-Pacific region categorized as "near-poor". The powerful tropical cyclones that have

Figure 3.11 Impact of recorded disasters on poverty rates, selected Asia-Pacific countries, 2011-2016



Source: ESCAP (2017g) based on the ESCAP statistical database and country post-disaster damage assessments.

devastated parts of the region in recent years are reminders of the challenges many vulnerable communities and municipal authorities face.

Insurance clearly plays a key role in enabling people, businesses and institutions to recover from natural disasters, but access to it varies enormously. In 2013, for example, 67 per cent of the economic losses from natural disasters in the United States were insured, while the corresponding figure for Asia was just 7.6 per cent.[36] Access to services such as insurance and banking is improving across the Asia-Pacific region, but it remains the privilege of wealthier citizens in many countries.

Women and children in low-income households are disproportionately affected by disasters and by slow-onset impacts of climate change.[37] Stunted children are disproportionately found in households belonging to the poorest 40 per cent of the population, and their mothers almost always have lower education levels. Poor, crowded urban communities are often located on marginal land that is vulnerable to floods and landslides. People who spend longer periods working outdoors or have limited access to water or air conditioning are inevitably most at risk from heat waves, which are becoming increasingly frequent in parts of the region. Malnutrition further contributes to the susceptibility of low-income groups to heatwaves.[38]

3.5 ENVIRONMENTAL INEQUALITIES AND CONFLICTS

Competition over natural resources can lead to, intensify or sustain violent conflict, especially if resources are owned or controlled by a small group. On the one hand, a rich endowment in natural resources generates revenue streams that can be channeled into sustainable development, reducing income inequalities and hence alleviating the potential for conflict. On the other hand, the exploitation and mismanagement of natural resources can deepen poverty and social inequality, exacerbating impacts of climate change and conflict. Inequality in natural resource ownership, coupled with weak political institutions, creates self-perpetuating negative cycles that can be very difficult to break.

In the Asia-Pacific region the following places and practices have been identified as at risk from natural resource-based conflict: a) The use of freshwater and freshwater ecosystems in the Mekong, Amu Darya, Syr Darya, and Ganges river basins as well as the Aral Sea; b) Air pollution from forest fires in South-East Asia; c) Access to energy resources in the South-China Sea; d) The energy-water-food nexus in Central Asia and e) intra-State, local-level conflicts related to foreign investments in the mining and agro-industry.[39]

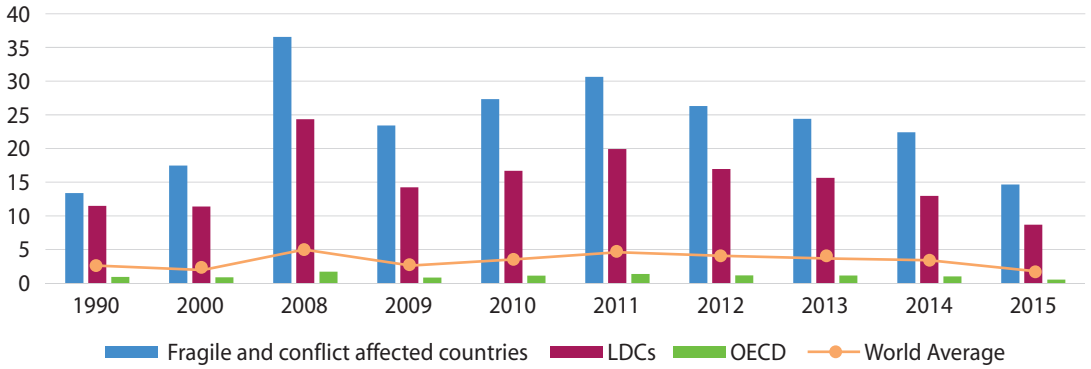
Globally, at least 40 per cent of all intrastate conflicts are assessed as having a link to natural resources in the last 60 years.[10] Furthermore, different types of commodities can correlate with conflict in different ways. For example, oil and other reserves can be associated with a higher risk of conflict while "lootable" commodities such as gemstones can prolong conflict[41] by feeding illicit financial flows and promoting practices that institutionalize inequality.[42] Global estimates of illicit financial flows show that the problem is significant and widespread and poses particular problems for poor, institutionally fragile and resource-rich countries.[43] Figure 3.12 illustrates the clear connection between increased dependence on natural resource rent and fragility and conflict in countries.[44]

Natural resources provide an important basis for rural livelihoods. Consequently, resource scarcity coupled with poverty, inequality, insecure land tenure and imbalances of power all heighten the risk of conflict. Examples include illegal land acquisitions that displace local communities, and energy developments (such as in the Mekong River) that have impact on biodiversity, land-use patterns and, consequently on rural livelihoods. Indigenous peoples have also faced significant hardship in the face of agricultural investment linked to the production of palm oil in South-East Asia.

These factors can, according to the environmental change and violent conflict theory, trigger conflicts of differing types: "simple-scarcity" conflicts due to declining levels of natural resources; "group-identity" conflicts due to large population movements caused by environmental stress; and "deprivation" conflicts due to socio-economic deprivation from environmental scarcities. While the theory does not apply to all conflicts, it is worth studying its implications in the context of the Asia-Pacific region in more detail.[45, 46]

ESCAP analysis suggests that conflict occurrence is cyclical, with variations that could be weekly or seasonal,

Figure 3.12 Natural resources rents as percentage of GDP



Source: World Bank, World Development Indicators, accessed 2017.

and linked to anthropogenic activities that influence weather cycles and climate patterns. Furthermore, communities in conflict-affected areas tend to be less resilient. Worse is that among the poor, conflicts disproportionately constrain their adaptive capacity and choices. Similarly, community members affected by disasters are more likely to engage in conflict. In these circumstances, inequality across societies can widen quickly. It has therefore become a matter of urgency to recognize that, in addition to more conventional peace-building approaches, climate adaptation and disaster risk reduction are entry points for preventing conflict. In situations where conflict is based on competition for scarce resources, better management of natural resources, combined with climate change adaptation, must be channeled into non-violent resolutions.

3.6 CONCLUSIONS AND RECOMMENDATIONS

The key message of this chapter is that environmental degradation (pollution, exploitation of natural resources, natural hazards and climate change) and related conflicts disproportionately impact the poor and disadvantaged (as well as poorer countries) and can exacerbate inequality of opportunity and outcome both within and among countries. The analysis specifically showed that, within countries, the damaging effects of air pollution can exacerbate inequalities, while conserving and expanding natural capital is associated with reduced inequality. Therefore, it is paramount to recognize the critical role of the environment in efforts and policies that tackle inequality and ensure development is inclusive.

Effective actions need to reflect national and local circumstances, but, with that in mind, the following are some specific policy directions to consider:

Address unequal impacts of air pollution

- While taking action to reduce pollution, make focused efforts to protect vulnerable groups, especially children, older persons and residents of areas with low socioeconomic status.

- Enhance city planning and zoning to reduce exposure to pollution. Seek to separate residential areas from polluting industries and major roads. Establish green corridors and wedges in the cityscape, and ensure that many streets are tree-lined.

- Strengthen capacity for pollution monitoring and disclose such data in real time to the public, using ICT and other channels. Consider that pollution levels vary across cities, implying a need for multiple monitoring stations to cover the full range of neighbourhoods. Partner with local universities to develop more comprehensive monitoring campaigns. Educate citizens about the relationship between air quality and health, including awareness of protective measures.

- Map out the sources of pollution, especially in poorer neighbourhoods. Use the mapping to enforce regulations on emissions to proactively apply the polluter-pays principle, with adequate measure to increase compliance, reduce corruption and channel funds generated towards resilience-building among vulnerable groups.

- Facilitate the switch to cleaner energy sources in households in order to reduce the burden of indoor (and outdoor) air pollution. Electrification, based on renewable sources, should be promoted wherever possible. Subsidy schemes for the poor can facilitate the uptake of household equipment using cleaner energy. Regulations, awareness campaigns and social marketing will also be needed for enhanced effectiveness.

- Make basic health-care services accessible and affordable to all, as highlighted in chapter 2, and establish regular health screenings in neighbourhoods with low socioeconomic status, especially in schools.

Reduce vulnerabilities to climate change impacts and help improve resilience

- Channel more financial resources for climate change adaptation directly to local communities and civil-society organizations that are rooted in local realities. Provide targeted agricultural extension services to those relying on marginal land and other climate-sensitive lands for their livelihoods.
- Ensure that disaster preparation drills reach also disadvantaged communities and involve especially vulnerable groups, such as women, children, elderly, people with low education, and those with disabilities. Develop evacuation plans and build storm shelters in rural areas likely to be affected by strong cyclones.
- Protect and restore coastal forests that can lessen the combined impact of sea-level rise and storms. Seek opportunities to create green jobs by involving rural poor in such projects.
- Prevent informal settlements in flood-prone urban areas by creating opportunities for affordable housing in safer locations, in line with SDG 11.1.
- Facilitate access to insurance for low-income communities. One way to take action in this area is by joining and supporting the InsuResilience Global Partnership, which has been endorsed by G20, V20, and G7, and which was officially launched in November 2017 at the UN Climate Conference COP23 in Bonn.
- Provide adequate assistance to the growing number of climate migrants/refugees. Take steps towards providing climate migrants the same legal status and right to protection as other refugees. International cooperation, including on financing and in the form of reformed rules for international resettlement, is needed to help secure the livelihoods of these groups.

Secure access to environmental systems as livelihood resource

- Speed up efforts to formalize land ownership, while respecting traditional forms of ownership and use rights, such as collectively managed commons.
- Improve access to justice to help subsistence-oriented communities defend the resources they rely on for their livelihoods and continued existence. Consider establishing special courts for resolving conflicts over land and other natural resources.
- Strengthen mechanisms for social and environmental assessments of large-scale investments in agriculture, and involve local communities in the decision-making process.
- Reduce and reform government subsidies for large-scale fishing, reflecting not only sustainability of fish stocks but also impacts on small-scale coastal fisheries. Support the establishment of a Conservation Treaty for the High Seas.

Cross-cutting actions

- Generate disaggregated data systems and conduct more systematic research, especially in developing countries, to deepen understanding of how environmental hazards impact the poor and disadvantaged groups (as identified in chapter 2). Such research would help deconstruct inequalities that exacerbate vulnerability to natural disasters and reinforce environmental degradation and its impacts.
- Policy processes and decision-making, at all levels should be strengthened to ensure effective participation of women. Instruments to capture sex-disaggregated data should also be in place to reveal the contribution of women to all sectors of economy. Sex-disaggregated data will also be critical in devising ways to harness women's agency to reduce the disproportionate environmental impacts on the poor and disadvantaged communities.
- Incorporate the right to a clean, safe and healthy environment in national constitutions. Although constitutional provisions do not guarantee good environmental stewardship, they provide opportunities for all citizens, regardless of social status, to demand protection from environmental hazards through the judiciary system. Ensure that all citizens have access to justice, with special attention to marginalized groups. Support international efforts to formally include the right to a clean, safe and healthy environment as one of the human rights, in the form of a legally binding treaty.

While environmental degradation aggravates inequalities, and climate change is set to accentuate the impact of existing inequalities, many people are looking to technology to provide the solutions of the future that will help manage risks and asymmetric impacts. The following chapter reviews the impact that technology has had so far in shaping inequalities – and its prospective role in reducing or further aggravating inequalities of outcome, opportunity and impact.

ENDNOTES

[1] See Koop and Tole (2001); Holland et al. (2009); Islam (2015).
[2] Dorling (2017).
[3] Clapp and Dauvergne (2011).
[4] See Evans and Kantrowitz (2002); Jerrett (2009); Boyce (2017).
[5] See Schoolman and Ma (2012); Pant et al. (2016).
[6] Mannucci and Franchini (2017).
[7] Landrigan et al. (2018).
[8] Word Health Organization (2016).
[9] Landrigan et al. (2018).
[10] Particulate emissions damage is the damage due to exposure of a country's population to ambient concentrations of particulates measuring less than 2.5 microns in diameter (PM2.5), ambient ozone pollution, and indoor concentrations of PM2.5 in households cooking with solid fuels. Damages are calculated as foregone labour income due to premature death. See more details on the variable: http://databank.worldbank.org/data/reports.aspx?source=2&type=metadata&series=NY.ADJ.DPEM.CD
[11] Landrigan et al. (2018).
[12] The existence of 'threshold effects' of environmental degradation, is well recognized in the ecological literature. See http://www.openness-project.eu/sites/default/files/SP_Thresholds.pdf
[13] Kan et al. (2008).
[14] Pant et al. (2016).
[15] World Bank (2006).
[16] Schoolman and Ma (2012).
[17] Zheng, Sun and Kahn (2015).
[18] Asia Pacific Clean Air Partnership (2018).
[19] Chhetri, Larsen and Smith-Hall, C. (2015).
[20] Bren d'Amour et al. (2016).
[21] Lange, Wodon and Carey eds. (2018).
[22] It comprises energy (oil, gas, hard and soft coal) and minerals (10 categories), agricultural land (cropland and pastureland), forests (timber and some non-timber forest products), and terrestrial protected areas. Natural capital is measured as the discounted sum of the value of the rents generated over the lifetime of these assets.
[23] See table ES.1, Lange and Carey eds. (2018)
[24] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017h)
[25] Lange, Wodon and Carey eds. (2018).
[26] Suich et al. (2015).
[27] Forest Peoples Programme (2012).
[28] World Bank (2008).
[29] Genetic Resources Action International (GRAIN) (2015).
[30] Government of Bangladesh (2008).
[31] Suich et al. (2015).
[32] Kreft et al. (2017)
[33] Munich RE (2018).
[34] United Nations, Department of Economic and Social Affairs (DESA) (2016b).
[35] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017g).
[36] Impact Forecasting 2014
[37] Asian Development Bank (ADB) (2017).
[38] Intergovernmental Panel on Climate Change (IPCC) (2012).
[39] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017d).
[40] United Nations Environment Programme (UNEP) (2009).
[41] Ross (2004).
[42] Organisation for Economic Co-operation and Development (OECD) (2016c).
[43] Worlds Bank (2016b).
[44] Organisation for Economic Co-operation and Development (OECD) (2016c).
[45] Homer-Dixon, Thomas (1994).
[46] Kaplan (1994).


for Healthy & Beautiful Life

Chapter 4

Technology and Inequalities

4.1 HOW CAN TECHNOLOGY IMPACT INEQUALITY?

The relationship between technology and inequality is multifaceted. Technology has enhanced productivity, accelerated economic growth, enabled knowledge and information sharing and increased access to basic services. However, it has also been the cause of inequalities. This chapter examines the role of technology across the three facets of inequality discussed in the previous chapters: inequality of outcome; inequality of opportunities; and inequality of impact, which is concerned with the impact of environmental hazards on the most vulnerable.[1]

The chapter starts by underlining that digital connectivity is a core enabler of the emerging Fourth Industrial Revolution – a wave of highly disruptive innovations that will bring new big ideas and trigger additional layers of technological innovations that compel a rethink of all traditional responses, as societies, communities and even what it means to be human, is challenged. These future impacts cannot be underestimated. While digital innovation and the spur of the Third Industrial Revolution helped accelerate economic growth through the competitive participation of the Asia-Pacific region in the global supply chain, a number of low-income countries lagged behind and did not benefit equally from the digital revolution. Therefore, as frontier technologies go mainstream, a key policy concern given the speed, scale and depth of the changes ahead, is that the "digital divide" will amplify the "technology divide" and widen inequalities, across all three of its dimensions, and between subregions, countries and people. [2]

Technology, together with the opportunities provided by trade and investment for capital accumulation and productive transformation, has helped achieve an unprecedented level of economic growth in Asia and the Pacific, enabling several countries to catch up with developed nations. However, least developed countries (LDCs) and countries with special needs have not been able to build technological capabilities and are lagging behind.

The potential of technologies to reduce inequality in opportunities is vast but is not automatic. It largely depends on the capabilities of the poor to access and use technologies and solutions that respond to their needs. Technologies also play a critical role for reducing the impact of environmental degradation and disasters, which disproportionately affect the poor.

Policymakers seeking to ensure that technology contributes to, rather than undermines, equality face challenging questions:

- What role has technology played in creating and addressing inequality, in terms of income,

opportunity and environmental impact in Asia and the Pacific?

- How will future technologies potentially reshape trends in inequalities in the region?

The rest of the chapter aims to answer these questions and provides policymakers with recommendations to ensure that technology as a means for implementing the Sustainable Development Goals (SDGs) reduces rather than accentuates inequality. A key message is that among the combination of enabling factors that are needed, public policy is key. Technologies and solutions need to respond to the needs of the poor, who need to be empowered to access and use such technologies.

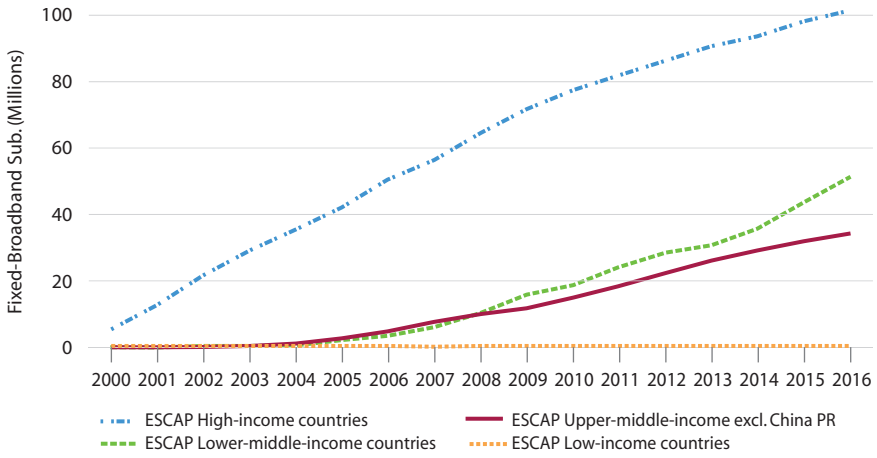
4.2 DIGITAL DIVIDE AND INEQUALITY

As the Third Industrial Revolution has evolved, information and communications technologies (ICT) emerged as a meta infrastructure – an infrastructure that reconfigures all other infrastructures into smart systems that accelerate socioeconomic development. More importantly, today as the Third Industrial Revolution morphs into the Fourth Industrial Revolution with the Internet of Things (IoT) at its core, artificial intelligence (AI) – that is machines performing cognitive, human-like functions – has emerged as the next technological frontier of sustainable development. As AI goes mainstream, its disruptive impacts are likely to be seen at an unprecedented speed and scale, which underlines the need for governments and stakeholders to discuss and shape their collective future.

Frontier technologies are based on huge quantities of real-time data, which are themselves critically dependent on high-speed (broadband) Internet. The existing lack of broadband connectivity across many Asia-Pacific countries means that the uptake, adoption and development of AI and other technologies will continue to be uneven.

Analysis of fixed (wired) broadband subscriptions across the region points to a widening digital divide, with an increase in coverage and quality in high-income countries (Figure 4.1). In 2016, in 18 low-income countries in the region, less than 2 per cent of the population had access to fixed-broadband– a level that has remained unchanged for nearly two decades.[3] This stands in sharp contrast with fixed-broadband subscriptions in East and North-East Asia, where it ranged between 22 and 41 per cent (Figure 4.2). Clearly, the digital revolution bypassed many countries in the region, many of which may also be bypassed by the Fourth Industrial Revolution.

Figure 4.1 Total fixed-broadband subscriptions by income group in 2000-2016, excluding China



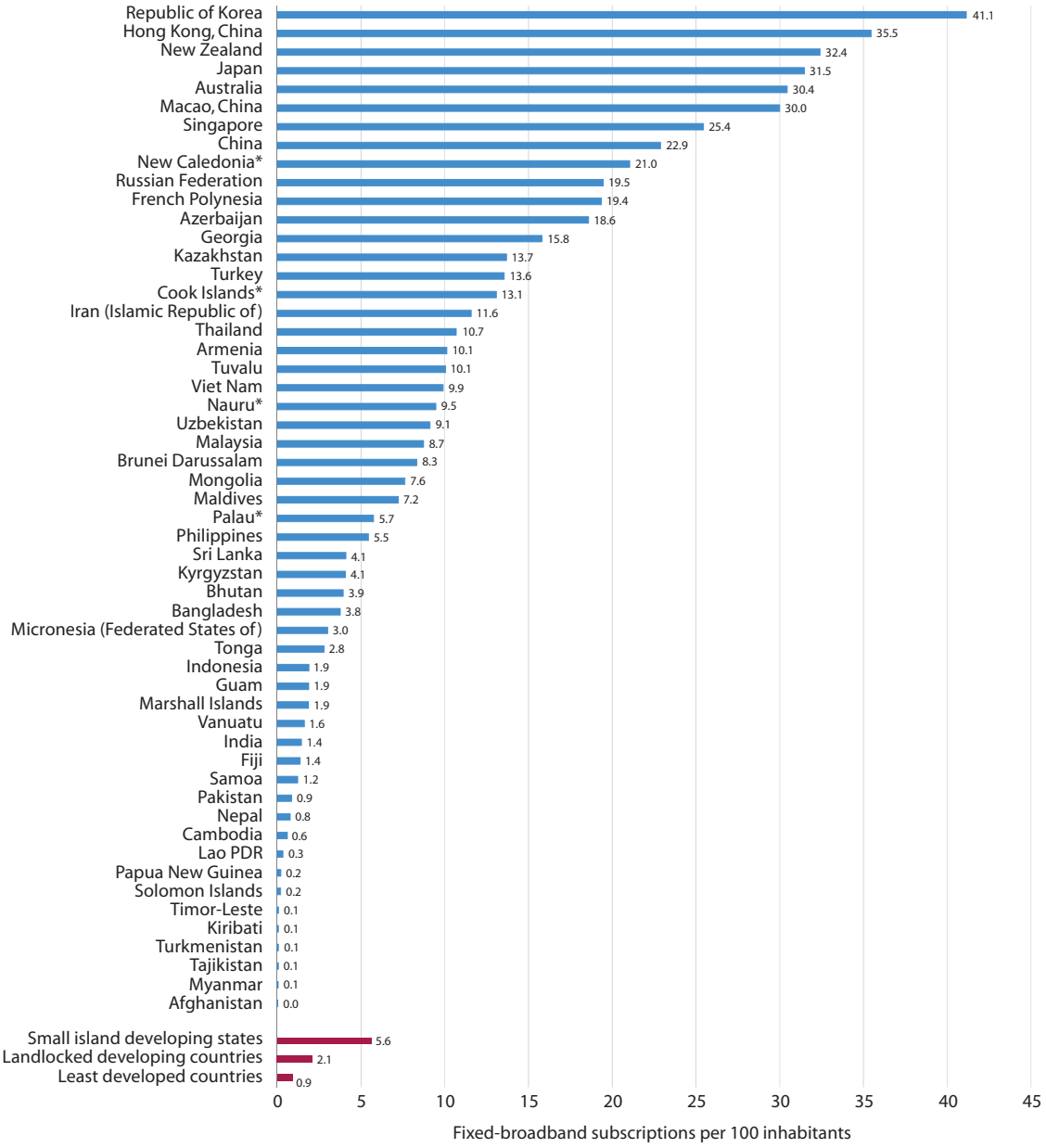
Source: ESCAP, based on data from ITU World Telecommunication/ICT Indicators Database (accessed July 2017).

A digital divide also exists within countries – between urban and rural areas and between men and women – driven by the availability, affordability and reliability of broadband services.[4]

The conditions, prerequisites and drivers of AI development and uptake show a positive correlation between the quantity of AI on the one hand, and market size, capacity for technology absorption and investment in ICT services on the other hand.[5] Thus the return on investment in AI is likely to be significantly greater among countries with a high capacity for technology absorption – a characteristic that tends to reflect inequalities accumulated in the past.

If current trends continue, AI and other frontier technologies may further increase income, opportunity and impact inequalities and widen development gaps among countries and people by providing transformative opportunities to those with the requisite

Figure 4.2 Fixed-broadband subscriptions in the Asia-Pacific region (percentage), 2016



Source: ESCAP, based on data from ITU World Telecommunication/ICT Indicators Database (accessed July 2017).
Note: * Countries with latest data available.

infrastructure, access, investments and knowledge, while those without are left further behind. The nature of each of these dimensions is analysed in the following three sections.

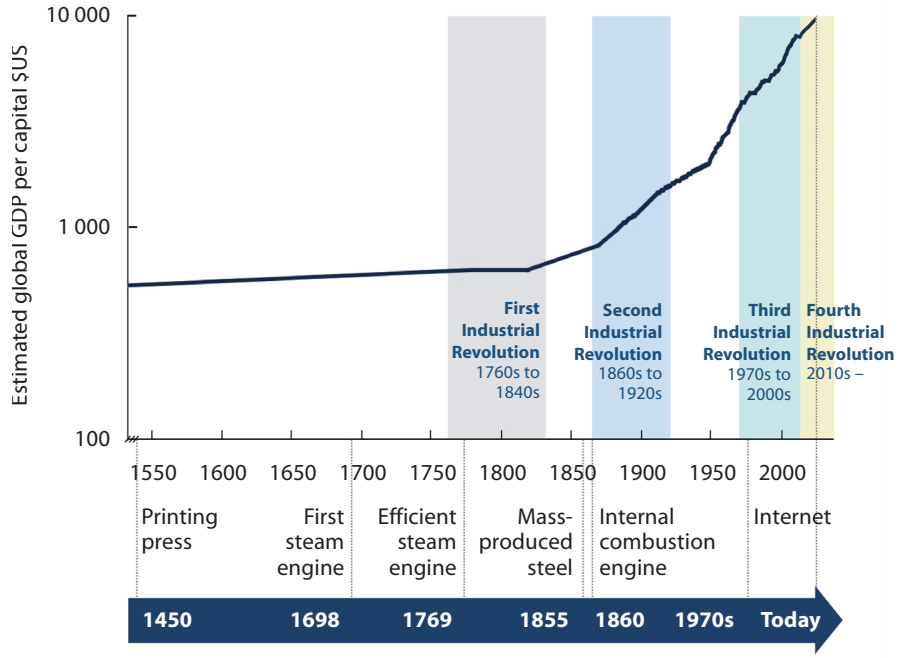
4.3 TECHNOLOGY AND INEQUALITY OF OUTCOME

The role technology plays in income and wealth inequality is complex and contested. Technology is a key driver of aggregate economic growth, through productivity improvements, but its contribution to economic growth varies greatly across countries. Technology can also be a driver of income and wealth inequality because of its skills-bias nature and because innovators can capture high rents. This section explores these dimensions, as supplemental to the drivers of inequality explored in previous chapters.

4.3.1 Technology as a driver of economic growth

Technology is considered fundamental to sustaining economic growth. The harnessing of water power, followed by the invention of an efficient steam engine in 1769, played vital roles in the First Industrial Revolution, which drove economic development in Europe. The internal combustion engine arguably sparked the Second Industrial Revolution, while the third has been driven by computers and the Internet (Figure 4.3).

Figure 4.3 GDP per capita growth and technology



Source: Adapted from "Disruptive technologies: Advances that will transform life, business, and the global economy," McKinsey Global Institute, May 2013, p. 24." The figure was derived from Angus Maddison, "Statistics on world population, GDP and per capita GDP, 1–2008 AD," the Maddison Project database. Data for 2008-2016 is GDP per capita (constant 2010 US$), from World Bank national accounts data (Available at: https://data.worldbank.org/indicator/NY.GDP.PCAP.KD)
Note: the graph is on a log scale—the actual slope of the line after World War II is much steeper than visually depicted.

Technologies and, more broadly, innovation are central to long-term growth because of their impact on productivity. Technological capabilities, that is a country's capacity to acquire, absorb, disseminate and apply modern technologies, are thus fundamental to maintain broad economic growth.[6]

Quantifying the contribution of technology to productivity or economic growth is challenging, contested and approximative at best. It is challenging because technology is interwoven with other drivers of productivity and singling out its unique role is seldom straightforward. It is contested because multiple methodologies are used to evaluate its impact.[7] Total factor productivity (TFP), an aggregate measure of productivity first introduced by Solow (1957), has been the traditional measure of economy-wide technological change.[8] TFP is the portion of output not explained by the amount of inputs used in production, and represents how efficiently and intensely the inputs are utilized in production[9]. Changes in TFP can be explained both by technology changes and by non-technological innovation. It is approximative at best because of the difficulties in measuring inputs and outputs.[10]

The economic growth trajectories of the more advanced economies (including China, Japan and the Republic of Korea) have been sustained by technological capabilities.[11]

Accelerating economic growth in the LDCs and countries with special needs is key to reducing income inequalities in the region, but most of these nations are hampered by low technological capabilities. The extent of technological inequalities among countries broadly depends on three factors: investment in technological development, overall national capacity to innovate and the availability of ICT infrastructure. Regarding investment in technological development, 16 countries in the region (half of those surveyed) spent less than 0.25 per cent of GDP on R&D in 2015 (Table 4.1).

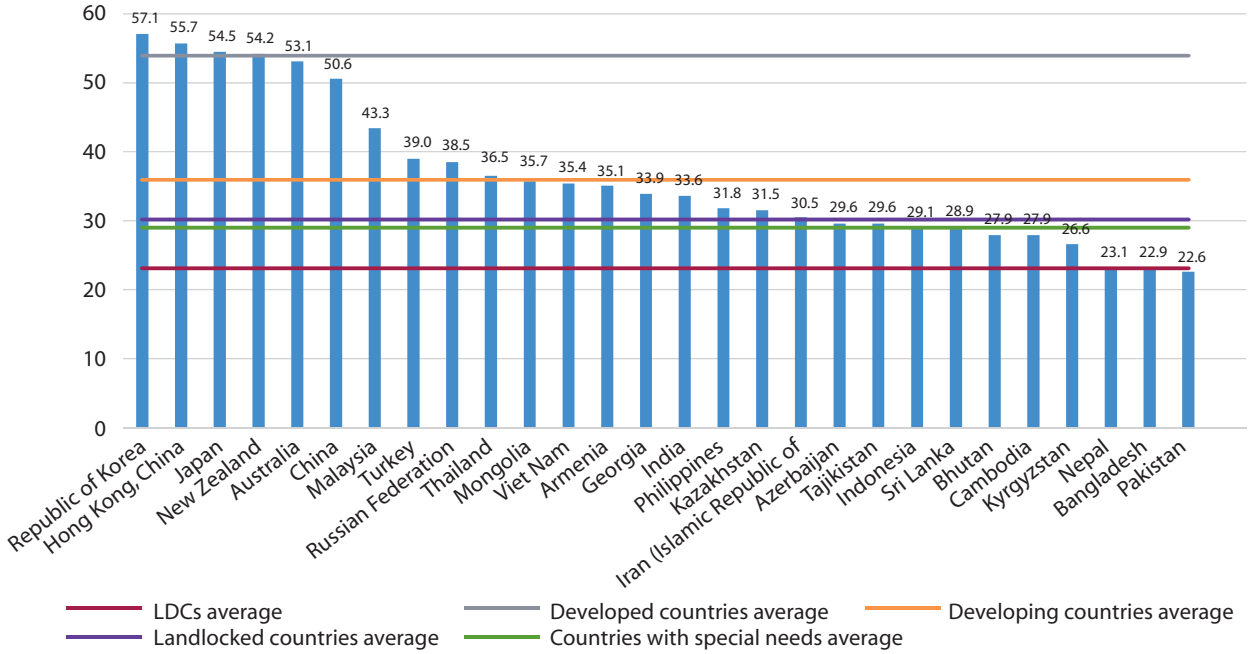
Regarding the overall capacity to innovate, including through non-technological innovation activities such as the reorganization of production processes or organizational improvements, among the LDCs in the Asia-Pacific region, Bhutan and Cambodia perform best in the Global Innovation Index (GII), but their scores are still well below the average for developing countries (Figure 4.4). Reasons for innovation weakness among LDCs and other countries with special needs include the low absorptive capacity of firms, weaknesses in knowledge generation (basic research capacity) and diffusion (limited vocational and STEM education and weak linkages between academia and industry). Weak framework conditions (where governance and market weaknesses inhibit FDI and curtail business activities), along with poor infrastructure (energy, transport and telecommunications) also constrain the development of technological capabilities.[12]

Table 4.1 Gross domestic expenditure on R&D in the Asia-Pacific region, 2015 or most recent year available, percentage of GDP

Republic of Korea	4.23	Thailand	0.63	Mongolia	0.16
Japan	3.28	Viet Nam	0.37 (2013)	Philippines	0.14 (2013)
Australia	2.20 (2013)	Iran (Islamic Republic of)	0.33 (2012)	Macao, China	0.13
Singapore	2.20 (2014)	Georgia	0.32	Cambodia	0.12
China	2.07	Nepal	0.30 (2010)	Kyrgyzstan	0.12
Malaysia	1.30	Armenia	0.25	Tajikistan	0.11
New Zealand	1.15 (2013)	Pakistan	0.25	Sri Lanka	0.10 (2013)
Russian Federation	1.13	Azerbaijan	0.22	Indonesia	0.08 (2013)
Turkey	1.01 (2014)	Uzbekistan	0.21	Lao PDR	0.04
Hong Kong, China	0.76	Kazakhstan	0.17	Brunei Darussalam	0.04 (2004)
India	0.63	Myanmar	0.16 (2002)		

Source: UNESCO, Institute for Statistics Data Center (accessed January 2018).

Figure 4.4 Global Innovation Index, Asia-Pacific countries, 2016



Source: Global Innovation Index. Available from: https://www.globalinnovationindex.org/analysis-indicator (accessed January 2018).
Note: Overall GII score, computed as the simple average of the Input and Output Sub-Index scores

The absence of basic technological capabilities (especially in terms of digital infrastructure and skills) will limit the ability of these countries to access, use and develop frontier technologies. Regulatory frameworks for AI and frontier technology also need to be in place before the digital divide becomes unbridgeable. This is important because automation may prove to be a double burden by reducing employment in manufacturing, but opportunities to develop technological capabilities, given also by limiting the role of the manufacturing sector as a vehicle for technological learning.[13]

4.3.2 Technology and its effect on jobs and wages

The adoption of technologies can sustain competitiveness. However, technology also affects the composition and nature of jobs available as well as relative wages. Jobs are being created and destroyed all the time and the net effect of technology on aggregate employment is ambiguous. Labour-augmenting technology can complement workers and increase their productivity.[14] Labour-saving technology (e.g. automation) can, on the other hand, substitute workers for machines in certain tasks. It can give rise to different jobs too. Empirically, the fears of massive unemployment have proven unfounded especially in the long term. Although unemployment may increase in the short-to-medium term because of the frictions in labour markets, technological changes have empirically shown small negative effects on long-term employment levels, and even positive effects in some cases.[15]

Regarding the effects of technology on the composition and nature of work, automation and robotic technologies tend to favour non-routine cognitive tasks

while they are reducing demand for manual work. Robotics and AI tend to augment the tasks of high-skilled professionals such as engineering, customer-problem solving, management, medical diagnosis, software development, etc. New technologies also have the capability to take over routine tasks, for example manufacturing assembly and back-office work, which fall under the middle-skilled category.[16] As a result, automation can create employment polarization by "hollowing out" jobs in the middle of the employment distribution. Evidence is extensively documented in developed countries, such as the United States and the European countries.[17] In Asia-Pacific economies, the share of "middle-skilled" jobs in overall employment has been shrinking. China is an exception due to the growing mechanization in agriculture, which has led to an increase of routine jobs (Figure 4.5). Most of the economies that experienced a fall of middle-skilled jobs saw the share of high-skilled jobs increasing. However, the rise in high-skilled jobs was only able to offset the fall in middle-skilled jobs in three countries: Bhutan, Kazakhstan and Pakistan. This unbalanced shift in the composition of job markets can translate into rising income inequality as high-skilled workers will see higher wages while low-skilled workers will have to compete with displaced middle-skilled workers.

Figure 4.5 Changes in employment share by skill type, selected Asia-Pacific economies, annual average, 1995-2012

Source: ESCAP's compilation, using data from World Bank (2016).

Looking forward, the region can expect further job displacement. As labour costs in developing economies increase, tasks that can be automated will return to developed countries.[18] This trend could reduce the opportunity not only to create more jobs but also for industrialization and technological upgrading strategy based on labour-intensive manufacturing. Countries such as India, which aims to increase manufacturing value added to 25 per cent by 2020, from 16 per cent in 2015, could be affected.[19]

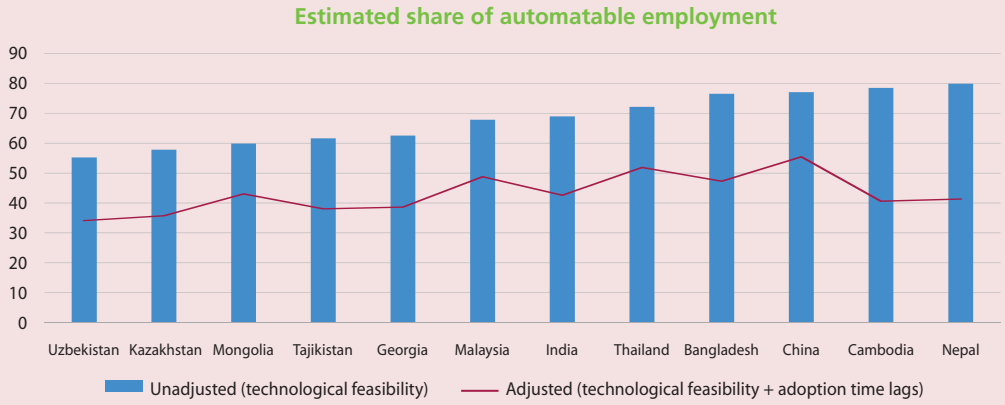
Technically, the share of jobs at risk of automation is high (Box 4.1). However, for now, robot deployment remains mostly confined to the manufacturing sector as automation in Asia and the Pacific is moderated by lower wages and slower technological adoption.[20] AI is considered to be the most important general-purpose technology in the new era and is expected to have the deepest impact, permeating all industries and playing an increasing role in daily life.[21] Research on AI is advancing quickly, but its application for most developing countries remains largely at a nascent stage.[22] Nevertheless, countries need to consider policies (regulatory and others) that would help them prepare for this technological change.

Empirical data on the impact of technology on income inequality across Asia and the Pacific is scarce. A recent study shows that the skills premium has been declining or stagnant in recent years in some countries, including Indonesia, Pakistan and the Russian Federation, and that there is a positive relationship between the skills premium and income inequality as measured by the Gini coefficient (Figure 4.6).[25]

Box 4.1 Automation and risk of job displacement

About half of all the activities people are paid to do globally, amounting to 1.2 billion workers, could potentially be automated by adapting currently demonstrated technologies.[23] The World Bank estimates that up to two-thirds of all jobs are susceptible to automation in the developing world. In the Asia-Pacific region the risk of jobs being automated is also high: 785 million workers or 51.5 per cent of total employment in the region.[24]

The share of automatable employment varies among countries and sectors, depending on the nature of the workforce and their tasks. Vulnerability to automation, based on technological feasibility, is estimated to range from 55 per cent in Uzbekistan to nearly 80 per cent in Nepal.



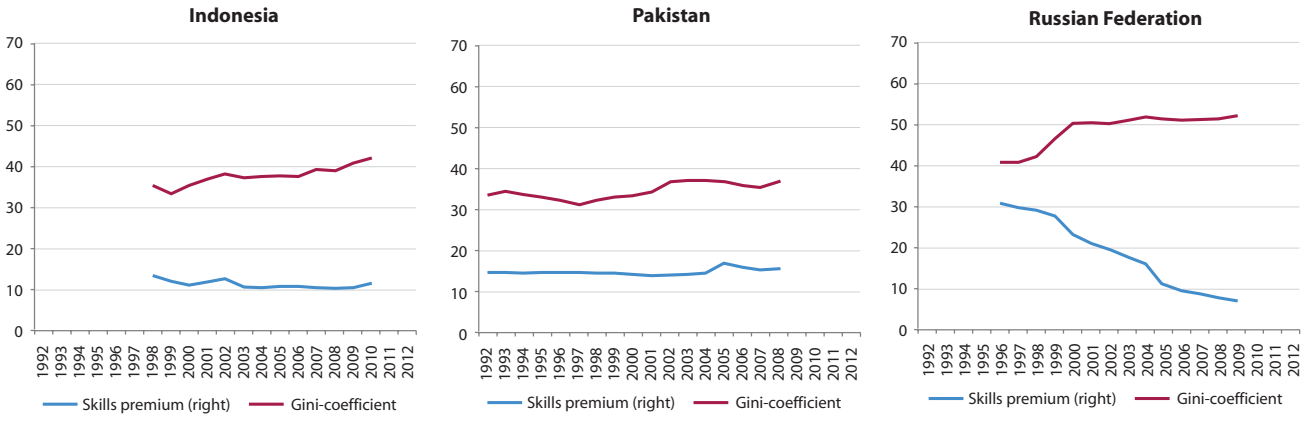
Source: ESCAP's compilation using data from World Bank (2016).

Similarly, findings from a firm-level survey for ILO by Chang et al. (2016) suggest that automation might have a significant impact on the job security of salaried workers in five major sectors of ASEAN economies: automotive and auto parts; electrical and electronics; textiles, clothing and footwear; business process outsourcing; and retail (from 60 per cent to 89 per cent, depending on country and sector). Additionally, based on data from MGI, 68 per cent of accommodation and food services jobs of major Asia-Pacific economies are technically automatable.

However, the automation effects are moderated by lower wages and slower technology adoption. UNCTAD (2017b) indicates that, for now, robot deployment has remained limited in manufacturing, especially in the textiles, apparel and leather sectors, which are particularly relevant to LDCs. Adjusting for adoption time lags reduces the estimates share of susceptible automation by half for Cambodia and Nepal.

Sources: Chang et al. (2016), MGI (2017), UNCTAD (2017b) and World Bank (2016).

Figure 4.6 Skill premium in selected Asian countries, percentage



Source: UNIDO (2016), p.114.

4.3.3 Capture of technology rents impacts inequality

Increasingly, the impact of technology on inequality has been associated with the generation of economic rents and rent-seeking behaviour. The economic rent (defined as excess income such as monopoly profits or unearned benefits emanating from preferential regulation) is not a new phenomenon. However, it is now argued that financial globalization, digitalization and the rise of frontier technologies are the enabling environments for rent-seeking that cause extreme, long-lasting and deepening inequality.[26] In the absence of global regulatory frameworks, globalization has accentuated the spread of digital companies and platforms as unregulated monopolies. These powerful monopolies influence the political process and tilt the rules in their favour, allowing them to capture a disproportionate share of the national income. Therefore, whenever a regulatory capture is allowed to persist, (extreme) inequality is not an unexpected unfortunate economic outcome, but rather a policy and governance failure to deal with the excesses of regulatory lobbying.[27]

Technology rent-seeking companies combine at least three types of rent sources. The first is linked to ownership of intellectual property, mostly patents.[28] The second is an ability to "force" customers to buy bundled products or services together, normally linked to the existence of monopoly power and high market concentration and coexisting with regulatory capture. [29] The third is network externalities, where consumers draw value from other consumers using the same product or service, such that the company that manages to get a critical mass of consumers tends to attract many more of them. The rise of online platforms (such as Alibaba, Amazon, Facebook, Google or Baidu) are perhaps the best example of network externalities.

Credit should be given to individuals and their talent and knowledge for making the digital world possible, but the extreme wealth based on rents should be shared with those who helped create it. While the knee-jerk reaction to a discussion concerning distribution is, in general, to impose taxes, a host of other policies can be effective in ensuring long-term fair solutions. Competition or anti-trust policies need to be the responsibility of an independent public entity to prevent it from capture by the vested interest groups. Furthermore, consumers might be given ownership rights to their own data streams, while those contributing to the creation of intellectual property (IP) should share royalty revenues. Labour laws could be revised giving more protection to workers, not jobs, so that they also benefit from the rents they generated.

To conclude, technology may drive income inequalities among countries, given the limited technological capabilities of LDCs, and between different types of workers given shifts in the nature of work, the skills-biased nature of technology and through the capture of rents.

4.4 TECHNOLOGY AND INEQUALITY OF OPPORTUNITIES

Under the right policy environment, the potential for technologies to reduce inequality in opportunities is vast. Technology innovation has contributed to major breakthroughs in providing the poorest with access to basic services. Solar home technologies have provided access to electricity to millions of households in Bangladesh, while providing job opportunities to 140,000 people.[30] Digital technologies have enlarged access to education and training, including to world-leading universities, through massive open online courses (MOOCs). Online e-commerce platforms have enabled small producers to sell their products worldwide and develop new markets in rural areas. In China, for example, more than 1,300 "Taobao villages" produce goods amounting to more than US$1.5 million each in annual trade.[31] In India, a technology-based financial inclusion system has provided financial access to 1.2 billion people in just six years (Box 4.2). Furthermore, technologies can support movements for democracy and social justice. The #metoo social media campaign against sexual harassment and assault has given a voice to women across the globe.

Technology offers considerable opportunities, but rewards are not guaranteed. For lower-income and other vulnerable groups to see benefits, research suggests that at least three conditions are necessary:

1) The availability of ICT infrastructure

ICT infrastructure is a prerequisite for knowledge-enhancing and content-rich applications, including online payments. Fixed-broadband Internet is required for more advanced applications. Inequalities in the availability of such infrastructure have widened as advanced countries developed rapidly (Figures 4.1 and 4.2).

2) Skills to identify and use technologies

Skills development is a second pathway to address growing inequalities, particularly in universities and institutes of higher learning (IHL).[32] Skills and knowledge acquired at IHL should be able to help address challenges associated with sustainable development, by providing applications and solutions focused on reaching the poor in remote rural areas and delivering services and information that narrow various forms of inequalities.

Examining the leading academic programmes of technology and computer science/engineering in five countries, namely Cambodia, India, Republic of Korea, Sri Lanka and Thailand, showed that some of the leading universities lacked affordable, reliable and adequate connectivity, which is the basis of science and technology education and research.[33] A lack of employment opportunities in Cambodia, for example, meant that ICT graduates were forced to work as taxi drivers. The study found that the required education goes beyond skills development and now encompasses cross-disciplinary, problem solving and critical thinking aspects, which are not widely available among the surveyed programmes. The ratio of women studying technology was found to be worryingly low – below 35 per cent in all surveyed countries.

3) Opportunities to access technologies that address the needs of low-income groups

Technologies available today do not necessarily respond to the needs of low-income and vulnerable groups. They are often developed by profit-seeking firms and naturally respond to the needs of more affluent markets. Policymakers can take multiple approaches that support the development of technologies and innovation solutions that respond to the needs of vulnerable groups, for example, the adoption of mission-oriented policies or system-wide transformations that address complex developmental challenges such as financial inclusion or renewable energy, financing social-problem research programmes or taking measures that promote grassroots innovations (Table 4.2).

Table 4.2 Approaches that promote technologies addressing the needs of low-income groups

Mission-oriented policies	**Examples**	**Characteristics**
Set of complementary policies and measures aiming to address complex society challenges	• Supporting financial inclusion in India • Transforming fuel-based energy systems towards renewable energy in China	• Aim to change the direction of technological systems • Focus on diffusion of technologies • Seek the development of radical and incremental innovations • Require leadership from the top, long-term investments and comprehensive policies
Grand challenge competition	**Examples**	**Characteristics**
Seek answers to intractable, complex and priority global health and development problems through crowdsourcing solutions.	• Water abundance XPRIZE[34]	• Incentivizes researchers, engineers or development agents to come up with concrete solutions • High upfront costs • Addressing the challenges may require regulatory changes beyond the sphere of influence of competition organizers
Social-problem research programmes	**Examples**	**Characteristics**
Research programmes that specifically search solutions to development problems	• Republic of Korea's social-problem research programme[35]	• Multi-departmental research projects driven by demand instead of supply • Require joint planning and implementation across different research departments • Require sound participation of civil society and citizens
Promotion of grass-roots innovations	**Examples**	**Characteristics**
Grassroots innovations are driven by groups typically excluded from the innovation process, through projects designed by local communities and/or inventions designed to meet specific local needs	• India's National Innovation Foundation[36]	• These innovations are driven by grass-roots organizations, but governments can also encourage them

Sources: Mazzucato (2017), OECD (2015)

Innovation activities, including the commercialization and transfer of technologies, and policies promoting the adoption and diffusion of technologies are important for ensuring that the poor benefit from technologies.

Market inefficiencies can, however, constrain access to existing solutions. An absence of local suppliers or a lack of access to credit are obvious barriers to the adoption of technologies. In agriculture, a lack of information on

the benefits of certain farming techniques or market failures in land ownership – such as where lack of security of tenure undermines investment in irrigation – can all prevent agricultural technologies from being adopted.[37]

Innovative business and financing models that explore channels to reach the poor are vital. Large corporations have sought to reach poorer market segments through "bottom of the pyramid" business strategies that provide large-scale, low-cost and low-margin products, but their experiences have been mixed.[38]

One of the traditional roles of the public sector has been to address such market inefficiencies through incentives, regulations and support programmes. In the case of agriculture, these have included technology extension services that reduce informational inefficiencies; market development programmes or finance programmes that address the supply of credit.

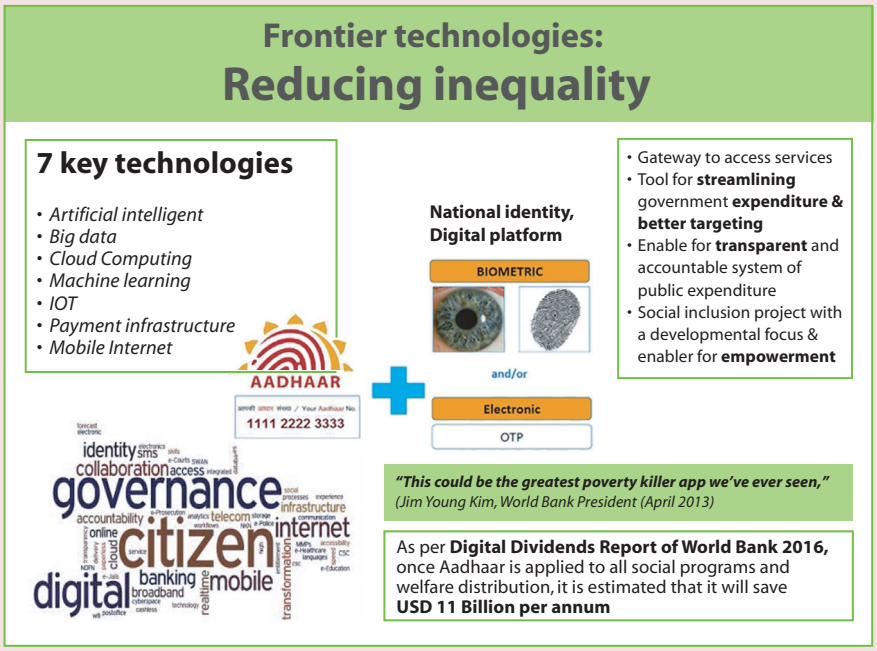
It is important to recognize that the state is not only a market fixer, it can also be a leader. Public policy action can support system-wide transformations that ensure that no one is left behind. Through public investment and procurement policies, governments can influence how technology is developed and diffused to address social challenges.[39] Several countries in the Asia-Pacific region have successfully introduced technologies that provide services to the poor on a large scale. India's technology platform based on Aadhaar biometric identification has, for example, revolutionized access to banking services (Box 4.2).

Box 4.2 Digital Aadhaar: financial services for 1.2 billion people in India

The world's largest digital ID programme, Aadhaar is a unique identification number based on biometric and demographic data issued to 99 per cent of Indian residents. It is linked to a mobile phone number and a low-cost (Jan Dhan) bank account, which facilitates the transfer of direct benefit schemes to the poorest and vulnerable in the fastest and most direct way. To provide incentives for people to use the Jan Dhan bank accounts, and thus for banks to eventually offer financial services to a wider range of citizens, the federal government and state governments are routing certain subsidies and salary payments through this platform. Almost 340 million people have now received direct benefit transfers, saving the Government an estimated US$7.51 billion over three years. As more people use Jan Dhan accounts, banks are piloting new digital financial services.

Key elements of the scheme's success have included: political support at the highest level, a large-scale and systemic approach, "buy-in" from capable private-sector suppliers and planning and building a simple, open, ubiquitous digital identity infrastructure. The project has nevertheless encountered several challenges. Some have been technical glitches and the limitations of the technology but perhaps of more importance has been the political challenge. The legal validity of Aadhaar, for instance, has been questioned on grounds of privacy and security.

Aadhar platform for financial inclusion and direct benefit transfers to the rural poor



Source: ESCAP and STEPI (2017)

4.5 TECHNOLOGY AND INEQUALITY OF IMPACT

The convergence of digital, space and other technologies, combined with advances in material sciences has helped reduce environmental inequalities and mitigate the asymmetric impact of environmental hazards, extreme weather events and disasters on the most vulnerable. Early warning services have proved particularly useful in that regard. Developed countries in the Asia-Pacific region are making great strides in harnessing frontier technologies to provide real-time, location-specific early warning information. AI interacting with high speed digital connectivity, now has the power to combine huge datasets and identify increasingly complex patterns. This data revolution greatly augments human understanding of evolving situations and helps policymakers prioritize actions. Similarly, thanks to innovations at the intersection of technology and science, early warning messages can be sent with ever-increasing lead times and accuracy in situations that cover both slow-onset and acute disasters.

A growing body of evidence is showing that innovative technologies can ease disaster-induced poverty and inequalities. Satellite-technology applications, for example, are helping countries with fragile ecosystems anticipate and respond to climate risks. In Mongolia, large geospatial datasets, disaggregated to district levels, are helping the authorities forecast droughts. By combining this information with detailed maps of poverty and livestock, by province and district, at a given time, it has been possible to identify those herders at highest risk of being affected by localized drought. The cost of mitigation actions such as additional livestock feed can also be calculated. Availability of such information has also helped mitigate the impact that such recurring disasters have on rural-urban inequalities. Other technologies also help anticipate and respond to climate change risks. For instance, in Tamil Nadu, India, traditional water harvesting techniques have been combined with biotechnologies that increase the tolerance of crops to the effects of climate change (Box 4.3).

Box 4.3 Tamil Nadu, India: a climate-risk hotspot

Tamil Nadu in India is exposed to various climate-related risks including cyclones, heavy rainfall, floods, droughts and landslides. The climate-risk assessments, based on high, medium, and low emission IPCC scenarios for the 2030s, 2050s, and 2080s, indicate persistent drought. Furthermore, increased rain at certain times of the year is likely to cause more intense flooding events in areas with increasing numbers of poor and vulnerable people.

Against these scenarios, policymakers have been encouraged to incorporate comprehensive climate-risk management into development planning. This comprehensive approach consists of an innovative mix of indigenous knowledge and advances in biotechnologies such as cultivation of drought-resistant crops.[40] Such applications enable increasingly accurate calculations of the impact of climate change on the agriculture sector with longer lead times.[41]

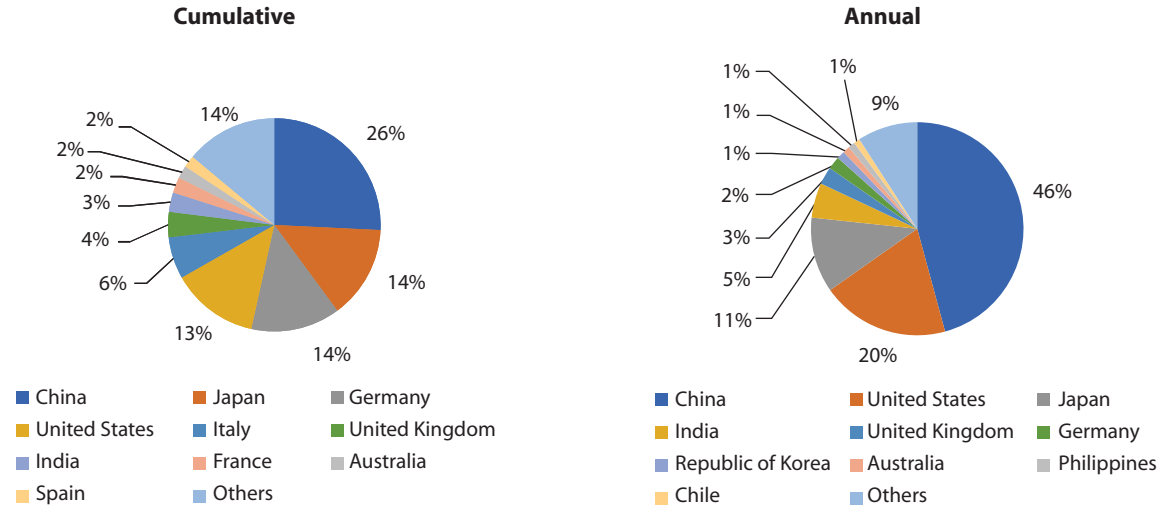
More specifically, traditional water harvesting techniques through percolating tanks have been combined with advances in biotechnologies that increase the tolerance of already drought tolerant crops to climate-change extremes such as increased average minimum and maximum temperatures, extreme heat events, flooding and increased salinity. Marker-assisted selection (MAS) techniques have been used on crops such as chickpeas and groundnuts that are important sources of nutrition in many drought-prone regions. With molecular breeding, a drought-tolerant chickpea variety has produced 10 to 20 per cent higher yield under increasingly variable weather conditions.[42]

Source: *The Hindu* (2016), Eisenstein (2013) and ESCAP (2015c)

The adoption of green technologies is also crucial to limiting air pollution and, given the disproportionate impact of air pollution on the poor (as discussed in chapter 3), to reduce inequalities of impact. For instance, China has made great strides in promoting the national solar industry to reduce the impact of air pollution, to respond to its growing energy needs and to support economic growth. As a result, China's solar photovoltaic (PV) industry has experienced a tremendous expansion since 2011, including significant growth in distributed energy.[43] By 2016, China had the largest installed photovoltaic capacity in the world, accounting for 25 per cent of the world cumulative capacity and contributing nearly half of world additional annual capacity (Figure 4.7). Chinese companies account for around 60 per cent of the world's annual solar cell manufacturing capacity.

The development of China's solar PV manufacturing has contributed to a steep reduction in the global cost of such technologies (between 2008 and 2015, the average cost of solar PV dropped by almost 80 per cent).[44] China's authorities are therefore supporting a global shift in power generation to renewable sources (including wind and hydropower), which will reduce the impact of air pollution for everyone. Nevertheless, coal

Figure 4.7 Installed photovoltaic capacity, top ten countries, 2016



Source: IEA (2017), 2016 Snapshot of Global Photovoltaic Markets.

still accounts for 66 per cent of China's primary energy supply.

Similarly, the Chinese Government is facing immense pressure to create jobs. While investment in renewable energy will help, job creation has not been enough to absorb the capacity cuts in the coal industry. In 2016 it reallocated 726,000 coal and steel workers, and in 2017 it had to reallocate half a million.[45] Finally, the lowering cost of PV solar technologies, has made investments in regions other than the economically poor, but energy-rich northern provinces, more attractive.[46]

4.6 CONCLUSIONS AND RECOMMENDATIONS

The relationship between technology and inequality is multifaceted. Technology has brought equality dividends by enabling productive transformation and rapid economic growth in a number of developing countries across the Asia-Pacific region. Technologies, notably ICT, have brought improved access to basic services such as finance and education, and are preventing and mitigating the environmental hazards that often disproportionately affect the poor. Technology has also widened inequality as countries differ in terms of investments, policy support or technological capabilities, or because technology is skill- and capital-biased and enables rent seeking, or because certain conditions need to be in place for vulnerable populations to benefit from technology, including ICT infrastructure, skills and access to appropriate technology solutions.

Frontier technologies, such as AI, are likely to intensify both the divides and the dividends. New technologies can create and reinforce inequality of outcome and opportunity with an implicit impact on the environment. Frontier technologies are likely to intensify these impacts because technological capabilities are not equally distributed across countries and people in the region. Particularly worrisome is the persistent digital divide in the region. Reliable and resilient broadband networks are often the foundation for developing and using frontier technologies such as AI. However, the lack of such broadband networks in many parts of the region means that AI uptake is and will continue to be uneven.[47]

The impact of technology on inequality is country-specific. Thus, measures aiming at ensuring that technologies do not exacerbate inequalities will vary. As a general guideline, more advanced countries, often early-adopters of frontier technologies, are advised to focus on managing the impact of technological transitions on inequality. The priority for countries with low levels of technological capabilities is to build their technological capabilities to spur economic growth. As countries accumulate technological capabilities, they would need to focus simultaneously on building stronger technological abilities, in particular technological skills, and increasingly on ensuring that technological progress does not translate into increased inequality. The following are the main thrusts of such policies.

1. Investment in ICT Infrastructure development

To address technology-induced inequality in the region, ICT infrastructure, notably broadband networks, must be affordable, reliable and resilient. Where progress has stagnated, such as in many LDCs and countries with special needs, a big investment push is needed. Without this investment in infrastructure there will be no narrowing of the existing digital divide and mitigation of the widening disparities.

2. Address persistent inequalities in technological capabilities

To catch up with more advanced economies, and thus reduce income inequalities among countries, countries with low technological capabilities should consider strengthening technological learning through public policies that should focus on the adoption, adaptation and diffusion of existing technologies rather than on investing in cutting edge R&D. Policies should aim to promote greater learning from trade and FDI, increasing productivity in existing productive sectors, and support the formation and growth of domestic firms, the absorptive capacity of domestic knowledge systems, productive diversification and export upgrading.

3. Promote regional and international cooperation to exploit technology dividends

ESCAP member States, regional and international partners, including donors, could prioritize funding for trans-border broadband infrastructure. In doing so, development can take advantage of existing infrastructure, such as trans-regional power grids, highways and railways. By making broadband infrastructure available in sparsely populated areas (the so-called last mile connectivity, where the business case is weak) the most effective use of government funds could be made in reducing digital inequalities and its knock-on effects on a range of inequalities.

In an effort to increase the availability of affordable broadband connectivity for all, ESCAP has been supporting its member States and partners in the region for the implementation of the Asia-Pacific Information Superhighway (AP-IS).

Regional cooperation platforms can also be helpful in the exchange of expertise and knowledge services that reduce capacity inequalities among countries. For example, ESCAP's well established Regional Space Applications Programme (RESAP) has promoted the exchange of tools between advanced space-faring countries and low capacity, but high disaster risk countries.

As part of the 2030 Agenda, governments have committed to fostering technology development, dissemination and transfer and to the strengthening of scientific and technological capabilities of all countries and have agreed to put in place two global mechanisms: the United Nations Technology Facilitation Mechanism and the United Nations technology bank for LDCs. The implementation of such mechanisms have taken a slow start, largely because of a lack of financial resources, and will require further support from more advanced economies.

4. Anticipate the impact of technologies on jobs and wages

Technology changes may transform the composition and nature of work. Reducing income inequalities within countries requires seeking economic growth paths that minimize the impact of technologies on those in fragile job situations. Policymakers need to anticipate the specific changes that are likely to take place. This preparation requires, for instance, more detailed sectoral studies on which tasks are more likely to be replaced by technology, how labour and wages will be impacted, and the nature of re-skilling that would allow displaced workers to transition to new jobs.

There is also a need to consider the implications for the education sector and ensure that it is better equipped to build the skills required for current and future work. Education policies are the foundation for building technological capabilities and a fundamental element for addressing inequalities of opportunity. However, enhancing human capital is necessary but not sufficient to make economies more inclusive. Social protection policies will also be required to mitigate the impact of labour-replacing technologies (as discussed in chapters 1 and 2).

5. Address technology rents to mitigate their impact on extreme inequality

Taming technology rents and rent-seeking is critical to reining in inequality. However, technology per se is neither the problem nor the solution. Policymakers need to address the conditions that have allowed extreme accumulation of wealth, including enforcing competition laws, strengthening intellectual property protection and bargaining power of workers and consumers.

6. Introduce more inclusive technology and innovation policies

Inclusive technology and innovation policies can help address inequalities. While the market is a key determinant of technology development, governments have influence in the direction of technology change.

Governments can lead with mission-driven policies or system-wide transformations to address a national social or environmental priority. Mission-driven policies are complex endeavours that require leadership from the top, long-term investments, and comprehensive and coherent policies from the supply and demand-side that support the development and adoption of technologies. These are likely to be best suited to high and middle-income economies with solid public-sector capabilities.

Governments may also introduce targeted technology and innovation programmes that address the specific needs of vulnerable populations, such as public research programmes that specifically seek solutions to development problems or the promotion of grassroots innovations.

The governance of technology and innovation policy processes matters for equality. In lower-income countries, governments are advised to give due priority to the building of domestic technological capabilities and, accordingly, allocate the corresponding budget funds. In more advanced economies, there is a need for governance models to integrate and coordinate technological and innovation policies with other economic and social policies and to give voice to a wide range of agents throughout the policy cycle.

ENDNOTES

[1] United Nations, Department of Economic and Social Affairs (DESA) (2015).

[2] The most promising and potentially the most disruptive emerging technology trends are, according to (OECD, 2016b): big data, the Internet of Things, artificial intelligence, additive manufacturing, nano/microsatellites, neurotechnologies, synthetic biology, nanomaterials, advanced energy storage technologies and blockchain. All these frontier technologies are dependent on digital infrastructure.

[3] The 18 countries referred to are: Afghanistan, Cambodia, Fiji, India, Indonesia, Kiribati, Lao PDR, Marshall Islands, Myanmar, Nepal, Pakistan, Papua New Guinea, Samoa, Solomon Islands, Tajikistan, Timor-Leste, Turkmenistan, and Vanuatu. See United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017e).

[4] See, for example, data provided by ITU (2017).

[5] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017e).

[6] Metcalfe and Ramlogan (2008)

[7] For a summary of methodologies see Reamer (2014)

[8] Violante (2016)

[9] Comin (2006).

[10] For an overview on current discussions on measuring productivity see OECD (2016a).

[11] See Kingston, (2001); Kozo and Yasukichi (1987); UNIDO (2016); Shi, (2010)

[12] See, for instance, Cirera and Maloney (2017), United Nations Conference of Trade and Development (UNCTAD) (2017a) and UNCTAD (2007).

[13] Rodrik (2015)

[14] The use of software applications in drafting a design, data analysis, accounting are some examples of technology complementing workers.

[15] See, for example, Arntz et al. (2016); Bessen (2015 and 2017); Graetz and Michaels (2015); Lawrence (2017); Ugur and Mitra (2017); Vivarelli (2014).

[16] Jobs for high-skilled workers and low-skilled workers have still not been economically feasible to be automated in a large scale. High-skilled jobs often involve non-routine cognitive tasks (such as managerial tasks and technical specialists). Low-skilled jobs are manual tasks, many of which are non-routine (such as gardening and babysitting). Automating low-skilled tasks in a large scale has also not been economically feasible due to relatively low cost of labour in this segment.

[17] See, for example, Arntz et al. (2016); Bessen (2015 and 2017); Graetz and Michaels (2015); Lawrence (2017); Ugur and Mitra (2017); Vivarelli (2014).

[18] Shih (2013).

[19] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2018g).

[20] UNCTAD (2017b).

[21] See HBR (2017) and PWC (2018).

[22] See, for example, PWC (2017) and MGI (2017b).

[23] MGI (2017a).

[24] Data retrieved from https://public.tableau.com/profile/mckinsey.analytics#!/vizhome/AutomationBySector/WhereMachinesCanReplaceHumans.

[25] UNIDO (2016).

[26] Rent-seeking entails capturing wealth produced by others (rather than by generating any actual economic activity) (Krueger, 1974). An example is lobbying Government to obtain a subsidy.

[27] "Over the past few years, Big Tech has quietly become the dominant political lobbying power in Washington, spending huge amounts of cash and exerting serious soft power in an effort to avoid regulatory disruption of its business model, which is now the most profitable one in the private sector. According to the Center for Responsive Politics, the internet and electronics industry together spent a record US$181m on federal (US) lobbying in 2015 and US$178.5m in 2016, making them the second-largest corporate lobbyist, behind Big Pharma. Alphabet, Google's parent company, is now the tenth-largest individual corporate spender in the country." (Foroohar, 2017).

[28] Patents, while established to serve as an incentive for innovators to innovate, they also prevent others from innovating. Some firms use aggressive patent strategies (such as aggressive litigation, aggressive patenting, acquisition of start-ups merely for their patents), to maintain a monopoly situation and prevent competition.

[29] De Loecker and Eeckhout (2017) argue that the increase in market power (in the US) is consistent with the decline in the labour and capital shares in income, declining wages for low skilled labour, decreases in labour force participation, flows and inter state migration rates, as well as lowering GDP growth.

[30] See United Nations Conference of Trade and Development (UNCTAD) (2017a) and http://www.daily-sun.com/printversion/details/198809/Bangladesh-seeks-IRENA%E2%80%99s-support-for-renewable-energy-dev

[31] AliResearch (2016).

[32] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017e).

[33] Ibid.

[34] Mitchell et al. (2014)

[35] ESCAP and STEPI (2017).

[36] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2016b).

[37] Jack (2013).

[38] Simanis (2012).

[39] Mazzucato (2013).

[40] *The Hindu* (2016).

[41] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2015c).

[42] Eisenstein (2013).

[43] The 12th Five-Year Plan (2011-15) already supported the development of the photovoltaic capacity.

[44] OECD/IEA (2016d).

[45] Reuters (2017).

[46] Zhou and Lu (2017).

[47] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017e).

Chapter 5

A Policy Agenda to Address the Mutually Reinforcing Dimensions of Inequality

The 2030 Agenda for Sustainable Development, which was unanimously adopted by 193 Member States of the United Nations in September 2015, includes strong commitments to reduce various forms of inequality. In addition to Sustainable Development Goal 10, "Reduce inequality within and among countries", the Agenda includes several targets to reduce specific aspects of inequality. Examples include targets on social protection systems for all (1.3), access by all people to food (2.1), universal health coverage (3.8), completion of primary and secondary education by all girls and boys (4.1), ending all forms of discrimination against women and girls (5.1), and universal access to drinking water (6.1) and modern energy services (7.1).[1]

This report has found that income and wealth inequality has increased in Asia and the Pacific over the last two decades and that there are significant gaps in access to education, health care and nutrition, water and sanitation, clean energy, information and communications technology, as well as finance and credit within countries. The report has also found that the impact of natural disasters and environmental hazards, such as air pollution, is unevenly distributed among the population, affecting more severely the poor and the most vulnerable segments of the population. The inequality trends and gaps uncovered by this report pose a serious threat to the successful implementation of the 2030 Agenda.

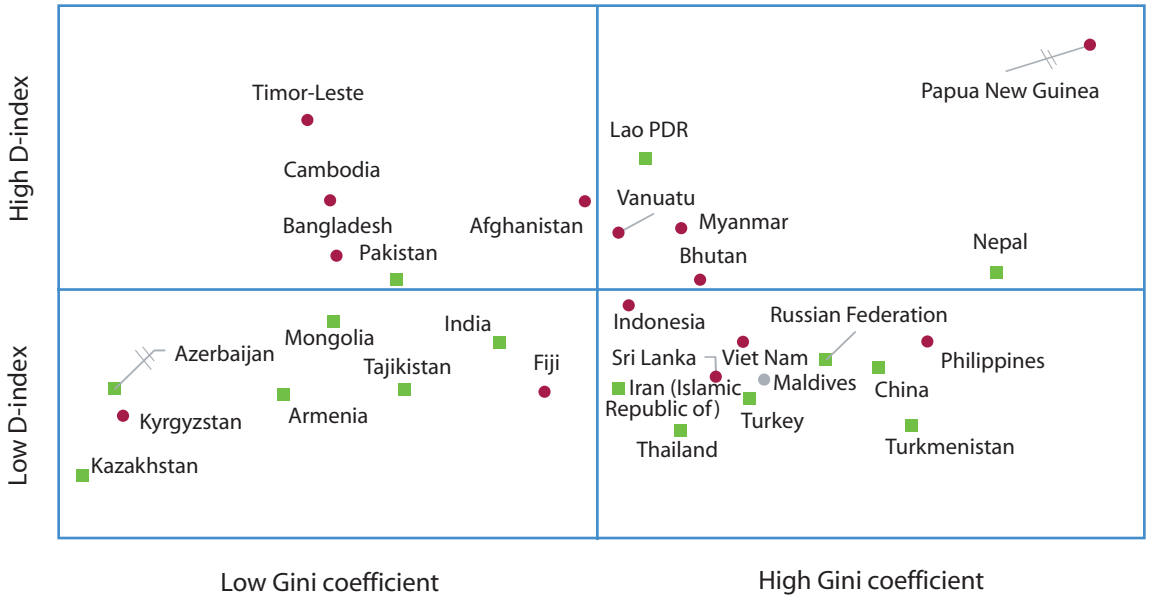
5.1 INTERACTION OF DIFFERENT DIMENSIONS OF INEQUALITY

A novel aspect of this report is its focus on multiple aspects of inequality – of outcomes, opportunities and impacts – and its special attention to the role of technology. While the preceding chapters have considered these forms of inequality separately, the analysis has also shown that different forms of inequality are interdependent and mutually reinforcing. On the one hand, unequal access to opportunities exacerbates inequality of outcomes. On the other hand, unequal outcomes in terms of income and wealth aggravate inequalities in access to health care, education, technology and protection from natural disasters and environmental hazards. Such disparities perpetuate themselves when the wealthy have disproportionate influence over political power and policymaking decisions. Inequalities can also perpetuate over time and over generations if they are driven by prejudice and discrimination against certain groups of the population.

The interaction between inequality of outcome, opportunity and impact varies across the region's very diverse economies as indicated by their position in one of the four quadrants of Figure 5.1. The figure classifies

countries into four groups according to the values of their Gini coefficients and D-indices as well as countries' vulnerability to natural disasters, with green indicating low to medium risks and red indicating high risks.[2] The figure provides a typography of inequality, which is described below.

Figure 5.1 Inequality of outcomes and opportunities, and their relation to vulnerability to natural disasters



Source: ESCAP calculations using data from the latest DHS and MICS for countries in the Asia-Pacific region.
Note 1: D-index values for Azerbaijan, China, Fiji, Islamic Republic of Iran, Nepal, Papua New Guinea, Russian Federation, Sri Lanka and Turkey are interpolated using OLS with data of access to electricity, clean water and safe sanitation in respective countries.
Note 2: The quadrants are split as per average Gini (35.73) and D-index values (0.2) for countries used in the analysis. Red dots and green squares stand for World Risk Index values, with green squares for low and medium risks (0-7.35) and red dots for high risk (7.35+) of disaster.
Note 3: Azerbaijan and Papua New Guinea have been rescaled to improve the graph's clarity.

Group 1: Low Gini, low D (lower, left quadrant)

These countries are mostly in North and Central Asia. Some of them (Kyrgyzstan and Tajikistan) are also low-income countries. Inequalities of opportunity among these countries are generally low because of historically strong provision of universal social protection and basic public services. When these countries became independent in the early 1990s, they suffered a severe economic crisis that led to negative economic growth and steep increases in income inequality. In recent years, many of these countries have managed to also reduce their income inequalities to comparably lower levels, especially Armenia, Kazakhstan, Kyrgyzstan and Tajikistan. All of these countries, with the exception of Fiji and Kyrgyzstan, are fairly resilient to natural disasters.

Group 2: High Gini, low D (lower, right quadrant)

This group consists of mostly upper-middle income countries, such as China, the Maldives, Russian Federation and Turkey, but also some lower-middle income countries, such as the Islamic Republic of Iran, the Philippines and Thailand. Several of these countries, such as China, Indonesia, and Viet Nam, experienced increases in income inequality over past decades, while others saw an opposite development. In general, these countries have prioritized investment in public services and as a result have seen opportunities more equally distributed. Close to half of these countries are also highly vulnerable to natural disasters.

Group 3: Low Gini, high D (upper, left quadrant)

This group includes three countries from South and South-West Asia – Afghanistan, Bangladesh and Pakistan – and two from South-East Asia – Cambodia and Timor-Leste. Four of the five countries in this group are least developed countries (LDCs). All these countries have relatively higher inequality in access to opportunities but lower, albeit often increasing, income inequalities. This is particularly the case for Bangladesh. Some of these countries are transitioning from agricultural-based societies to manufacturing- and services-driven economies. Four out of the five countries in this group are highly vulnerable to natural disasters.

Group 4: High Gini, high D (upper, right quadrant)

This group includes five LDCs plus Papua New Guinea. These countries are transitioning from primarily agriculture-based societies to manufacturing- and

services-driven economies. During this transition, they may experience large increases in income to people engaged in new economic activities characterized by faster increases in labour productivity.[3] At the same time, these countries are also experiencing higher levels of inequality of opportunities because of inadequate investments in people. Specifically, the tax base remains narrow, with more reliance on indirect taxes, often regressive taxes, as opposed to direct and progressive taxation. This, in turn, is adversely affecting the fiscal space to invest in education, health care and other basic social services. Four of the six countries in this group are highly vulnerable to natural disasters.

A commonality across groups is the higher vulnerability to natural disasters by countries with high inequality of opportunities (Groups 3 and 4). This is worrisome because it implies that the most vulnerable and marginalized people in these countries face not only a higher risk of being affected by a disaster but also lower access to basic services, making inequality of impact more severe. Given that impacts of climate change are expected to intensify in the future, it is important to implement policies aimed at increasing the resilience of poor and marginalized people in countries with high vulnerability to natural disasters.[4]

Likewise, it is worthwhile noting that Afghanistan, Bangladesh, Bhutan, China, India, Islamic Republic of Iran, Myanmar, Nepal, Pakistan and Tajikistan record the highest levels to air pollution in the region. [5] While these countries can be found in all quadrants in Figure 5.1, the common threat from air pollution also requires strategies aimed at protecting the poor and the vulnerable as a means to reducing inequality of impact.

Yet another measure of rising environmental risk is the rate of degradation of natural capital. Several developing countries, such as Indonesia, showed deceleration in their growth rates of renewable natural capital in 2010-2014 compared with 2005-2010.[6] In these countries, conserving the renewable natural capital and ensuring growth of natural capital through policies would help in fighting inequalities. The analyses in chapter 3 has clearly shown that the poor are disproportionately more dependent on natural capital and destruction of natural capital contributes to widening within country inequalities.

A final finding from the typography of countries is related to their relationship to the digital gap, measured by the share of the population that has access to fixed-broadband internet services. In Figure 5.2, this variable is depicted as a bubble, with larger bubbles representing greater access.[7] Irrespective of countries' inequality of outcomes, their access to broadband internet services is significantly higher if their inequality of opportunities is low.

Technological advances further complicate these interactions. For example, access to digital technology broadens access to opportunities. Therefore, countries with high access to digital technology show lower levels inequality of opportunities. However, countries with high access to digital technology show both low and high inequalities of outcomes.

5.2 POLICY RECOMMENDATIONS

Policies that aim to reduce inequality in all its forms need to tackle a range of areas, but also to reflect national and local circumstances. Detailed recommendations have been included at the end of each of the previous chapters. With that in mind, the following are eight broad policy directions for consideration, abstracting from the more detailed recommendations found in individual chapters:

1. Strengthen social protection

Social protection policies, including access to health- care services, are central to closing the gaps in access to most opportunities, while also increasing prosperity, resilience and empowerment. Expanding social protection to low-income families through cash transfers, or other income-support mechanisms also tends to have strong multiplier effects, as these groups typically spend their extra income on domestic goods and services.

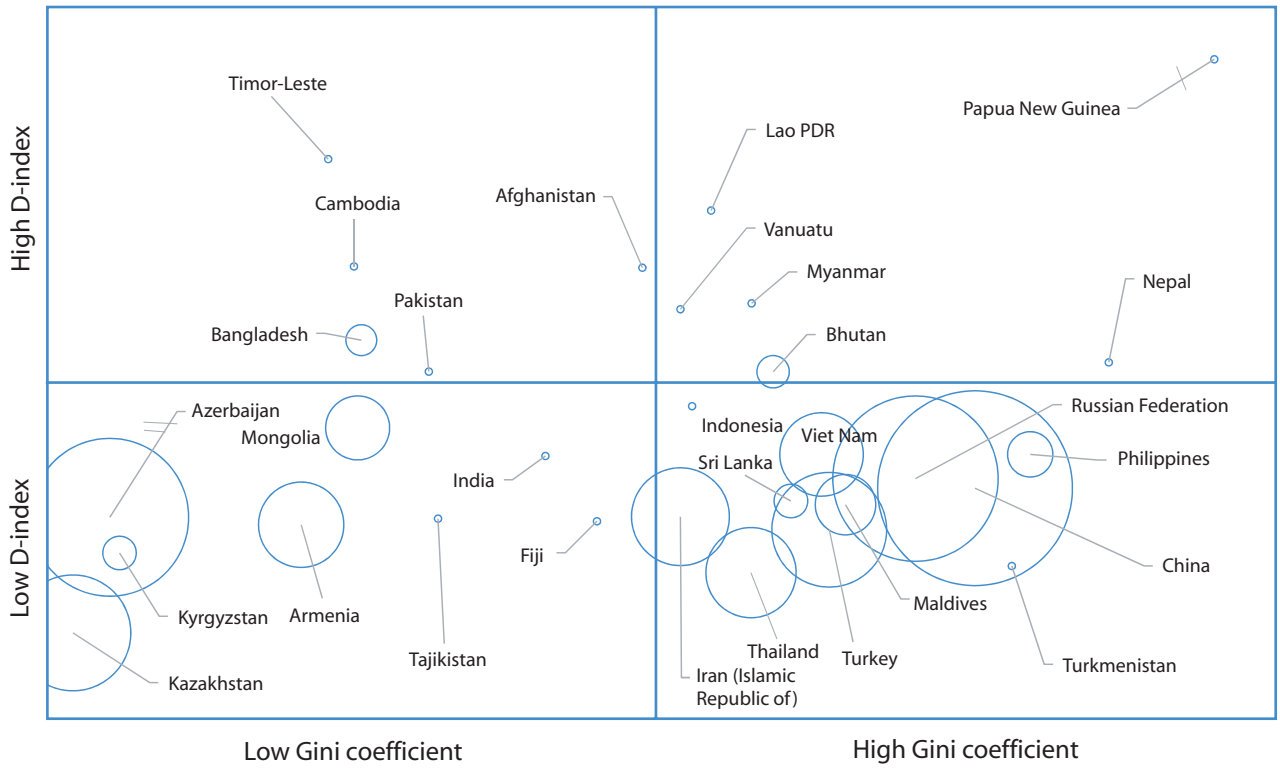
2. Prioritize education

A well-educated population is fundamental for all spheres of development. It is therefore critical for national education systems to encourage higher education attainment and at the minimum improve secondary completion rates by ensuring that it is accessible and affordable for all, including those living in rural areas. Countries where the gap in educational attainment has narrowed, and where overall access is high, should instead focus on strengthening the quality of education by investing in teachers' education and training, school equipment and infrastructure and making sure that current curricula correspond to future labour-market needs to facilitate the school-to-work transition. High quality higher education is also critical for harnessing the potential of technology for inclusive development.

3. Protect the poor and disadvantaged from disproportionate impact of environmental hazards

Targeted policy measures that reduce exposure of the poor and disadvantaged to environmental hazards are important to close inequalities within countries. Such measures could include better urban planning, establishing green corridors and regular health check-ups in schools in poorer neighbourhoods. This is

Figure 5.2 Inequality of outcomes and opportunities, and the digital gap



Source: ESCAP calculations using data from the latest DHS and MICS surveys for countries in the Asia-Pacific region.
Note 1: D-index values for Azerbaijan, China, Fiji, Islamic Republic of Iran, Nepal, Papua New Guinea, Russian Federation, Sri Lanka and Turkey are interpolated using OLS with data of access to electricity, clean water and safe sanitation in respective countries.
Note 2: The quadrants are split as per average Gini (35.73) and D-index values (0.2) for countries used in the analysis. Bubbles stand for the number of fixed-broadband Subscription per 100 inhabitants. Values range from 0.02 per cent in Afghanistan to 22.9 per cent in China. The minimum value for a visible bubble is 1 per cent.
Note 3: Azerbaijan and Papua New Guinea have been rescaled to improve the graph's clarity.

especially relevant in countries with a higher risk of pollution, natural disasters, overexploitation of natural capital and natural resource-related conflicts.

4. Address the digital divide and ICT infrastructure

ICT is a development enabler and a growth sector on its own. The development, application and adaptation of frontier technologies rely largely on the availability of ICT infrastructure and access to it. Thus, addressing the digital divide and developing affordable, resilient and reliable broadband infrastructure is a development priority in Asia and the Pacific. If left unaddressed, inequality could become unbridgeable, with implications for many other areas of development. As broadband development is geography-dependent, regional and subregional cooperation is key to addressing the challenge.

5. Address persistent inequalities in technological capabilities among and within countries

To catch up with more advanced economies, countries with low technological capabilities should consider strengthening technological learning through public policies that focus on the adoption, adaptation and diffusion of existing technologies. To ensure technology does not further exacerbate inequalities within countries, ESCAP member States will need to anticipate the impact of technologies on jobs, wages and markets; and introduce inclusive technology and innovation policies that enable low-income and vulnerable populations to benefit from technology and to participate in innovation activities.

6. Increase effectiveness of fiscal policies

An effective tax system enhances public revenues and facilitates increasing investments in essential services, such as health care, education and social protection. To this end, better and effective governance will be needed to boost overall tax compliance and improve composition and efficiency of public expenditure. Similarly, reforming tax structures to reduce their adverse effects on the poor through progressive taxes on personal income, property and wealth can help prevent excessive concentrations of wealth and power in the hands of a few, ensuring greater equality of opportunity within and across generations.

7. Improve data collection to identify and address inequality

To identify those at risk of being left behind and to direct policymaking at certain population groups, national data collection needs to allow for better disaggregation. It also needs to capture how unequal opportunities impact individual aspirations and household decisions and why certain individuals, for example, take their children out of school or continue using unclean energy options, while others do not.

8. Deepen regional cooperation

Regional cooperation can be fruitful for narrowing inequalities within and among countries. Regional economic cooperation and integration can help the lesser developed countries grow faster by leveraging the dynamism of more developed economies and by exploiting the complementarities in a mutually beneficial manner. Regional cooperation can also help in addressing common challenges, such as shared vulnerabilities to natural disasters and climate change, or in supporting common objectives, such as the extension of broadband networks, as highlighted in the report. In addition, regional platforms for sharing good practices in addressing inequalities and extending social protection coverage can be fruitful. Member States of ESCAP have adopted a number of resolutions for strengthening regional cooperation and integration, as well as the Regional Roadmap for Implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific, which also outlines opportunities for regional cooperation in different thematic areas including on inequality. As their regional commission, ESCAP stands ready to support the member States in implementing the Roadmap and in strengthening regional cooperation for addressing inequalities.

ENDNOTES

[1] Target number in parenthesis. For full descriptions of the targets and other examples, see United Nations (2015), Transforming our world: the 2030 Agenda for Sustainable Development. https://sustainabledevelopment.un.org/post2015/transformingourworld.

[2] See the footnote to Figure 5.1 for details.

[3] An example would be when a mineral deposit is developed in a mainly agrarian country. The value of the new mineral production per unit of worker will greatly exceed the regular value of agricultural production per worker. As a result, income distribution will become skewed, with a large concentration accruing to the owners of the mine.

[4] United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (2017g). Available at: http://www.unescap.org/sites/default/files/1_Disaster%20Report%202017%20Low%20res.pdf

[5] ESCAP calculation based on data on PM2.5 air pollution, mean annual exposure (micrograms per cubic meter), available at https://data.worldbank.org/indicator/EN.ATM.PM25.MC.M3

[6] ESCAP calculation using data from World Bank (2018)

[7] See footnote to Figure 5.2 for details.

ANNEXES

Annex 1.1 Dataset on the Gini coefficient

The dataset of Gini coefficients used in this report draws on data from (1) "All the Ginis" dataset as developed by Branko L. Milanovic, which consists of data sets of the standardized Gini from various sources; [1] (2) UNU- WIDER's World Income Inequality Database (WIID), specifically WIID3.4 released in January 2017;[2] (3) Standardized World Income Inequality Database (SWIID) developed by Frederick Solt;[3] (4) Inequality Project of the University of Texas's Estimated Household Income Inequality Data Set (EHII);[4] (5) Asian Development Outlook 2012: Confronting Rising Inequality in Asia;[5] and (6) ESCAP Statistical Database.[6] For Asia and the Pacific, data are available for 46 countries, including the region's developed countries (Australia, Japan and New Zealand).[7]

In constructing the dataset, priority was given to Gini coefficients based on market or gross income, which excludes transfers and taxes. In some cases, due to data limitations, Gini coefficients based on expenditure or consumption were used. Linear interpolation was used to estimate missing Gini coefficient data. Data for the early 1990s includes average Gini coefficients for each country based on the observations available between 1990 and 1994, while the early 2010s period includes average Gini coefficients for 2010-2014. For the regression analyses, the sample used includes 31 Asia-Pacific countries for which Gini coefficients are available for at least one year within five five-year periods: 1990-1994, 1995-1999, 2000-2004, 2005-2009, and 2010-2014.

Annex 1.2 Kakwani decomposition of the Gini coefficient for components of per capita GDP

When income can be expressed as the sum of various components, it is possible to decompose the Gini coefficient into the contribution of each component following Kakwani (1977, p. 724), as

$$Gini = \sum_k S_k C_k \,,$$

where S_k and C_k are, respectively, the share and the concentration index of the k^{th} income component. The concentration index C_k is conceptually similar to the Gini coefficient for the k^{th} income component, but is obtained by ordering the units for which the calculation is performed according to increasing values of total income instead of increasing values of the k^{th} income component.[8] Based on the decomposition above, Wan, Wang and Zhang (2016) obtain the following equation of changes of the Gini coefficient over time:

$$\Delta Gini = \sum_k 0.5(C_{kt} + C_{kt+1})\Delta S_k + \sum_k 0.5(S_{kt} + S_{kt+1})\Delta C_k = \sum_k (C_k^* \Delta S_k + S_k^* \Delta C_k).$$

[1] www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Centers-and-Institutes/Stone-Center-on-Socio-Economic-Inequality/Core-Faculty,-Team,-and-Affiliated-LIS-Scholars/Branko-Milanovic/Datasets.
[2] www.wider.unu.edu/project/wiid-world-income-inequality-database.
[3] http://fsolt.org/swiid/.
[4] https://utip.lbj.utexas.edu/data.html.
[5] www.adb.org/sites/default/files/publication/29704/ado2012.pdf.
[6] http://data.unescap.org/escap_stat/#data/.
[7] See Basu (2017)
[8] If, for example, we are considering personal income as the sum of labour income and property income, the calculation of concentration indexes for labour income and property income requires sorting individuals from the lowest to the highest level of their personal income. The concentration indexes for labour and property income will only be equivalent to the Gini coefficients for these income components if they are sorted in the same order as personal income. Kakwani (1977, p. 721) shows that -G_k ddC_k dd G_k, where G_k is the Gini coefficient for the kth income component.

The equation indicates that a change in inequality can be attributed to changes in the income shares $\sum_k C_k^* \Delta S_k$ and changes in concentration indexes $\sum_k S_k^* \Delta C_k$. The first component represents the impact on inequality of structural transformation, while the second represents the impact on total inequality of changes in the inequality of its components. In the text we use this decomposition to analyse the contributions to GDP per capita inequality of both its supply-side components (agriculture, manufacturing and services) and its demand-side components (private consumption, investment, government consumption and net exports).

Annex 1.3 Regression analysis for the driving forces of income inequality

Estimations of the driving forces of income inequality were obtained through pooled cross-country, time series regressions:

$$Gini_{it} = \alpha + \beta' X_{it} + \mu_i + \varphi_t + \varepsilon_{it}$$

where Gini is the Gini coefficient for country i in period t. Based on data availability, the dataset includes five periods – 1990-1994, 1995-1999, 2000-2004, 2005-2009, and 2010-2014 – and 31 countries: Afghanistan, Armenia, Australia, Azerbaijan, Bangladesh, Bhutan, Cambodia, China, Fiji, Georgia, India, Indonesia, Islamic Republic of Iran, Japan, Kazakhstan, Kyrgyzstan, Lao People's Democratic Republic, Malaysia, Maldives, Mongolia, Nepal, Pakistan, Papua New Guinea, Philippines, Russian Federation, Sri Lanka, Tajikistan, Thailand, Turkey, Uzbekistan and Viet Nam.

The vector X_{it} contains the logarithm of GDP per capita and its square, capital stock per capita, value of the human capital index, TFP growth, ratio of manufacturing to agriculture sector, trade openness, total tax revenue and its square, environmental damage and its square, renewable natural capital, and four indicators of governance and its square. μ_i and φ_i represent unobserved country- and year-specific effects, and ε_{it} is the error term. The dependent variable, income inequality, is measured as the Gini coefficient (see Annex 1.1 for details). GDP per capita and the capital stock per capita are measured in US dollars of 2011 adjusted for differences in purchasing power. These variables together with the human capital index, which represents the quality of the labour force,[9] and TFP growth are from the Penn World Table (PWT) version 9.0.

The ratio of the manufacturing value added over the agriculture value added and trade openness are from the World Bank's World Development Indicators (WDI). Trade openness is measured as exports plus imports over the GDP. Tax revenue as a share of the GDP comes from the IMF's World Revenue Longitudinal Data set (WoRLD).[10] Environmental damage is defined as foregone labour income, measured in current US dollars, caused by exposure of a country's population to ambient concentrations of particulates measuring less than 2.5 microns in diameter (PM2.5), ambient ozone pollution and indoor concentrations of PM2.5 in households cooking with solid fuels. These data come from WDI.[11] Renewable natural capital is defined as the sum of the value of the rents generated over the lifetime of forests, agriculture land and protected areas. It is measured in US dollars of 2014, and the data source is the World Bank Wealth Accounts data base.[12] Finally, the four governance indicators, that come from World Bank's Worldwide Governance Indicators, are government effectiveness, rule of law, political stability and absence of violence and regulatory quality.[13]

[9] See www.rug.nl/ggdc/docs/human_capital_in_pwt_90.pdf for details.

[10] https://data.world/imf/world-revenue-longitudinal-dat.

[11] http://databank.worldbank.org/data/reports.aspx?source=2&type=metadata&series= NY.ADJ.DPEM.CD.

[12] http://databank.worldbank.org/data/reports.aspx?source=wealth-accounts#dbMetadata.

[13] http://info.worldbank.org/governance/wgi/#home.

Table A.1 Driving forces of income inequality, Gini coefficient, Asia-Pacific countries

	Col 1	Col 2	Col 3	Col 4
log (GDP per capita)	52.952***	50.558***	34.768***	41.029***
	(9.033)	(8.129)	(9.490)	(8.800)
log (GDP per capita) squared	-3.379***	-3.257***	-2.304***	-2.646***
	(0.521)	(0.479)	(0.564)	(0.519)
Capital stock per capita	0.185***	0.162***	0.144***	0.173***
	(0.028)	(0.023)	(0.023)	(0.024)
Human capital index	-5.123**	-6.764***	-6.238***	-7.821***
	(2.100)	(2.318)	(2.288)	(2.289)
TFP growth	10.014***	11.142***	11.228***	10.004***
	(3.786)	(3.857)	(4.044)	(3.765)
Ratio of manufacturing to agriculture	-0.732***	-0.848***	-0.793***	-0.717***
	(0.217)	(0.255)	(0.241)	(0.227)
Trade openness	0.032***	0.032***	0.031***	0.025***
	(0.007)	(0.007)	(0.007)	(0.007)
Total revenue	0.375*	0.454**	0.588***	0.495**
	(0.205)	(0.215)	(0.222)	(0.215)
Total revenue squared	-0.007*	-0.008*	-0.011**	-0.009**
	(0.004)	(0.004)	(0.005)	(0.004)
log (environment damage)	-13.175***	-14.027***	-14.593***	-14.441***
	(2.457)	(2.321)	(2.281)	(2.226)
log (environment damage) squared	0.446***	0.468***	0.464***	0.464***
	(0.056)	(0.054)	(0.053)	(0.053)
log (natural capital)	-3.803**	-4.597***	-3.518**	-4.442***
	(1.523)	(1.760)	(1.703)	(1.677)
Governance effective	0.174**			
	(0.070)			
Governance effective squared	-0.001			
	(0.001)			
Governance law		0.185**		
		(0.091)		
Governance law squared		-0.002		
		(0.001)		
Governance stability			0.093***	
			(0.030)	
Governance stability squared			-0.001*	
			(0.000)	
Governance regulatory				0.245***
				(0.075)
Governance regulatory squared				-0.003***
				(0.001)
_cons	18.013	65.278	113.285*	108.521*
	(58.331)	(66.161)	(58.594)	(56.630)
Country dummy	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y
N	239	239	239	239
Adj. R-square	0.924	0.921	0.922	0.922

Note: Robust standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

Annex 1.4 Regression analysis for the impact of income inequality on growth

To examine the relationship between inequality and economic growth, pooled time series and cross-section regressions were used. The estimations are based on the following equation:

$$GDP_{it} = \alpha + \beta' Gini_{it} + \delta' Z_{it} + \mu_i + \varphi_t + \varepsilon_{it}$$

where the dependent variable is GDP per capita for country *i* in year *t*. $Gini_{it}$ is the Gini coefficient, and Z_{it} includes control variables representing technology, investment, labour, sector structure and trade openness. μ_i and φ_i represent unobserved country- and year-specific effects, and ε_{it} is the error term. With the inclusion of country-specific effects, the estimator is focused on the variation within countries. As such, the aim of the estimations is to test whether decreases in GDP per capita are associated with rising income inequality across Asia-Pacific countries.

The only additional variable is ESCAP's Access to Physical Infrastructure Index (APII). This index includes four dimensions of infrastructure: (1) transport, which includes access to road and railways; (2) energy, which captures electricity and power consumption; (3) information and communications technology (ICT), which includes access to Internet, mobile and fixed lines; and (4) water supply and sanitation.[14]

Table A.2 Relationship between GDP per capita and income inequality, Asia-Pacific countries

	Col 1	Col 2	Col 3
Gini coefficient	-163.571***	-157.073***	-140.100**
	(49.109)	(59.134)	(58.744)
Capital stock per capita	0.113***	0.106***	0.116***
	(0.014)	(0.015)	(0.015)
Human capital index	1.258	1.881	1.039
	(1.853)	(1.931)	(1.918)
TFP	3.387***	3.391***	3.964***
	(1.076)	(1.040)	(1.225)
ESCAP Physical Infrastructure index	0.019***	0.017***	0.022***
	(0.004)	(0.005)	(0.005)
Ratio of manufacturing to agriculture	0.001	0.002	0.003
	(0.007)	(0.007)	(0.007)
Trade openness	2.048	4.268	0.068
	(5.291)	(5.005)	(5.178)
Governance effective	67.674***		
	(14.249)		
Governance law		73.530***	
		(14.521)	
Governance regulatory			25.933*
			(14.055)
Constant	-2.0e+03	-2.9e+03	-1.5e+03
	(6635.262)	(6893.576)	(7069.753)
Country dummy	Y	Y	Y
Year dummy	Y	Y	Y
N	328	328	328
Adj. R-square	0.992	0.992	0.992

Note: Robust standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01

[14] See ESCAP (2017c, Annex II) for details on the construction of this index.

Table A.3 Relationship between GDP per capita and income inequality, Asia-Pacific countries, lagged variables

	Col 1	Col 2	Col 3
lag. Gini coefficient	-135.473*** (49.817)	-131.755** (58.591)	-114.841** (58.269)
lag. Capital stock per capita	0.104*** (0.014)	0.097*** (0.015)	0.106*** (0.015)
lag. Human capital index	2.200 (1.874)	2.798 (1.922)	2.031 (1.908)
lag. TFP	3.548*** (1.066)	3.480*** (1.023)	3.974*** (1.235)
lag. ESCAP Physical Infrastructural index	0.018*** (0.004)	0.016*** (0.004)	0.021*** (0.004)
lag. Ratio of manufacturing to agriculture	0.009 (0.008)	0.009 (0.007)	0.011 (0.008)
lag. Trade openness	2.738 (5.544)	5.345 (5.210)	0.798 (5.388)
lag. Governance effective	61.232*** (14.012)		
lag.Governance law		75.451*** (14.690)	
lag. Governance regulatory			30.136** (12.962)
Constant	-4.6e+03 (6492.959)	-5.5e+03 (6664.226)	-4.4e+03 (6825.543)
Country dummy	Y	Y	Y
Year dummy	Y	Y	Y
N	327	327	327
Adj. R-square	0.993	0.993	0.992

Note: Robust standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

Annex 1.5 The impact of inequality on extreme poverty

The methodology of the calculations shown in Section 1.5.2 is based on Zhang and Wan (2006), who modified a decomposition framework proposed by Datt and Ravallion (1992). ΔP, the change in poverty index P between period 0 and period T can be expressed as

$$\Delta P = P(Y_T; I_T) - P(Y_0; I_0)$$

where Y is average income or consumption and I is an indicator for income distribution or inequality, such as the Gini coefficient. The poverty cost of rising inequality is defined as the change in poverty due to a change in inequality while holding Y constant. Let be the poverty estimate from a hypothetical distribution with $i = 0$ or T, $j = 0$ or T and $i \neq j$. The poverty cost can be computed as:

Poverty cost = $P(Y_0, I_T) - P(Y_0; I_0)$

or

Poverty cost = $P(Y_T, I_T) - P(Y_T; I_0)$

It is easy to see that the above two estimates may differ simply because the reference year is different. One way to obtain a single estimate is to compute average of these two estimates:

$$\text{Poverty cost} = 0.5\{[P(Y_0, I_T) - P(Y_0; I_0)] + [P(Y_T; I_T) - P(Y_T, I_0)]\}.$$

For more details, see Zhang and Wan (2006) who used the term of "distribution or inequality impact" instead of "poverty cost".

Gini coefficients data for the early 1990s and 2010s for 24 countries in the Asia-Pacific region are based on data as in Annex 1.1. The data on mean expenditure is from the World Bank's PovcalNet database.

Annex 2.1 Calculating the Dissimilarity Index

The dissimilarity index, or D-index, is a measure similar to the Gini coefficient, which can be used for measuring inequality for binary variables, such as having access to an opportunity (e.g. education) or not.[15] The D-index measures how all different population groups fare in terms of accessing this opportunity. For example, two countries with identical secondary education attainment rates may have a very different D-index if the distribution of attainment in one country excludes certain groups (such as rural women). To obtain the D-index, inequalities in access among all possible population groups are calculated using the following equation:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^{n} \beta_i \, |p_i - \bar{p}|$$

where β_i is the weighted sampling proportion of group *i*, (sum β_i of equals 1), $\bar{p}$ is the average attainment rate for secondary or higher education in the country and p_i is the level of attainment of that level for population group *i*, and takes values from 0 to 1. Unlike the Gini coefficient, where there is no ideal level, the ideal level of a D-index of 0, whereby everyone has access to an opportunity and there is no inequality.

There are n number of groups defined by using the interactions of the circumstances selected for the analysis. In the case of secondary education attainment, three circumstances are used forming 8 groups: wealth (2 groups); residence (2 groups); sex (2 groups). This produces at least n=8 groups (2x2x2), covering the entire sample population.

Annex 2.2 Shapley decomposition

The Shapley decomposition method estimates the marginal contribution each circumstance has on inequality in access to a certain opportunity. The basic idea behind this decomposition, taken from cooperative game theory, is to measure how much the estimated D-index would change when a circumstance was added to the pre-existing set of circumstances. The change in inequality caused by the addition of a new circumstance would be a reasonable indicator of its contribution to the overall inequality.[16]

The impact of adding a circumstance A (e.g. wealth) is given by the following formula:

$$D_A = \sum_{S \subseteq N\{A\}} \frac{|S|!(n-|S|-1)!}{n!} [D(S \cup \{A\}) - D(S)]$$

Where N is the set of all n circumstances, which are different depending on the opportunity, as shown in Table 2.1; and S is the subset of N circumstances obtained after omitting the circumstance A. D(S) is the D-index estimated with the sub set of circumstances S. D(SU{A}) is the D-index calculated with set of circumstances S and the circumstance A.

The contribution of characteristic A to the D-index is then formula:

$$M_A = \frac{D_A}{D(N)}$$

The critical property satisfied by the Shapley decomposition is that the sum of contributions of all characteristics adds up to 1 (100 per cent).

[15] Barros, Ferreira, Vega and Chanduvi (2009).

[16] Shorrocks (2013).

Annex 2.3 Who are the furthest behind in all opportunities?

Country/ Circumstances	Who are those left behind in terms of...																				
	...access to full-time employment?						...secondary education attainement?			...higher education attainement?			...access to professional help during childbirth?					...access to contraception?				
	Age group	Educa-tion	Resi-dence	Marital status	Sex	Have children	Wealth	Resi-dence	Sex	Wealth	Resi-dence	Sex	Wealth	Age group	Children under 5	Resi-dence	Educa-tion	Wealth	Educa-tion	Age group	Children under 5	Resi dence
Afghanistan	15-49	Low		Sgl	M		B40	Rur	W	B40	Rur	W	B40	>25	1					15-24		Rur
Armenia			Rur	Sgl or Sep			B40		M	B40		M	B40	25-34				B40		15-24 or >35		
Bangladesh			Rur		W		B40		W	B40		W	B40				Low			15-24	No	
Bhutan					W	NC	B40	Rur	W	B40	Rur	W	B40		2 - 4					15-24		
Cambodia	25-64	Low	Rur	Mar or Sep	W		B40	Rur	W	B40	Rur	W	B40				Low			15-24 or >35	No	Urb
India	15-24			Sgl			B40		W	B40		W	B40		1		Low			15-24		
Indonesia		Low		Mar or Sep	W		B40	Rur	W	B40	Rur		B40			Rur	Low			15-24 or 25-34	No	
Kazakhstan	15-24						B40		M	B40		M		>25		Rur	Low or High			15-24 or 25-34	No	
Kyrgyzstan		Sec	Rur			NC	B40	Rur	W	B40	Rur	M		>35						15-24		
Lao PDR	25-49	Low	Rur		W		B40	Rur	W	B40	Rur		B40		2 - 9		Low		Low or High		Yes	
Maldives							B40	Rur	W	B40	Rur	W		>35	1					15-24 or 25-34	No	
Mongolia	15-24 or 50-64	Low	Rur				B40	Rur	M	B40	Rur	M			2 - 4		Low		Sec or High		No	Urb
Myanmar	50-64				W		B40	Rur	W	B40	Rur											
Pakistan	50-64						B40		W	B40		W	B40	>35			Low			15-24		
Philippines	50-64				W		B40		M	B40		M	B40				Low		Low or High		No	
Tajikistan	25-49	Low					B40		W	B40	Rur	W	B40							15-24		
Thailand	15-24 or 50-64	Low	Urb	Sgl or Mar			B40			B40			B40	25-34					Low or High			
Timor-Leste							B40	Rur	W	B40	Rur	W	B40	>35		Rur	Low		Low		No	
Turkmenistan	15-24				W	NC	B40		W	B40	Rur	W	B40	>25						15-24		
Vanuatu							B40	Rur	W	B40	Rur	W	B40		2 - 3				Low or High	15-24 or >35	No	
Viet Nam		Low or Sec	Rur		W	NC	B40		W	B40		W					Low			15-24		
Australia	15-24																					
Azerbaijan			Rur	Sgl or Sep	WoM																	
China	15-24 or 50-64	Low			W																	
Georgia			Rur	Mar	W																	
Iran (Islamic Republic of)	15-24 or 50-64	Low or Sec				NC																
Japan		Low or Sec	Urb	Mar or Sep	W																	
Malaysia	15-24 or 50-64				W																	
Nepal	15-24 or 50-64	Low	Rur		W																	
New Zealand	15-24																					
Republic of Korea				Sep																		
Russian Federation	15-24																					
Singapore	50-64	Sec		Mar																		
Sri Lanka	15-24 or 50-64	Low			M	NC																
Turkey				Mar	W																	
Uzbekistan		Low or Sec	Rur	Mar	W	C																

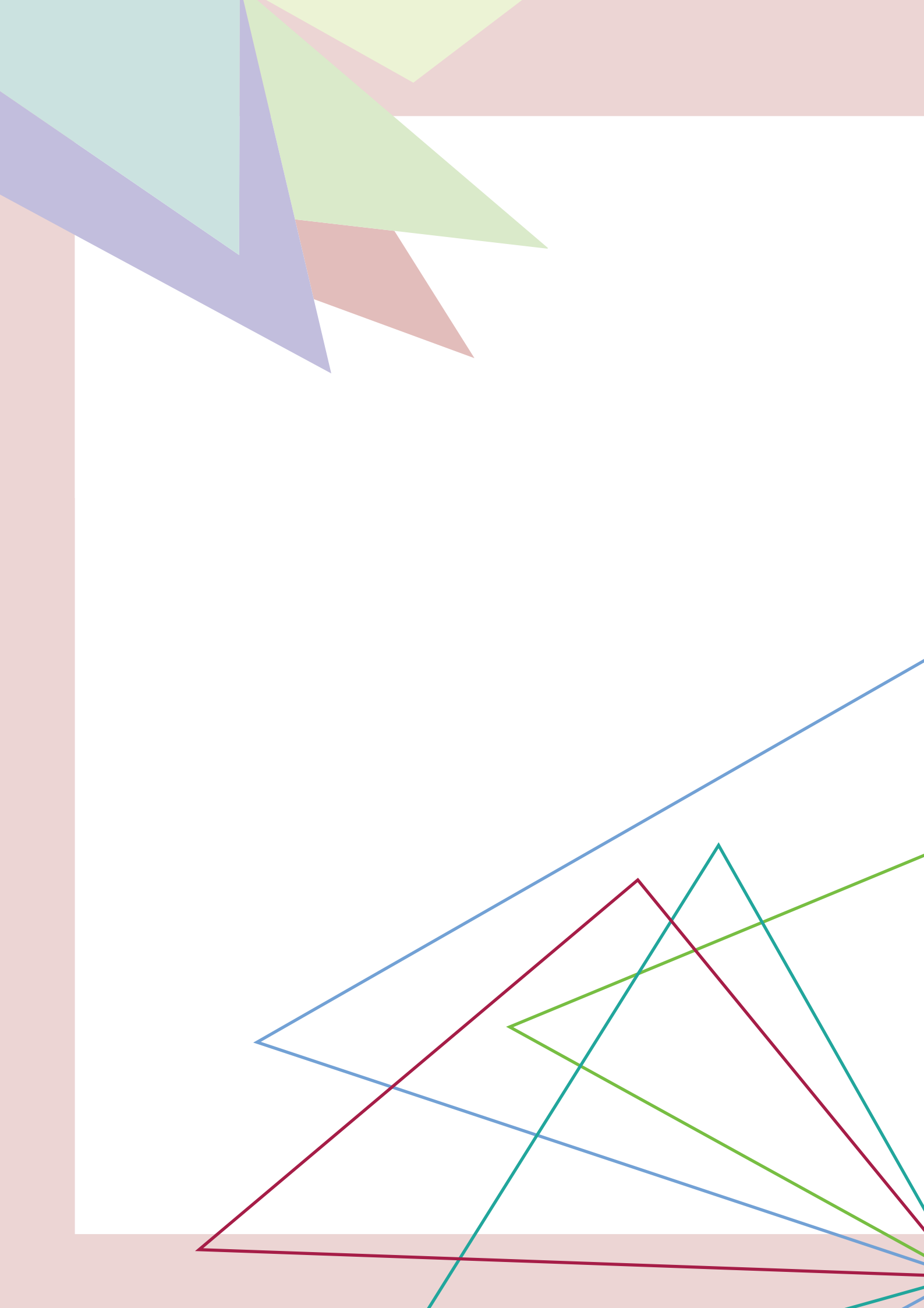
Source: ESCAP calculations using data from the latest DHS and MICS surveys for countries in Asia-Pacific Low = Lower education (no or primary education), Sec = Secondary education, High = Higher education, Urb = Urban areas, Rur = Rural areas, Sep = Separate, Mar = Married, Sgl = Single, NC = No Children, C = Have children, M = Men, W = Women, B40 = Bottom 40% households, T60 = Top 60% households.

Country/ Circumstances	Who are those left behind in terms of…																			
	…access to electricity?			…access to clean fuels?			…access to mobile phone?			…access to bank account?			…access to clean water?			…access to safe sanitation?			…basic household services?		
	Wealth	Educa-tion	Resi-dence	Wealth	Educa-tion	Resi-dence	Wealth	Resi-dence	Educa-tion	Wealth	Educ-ation	Resi-dence	Wealth	Educa-tion	Resi-dence	Wealth	Educa-tion	Resi-dence	Wealth	Resi-dence	Educa-tion
Afghanistan		Low	Rur	B40	Low or sec	Rur	B40		Low	B40	Low		B40	Low		B40	Low	Rur	B40	Rur	Low or Sec
Armenia	B40		Urb	B40		Rur	B40		Low or sec	B40	Low or sec		B40		Rur	B40		Rur	B40	Rur	Low or Sec
Bangladesh	B40	Low		B40		Rur			Low	B40	Low		B40	Low		B40	Low		B40	Rur	
Bhutan	B40			B40			B40		Low	B40	Low		B40	Low		B40	Low		B40	Rur	
Cambodia	B40	Low or high		B40		Rur	B40		Low	B40	Low		B40	Low or high		B40	Low		B40	Rur	Low or Sec
India	B40	Low		B40	Low		B40		Low	B40	Low		B40			B40	Low		B40	Rur	Low
Indonesia	B40	Low	Rur	B40	Low	Rur			Low	B40	Low high	Rur	B40 B40	Low or Low		B40	Low				
Kazakhstan	B40	Low or sec		B40	Low or sec				Low or sec		Low or sec		B40	Sec				Urb	B40		Low or Sec
Kyrgyzstan	B40	High	Rur	B40	Low or sec	Rur	B40		Low or sec	B40	Low or sec		B40	Low or sec		T60		Urb	B40		Low or Sec
Lao PDR	B40	Low		B40		Rur	B40		Low	B40	Low		B40	Low		B40	Low		B40	Rur	Low
Maldives		Low or high		B40	Low or sec				Low	B40	Low		B40	Low or high		B40	Low		B40		Low
Mongolia	B40		Rur	B40		Rur	B40	Rur		B40		Rur	B40	Sec	Rur	B40			B40		
Myanmar																B40	Low				
Pakistan	B40	Low		B40	Low	Rur	B40		Low	B40	Low		B40	Low		B40	Low		B40	Rur	
Philippines	B40	Low		B40		Rur			Low				B40	Low		B40	Low				
Tajikistan	B40	Low or sec		B40	High		B40		Low or sec		Low or sec	Urb	B40	Low			Low or Sec	Urb	B40	Rur	Low or Sec
Thailand	B40	Low or high		B40		Rur	B40		Low	B40	Low		B40	Low or sec	Rur	B40		Urb	B40		Low
Timor-Leste	B40	Low		T60	Low	Rur	B40		Low	B40	Low	Rur	B40	Low or high		B40	Low		B40	Rur	Low
Turkmenistan		High			Sec	Urb		Urb	Low or sec	B40	Low or sec		B40	Low or high			Low or Sec	Urb		Rur	Low or Sec
Vanuatu	B40		Rur	B40		Rur	B40	Rur					T60		Rur	B40					
Viet Nam		Low		B40	Low or high				Low	B40	Low or sec		B40	Sec		B40			B40		Low

Source: ESCAP calculations using data from the latest DHS and MICS surveys for countries in Asia-Pacific Low = Lower education (no or primary education), Sec = Secondary education, High = Higher education, Urb = Urban areas, Rur = Rural areas, B40 = Bottom 40% households, T60 = Top 60% households.

Country/ Circumstances	Who are those left behind in terms of...														
	...stunting among children?					...wasting among children?					...overweight among children?				
	Wealth	Mother's education	Residence	Number of siblings	Sex	Wealth	Mother's education	Residence	Number of siblings	Sex	Wealth	Mother's education	Residence	Number of siblings	Sex
Afghanistan															
Armenia		Low	Rur			B40	Low							3-6	B
Bangladesh		Low	Rur		B	B40				B		High			
Bhutan	B40	Low				T60	Low or sec	Rur		B		Sec			
Cambodia	B40					B40				B			Urb		
India	B40	Low		3+		B40				B		Sec or high	Urb		
Indonesia															
Kazakhstan		Sec		1+		T60	Sec					High	Urb	1	
Kyrgyzstan	B40			2+	B		High	Urb			B40			1-3	
Lao PDR	B40	Low				B40	Low or sec			B				3-9	
Maldives	B40			2+		B40	Low	Rur	3-6			Sec or high		3-7	
Mongolia	B40		Rur	1-2			Low or higher	Rur	1-10	B		High		1	
Myanmar		Low					Low					Low			
Pakistan	B40	Low			B	B40			4-10			High			
Philippines															
Tajikistan	B40						Low				T60		Rur	1-3	
Thailand	B40		Rur				Low or sec			B	T60	Low or high	Rur		
Timor-Leste	B40		Rur		B		Low	Rur		B	B40			4-8	
Turkmenistan				2+				Rur	1		T60			2-7	
Vanuatu		Low			B			Urb		G			Urb		B
Viet Nam	B40	Low				B40	Low			B			Urb		

Source: ESCAP calculations using data from the latest DHS and MICS surveys for countries in Asia-PacificLow = Lower education (no or primary education), Sec = Secondary education, High = Higher education, Urb = Urban areas, Rur = Rural areas, B = Boys, G = Girls, B40 = Bottom 40% households, T60 = Top 60% households.



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Inequality in Asia and the Pacific in the era of the 2030 Agenda for Sustainable Development

Inequality in Asia and the Pacific is on the rise. Many countries, including those held up as models of dynamism and prosperity, have experienced a widening of existing gaps, accompanied by environmental degradation. Market-led growth alone is not sufficient to deliver a prosperous, sustainable future for all.

This report takes a novel approach by focusing on multiple aspects of inequality – inequality of outcomes, of opportunities and of impacts. It also pays special attention to the potentially transformative role of technology and the impact that the incipient Fourth Industrial Revolution may have on inequality.

The report finds that unequal access to basic opportunities has left large groups of people behind and contributed to widening inequalities of outcomes, particularly in income and wealth. In turn, these inequalities have aggravated inequalities in access to health care, education, technology, and protection from natural disasters and environmental hazards – creating hardship for communities and families over generations.

Written against the backdrop of the 2030 Agenda for Sustainable Development and its pledge to "leave no one behind", the report analyses the consequences inequality has on countries, communities and people across the Asia-Pacific region. Drawing on a wide range of data sources, backed up with evidence-based studies, it examines the drivers of inequality and identifies groups of people that are most likely to be left behind. It presents a convincing case for reducing inequality and puts forward an eight-point policy agenda for shaping a more inclusive, prosperous and sustainable future for all.

It will be found useful by policymakers, development practitioners and academics in the Asia-Pacific region and beyond.

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