THE UNIVERSITY OF WESTERN AUSTRALIA

UWA Public Policy Institute

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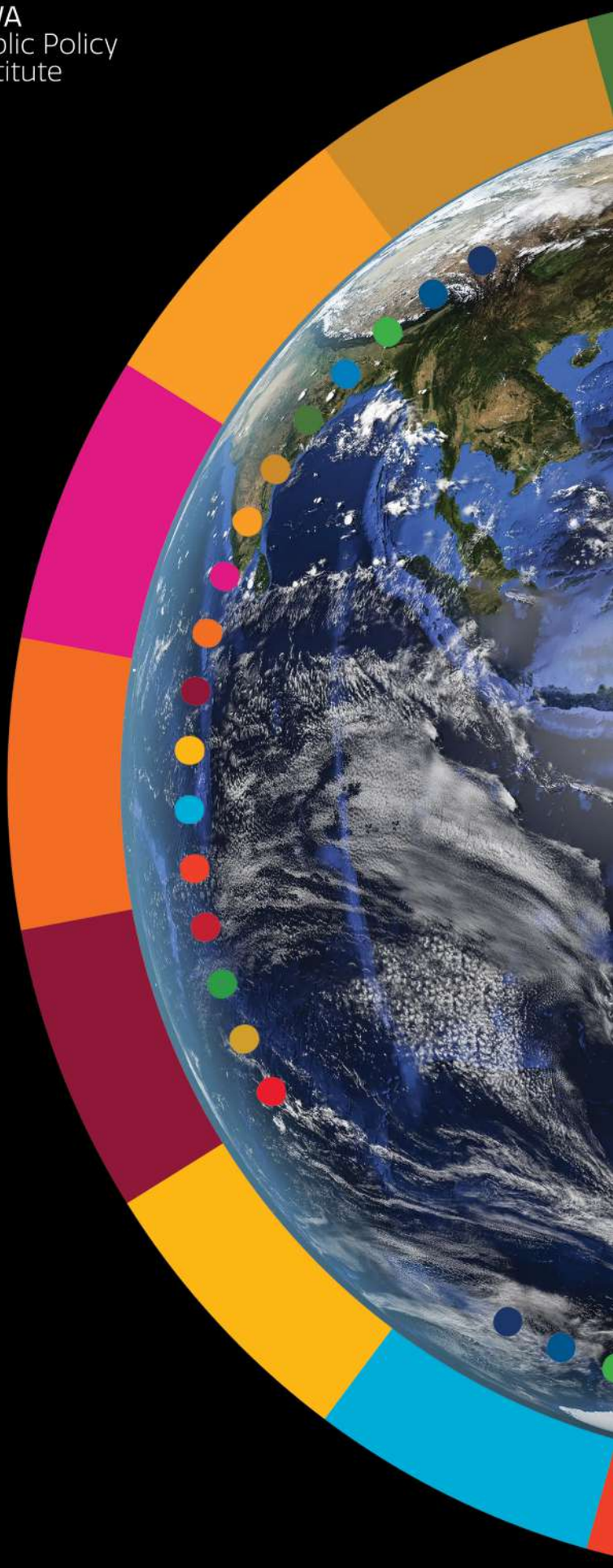

SUSTAINABLE DEVELOPMENT GOALS

Local | Regional | Global

THE UNIVERSITY OF WESTERN AUSTRALIA

UWA Public Policy Institute

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Contents

Foreword

Knowledge for a Sustainable Future

The Sustainable Development Goals (SDGs) are more than a global checklist created at the United Nations. They are a shared vision for a world where prosperity does not come at the expense of the planet, and where progress is equitable, and enduring. They matter because they define what is needed for a decent life and a fair society. The goals span economic, environmental, and social dimensions, recognising that these are deeply interconnected.

The SDGs remind us that human well-being and planetary health are inseparable. Economic progress has always relied upon the Earth's natural assets. Fertile soils fed civilisations, clean water sustained health, and once-abundant forests supplied materials and space for expansion. For generations, these natural assets were treated as inexhaustible in economic models. That assumption no longer holds. Today, more than 90% of people on Earth live with degraded land, unsafe air, or stressed water supply. Maintaining a livable planet is not a distant ecological concern—it is a present economic imperative.

The SDGs also capture a paradox of our times. In the span of mere generations, much of the world has emerged from the misery of poverty and hunger to an era of relative abundance. Extreme poverty rates have plummeted, lifting billions into lives of greater economic security. Food scarcity has given way to global calorie surpluses. Access to clean water, electricity, and modern infrastructure were once unimaginable luxuries, and are now regarded as necessities. Today, most of humanity lives more comfortably than any previous generation. That said, much more still needs to be done. And, vigilance is essential in the event of the next global economic, social or environmental, disruption as evidenced by the COVID-19 pandemic.

Yet, in reshaping the world for prosperity, humanity has unsettled the foundations of progress. The very forces that fueled economic growth—industrial expansion, energy consumption, and large-scale agriculture—now strain the planet's ability to sustain this prosperity. Air pollution shortens millions of lives each year; biodiversity loss and climate change threaten food systems and livelihoods.

This is why the SDGs matter. Development that ignores environmental limits is fragile. Climate shocks, biodiversity loss, and resource depletion can all unravel progress. The SDGs provide a framework for building resilience, guiding nations to invest in ways that are sustainable, can withstand future shocks, and overcome our shared challenges.

Universities occupy a unique and indispensable position in helping to advance the SDGs. They are the engines of knowledge that generate evidence-based policy advice and educate the next generation of leaders. In these changing times, they must embrace this responsibility with urgency and purpose. Their role is not only to research and teach, but also to speak with clarity and integrity to decision-makers—political and policy—on issues that shape our collective future.

For institutions such as The University of Western Australia, this is both an opportunity and an obligation. In a world where knowledge can guide action, UWA is well placed to lead by example. The ability to convene diverse disciplines and produce a report of this breadth, depth and accessibility speaks to the institution's intellectual strength and collaborative ethos. By building on this foundation, UWA can position itself as a global thought leader, shaping policy thinking and solutions that resonate far beyond Australian shores.

This volume arrives at a critical moment. It takes stock of what remains to be done. It offers insights and practical pathways for action. It is my hope that this volume will inspire researchers and practitioners to act boldly and collaboratively.

Richard Damania

Chief Economist, The World Bank, Sustainable Development Practice Group

Introduction

Sustainability: Some Beginnings

The concept of sustainability has been swirling around academic, policy and political circles since 1987 following the publication of the World Commission on Environment and Development's landmark report—*Our Common Future/the Brundtland Report*—led by then Prime Minister of Norway, Gro Harlem Brundtland.

The Brundtland Report defined sustainable development as 'meeting the needs and aspirations of the present without compromising the ability to meet those of the future'. There has been a (mis)perception in some quarters that sustainable development is solely about environmental protection, preservation and conservation. To use common parlance, sustainability and sustainable development have come to be portrayed by some as part of the "woke agenda" that seeks to stymie economic development and growth. This cannot be further from the truth:

> 'Far from requiring the cessation of economic growth [sustainable development] recognizes that the problems of poverty and underdevelopment cannot be solved unless we have a new era of growth in which developing countries play a large role and reap large benefits'. (The Brundtland Report, 1987)

The overarching aim of the Brundtland Report was to highlight to governments in both the Global North and the Global South that there was a need to somehow strike a balance between economic growth, social well-being, and environmental amenity—the so-called triple bottom line.

Sustainability 1.0: The MDGs

Global policy ambition and action on sustainable development essentially commenced at the start of the new millennium. In 2000, the United Nations launched the Millenium Development Goals (MDGs). These included eight meta-policy goals:

1. Eradicate extreme poverty and hunger;
2. Achieve universal primary education;
3. Promote gender equality and empower women;
4. Reduce child mortality;
5. Improve maternal health;
6. Combat HIV/AIDS, malaria, and other diseases;
7. Ensure environmental sustainability;
8. Develop a global partnership for Development.

It is difficult, if not impossible, to oppose these goals on moral grounds.

In a recent review paper, Cernev and Fenner[1] note that the MDGs had mixed success. During the MDGs' lifetime there were 'declines in levels of extreme poverty and hunger, increases in primary school education rates, and reductions in child mortality'. On the one hand, the MDGs were deemed to be 'non-action oriented', but on the other hand they were seen as an 'effective method to develop political and public support'. The major criticism of the MDGs was that they gave too much emphasis to the social and too little to environmental and sustainability issues per se.

Sustainability 2.0: The SDGs

Toward the end of the MDGs' life, the UN commenced reviewing and planning the next stage of its sustainability agenda. This gave birth to the Sustainable Development Goals (SDGs) which were also given a 15-year policy lifespan (2015-2030). The number of goals were expanded to 17. Furthermore, in order to both benchmark and track achievement in meeting the SDGs—individually and collectively—the UN created a series of indicators to assist governments in their endeavours to realise the goals.

There are around 234 indicators spread across the 17 SDGs, and these are classified into three tiers[2]:

- **Tier I:** The indicator is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50% of countries and of the population in every region where the indicator is relevant (n=161).
- **Tier II:** The indicator is conceptually clear, has an internationally established methodology and standards are available, but data are not regularly produced by countries (n=60).
- **Tier III:** No internationally established methodology or standards are yet available for the indicator, but methodology and standards are being (or will be) developed or tested (n=8).

Having such a large array of indicators can be both beneficial and detrimental. They are beneficial in the sense that they provide policymakers with a sense of policy direction and certainty. However, having so many indicators also means committing significant policy funding and resources to ensure policy success across all indicators. Unfortunately, such policy resourcing has tended not to be available.

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2 Agenda 2030 LAC. (2025, April 10). *Global indicator framework for the SDGs*. Agenda 2030 LAC. https://agenda2030lac.org/estadisticas/global-indicator-framework-sdg.html#:~:text=In%202024%2C%20the%20IAEG%2DSDG,for%20the%20Global%20SDG%20indicators

Success... But More Work to be Done

In the UN's (2025) most recent SDG Report, Li Junhua, Under-Secretary-General for the Department of Economic and Social Affairs, has issued a rally cry on this front[3]:

> 'This moment demands what I call "urgent multilateralism" – a renewed commitment to international cooperation based on evidence, equity, and mutual accountability. It means treating the SDGs not as aspirational goals but as non-negotiable commitments to current and future generations.'

The 2025 SDG Report is imbued with a blend of 'room for improvement' at the global scale, and examples of local success stories. This report builds on this latter point via the presentation of a diverse range of local cases studies showcasing what has been and can be achieved in addressing sustainable development—social, economic and environmental.

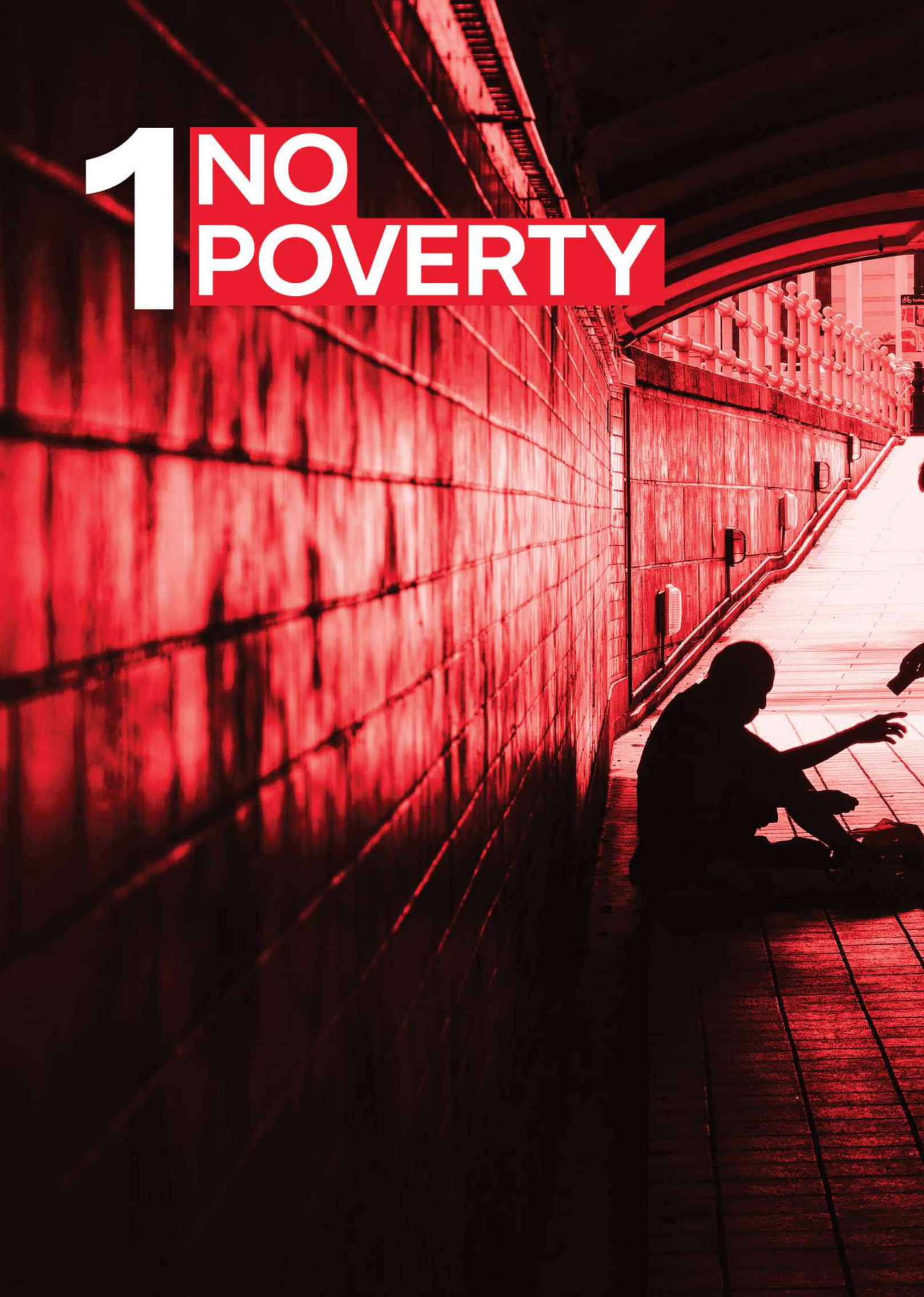
SDGs: Local, Regional, Global

In bringing together a rich mix of contributors from the academic, not-for-profit, advocacy, and government sectors from around the world, this report provides empirical analysis and policy ideas written in an informative and accessible manner for politicians and policymakers at the local, state and/or national government level plus wider publics.

In essence, the basic aim here is to socialise, promote and inform different constituencies as to the significance of the SDGs as a meta-policy program that seeks to enhance social, economic, environmental well-being for all at the local, regional and global scales.

Associate Professor Paul J. Maginn
Director, UWA Public Policy Institute

3 United Nations. (2025). *The Sustainable Development Goals report 2025*. United Nations. https://unstats.un.org/sdgs/report/2025/The-Sustainable-Development-Goals-Report-2025.pdf


1
NO
POVERTY


SINGAPORE RIVER CRUISE

End Poverty in All its Forms Everywhere: Working Towards No Place for Poverty in Western Australia

Alex Hughes, No Place for Poverty
Myles Kunzli, Anglicare WA

Australia adopted the United Nations Sustainable Development Goals (SDGs) in 2015. The first goal being: End Poverty in All Its Forms Everywhere, outlines seven targets and associated indicators for countries to progress. Within the domestic policy context, two targets are particularly relevant:

1.1 By 2030, reduce, by at least half the proportion of men, women and children living in poverty in all its dimensions, according to national definitions.

1.3 Implement nationally appropriate social protection systems and measures for all, including social floors, and achieve substantial coverage of the poor and vulnerable by 2030.

Unfortunately, Australia is currently performing poorly on both fronts with the Monash Sustainable Development Institute assessing Australia as "Off Track" to meet SDG 1 by 2030 unless significant action is taken.[1]

Measuring Poverty in Australia

For Target 1.2, the lack of an official national definition of poverty complicates policy efforts. Given Australia has no national definition, policymakers and researchers rely on alternative measures, such as the OECD Relative Poverty Line which defines poverty as being below 50% of median household income.

Using this measure, the poverty rate in Australia has risen significantly, including in Western Australia (WA), increasing from 8.7% to 13.9% between 2014 and 2025.[2] To put this in perspective, the number of people living below the poverty line has grown from the equivalent of 3.7 Optus Stadiums in 2012 (223,000 people) to 7 stadiums in 2022 (419,800 people). This means that one in seven Western Australians are now living in poverty as defined by the OECD.

The SDG target for 2030 is to reduce poverty to 6.6%. At the current rate, WA and Australia more broadly are heading rapidly in the opposite direction, highlighting the urgent need for coordinated policy action and sustained investment in poverty reduction.

Children are particularly vulnerable, with an estimated 103,900 living below the poverty line. This represents around 17% of children in Western Australia, or roughly one in six.[2]

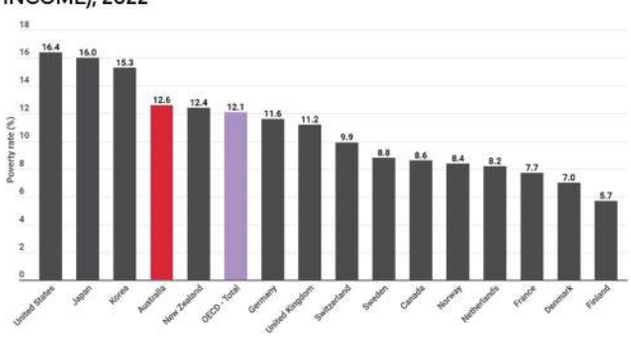
This trend is deeply concerning, as growing up in poverty can have lasting consequences. Research

shows that children who experience poverty are over three times more likely to remain in poverty as adults.[3] We do not know exactly how many children are affected, however, because we do not measure it. Without a shared definition, it's impossible to track progress or hold anyone accountable.

Children cannot choose their circumstances and too many are growing up without the basics, despite their parents' best efforts. Yet, children in poverty are among the most vulnerable and often the least visible in policy debates.

Target 1.3 relates to the adequacy of welfare payments. For single adults without children, welfare payments (including housing benefits) fell sharply from 2001 to 2008, reaching 70% of the poverty line, and declined further to 66% by 2020. Temporary COVID-19 income support programs increased this to 78%, before returning to 2020 levels by 2022.

FIGURE 1.1 INTERNATIONAL COMPARISON: ADEQUACY OF WELFARE PAYMENTS (RATIO TO POVERTY LINE 50% MEDIAN INCOME), 2022 [1]



In WA, communities have expressed dissatisfaction with social support systems. The 2024 Cost of Living report found that 53% of respondents wanted government support to prioritise low-income earners.[4] Similarly, 75% of respondents in the 2020 *Above the Line* report deemed JobSeeker payments inadequate, while the Scanlon Institute's Mapping Social Cohesion survey revealed that 84% of Australians view income inequality as excessive.[5] [6]

Despite the government's Economic Inclusion Advisory Committee recommending in 2023 to "substantially increase the base rates of JobSeeker and related working age payments...as a first priority" change has been stubborn.[7]

No Place for Poverty: Foundations for a Good Life Free from Poverty

The No Place for Poverty movement adopts a multidimensional model to conceptualise poverty and advocate for systemic change.

Poverty is not solely about insufficient income; it encompasses multiple, interconnected dimensions that compound disadvantage. The No Place for Poverty model identifies five key dimensions essential for a good life free from poverty:

1. **Adequate Income:** Ensuring financial resources to meet basic needs.
2. **A Place to Call Home:** Access to safe, stable, and affordable housing.
3. **Health and Wellbeing:** Physical and mental health support to thrive.
4. **A Good Start to Life:** Opportunities for education and early development.
5. **A Sense of Belonging:** Social inclusion and community connection.

FIGURE 1.2 NO PLACE FOR POVERTY MULTIDIMENSIONAL MODEL OF POVERTY

Restrictions in any one of these dimensions reduce opportunities, undermine equality and equity, and adversely impact community cohesion. This highlights the need for systemic interventions to create fair opportunities for all.

No Place for Poverty provide actionable strategies, resources, and pathways for communities, businesses,

and governments to improve systems and expand opportunities, aligning directly with progressing SDG 1.

A Community-Driven Response

Public policy plays a critical role in both perpetuating and dismantling poverty. Many Western Australians feel disillusioned with the government's commitment to meaningful change and often feel powerless to effect change themselves.

In response, No Place for Poverty was launched in early 2025 to combat rising poverty and inequality in WA. Through two interlinked pillars of (1) local acts of support and (2) systemic advocacy, the movement aims to:

- Transform public perceptions of poverty and inequality.
- Foster and unite compassion.
- Drive collective action for systemic change.

Grounded in the formula: **Evidence + Focused Public Concern + Political Alignment = Positive Policy Change**, the movement unites communities to advocate and act for a fairer society. While a bottom-up approach ensures authenticity, grounding change in community voices and experiences.

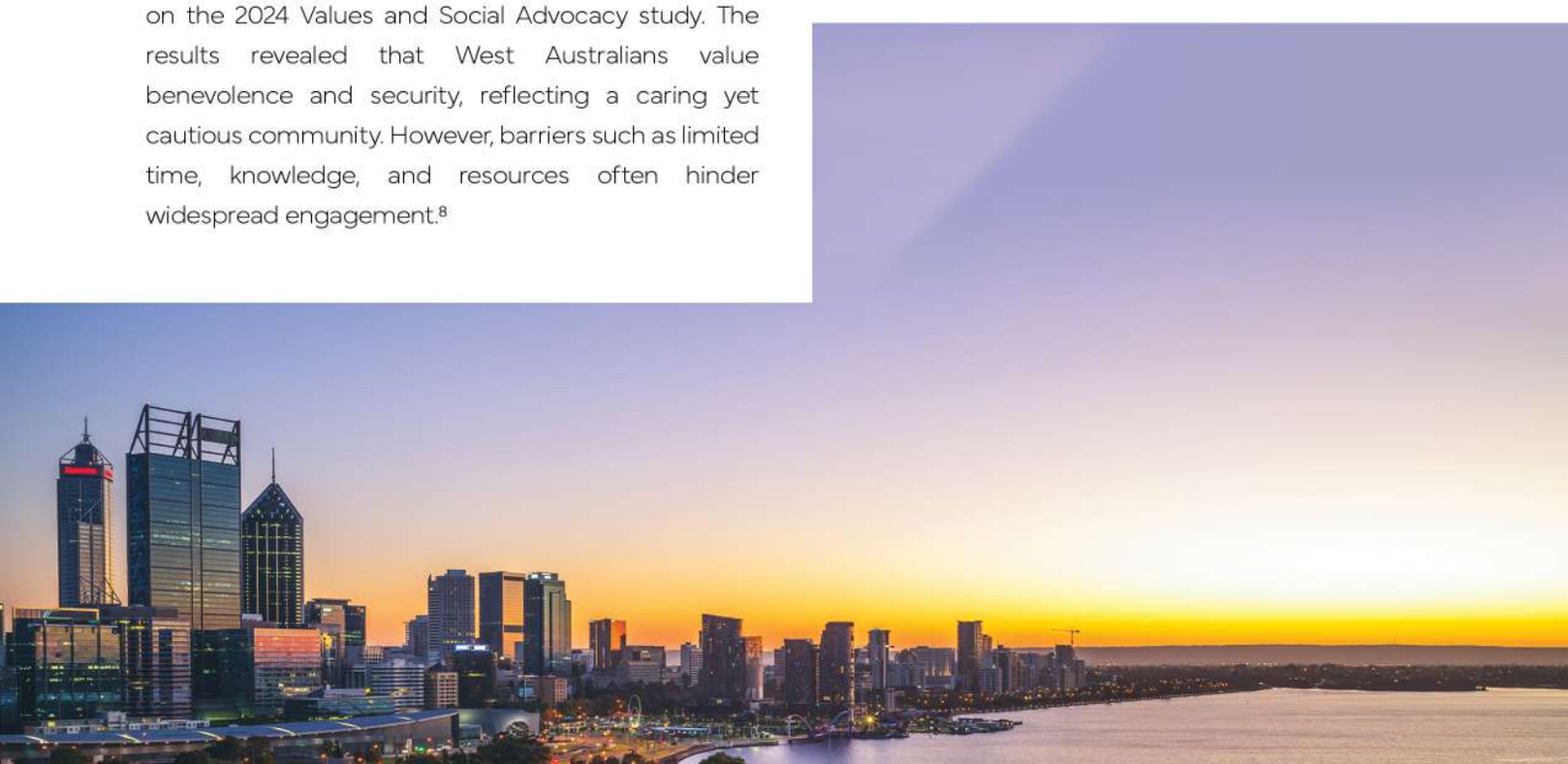
To understand public sentiment, No Place for Poverty collaborated with the University of Western Australia on the 2024 Values and Social Advocacy study. The results revealed that West Australians value benevolence and security, reflecting a caring yet cautious community. However, barriers such as limited time, knowledge, and resources often hinder widespread engagement.[8]

Civic Participation Program

To help support civic participation, No Place for Poverty created the Civic Participation Program which empowers communities through grassroots efforts that support local and systemic change. This is achieved via the following initiatives:

- **Power of a Postcard:** Educational engagement sessions on poverty in WA, coupled with simple advocacy actions.
- **Making a Difference, Made Easy:** Workshops guiding groups to develop local solutions to poverty, tailored to their context.
- **School Lesson Plan:** Teacher- and lived-experience -led videos introducting students to democracy and advocacy, using poverty as a case study.
- **Downloadable Action Packs:** Online resources, videos, and guides to help community and businesses understand poverty and take action.

The movement also has a strong focus on communication and social marketing, using a range of channels to increase awareness, bolster compassion and mobilise local action. This is achieved by platforming key voices (e.g. people with lived experience, frontline workers, community members, and experts) on social media, supplying credible information and evidence in digestible formats, as well as communicating pathways people can take to support change.



Policy Proposals/ Recommendations

Using the five dimensions with the No Place for Poverty model of a good life free from poverty, five critical policy actions are recommended that directly address the SDG No Poverty.

1 **Raise the rate of JobSeeker and other income support payments above the poverty line.** Evidence shows that this is the single most effective intervention. During the 2020 Coronavirus Supplement, additional payments of $550 per fortnight lifted approximately 425,000 Australians out of poverty, including children and renters. It also stabilised housing situations and reduced financial stress significantly.

The Economic Inclusion Advisory Committee has, for 3 years now, recommended to raise the rate, while community polls continue to support taking care of Australians who need it. A rate raise would bring Australia in line with our OECD counterparts.

2 **Make housing affordable and expand social housing to meet community need.** Decades of policy settings that treat housing primarily as an investment have pushed home ownership and secure rental housing out of reach for many people. At the same time, the social and affordable housing sector remains chronically underfunded, leaving too many West Australians without stable homes.

Governments should pursue a two-part strategy involving (1) the expansion of social and affordable housing stock through sustained public investment, ensuring supply keeps pace with community need; and (2) the reform of tax settings that fuel speculative investment, including reviewing capital gains tax discounts and negative gearing, so that housing is seen as a human right rather than a wealth-building tool.

3 **Adopt a national definition of poverty - and act on it.** A nationally agreed definition of poverty, backed by legislation and regular reporting, is urgently needed. It would make tackling poverty for both children and adults a true political and policy priority breaking the cycle of disadvantage that passes from one generation to the next.

4 **Close the Medicare gap to improve access to specialist care.** Struggling West Australians with complex or chronic conditions often face an impossible choice: pay high out-of-pocket costs for private specialist care or endure long waits in the public system. The growing gap between Medicare rebates and actual specialist fees has created a two-tier system that undermines Medicare's promise of universal health care.

Governments should invest in expanding and modernising public specialist clinics, ensure greater transparency around waiting times and fees, and strengthen GP–specialist collaboration to reduce unnecessary referrals. At the same time, the federal government must address excessive private fees by reviewing subsidies and ensuring rebates better reflect the true cost of care. These steps would make specialist treatment more affordable, improve universal access, and restore confidence in the health system.

5 **Invest in inclusion to strengthen Australia's social fabric.** West Australia's social cohesion is fraying with inequality deepening divisions and weakening our shared sense of belonging. To address this, targeted investment towards people and communities who are socially excluded is both a moral imperative and a smart community-building strategy. Initiatives that counter division and foster unity will not only help bring us together but also support long-term gains in health, productivity, and democratic and community engagement.

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Poverty in the Indo-Pacific Region: Progress and Persistent Challenges

Professor Anu Rammohan, The University of Western Australia, UWA Business School, Department of Economics

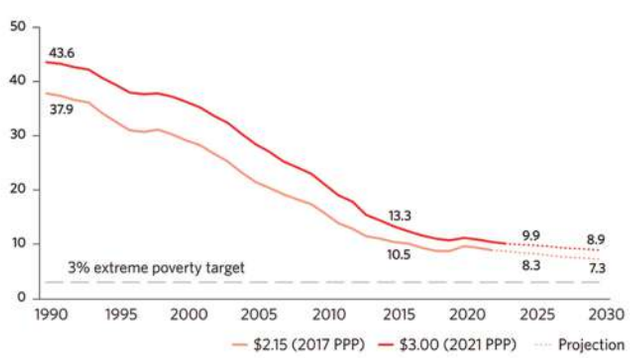
Poverty has declined significantly but remains persistent worldwide.

The Sustainable Development Goals (SDGs), were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. SDG 1 aims to end poverty in all its forms everywhere by 2030. It comprises multiple targets, including the eradication of extreme poverty, the reduction of multidimensional poverty, and the channelling of resources to build better social safety nets. The commonly used measure of poverty is based on income or consumption levels. A person is considered to be poor if their consumption or income levels fall below some minimum level necessary to meet basic needs. For international comparisons, the World Bank uses the following thresholds: Extreme poverty line (US$2.15/ day per capita in 2017 Purchasing Power Parity), as well as the lower-middle-income ($3.65/ day) and upper-middle-income ($6.85/ day) poverty lines.

> The UN has estimated an increase of 76 million people living below the international poverty line in 2022 alone. As of 2025, 808 million people (or 9.9% of the world's population) were estimated to be living in extreme poverty.[1]

The UN estimates that 575 million people will still be living in extreme poverty in 2030, and only about one-third of countries will meet the target to halve national poverty levels. While poverty rates steadily decreased between 2015-2019, the COVID-19 pandemic and subsequent conflicts have severely affected reduction efforts (see Figure 1.3). The UN has estimated an increase of 76 million people living below the international poverty line in 2022 alone. As of 2025, 808 million people (or 9.9% of the world's population) were estimated to be living in extreme poverty.[1]

FIGURE 1.3 PROPORTION OF THE POPULATION LIVING BELOW THE POVERTY LINE 1990-2030 (%) [1]



Poverty extends beyond income. The Global Multidimensional Poverty Index (MPI), developed by Alkire et al.,[2] measures acute poverty in over 100 developing countries using ten weighted indicators across health, education, and living standards.

Individuals deprived in at least one-third of these indicators are classified as 'MPI poor,' with the index also capturing the intensity of their deprivations.

When extending poverty to beyond income measures using the Global MPI, 1.1 billion people live in acute multidimensional poverty, over half of them being children.

Poverty in the Indo-Pacific Region

The Indo-Pacific's poverty landscape is marked by stark disparities. While economic powerhouses like Singapore, Japan, and South Korea have virtually eliminated extreme poverty, smaller island nations and conflict-affected areas continue to struggle. The Pacific Island nations face unique challenges relating to climate change impacts, limited economic diversification, and geographic isolation that constrain development opportunities.[3] Poverty among these Pacific nations is characterised by vulnerability and volatility, rather than economic deprivation alone. Their high reliance on trade, employment, remittances, tourism, and aid increases their vulnerability to external shocks. Among sources of vulnerability, environmental degradation, loss of biodiversity, and climate change impacts expose nations to shocks, often generating disasters which undermine the livelihoods of households.[4]

> Countries in the Indo-Pacific region account for around half of the world's multidimensionally deprived, approximately 500 million. Overall, about 22.7% of the population of Asia and the Pacific is poor, with 3.9% estimated to be living in extreme poverty.

Countries in the Indo-Pacific region account for around half of the world's multidimensionally deprived, approximately 500 million. Overall, about 22.7% of the population of Asia and the Pacific is poor, with 3.9% estimated to be living in extreme poverty. Furthermore, the prevalence of multidimensional poverty exceeded 10% in more than 40% of economies with available data. These figures suggest that there are significant global challenges in meeting the United Nations' SDG Goal 1, particularly for countries in the Indo-Pacific region.

Decades of rapid economic growth in India have resulted in dramatic improvements in development indicators, including a sharp reduction in extreme poverty prevalence. Extreme poverty fell from 16.2% in 2011-12 to 2.3% in 2022-23, lifting 171 million people above this line. Rural extreme poverty dropped from 18.4% to 2.8%, and urban areas it fell from 10.7% to 1.1%, narrowing the rural-urban gap from 7.7 to 1.7 percentage points—a 16% annual decline.

Indonesia's poverty rate decreased from 9.4% in 2023 to 9% in 2024, while extreme poverty fell from 1.1% to 0.8%, demonstrating steady improvement in Southeast Asia's largest economy. Meanwhile, the Philippines' poverty rate dropped to 15.5% in 2023 from 18.1% in 2021, though rising food prices have limited the pace of reduction.

Countries like Bangladesh have made significant strides, with the proportion of the employed population below $2.15 purchasing power parity per day reaching 2.6% in 2024. However, challenges remain in areas such as child mortality, where 31 out of every 1,000 babies born in Bangladesh in 2023 died before their 5th birthday.

Recent reporting by the UN's Regional Human Development Report found that 45% of people in the region have no government provided social protection coverage, which increases their vulnerability to negative economic and environmental shocks.[3]

Regional Disparities and Challenges

Although rapid economic growth has led to over 1.5 billion people in the region exiting extreme poverty, rural-urban divides persist across the region. According to UN estimates, approximately 79% of the world's poor live in rural areas, and rural residents accounted for four out of every five individuals living below the international poverty line.[5] Efforts to alleviate extreme poverty in rural areas are made even more challenging due to the casual and informal nature of rural employment and that agricultural activities are often subsistence-oriented.[6,7] And, a changing technological and trade environment has hampered economic growth and job creation in many countries. Lastly, there are also mounting risks to effective policy implementation arising from the erosion of democracy and national institutions, and increasingly polarized public opinions.

Gender inequality continues to perpetuate poverty cycles, with women facing barriers to education, employment, and asset ownership. In many parts of the region, traditional gender roles limit women's economic participation, reducing household incomes and perpetuating intergenerational poverty. Climate change further exacerbates the general and gendered risks related to poverty as changing and severe weather patterns affect economic activity and access for the poorest communities.

Factors Driving Poverty Reduction

Several factors have contributed to poverty reduction successes across the region. Economic growth, particularly in the manufacturing and services sectors, has created employment opportunities and lifted millions out of poverty.[1] Countries like Vietnam have leveraged export-oriented manufacturing to drive economic transformation, while India's technology sector has created high-paying jobs and spillover effects throughout the economy. A central tenet to each countries' success is a deliberate specialisation in an area of the economy where they are best positioned to develop, be it through natural resources, workforce composition or historical industrial policy.

Government social protection programs have also played crucial roles. Targeted cash transfer programs, subsidised food distribution, and rural employment guarantee schemes have provided safety nets for vulnerable populations. These targeted poverty programs represent crucial interventions for reducing poverty in developing countries. Recent years have witnessed a proliferation of unified poverty targeting systems, based on single consolidated registries. Around 92 countries are currently implementing or preparing to roll out unified targeting systems, which cover almost two billion people.[8,9] Indonesia's conditional cash transfer programs and India's rural employment guarantee scheme exemplify successful policy interventions.

Policy Proposals/ Recommendations

The world stands at a critical juncture in its fight against poverty. While remarkable progress has been achieved in countries like India and Indonesia, millions still lack access to necessities and opportunities for advancement. Success in addressing poverty will require sustained political commitment, innovative policy solutions, and recognition that inclusive development benefits entire societies.

1. **Addressing poverty requires sustained commitment to inclusive growth, climate resilience, and social protection.** Countries must invest in education and healthcare to build human capital, while enabling environments for private sector job creation. Infrastructure development, particularly in rural areas, can connect isolated communities to markets and opportunities.
2. **Regional cooperation offers additional pathways to poverty reduction.** Trade facilitation, knowledge sharing, and coordinated responses to climate change can amplify individual country efforts.
3. **Regional diversity presents both challenges and opportunities.** Learning from successful poverty reduction strategies, adapting them to local contexts, and maintaining focus on the most vulnerable populations will be essential for achieving the goal of ending poverty in all its forms globally by 2030.

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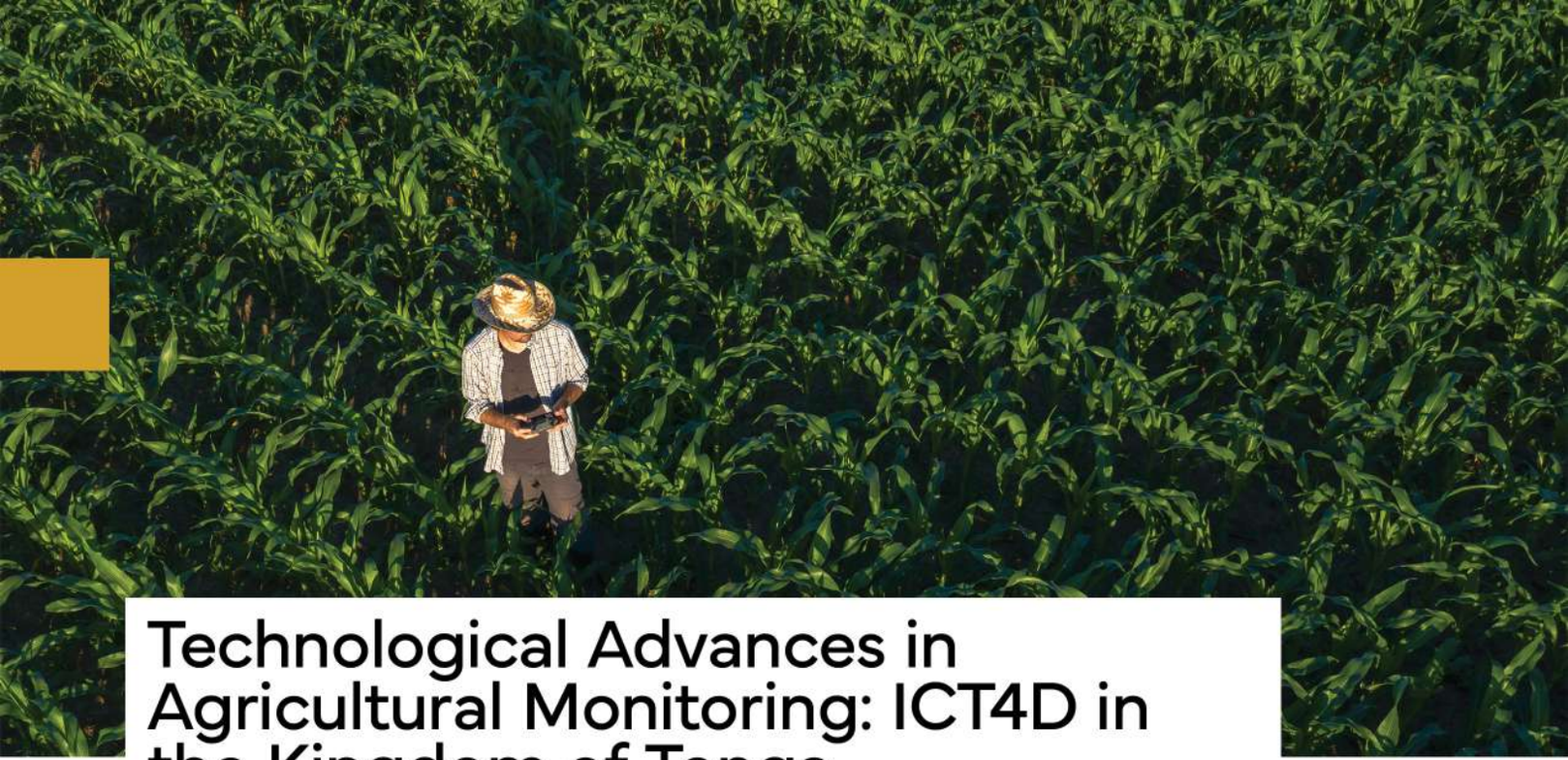
2 ZERO HUNGER



Technological Advances in Agricultural Monitoring: ICT4D in the Kingdom of Tonga

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Introduction

Information is integral to guiding progress towards achieving the UN's Sustainable Development Goals (SDGs). Numerous initiatives have been developed to assist in leveraging available datasets, including the UN Data Commons for the SDGs and the Global Partnership for Sustainable Development Data. At a base level, data is required for benchmarking progress towards SDGs. At a more focused level, data is used to evaluate the impact of specific projects and programs, guide policy formation and inform disaster response.

While the importance of data is acknowledged, in many parts of the world and in many sectors, data gaps persist. There are myriad reasons for these data gaps: financial or labour costs to collect information; limited access to software or sensors; and lack of capacity or skills. In 2018, a collaboration between The Universities of Western Australia, Sydney, and the South Pacific and The Kingdom of Tonga's Ministry of Agriculture, Food, and Forests (MAFF) was initiated to develop a monitoring system for Tonga's agricultural landscapes. This collaboration was funded by the Australian Centre for International Agricultural Research (ACIAR).

Understanding the Technological Divide

Until 2019, data gaps were prevalent in Tonga's agricultural sector. The datasets that did exist were limited in their geographic coverage, thematic detail, temporal currency and quality. Further, data collection processes were primarily paper based, resulting in lengthy data collection processes, limited quality control and long lag times from collection to use.

> While the importance of data is acknowledged, in many parts of the world and in many sectors, data gaps persist.

The agricultural monitoring system developed by this project has been used to map tens of thousands of agricultural holdings across Tonga. This data has been used for ministry-level decision making, project design and disaster response following the Hunga-Tonga Hunga-Ha'apai volcanic eruption. At its core, the system makes it easy for a user to outline an agricultural plot, enter information describing the plot's use and condition, and transfer this data to a central database. The system also provides users with a suite of visualisation and dashboard tools for reporting and extracting information from data collected in-the-field.

FIGURE 2.1 EXAMPLE OF COMPLEX MIXED CROPPING SYSTEMS IN THE KINGDOM OF TONGA [1]

Bridging the Divide

Bridging the divide required building the Ministry's capacity to collect and work with large geospatial datasets and transition from paper-based to digital agricultural monitoring. To reduce the risks that the software and data collection processes did not have sustained uptake by end users or were not context appropriate, a collaborative and participatory software development method was used following the Principles for Digital Development.[2]

Initially, a range of needs assessment activities were undertaken to prioritise MAFF's data needs and pinpoint gaps in software, skills and capacity. For example, context analysis was undertaken to identify institutional, technical and geographic enablers or barriers to using geospatial data. These activities included focus groups and interviews with agricultural stakeholders, use case and narrative modelling, shadowing MAFF officials, pilot fieldwork activities and secondary data analysis.

> The system was developed incrementally with each stage carefully identifying a specific need for geospatial data and creating a narrative description of how this data could be collected and used.

Agricultural land use data with attributes recording the number of crops planted (cereals, roots and tubers, vegetables, fruit trees, or fallow), the number of trees planted (for forestry) and livestock population in a land parcel, was identified as the key data gap. The thematic detail of this data permits identification of diverse agroforestry and mixed cropping systems and the spatial detail allows for the identification of within farm and field variability in agricultural uses. Ideally, this data would have national coverage and be captured annually to support agricultural planning for the subsequent year. However, such data could also be captured on an ad hoc basis to support specific project needs (e.g., baseline data or monitoring and evaluation).

An agile, iterative, and collaborative approach was used to develop the agricultural monitoring system.[3] The system was developed incrementally, with each stage carefully identifying a specific need for geospatial data and creating a narrative description of how this data could be collected and used. An iteration was closed by developing a prototype application to collect the agreed data, in-the-field testing of the prototype, and then feedback gathering to inform subsequent development stages. This approach engaged end users throughout the development process and encouraged input from individuals that did not have high levels of technical or geospatial experience, to ensure that software applications and datasets were aligned with the contexts in which they were deployed and used. The iterative development approach also allowed users to build familiarity with geospatial data and adapt and refine the data collection workflow accordingly.

Initially, work focused on developing and refining in-the-field data collection tools using the open source QField mobile mapping application. Data collection tool development started with small-scale data collection projects focused on a single crop and a few farms and progressed through to island-scale surveys of entire cropping systems and thousands of farms. At this point, the focus switched to scaling up the data collection workflow to a system that could support large teams and enable more advanced user and data management. A national scale crop survey was undertaken in late 2021 with multiple teams of data collectors working on different island groups. This served as a test for delivering a data collection workflow for national scale agricultural monitoring

with both online and offline data collection capabilities and automated data syncing.

As the overall system and specific tools for in-the-field data collection and data management became more stable, considerable focus was devoted to understanding MAFF's analysis objectives, visualisation needs and monitoring requirements. Commonly used data analysis and visualisation tasks were identified and built into dashboards for data analytics and visualisation. This permitted end users with minimal experience in specialist geospatial analysis software to use their web browser to quickly visualise data collected in-the-field and extract useful information in the form of charts, summary tables, or maps.

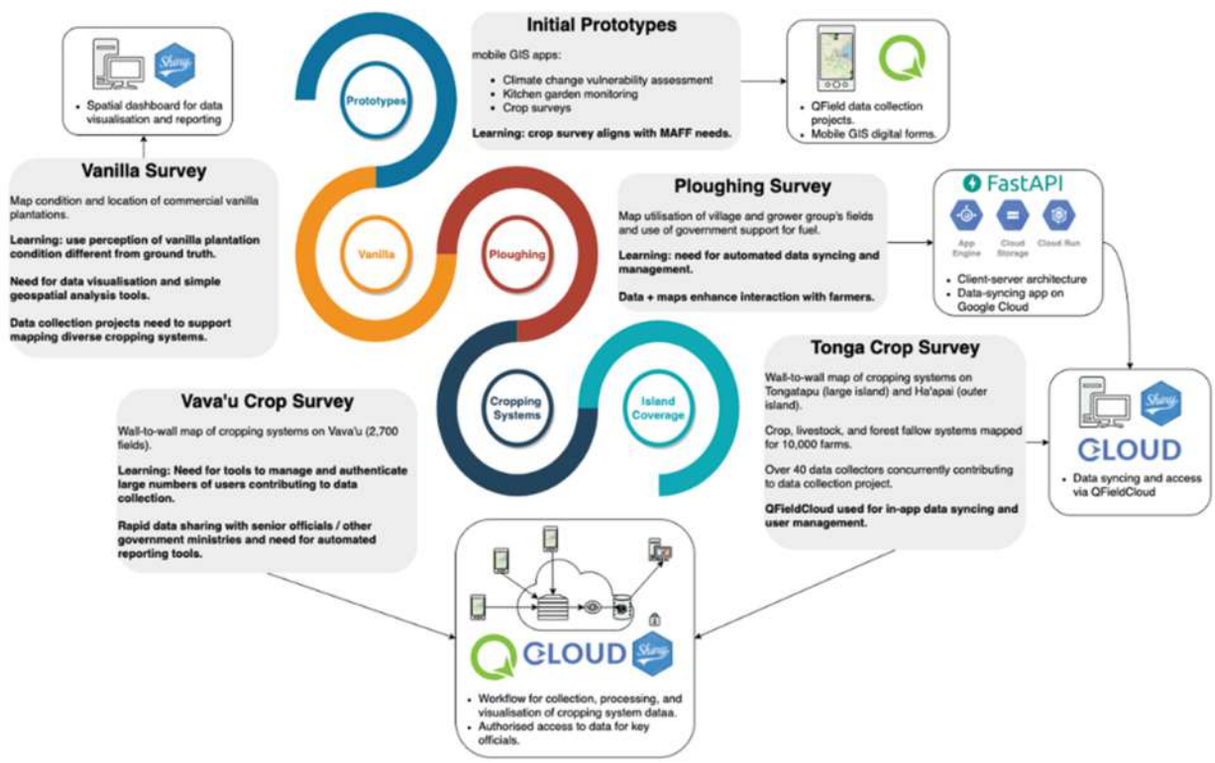
Sustaining the Bridge

For the agricultural monitoring system to have sustained use, there was a need to build the geospatial capacity within MAFF. It was important that this capacity building moved beyond training one or two key individuals, seeking to build capacity more broadly and instil a culture of problem solving using geospatial data. This broad organisation-wide capacity building helps ensure sustained use of the agricultural monitoring system is resilient to inevitable personnel changes. The project viewed building geospatial capacity within MAFF as a multi-year task comprising a series of classroom and seminar activities, online tutorials, in-the-field data collection workshops and on-the-job training. Since 2020, over 100 MAFF officials have taken part in geospatial training and capacity building activities. All training and workshop materials generated through this project are openly available, and before any large-scale data collection effort the relevant MAFF officials attend refresher and project specific training.

> Since 2020, over 100 MAFF officials have taken part in geospatial training and capacity building activities.

This project was conducted against a backdrop of ICT projects frequently failing to have sustained use in rural agricultural and international development sectors. However, this project demonstrates that ICT systems can be developed in ways that are context appropriate and deliver useful data outputs. Several

FIGURE 2.2 A SCHEMATIC OF THE ITERATIVE DEVELOPMENT PROCESS TO DESIGN AND BUILD TONGA'S AGRICULTURAL MONITORING SYSTEM



factors contributed to this success, which could form the basis of designing future ICT projects for sustainable and international development: long-term funding, identifying local champions, and a focus on enhancing existing organisation initiatives.

This project received long-term funding from ACIAR (6 years); allowing trust and working relationships to be cultivated between developers and end users for effective 'collaborative' development with time for understanding end users needs and constraints; and enabling end users to grasp the limits and opportunities of using geospatial data in their specific contexts. Ultimately, this long-term process led to the agricultural monitoring system being tailored for MAFF's specific needs and organisation requirements.

FIGURE 2.3 MAFF STAFF DELINEATING AN AGRICULTURAL PARCEL IN A MIXED CROPPING LANDSCAPE USING THE AGRICULTURAL MONITORING SYSTEM [4]

Working with "local champions" in both leadership and technical roles was key to the project's success. Local champions in leadership roles were quick to spot opportunities for using ICT and steer the project in those directions, providing legitimacy for the use of ICT and space for innovation. Local champions in technical roles quickly took ownership of deploying and using the agricultural monitoring workflow and provided "in-house" support for users within MAFF. It is recommended that similar projects developing ICT systems seek to identify and engage "local champions" in the project design stages.

It is important to recognise the contextual limits of any technology. Prior to the project starting, MAFF extension officials were already resource constrained, particularly in terms of their time; this situation being exacerbated by existing paper-based data collection processes. This project initially sought to use ICT to expedite analogue data collection processes, as opposed to creating new work. This encouraged end users to engage with the agricultural monitoring system, as they could see how it aligned with their existing tasks and did not create extra work.

Today, MAFF staff are currently analysing multiple years of field-level crop and livestock data to enhance understanding of local agricultural land use dynamics which will directly feed into agricultural planning and resource allocation. MAFF are also using the system to collect data for other ministries and guide the design of projects funded by major international donors.

Policy Proposals/ Recommendations

The project provides a robust example of how an adaptive ICT4D approach can provide the foundation for shaping a more resilient and sustainable futures through the co-development of landscape management tools. The co-design process adopted here resulted in a tailor-made application for mapping and monitoring agricultural landscapes. These tools have not only provided enhanced spatial analytic capabilities for MAFF, but also paved the way for more informed approaches to managing the Kingdom's agricultural systems in order to ensure sustainable food production and guarantee access to safe and nutritious food well into the future.

1. **Adopt a co-development process** to ensure that project deliverables align with partner organisation needs.
2. **Establish a flexible co-design process with end users** to gather insights on the appropriateness of technological solutions.
3. **Empower local stakeholders** to take ownership of new technological initiatives and capacity building to ensure a lasting impact.

Endnotes

1 Author's photograph.

2 Bon, A., Akkermans, H., and Gordijn, J., 2016. Developing ICT Services in a LowResource Development Context. Complex Systems Informatics and Modeling Quarterly, 9:84–109. https://doi.org/10.7250/csimq.2016-9.05.

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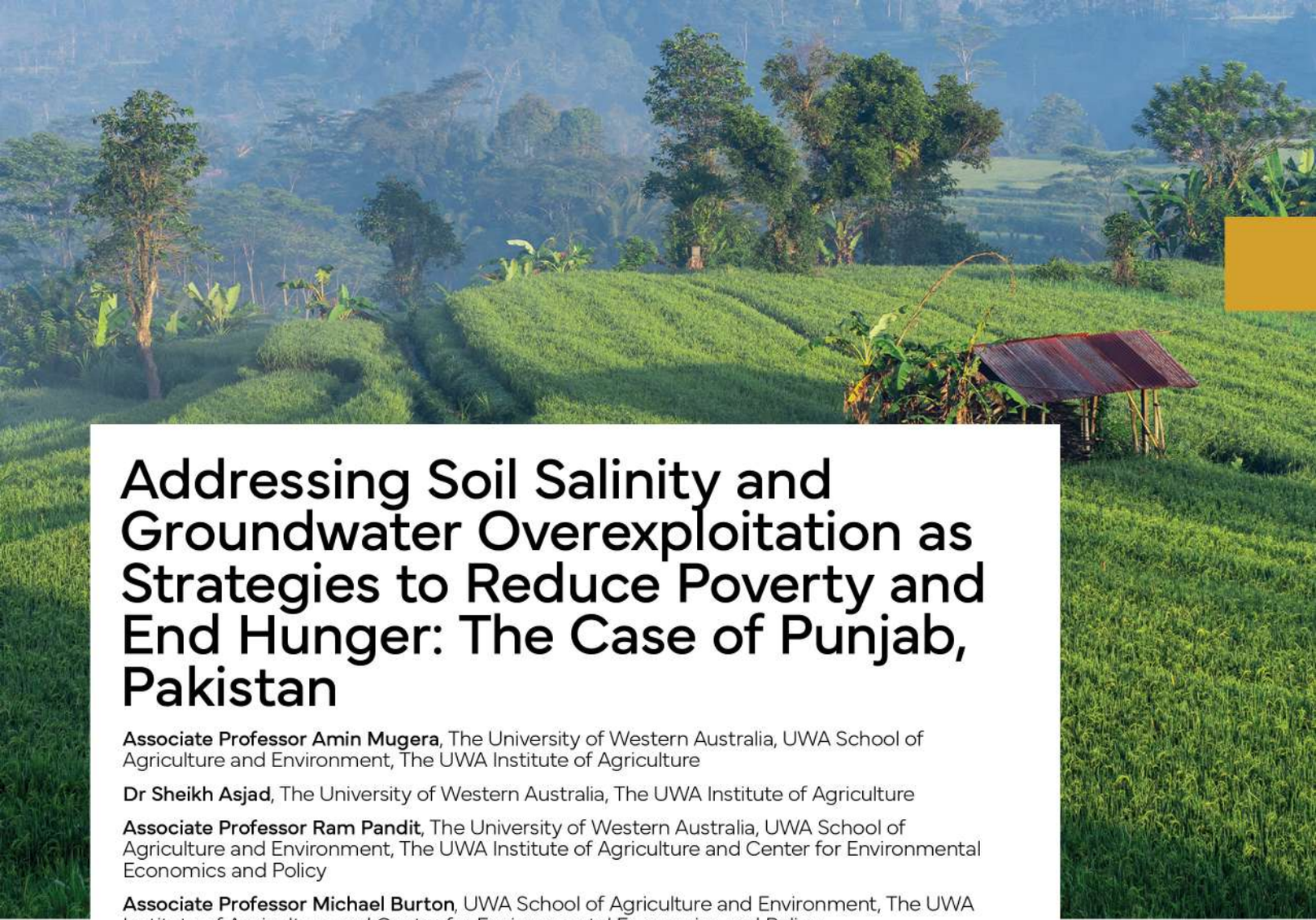

Addressing Soil Salinity and Groundwater Overexploitation as Strategies to Reduce Poverty and End Hunger: The Case of Punjab, Pakistan

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With the global population projected to reach 9 billion by 2050, healthy soils are critical for adequate food production.

However, soil salinity is emerging as a significant global challenge due to climate change, affecting agricultural productivity, environmental sustainability, and food security. Food and income insecurity due to poor crop yields and unsustainable agronomic practices has the potential to hinder the progress of SDG 1 Ending Poverty, and SDG 2 Zero Hunger. Further, land degradation, biodiversity loss, and desertification, affecting ecosystems and biodiversity has implications for SDG 3 Good Health and Well-being, SDG 6 Clean Water and Sanitation, and SDG 15 Life on Land.

Saline soils—found in many regions worldwide, from arid and semi-arid areas to coastal plains—are estimated to cover 20% of cultivated land and 33% of the irrigated agricultural areas worldwide.[1] Soil salinity often occurs where groundwater is used for irrigation due to factors like poor water quality, improper drainage systems, and climatic variability (i.e., irregular rainfall and evaporation).[2]

Soil salinity poses a significant threat to global food security, especially in developing countries where agriculture sustains a significant proportion of the population. Saline soils, characterised by reduced fertility and water infiltration, can hinder crop growth and productivity. Elevated salt levels in the soil can impede seed germination, stunt plant growth, and decrease crop yields. As a result, farmers may struggle to produce adequate crop output to meet food demands, translating into income losses, especially for small-scale farmers reliant on agriculture for their livelihoods. Diminished incomes further restrict access to food and other essential resources, exacerbating rural food insecurity and poverty.

Addressing this challenge requires a multi-faceted approach that includes improved irrigation practices, better drainage systems, sustainable agricultural practices, and increased farmer awareness of soil management techniques. Additionally, investments in research and technology are crucial for developing salt-tolerant crop varieties and innovative solutions for managing soil salinity effectively.

Two such approaches, Gypsum application—adding gypsum salt (calcium sulfate) in soil—and land levelling are common practices for managing soil salinity. Gypsum improves soil structure by replacing sodium ions with calcium ions and enhancing permeability. Gypsum application is often recommended in areas with high soil salinity levels to mitigate its adverse effects on crop production.

Land levelling alters the topography of agricultural land to create a uniform surface with minimal slopes. Proper land levelling ensures uniform water distribution during irrigation, preventing waterlogging and reducing soil salinity risk. Land levelling is crucial for optimising water use efficiency and managing soil salinity in regions where irrigation is prevalent.

Combining gypsum application with land levelling effectively addresses soil salinity in agricultural lands with tailored approaches based on factors like soil type, weather conditions, and crop type.

Soil Salinity Challenges in Punjab

Agriculture is a key sector in Pakistan's economy, contributing around 20% to the national income and employing 44% of the workforce, predominantly in rural areas. The livelihoods of most of the rural population hinge on this sector, underscoring the critical importance of healthy soil for agricultural sustainability.

Nevertheless, Pakistan's agricultural potential faces significant threats from persistent waterlogging and soil salinity issues. Of the country's 79.6 million hectares (Mha) of available geographical land, approximately 4.5 Mha is salt affected, with Punjab province bearing 30% of this burden. An estimated 17% of Punjab's land area is irrigated using saline groundwater.[3]

The Punjab Government has undertaken various initiatives to combat soil salinity and increase food production. One such endeavour—the 2006–2012 'Bio-Saline II' project in collaboration with the United Nations Development Program (UNDP)—aimed to engage communities to partner with the government to implement agriculture and land rehabilitation schemes, focusing on three districts in Punjab province: Jhang, Sargodha, and Hafizabad.

Under this project, the government and UNDP jointly subsidised 50% of gypsum costs, encouraging farmers to incorporate it into their farming practices. Gypsum's adoption proved beneficial in enhancing land productivity and optimising farming endeavours. However, despite its recognised advantages and promotional efforts, its uptake remained limited.

Additionally, the Punjab Government introduced laser land levelling (LLL) technology in 1985 to enhance surface water irrigation efficiency. Subsequently, in 2001, the government commenced promoting LLL technology through various schemes, including a subsidy program covering 50% of the LLL cost. Between 2005 and 2018, these schemes distributed approximately 11,500 LLL units to farmers and service providers. Despite the acknowledged benefits and widespread promotion of LLL, its adoption remained modest.

Understanding Farmers' Adoption Decisions

Policies and intervention strategies that encourage farmers to adopt innovations like gypsum and laser land levelling are important for promoting sustainable production. Understanding the drivers behind farmers' adoption decisions and their impact on farmer well-being is essential for tailoring effective plans and programs for technology diffusion. Farmers are more inclined to adopt new practices if they see clear benefits such as increased crop yields, higher income, and reduced groundwater use compared to their current methods.

Many factors influence farmers' adoption decisions, including their own characteristics, farm conditions, the nature of the practice, land tenure security, and access to markets, information, and credit. While studies have explored factors influencing the adoption of sustainable land management practices, limited research exists on the timeframe for farmers to adopt gypsum and laser land levelling technologies post-introduction.

For instance, studies in other countries have examined the adoption timeline for practices like zero-tillage. However, most research on gypsum use for soil salinity improvement has been experimental. None of these studies have delved into the factors accelerating gypsum adoption, which are crucial insights for policymakers aiming to support farmers in regions like Punjab grappling with soil salinity challenges.

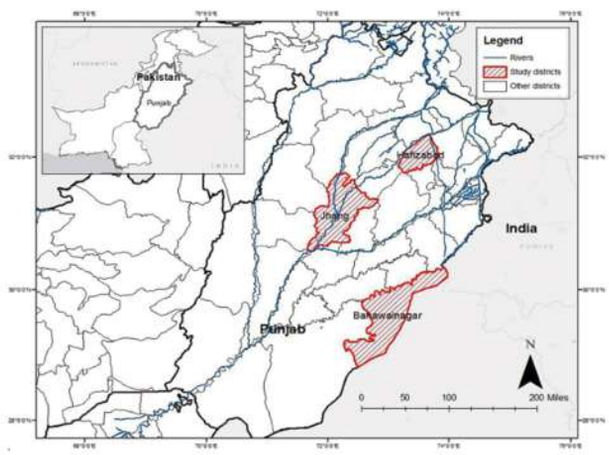
Empirical Studies for Evidence-based Policies

A team of researchers from the UWA Institute of Agriculture and Centre for Environmental Economics and Policy conducted two empirical studies to uncover barriers to adopting of soil management practices that address soil salinity in Punjab, Pakistan. Figure 2.4 shows the areas the study covered in the region.

The first study focused on gypsum adoption to rehabilitate salt-affected farmland.[1] The researchers surveyed 252 farm households across three agro-ecological zones (rice–wheat, maize–wheat–mix, and cotton–mix) in 2019 to determine the timeframe for farmers to adopt gypsum post-availability. They found that, on average, 56% of households adopted gypsum within 4.3 years.

Factors accelerating adoption included secure land rights, exposure to demonstration trials, and access to extension services and credit facilities. Conversely, distance to soil testing labs and input markets delayed adoption decisions. On average, gypsum adoption increased wheat and rice yields by 17% and 23%, respectively. That gypsum was seen to improve rice and wheat yields on saline soils is promising for

FIGURE 2.4 MAP OF THE STUDY AREAS IN PUNJAB, PAKISTAN [4]



farmers as it ultimately improves their livelihoods and ensures household food security. However, its cost may hinder adoption, particularly for resource-constrained farmers.

The second study investigated factors influencing the adoption speed of laser land levellers and their impact on groundwater application to wheat crops in the same regions.[5] The surveyed data collected from 504 farm households in 2019 revealed that about 70% had adopted the technology, with an average adoption time of nine years.

Key factors influencing the adoption speed included secure legal land rights, access to technology information, and prior exposure technologies.

However, distant rental markets for machinery slowed adoption. On average, LLL adoption reduced groundwater application by about 23%, suggesting that institutional improvements (such as, access to extension services, innovation exposure, and securing legal land rights) can bolster LLL technology adoption and groundwater conservation.

Policy Proposals/ Recommendations

A multi-faceted approach is required to address soil salinity and promote sustainable land and soil management practices. Based on the findings of the empirical studies, we propose the following recommendations:

1. **Increase farmer exposure to agricultural innovations** through field and demonstration trials, including promoting gypsum application and using LLL to control soil salinity and enhance water use efficiency.
2. **Reduce the high initial investment barrier associated with innovations** like the LLL by offering subsidies or financial assistance programs. Lowering upfront costs allows farmers to experiment with these technologies before making adoption decisions. Additionally, enhancing access to credit facilities with reasonable interest rates enables farmers to invest in these innovations.
3. **Provide secure land rights for ownership certainty** and to enable long-term investment in land management practices.
4. **Educate farmers on the real economic value of groundwater used for irrigation** to encourage them adopt water-saving practices and technologies, contributing to sustainable water management.

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1 Sheikh, A. T., Mugera, A., Pandit, R., Burton, M., & Davies, S. (2022b). What determines the time to gypsum adoption to remediate irrigated salt-affected agricultural lands? Evidence from Punjab, Pakistan. *Soil and Tillage Research*, 217, 1–11. https://doi.org/10.1016/j.still.2021.105266

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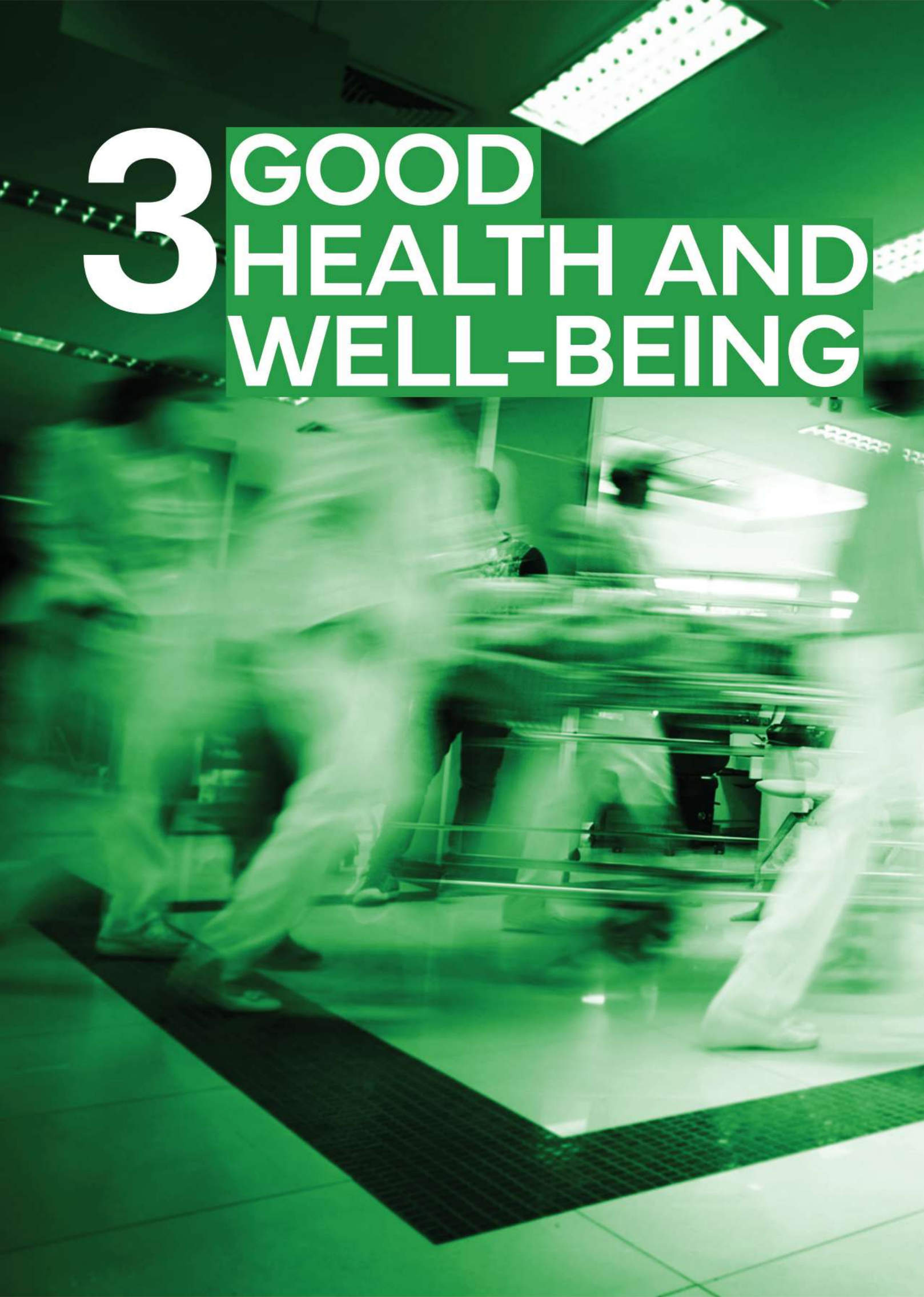

3 GOOD HEALTH AND WELL-BEING


EMERGENCY

Prioritising Eye Health to Advance the Sustainable Development Goals: A Call for Equity in Australia and Beyond

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Department of Optometry and Vision Sciences

Introduction

Globally, at least 2.2 billion people live with a vision impairment or blindness.[1] However, 90% of vision impairment is preventable or treatable with cost-effective interventions.[2] Poor vision limits access to education, employment, and social participation, which can perpetuate cycles of poverty and marginalisation. Eye health is one of the highest returns on health investments, yielding $36 in economic gains for every $1 invested.[3]

Ensuring universal access to eye care services advances multiple Sustainable Development Goals (SDGs), including those related to health (SDG 3), education (SDG 4), gender equality (SDG 5), and reduced inequalities (SDG 10). Addressing preventable vision impairment and blindness as a priority reflects our commitment to equity, inclusion, and in upholding human rights. In Australia, this includes an examination of our health system domestically, as well as thinking about how we can empower less well-resourced countries to address challenges relating to the social determinants of health. This contribution showcases some of the research at the Department of Optometry and Vision Sciences at The University of Western Australia and explores issues that can inform policy agendas on how eye care can be advanced to meet the SDG targets.

Eye care access in Australia

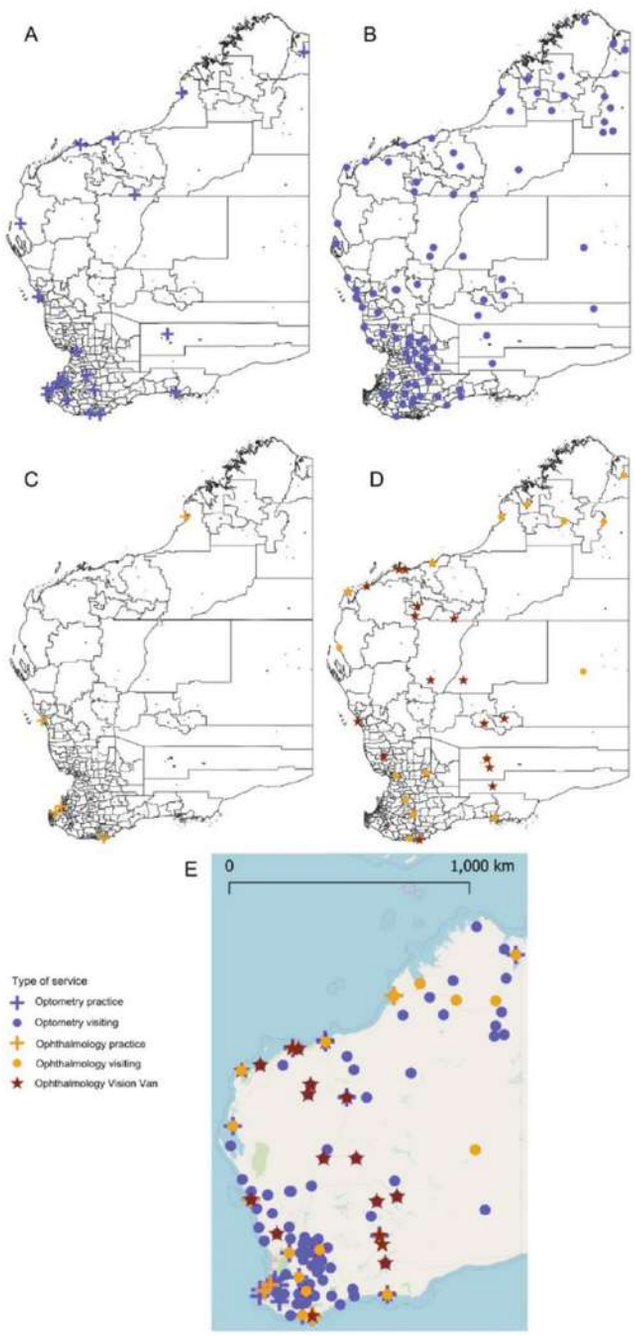
Australia is frequently regarded as a world leader in healthcare but is not immune to deep-seated inequities in eye health. While efforts to address health inequities have been made over time, Aboriginal and Torres Strait Islander peoples remain three times more likely to experience vision impairment than non-Indigenous Australians. The leading causes of vision impairment—namely, uncorrected refractive error, cataracts and diabetic retinopathy—are conditions that are usually

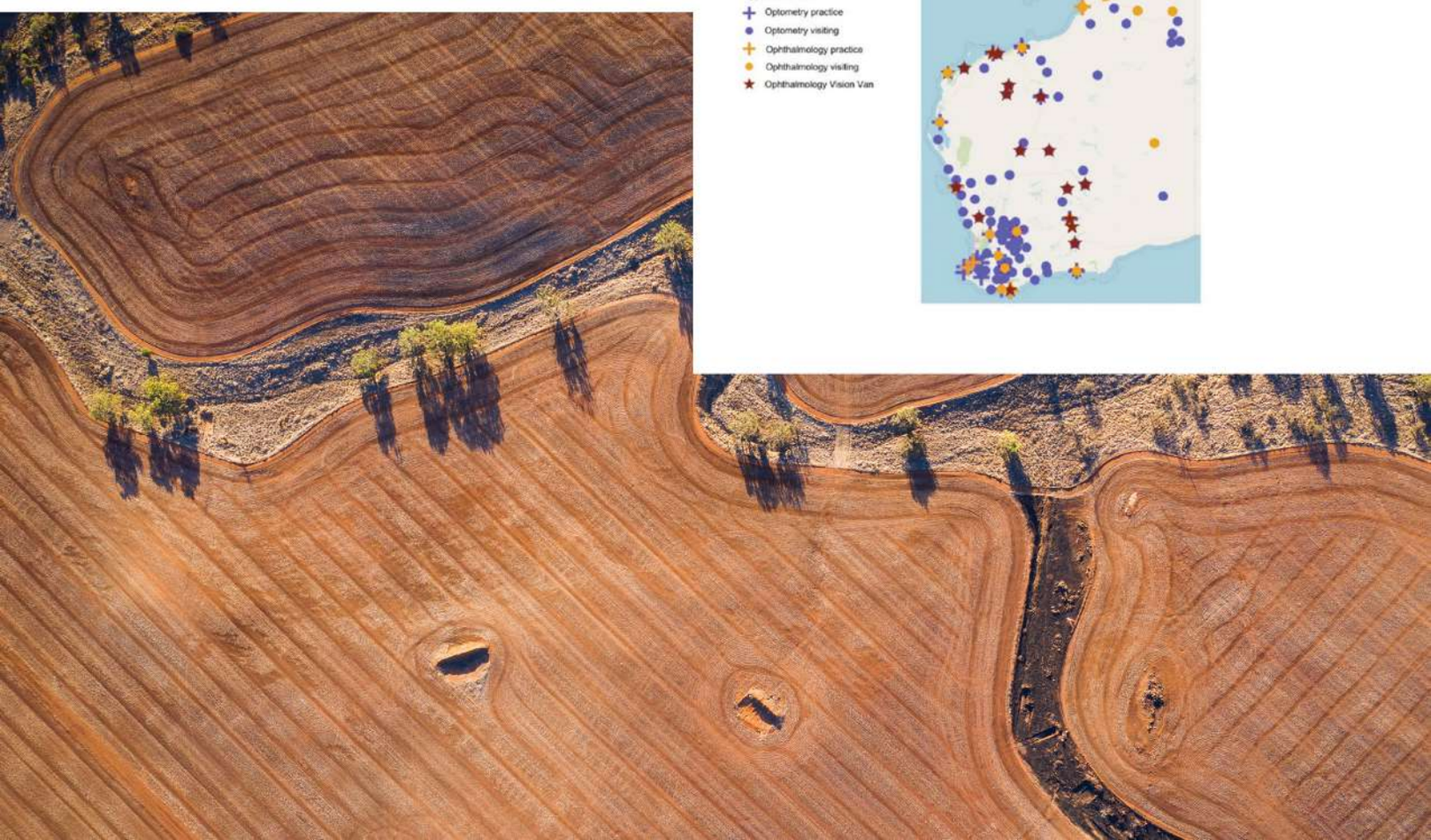
well-managed in urban, non-Indigenous populations. These health disparities are not due to medical complexity but can be attributed to multifactorial systemic failures in access, trust, and culturally safe care.

Geography also plays a significant role. Almost one-third of Australians live in rural and remote regions, and face reduced access to optometrists, ophthalmologists, and essential surgical services (see Figure 3.1). Outreach programs, though beneficial, are inconsistent and often underfunded. For Western Australia, the second largest state in the world by land area, these challenges are exacerbated due to the population's wide distribution.[4]

The dispersed population strains coordination efforts across optometry and ophthalmology, which provide primary eye care and secondary/tertiary care respectively. A maldistributed workforce requires resource-intensive collaboration between local and visiting service providers. Other initiatives that can help to overcome such challenges include innovative technologies, such as telehealth and strategies to recruit, support, and retain the rural workforce for long-term sustainability.[5]

FIGURE 3.1 OPTOMETRY AND OPHTHALMOLOGY SERVICES IN RURAL AND REMOTE WESTERN AUSTRALIA [4]





Ageing eye conditions, vision loss and falls prevention

With the Australian population ageing, falls have been identified as a public health crisis. As the leading cause of injury for older adults, falls bare a devastating cost to individuals, and the Australian government at more than $2 billion per year. Eye care practitioners have a crucial opportunity to reduce risk of falls through risk stratification, assessment and evidence-based management decisions and patient education. Critical to this is interprofessional referrals between eye care, primary care, and allied health. However, evidence suggests that eye care practitioners may not have good awareness or implementation of falls prevention.[6]

Similarly, low vision services are underutilised in Australia. There are several attributable causes of this underutilisation from low awareness of services, miscommunication between service providers, or between patients and clinicians, delayed referrals, service costs, or pervading social stigma.[7]

> For both falls prevention and low vision, targeted professional development, streamlined communication among providers, clearer referral pathways, and broader public awareness can improve eye health and provide support for those with vision impairment.

Global education

Avoidable blindness disproportionately affects low- and middle-income countries, where 90% of the global burden is concentrated. A major cause is the lack of access to cost-effective vision correction and an insufficient locally trained eye health workforce. For example, Australia's closest neighbour, Indonesia, has one of the highest rates of vision impairment and blindness. While international outreach initiatives, such as surgical blitzes, can provide short-term relief, their benefits are often temporary. Sustainable progress requires investing in local capacity-building, enabling communities to deliver ongoing eye care services.

Inconsistencies in optometric education across countries have in part hindered the development of a competent global eye health workforce. In Australia, optometrists are trained at a Masters or Doctorate level and play a key role in delivering eye care whereas in other countries, optometry is not a regulated profession. Global collaborations have enabled the development of education programs to advance optometric training. An example of global partnering is the introduction of optometry to Vietnam supported by the Brien Holden Foundation wherein contingents were trained overseas and returned as faculty of optometry university programs. Since the first optometry curriculum was approved in 2014, there are now 450 optometrists in Vietnam. Guided by global competency frameworks, such as the World Council of Optometry "Competency Framework for Optometry", the opportunity now exists to align optometry education with internationally recognised standards to improve care delivery and workforce capacity worldwide.[8]

> Collaborations between educators and institutions around the world can facilitate the training of the future optometric workforce and equip them with evidence-based knowledge and skills to deliver quality eye care. Technological advancements such as artificial intelligence can assist the development and delivery of a global curriculum.

FIGURE 3.2 NUMBER OF OPTOMETRISTS AND OPHTHALMOLOGISTS PER 100,000 POPULATION IN THE US, CANADA, UK, AUSTRALIA, AND NEW ZEALAND [10]

EYE CARE PROFESSION	US	CAN	UK	AUS	NZ
FULL TIME EQUIVALENT OPHTHALMOLOGISTS, PER 100,000 POPULATION	5.7	3.5	2	4	3.4
FULL TIME EQUIVALENT OPTOMETRISTS, PER 100,000 POPULATION	16.2	17	12.5	19	17.7
OPTOMETRIST/ OPHTHALMOLOGIST RATIO	2.84	4.85	6.25	4.75	5.20

Even in higher-income countries, scope of practice varies. Australia and New Zealand have a Trans-Tasman agreement, allowing optometry graduates of accredited programs to practice in either country (see Figure 3.2). However, the optometric scope difference between the countries has widened over time, as New Zealand optometrists have the authority to prescribe oral medications and to perform advanced procedures, such as laser, whereas optometrists in Australia, at the time of writing, are unable to do so. Current excess demand for ophthalmology procedures would likely be mitigated by increasing graduate optometrist education in select methods. Given the sizable optometry workforce in Australia, there is substantive opportunity and capacity to modernise scope of practice.

International training courses, such as the Northeastern State University Oklahoma College of Optometry Advanced Procedures Course and Laser Procedures Course, have shown that trained graduate optometrists in the United States and the United Kingdom (UK), among other countries, can safely and competently perform advanced procedures required to address current service gaps (see Figure 3.3).[9]

Eye health literacy

Improving eye health outcomes requires a focus on both patient empowerment and clinical excellence. Access to care starts with the patient's ability to perceive the need for care. Whilst original research in Australia is scarce, research suggests that eye health literacy is critical in enabling individuals to make

FIGURE 3.3 OPTOMETRIC SCOPE OF PRACTICE IN THE US, CANADA, THE UK, AUSTRALIA, AND NEW ZEALAND [9]

COUNTRY/STATE (WHERE APPLICABLE)	YEAR	TYPE OF TRAINING DURING SCOPE EXAPANSION	CHANGES IN THE SCOPE OF OPTOMETRIC PRACTICE
US/ALL STATES	PRIOR TO 1988	POST-GRADUATE AND UNIVERSITY CURRICULUM	DIAGNOSTIC AND THERAPEUTIC PHARMACEUTICAL AGENTS INCORPORATED INTO SCOPE OF PRACTICE
US/OKLAHOMA	1988	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/KENTUCKY	2011	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/LOUISIANA	2014	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/ALASKA	2017	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/INDIANA	2018	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/ARKANSAS	2019	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/MISSISSIPPI	2021	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/ WYOMING	2021	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/ WISCONSIN	2021	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/VIRGINIA	2022	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/COLORADO	2022	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
US/SOUTH DAKOTA	2024	POST-GRADUATE	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
CANADA	~2010	POST-GRADUATE	TOPICAL AND ORAL MEDICATIONS INCORPORATED INTO SCOPE OF PRACTICE
UK	1968	POST-GRADUATE	A LIMITED RANGE OF MEDICATIONS INCORPORATED INTO SCOPE OF PRACTICE
UK	2023	POST-GRADUATE	INJECTIONS INCORPORATED INTO SCOPE OF PRACTICE
NEW ZEALAND	2022	POST-GRADUATE AND UNIVERSITY CURRICULUM	LASERS AND INJECTABLES INCORPORATED INTO SCOPE OF PRACTICE
NEW ZEALAND	2014	POST-GRADUATE AND UNIVERSITY CURRICULUM	TOPICAL AND ORAL MEDICATIONS INCORPORATED INTO SCOPE OF PRACTICE
AUSTRALIA	2000	POST-GRADUATE AND UNIVERSITY CURRICULUM	TOPICAL MEDICATIONS INCORPORATED INTO SCOPE OF PRACTICE

informed decisions, take preventive action, and engage in early treatment.[9] Strengthening eye health literacy through targeted education campaigns, accessible resources, and community outreach is essential to improve early detection, encourage routine eye exams, and reduce the long-term burden on healthcare systems. Integrating these strategies into health policy can drive more equitable and sustainable eye health outcomes.

Health literacy is particularly important for vulnerable populations. The University of Western Australia Eye Health Centre of Western Australia operates a refugee eye health clinic with weekly services for newly arrived refugees and asylum seekers to receive primary eye care services and spectacles with no out-of-pocket cost. Engagement through the clinic has shown that there is a material eye health literacy gap amongst refugee populations. As such, our academic team has commenced research into eye health literacy in refugee patients with this study's results set to be used in developing targeted health promotional policy strategies.

Policy Proposals/ Recommendations

Educational institutions, health professionals, government agencies, non-governmental organisations, and policymakers are called upon to work collaboratively to develop sustainable systems of care that can create local and global social impact. Some recommendations include:

1. **Legislative changes that reflect education and training evolution to meet population needs.** Update legislation (scheduled medicines) to align with contemporary education and training, focusing on the competencies required to deliver safe, effective care that meet population needs rather than limiting definitions based on profession.
2. **Create systems where health professionals can practise to their full scope to maximise resources.** Develop and implement systems that allow health professionals to work to the full extent of their training. The 2024 Scope of Practice Review[11] highlights that many practitioners are currently underutilised, not because of a lack of capability, but because of legislative, regulatory, and funding barriers.
3. **Increase collaboration between professions.** Support initiatives that enhance collaboration between healthcare professionals, reduce service duplication and place patient needs at the centre of care delivery. Good collaboration allows better work to be done with less resources.
4. **Increased investment in eye health.** Increase both financial investment and strategic attention to eye health initiatives. While public and sector interest in prevention and early intervention is growing, government leadership and policy focus have not kept up at the same pace. Eye health needs to be elevated as a national priority, with targeted programs that can effectively meet rising community demand and reduce avoidable vision loss. Health professionals need to be appropriately reimbursed for their skill and expertise.

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Plastics, Diet and Human Health: The Need for Policy Change

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Introduction

A healthy diet is fundamental to good health (Sustainable Development Goal 3) and the prevention of non-communicable diseases. Yet, more than one third of Australians' daily kilojoule intake comes from discretionary foods that are energy-dense and nutrient poor—often highly processed and individually packaged.[1] With increasing rates of chronic diseases in Australia, it is important to consider what else is being ingested beyond just food and nutrients, such as plastics in food.[2]

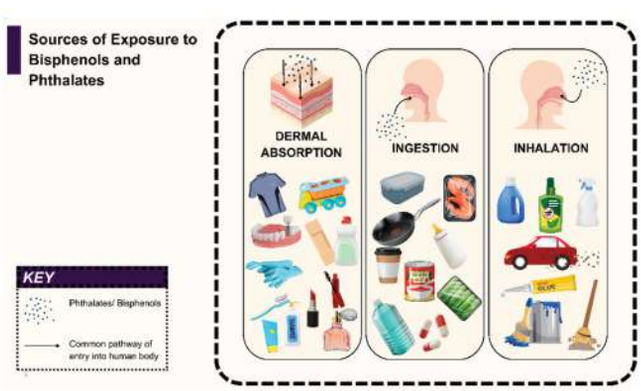
The production and disposal of plastics negatively impact the environment, and there is a growing body of evidence on the impacts on human health. Dietary intake has been identified as a major source of plastic exposure.[2] But, limiting foods and beverages in plastic is challenging, despite public interest in the issue. Tighter regulations and policy changes are needed to improve equity, access and affordability of low plastic foods in Australia.

What are plastics?

Plastics are made from carbon-based polymers that break down into microplastics and/or nanoplastics, which release plastic chemicals, such as bisphenols and phthalates.[3] Plastics are widely used in consumer and industrial products, from children's toys and food packaging to construction materials and electronics.[4]

Plastics have been detected in food and water sources and may continue to release plastic chemicals after ingestion. Plastic chemicals can enter the body through the food we eat, the products we put on our skin and the air we breathe (See Figure 3.4).

FIGURE 3.4 SOURCES OF EXPOSURE TO PLASTIC CHEMICALS



Plastics and Human Health

Plastics have been linked to poor health outcomes during their production, use and disposal.[2] Plastic chemicals, of which there are now >16,000 used in plastic products, have endocrine disrupting properties and have been linked to cardiovascular disease, metabolic syndrome, infertility, and other health concerns.[2, 4, 5] Human exposure to plastic chemicals is evidenced by their detection in adipose and brain tissue, urine, semen, nasal secretions and serum.[6] More recently, microplastics have been linked to atherosclerosis.[7]

There is substantial evidence on the health impacts of just a few plastic chemicals, such as bisphenol A (BPA),[4] and minimal research on 'regrettable substitutions', such as Bisphenol S or F. These are now being used by the food industry since regulations were introduced for more 'traditional' plastic chemicals.

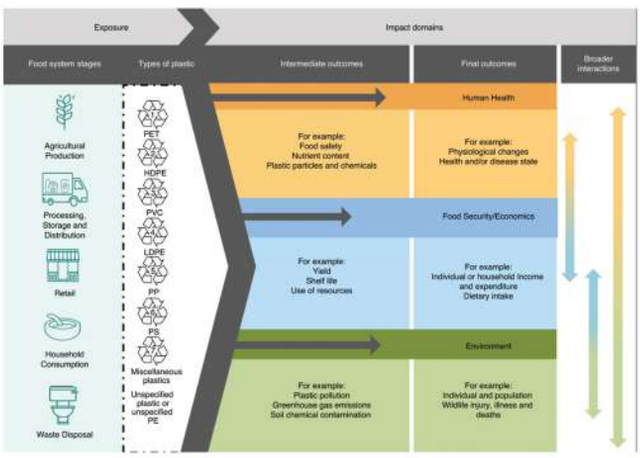
> Plastic chemicals can get into our bodies through the food we eat, the products we put on our skin and the air we breathe.

Plastics in food

Plastics are light, malleable, convenient, and used pervasively in the Australian food supply. They play a role in providing access to a safe food supply, especially for people living in rural and remote regions by extending shelf-life, preventing contamination, and ensuring food safety during transport and storage. However, they damage the environment and can migrate into food during farming, processing, transport, storage, packaging, preparation, cooking methods, utensils and appliances, and the crockery and cutlery used to eat (Figure 3.5).[8, 9] Both virgin and recycled plastic food packaging can leach plastic chemicals into food.

Public education on food choices and kitchen practices to reduce exposure to plastics, such as not microwaving in plastic or using non-stick pans, can support behaviour change. However, with competing health priorities, rising food costs and low plastic foods often being more expensive, tighter regulations and policy changes are needed to reduce dietary exposure to plastic.

FIGURE 3.5 RELATIONSHIPS BETWEEN FOOD SYSTEM USES OF PLASTICS AND THE INTERMEDIATE AND FINAL OUTCOMES [10]



Regulations of plastics in food

The health impacts associated with plastic chemicals, namely phthalates and bisphenols, have resulted in many countries initiating regulatory measures to limit public exposure. However, the Tolerable Daily Limits set by regulatory bodies vary internationally and for different products, despite a global evidence-base. Advancements in evidence on plastics and human health are being reflected in changes to regulations internationally. For example, the European Food Safety Authority reduced the Tolerable Daily Intake of BPA by 20,000 times in 2023.[11] This change has not yet been reflected in Australian regulations.

The emergence of alternative substitutes, such as Bisphenol S, are not closely regulated and exhibit similar physiological effects. This shift highlights the need for affordable and accessible plastic free options, and consistent and comprehensive international regulatory frameworks. Such regulations are particularly important for socio-economically disadvantaged communities who may not have access to low plastic food options.

> The European Food Safety Authority reduced the Tolerable Daily Intake of BPA by 20,000 times in 2023. This change has not yet been reflected in Australian regulations.

Plastic Exposure Reduction Transforms Health (PERTH) Trial

The PERTH Trial at UWA Medical School is a world-first clinical trial investigating the impact of plastics on human health. The Trial is being led by Professor Michaela Lucas and is funded by the Minderoo Foundation.

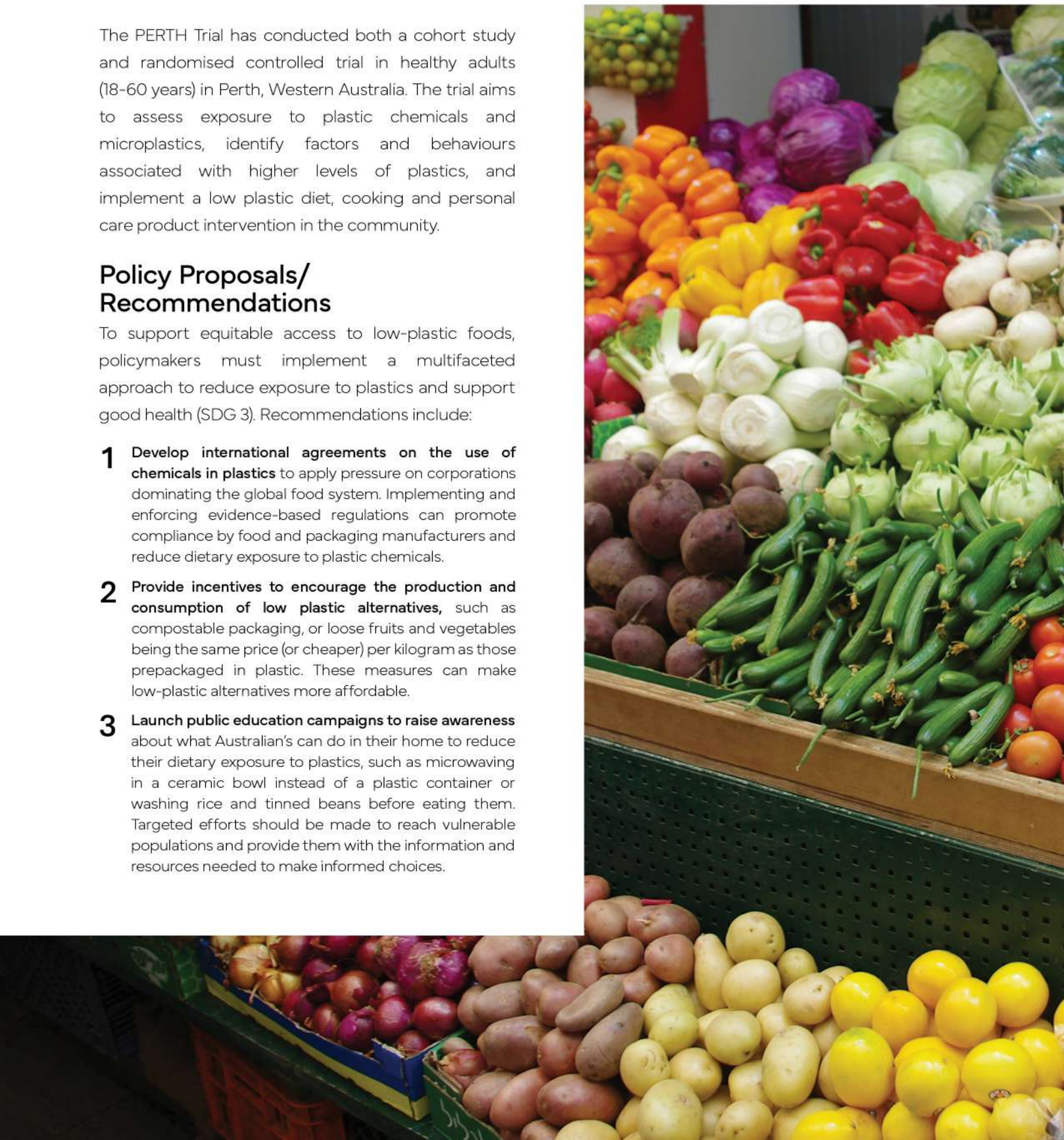
The PERTH Trial has conducted both a cohort study and randomised controlled trial in healthy adults (18-60 years) in Perth, Western Australia. The trial aims to assess exposure to plastic chemicals and microplastics, identify factors and behaviours associated with higher levels of plastics, and implement a low plastic diet, cooking and personal care product intervention in the community.

Policy Proposals/ Recommendations

To support equitable access to low-plastic foods, policymakers must implement a multifaceted approach to reduce exposure to plastics and support good health (SDG 3). Recommendations include:

1. **Develop international agreements on the use of chemicals in plastics** to apply pressure on corporations dominating the global food system. Implementing and enforcing evidence-based regulations can promote compliance by food and packaging manufacturers and reduce dietary exposure to plastic chemicals.
2. **Provide incentives to encourage the production and consumption of low plastic alternatives,** such as compostable packaging, or loose fruits and vegetables being the same price (or cheaper) per kilogram as those prepackaged in plastic. These measures can make low-plastic alternatives more affordable.
3. **Launch public education campaigns to raise awareness** about what Australian's can do in their home to reduce their dietary exposure to plastics, such as microwaving in a ceramic bowl instead of a plastic container or washing rice and tinned beans before eating them. Targeted efforts should be made to reach vulnerable populations and provide them with the information and resources needed to make informed choices.

In conclusion, addressing the interplay between plastics, diet, and human health requires concerted policy action that prioritises accessibility and affordability. By implementing regulations, subsidies and education campaigns, policymakers can support the use of low-plastic alternatives to benefit the health of all Australians.



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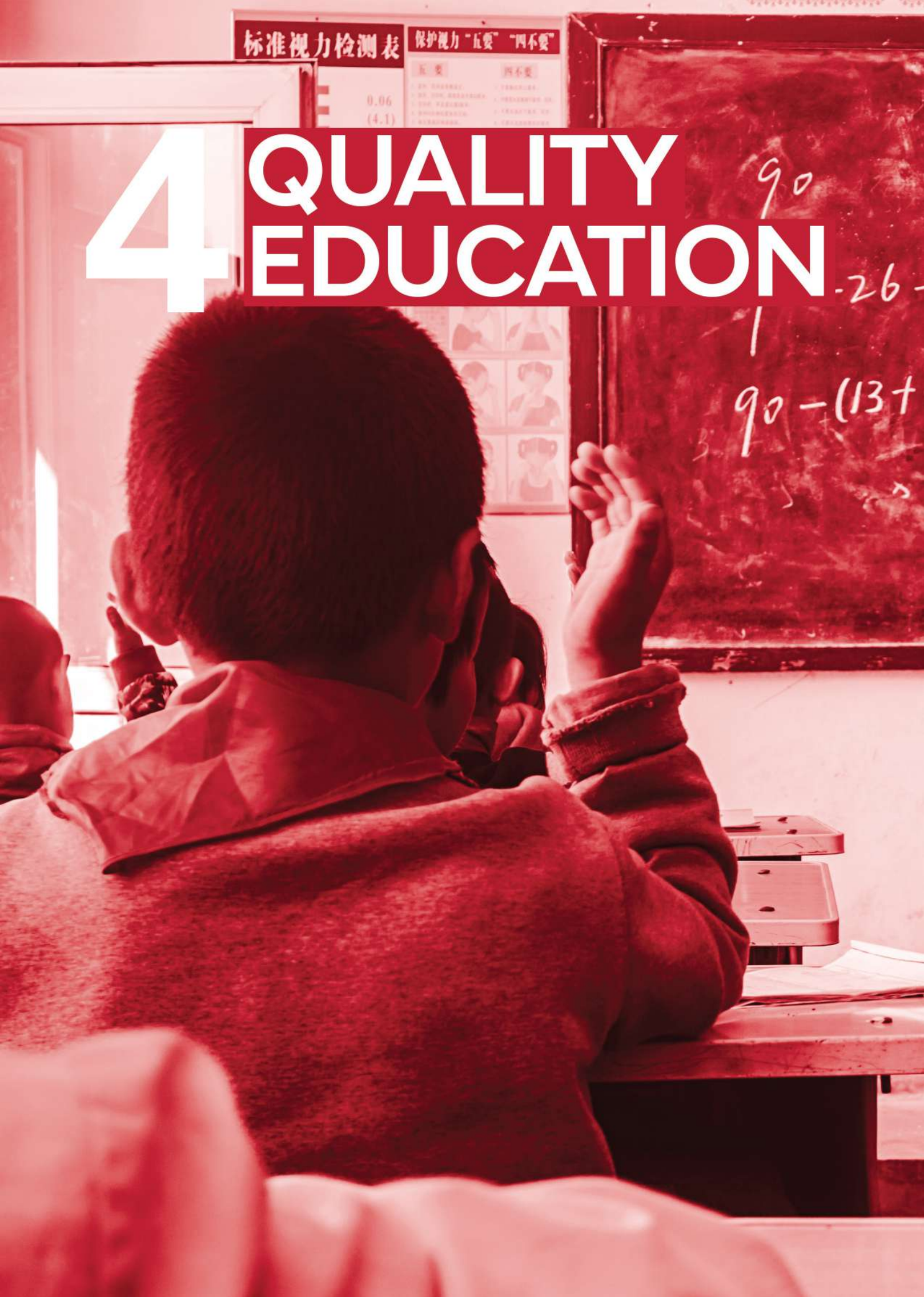

4 QUALITY EDUCATION


聪聪可能买了什么物品？
可能买了一个书包，一本童话故事或一个
-25=39(元)
42)=35(元)
2. 90元钱买了两件物品，还剩30多元，

Quality or Quantity?

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Introduction

The educational goal, SDG 4, is universal in nature. That is, all countries have a shared level of commitment to this goal and are expected to translate the goal into national policies and plans. Although the overall goal is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all", the focus is primarily on compulsory schooling (primary/elementary and secondary levels). In addition, and as outlined in this contribution, there is a notable gap between the ambitious goals and targets espoused in SDG 4, and the policies and processes to support and monitor their implementation. There is little doubt that this is a transformative and progressive agenda,[1] yet curiously, accountability, monitoring, and reporting appear to be almost wholly absent. Although an indicator framework has been developed, any follow-up review is voluntary and consequently, by the end of 2019, only an average of 36 countries a year had completed a national review.[2] Perhaps we ought to begin by asking—what are we attempting to measure? And then turn attention to the question: Are we endeavouring to measure the unmeasurable?

Targets and Tensions

A positive component of SDG 4 is the initial focus on literacy and numeracy and broader indicators linked with global citizenship, sustainability, and gender equality. SDG 4 comprises seven targets that address quality and equality and are broadly concerned with access, participation, and implementation.[3] However, there is a tension here between the broad conceptions of these terms and a perceived narrow approach to the indicators, or outcomes. There is a discernible tension between quality linked with a narrow range of measurable learning outcomes, and quality linked with immeasurable attributes, such as equality and values such as sustainable development and global citizenship.[4]

Although measurement and evaluation may present an indication of whether the SDG 4 targets and outcomes are being met, there is a disconnect with the overarching vision of an inclusive and equitable education.[5] It seems to be a lost opportunity for broader meanings of inclusion, access, quality, and equalities to surface in the ongoing quest for targets and indicators.[6] Indicators are no less than measures of inputs or outcomes that do not necessarily consider intersecting inequalities, inequitable practices, or reflect how more equitable provision of quality education might be achieved.[7] What is needed therefore is a shift away from proxy indicators of performance (i.e., the numbers and metrics) to looking more critically at how inequalities, inclusion and quality might be better understood and captured. What then might be the opportunities?

Possibilities and potential

The SDGs are critical global educational goals yet are ill-suited for quantification and global comparability. A frequent response to the complexities of ideas about quality, equality and inclusion is that they are immeasurable.[8] Perhaps the starting point ought to be a recognition that measurement and the power of numbers have inevitably imposed a form of domination and hierarchy that does not offer the necessary insights into what is actually occurring.[4]

To better understand the complexities and intersectionalities of equality, inclusion, access, and quality, we suggest that debates ought to focus on broader understandings of pedagogies, policies, practices, and social context. Learning outcomes, for example, should not be separated from pedagogies and, similarly, curriculum and learning materials cannot be disentangled from issues of access, equality, and inclusion. Better understanding about what ought to be measured and not measured is a constructive point at which to continue these debates.[2] Perhaps the questions ought to be: What are we trying to capture? And, what do we value and why?

These central questions offer the potential to acknowledge and recognise the limits of what is measurable and to open up the possibilities to considering more reflective, democratic, and critical approaches to SDG 4.

Policy Proposals/ Recommendations

1. **Set aside performance metrics and indicators** and for educators and policy makers to engage in a more critical and thoughtful way with the purposes and potential of SDG4.

2. **Develop wider strategies, policies, and practices** to identify and tackle inequalities and exclusions.

3. **Consult with those for whom these SDGs are written.** Rather than imposing a framework for evaluation, consider the possibilities that consultation might lead to greater insights into what might be needed, by whom, and when.

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Beyond Boundaries: Towards Equity for All

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Introduction

The Sustainable Development Goals epitomise a global endeavour to eradicate poverty, preserve the environment, and foster prosperity and peace. Among these goals, SDG 4 (Quality Education) aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". Our examination here focuses on Target 4.5, which is concerned with ensuring equal access to education for vulnerable groups and peoples.

The findings from the OECD Programme for International Student Assessment[1] indicate a correlation between the academic achievement of Australian 15-year-olds in mathematics, scientific literacy, and reading comprehension, and variables such as the geographical location of their schools (rural or urban) and socio-economic status. In the Australian context, ensuring equitable learning outcomes for all students demands a comprehensive understanding of the factors influencing educational equity, alongside targeted interventions to address these disparities. Thus, we suggest that equity is more than achievement linked with test scores and that concentrated attention on how inequities play out across various education sectors reveal the multifaceted challenges. The complexities of equational equity are the focus of this contribution.

Participation in early childhood education

The formative years of early childhood hold significant importance in shaping future trajectories and mitigating socio-economic disparities.[2] Yet, discrepancies persist across socio-economic and geographical contexts as Australian children from regional and rural areas and those from low socio-economic backgrounds are less likely to access childcare services or preschool, or both.[3] For example, in addition to having fewer early childhood education services available in rural and remote areas, transportation barriers can further limit access for families in these areas. Further, Indigenous children often face unique challenges, including cultural differences, historical disadvantages, and difficulties in navigating and engaging with mainstream services. While ensuring equitable access to quality care and educational experiences for all children is imperative, it is equally important to have a tailored approach that responds to the diverse needs of children and their families.

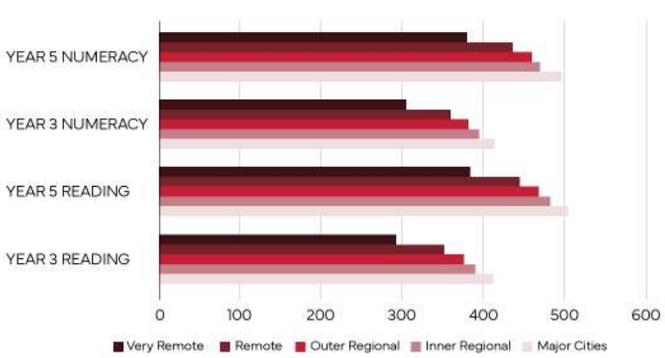
Early childhood educators were lauded as essential workers during the COVID-19 pandemic, yet many still experience what Blyth[4] describes as a disconnect between policy aspirations and the daily realities of their work. Surveys by the United Workers Union confirm that turnover remains high because educators feel exhausted, undervalued and paid too little. Although national strategies and inquiries have

recently used broad consultation processes involving unions, educators, and other stakeholders, researchers argue that market-driven early childhood education and care (ECEC) systems still position educators as "invisible actors", whose well-being and expertise are marginalised.[5] This structural undervaluation, rather than a lack of formal consultation, contributes to attrition and threatens the sustainability of services. In addition, critics have noted that the SDGs contain limited coverage of early childhood education and fail to fully account for the critical importance ECEC.[6]

Achievement gaps between "haves and have-nots" in primary schooling

Recent analysis of the National Assessment Program-Literacy and Numeracy (NAPLAN) results has unveiled significant achievement gaps in all five testing domains between socio-economically advantaged and disadvantaged students.[7] A considerable proportion of disadvantaged students are identified as requiring additional support within their schools. These findings demonstrate urgent need for initiatives that prioritise equity to effectively address the educational challenges encountered by marginalised student populations.

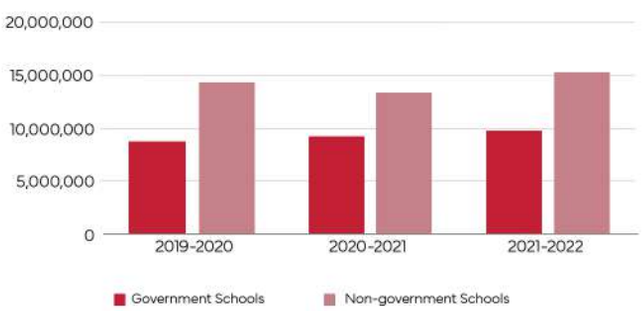
FIGURE 4.1 NAPLAN ACHIEVEMENT FOR YEAR 3 & YEAR 5 IN READING AND NUMERACY BY GEOLOCATION [7]



These data reveal that enduring educational inequalities persist in Australian schools. Public schools in comparison to non-government schools, exhibit a notable disparity in the enrolment of students from low socio-economic backgrounds, with three times as many students from this demographic background being enrolled in public institutions.

ACARA's 2022 data show that the average gross recurrent income per student across all Australian schools was $19,685, but it was only $18,076 in government schools compared with $19,681 in Catholic schools and $25,695 in independent schools. In a system committed to equity, the persistence of higher total income in the fee-charging sectors raises questions about the adequacy of resource distribution to schools serving the most disadvantaged communities.

FIGURE 4.2 DIFFERENTIAL GOVERNMENT FUNDING BETWEEN GOVERNMENT AND NON-GOVERNMENT SCHOOLS [8]



Public schools cater to a significant proportion of disadvantaged students. If Australia aims to eliminate inequities, it must address the root causes of achievement gaps and ensure all students have equitable access to quality education and opportunities for success.

Equitable access to the senior secondary curriculum

The concept of equity entails both fairness and inclusivity. Achieving fairness and inclusivity necessitates that education resources are available and accessible to all students, irrespective of their background.

Research evidence indicates that students' post-school opportunities are influenced by the curriculum offered by their schools.[9] For example, in the secondary context, schools in higher socioeconomic status (SES) areas tend to offer a greater number of mathematics and science courses, whereas vocational studies are more prevalent in areas with lower socioeconomic backgrounds.

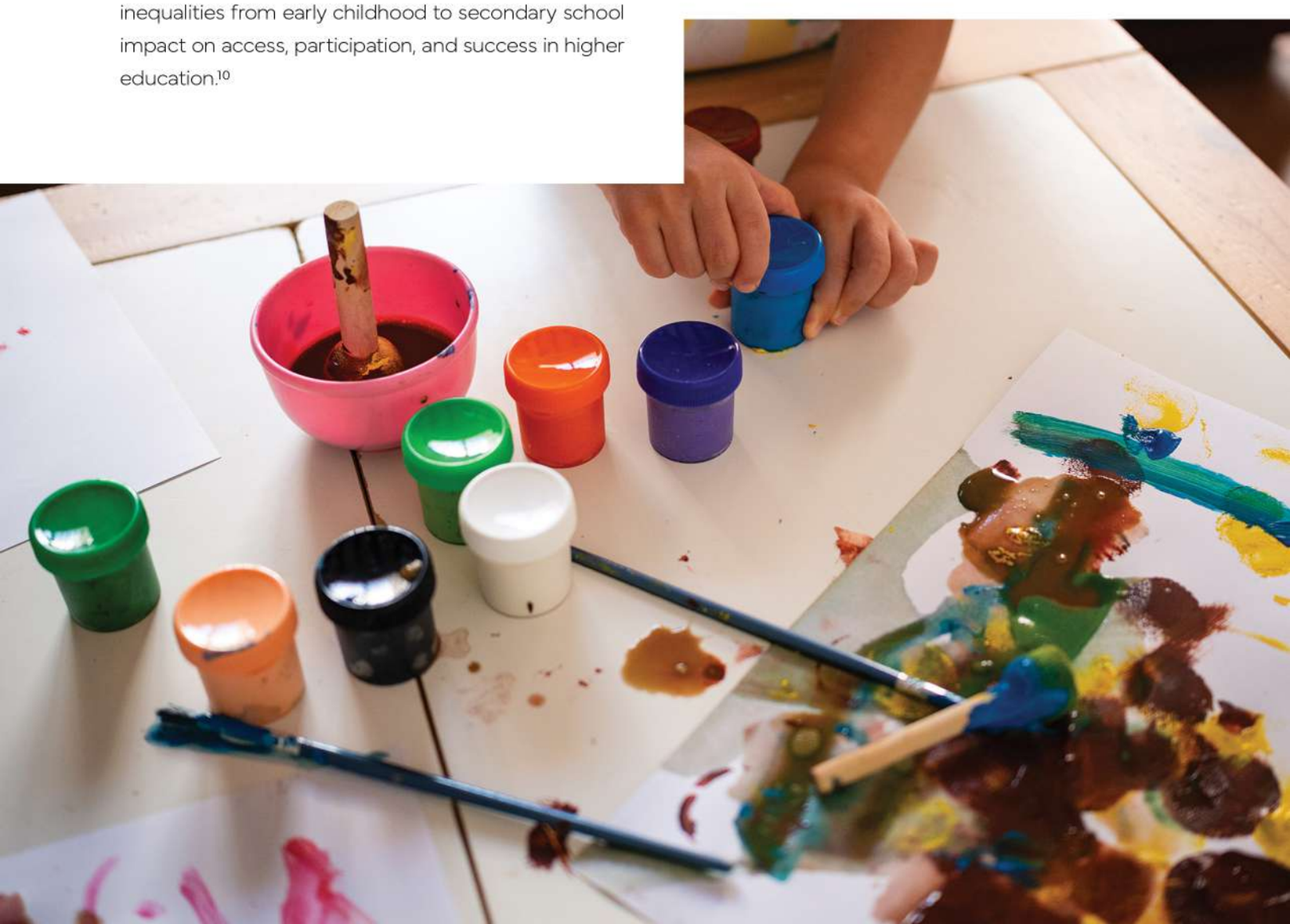
In addition to the disparities in curriculum offerings, the availability of extracurricular activities and support services also varies significantly between schools of different socioeconomic backgrounds. Schools in higher SES areas often have access to a wider range of extracurricular programs, such as advanced placement courses, sports teams, and arts programs, while schools in lower SES areas may face resource constraints that limit their ability to provide enriching opportunities, potentially widening the gap in post-school outcomes between students from different socioeconomic backgrounds.

Further, the quality of teaching and additional education support can differ based on the socioeconomic status of the school. Higher SES schools may have access to additional resources for professional development to train teachers. In contrast, lower SES schools may struggle to recruit and retain sufficiently experienced teachers, leading to potential disparities in teaching quality. These inequalities from early childhood to secondary school impact on access, participation, and success in higher education.[10]

Policy Proposals/ Recommendations

Equity, success, opportunity, and a quality education, are interlinked as we have outlined. However, equity and quality remain aspirational declarations as much still needs to be accomplished.

1. If equity is to be achieved, then **a system-wide approach is needed.** That is, policies and practices that address issues across the full life cycle of education.
2. Rather than viewing equity from the standpoint of policy makers, organisations and educators, **listen to the voices and perspectives from those impacted and design policy from the ground up.**
3. **Make equity everyone's responsibility** in order to build and sustain a fairer system that prepares young people for their future lives.
4. **Address the long term and sustained crisis in school funding, support services and resources**, and access to curricula to ensure quality learning opportunities.



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5
GENDER
EQUALITY

Brazil's Pathway to Closing the Gender Gap: Challenges and Opportunities

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Introduction

The Sustainable Development Goal (SDG) discussed in this contribution is SDG 5 Gender Equality and how this goal is performing in Brazil. Addressing gender inequality and its root causes in Brazil is instrumental to closing the vast social inequities in the country. Gender equality policy also contributes to other SDGs, especially SDG 1 No Poverty and SDG 10 Reduced Inequalities.

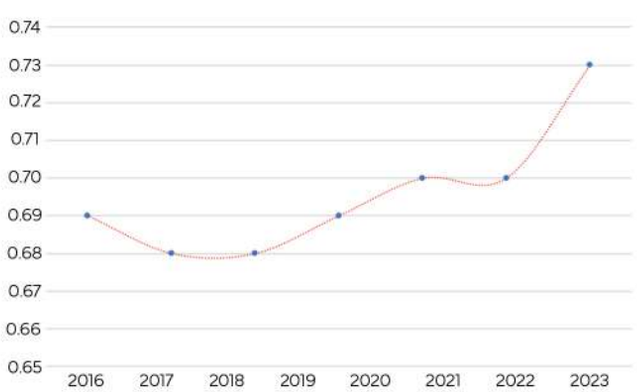
This contribution explores Brazil's overall performance when dealing with gender equality, and the centrality of targeting the country's high numbers of femicides and violence towards women.[1]

In Brazil, women experience high levels of inequality throughout society.[2] For example, women from lower socio-economic backgrounds and of African descent are at greater risk of experiencing violence or a violent death. Traditional views towards gender roles are central to the matrix of inequality experienced by women.

Gender Inequality in Brazil: An Overview

Brazil ranked 57th out of 146 countries in the 2023 Global Gender Gap Index, up from 94th in 2021, and "its highest parity level since 2006."[3] Despite this overall improvement in rankings, high levels of gender imbalance between men and women remain in areas such as political empowerment (0.26) and economic participation (0.67). The overall gender gap index score in Brazil for 2023 stood at 0.73 (see Figure 5.1). On average, women in Brazil have 27% fewer opportunities than men.

FIGURE 5.1 GENDER GAP INDEX, BRAZIL (2016-23) [1]



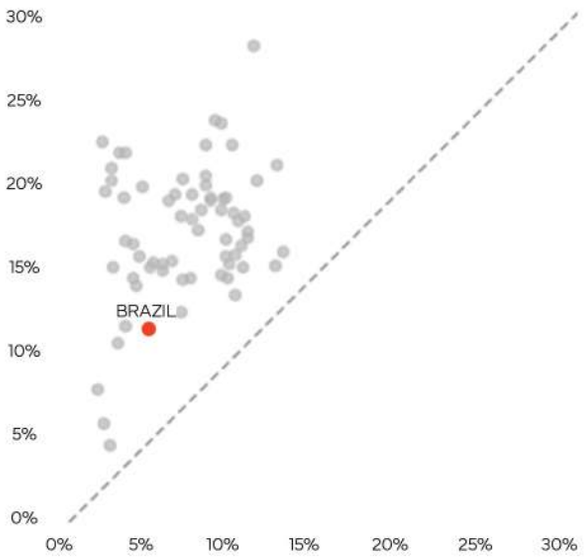
0 = inequality; 1 = equality

Over the years, there has been progress towards women's workforce participation in Brazil. Nonetheless, data from Brazil's Institute of Geography and Statistics (IBGE) indicates that Brazil's gender gap continues to be significantly high. Another example being that women in Brazil remain underrepresented

in leadership and parliamentary positions.[4] Brazilian women's low levels of representation in these areas are a matter of concern, as political participation is a key mechanism to close Brazil's gender gap.

One key factor that prevents women from achieving gender equality is workforce participation, and, relatedly, income parity. Recent IBGE data[5] shows that workforce gender participation has oscillated over the last decade. In 2022, workforce participation rates for men stood at 72% compared to 53% for women. And, in terms of management roles, men and women accounted for 61% and 39% respectively of relevant roles. The under-representation of Brazilian women from all socio-economic strata in the workforce is symptomatic of deeply rooted traditional socio-cultural views on the role of women. Put crudely, they should be primary home-carers. In Brazil, the estimated daily hours women spend on unpaid domestic/care work in Brazil is "2.3 times as much as...men". Women spend almost 12% of the day on unpaid domestic/care work relative to around 5% for men (see Figure 5.2).

FIGURE 5.2 PROPORTION OF TIME SPENT ON UNPAID DOMESTIC AND CARE WORK, BY WOMEN (% OF 24-HOURS DAY) [6]



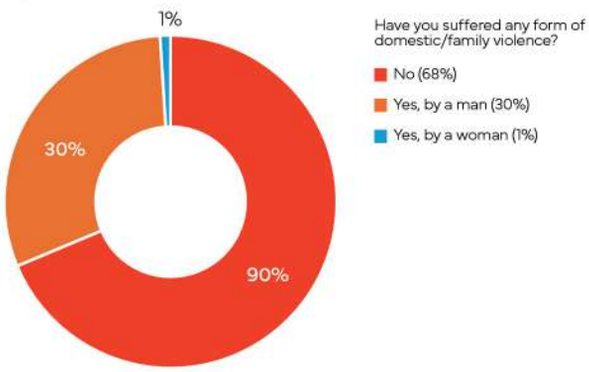
The inequalities endured by women are compounded further by race/ethnicity and geography. In Brazil, women of African and Indigenous descent experience relatively high levels of disadvantage and discrimination.[7] According to the World Bank, race and geography both increase Brazilian women's likelihood of a violent death. In 2017, Brazil ranked fifth highest in highest in Latin America for the number of femicides.

The south of Brazil had the lowest rates of femicides in the country and was the only region to record a decline in the killings of women between 2003-13.[8]

Conversely, in the North and Northeast of Brazil, total femicides increased by 70% during the same period. Women of Afro-Brazilian and Indigenous descent were the primary victims. In the Northeast region, femicides among Afro-Brazilian women increased by 103% between 2013-23. In Brazil, Indigenous women are highly vulnerable to violence, accounting for 4.6 per 100,000 registered homicides, and with suicide rates of 5.8 per 100,000–more than twice the national average of 2.2 females per 100,00.[9]

Brazil's most recent annual Report of National Security[10] indicates that the levels of violence against women and femicides increased 6.1% on the previous year. It is believed that real numbers are even higher, as femicides can incorrectly be classified as homicides. Results from the National Research on Violence Against Women highlight that almost a third of women in Brazil have been the victims of domestic violence at some point in their lives (see Figure 5.3).[11]

FIGURE 5.3 LEVELS OF DOMESTIC/FAMILIAL VIOLENCE IN BRAZIL, 2023 [12]



Policy Proposals/ Recommendations

Although gender inequality has diminished in the last 20 years women in Brazil still have less opportunities have one of the highest rates of gendered violence globally. The condition of women will improve in Brazil only when traditional socio-cultural views towards women are addressed and discussed in depth by policy makers and reflected in policy action. Effective policies to tackle violence against women and the crimes of femicides are central to closing the gender gap. New strategies need a subsidiarity and intersectional framework, developed at different levels of governance—regional, state and municipal—reflecting the country's diverse needs.

What then, could Brazil do to tackle gender inequality, especially, inequality premised on inter-partner violence and domestic violence? In short, traditional views towards honour and religion negatively impact gender relations in Brazil, and as such, these factors need to be at the core of all future policy and strategies to reduce gendered violence.[13] Relatedly, a multi-level governance approach is needed. Therefore, three policy recommendations are essential:

1 **A new National Plan on addressing violence towards women.** At the federal level, Brazil already has several policies and strategies designed to eliminate violence towards women. Unfortunately, these policies are out of date and in need of major reform.[14]

A more effective national strategy needs to apply the principle of subsidiarity, decentralising governance to the state and local levels, and setting up regular compliance mechanisms. Furthermore, given Brazil's complex regional and racial diversity, gender equality policy needs be framed through an intersectional lens.

The core elements of a new National Strategy on Gender Equality should include the following:

1. A plan with a clear gender equality matrix, integrating the Global Gender Index economic indicators, traditional socio-cultural values towards the role of women and impact assessments in the light of annual cases of femicides in the country.
2. The creation of pilot plans in the prevention of violence against women, in which state members of Brazil's federation design policy working in collaboration with state-based educational programs to raise awareness on the impact of traditional views on the role of women in Brazil.
3. Additional federal funding for research exploring how traditional views on the role of women impact female empowerment, violence towards women and gender equality outcomes.
4. The federal government needs an annual budget for research and strategy planning developed at the state and municipality (local) levels.

2 **Establish state-level prevention plans to address variation in context and geography.** Set out policy strategies and frameworks to access the progress of gender equality in the country. Traditional views on the role of women, for instance, demonstrate intra-cultural variation across the country, with significant regional development and racial differences. Such factors need to be considered by state governance, designing policy best suited for regional and state-specific perceptions on the family and the role of women. Given Brazil's huge social contrasts, states need to develop intersectional strategies, with more substantive funding and grants to less developed or lower socio-demographic regions.

3 **Establish education programs to support transition to healthier relationships.** Municipal (local) strategies should be designed using an intersectional framework, focusing on men's education programs and women's support groups and training. Early childhood, primary school, and high school policy planning on how to create healthier role models for the next generation are other targets that the local level of governance needs to consider. Local policies should include a window of two years from policy implementation to the first impact assessment. After the first four years there should be a review process to assess policy outcomes and to incorporate current research and developments.

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14 The National Plan in the fight towards violence against women was introduced by President Luiz Inacio Lula da Silva in 2007. There were impact assessments and increments during former President Dilma Rousseff's administration, the last one in 2011. Policy increments and regular impact assessments are central to any further progress in this space in Brazil. Traditional views on honour and religion have not been incorporated in policy addressing gender inequality and violence towards women in the country but are an important variable in the matrix of inequality.

Gender Diversity in Governance: A Different Take on Australia's Key to ESG Progress

Francesca Stewart, The University of Western Australia, UWA Business School

Introduction

The argument for more women on boards has been made clear. Centred on the belief that gender diversity leads to better outcomes across Environmental Social and Governance (ESG) objectives, this business case has been the key driver for corporations across Australia to open their boardroom doors to women, often for the first time.

However, the ESG argument relies on the assumption that gender diversity alone brings a broad range of perspectives leading to more sustainable and ethical decision making. This assumption not only risks creating another stereotype for women to overcome but also overlooks a critical opportunity. By relying on the business case to drive equal participation in the board room we fail to leverage governance as a crucial mechanism in securing the financial futures of women and their families, especially those from minority backgrounds, and thus directly advancing SDG 5 Gender Equality.

Commission on the Status of Women 64 - Economic Security

The United Nations Commission on the Status of Women priority theme for 2024, *Accelerating the achievement of gender equality and the empowerment of all women and girls by addressing poverty and strengthening institutions and financing with a gender perspective*, set the tone for International Women's Day 2024 and directed collective action around the world towards SDG 5.

At its core, the 2024 priority theme related to economic security which is measured at national levels by key gender and financial wellbeing indicators. These indicators tell a story about how gendered experiences shape access to resources, opportunities, and stability. They reveal disparities in income, employment, caregiving responsibilities, and safety, highlighting the systemic barriers that women and marginalised groups face in achieving economic security. Such insights are essential for designing policies that promote equity, resilience, and inclusive growth.

As recently as 2018 in Australia, The Treasury predicted that, a girl born to a working single mother would grow up to experience poor educational outcomes, erratic work and unstable housing, likely retiring with inadequate superannuation and/or ending up in social housing on the aged pension. To think that we cannot imagine better for our girls is alarming.[1]

What is even more alarming is the compounding effects of intersectionality. We know that First Nations people, ethnically, culturally and linguistically diverse people, those identifying as LGBTQIA+, and people living with disability face more severe structural economic disadvantage on average. When entrenched socioeconomic disadvantage and intersecting identities are taken into consideration, the opportunities and prospects of girls and women over the life course are severely limited.

As a result of SDG 5 and its underlying targets, much discussion has developed around improving women's economic security in Australia, particularly in relation to increasing participation in paid work, boosting superannuation, enhancing access to housing finance and imaginative solutions to the HECS debt problem. However, women cannot truly realise economic security unless their base income is at an adequate level. Doing more with less is not the answer.

The Path of Resistance

Women face numerous headwinds as they seek to develop and advance their careers. Gender stereotypes combined with individual and institutional biases against women are still common in the workplace. Terms such as 'the broken rung', 'the glass ceiling', and 'the double bind' neatly encapsulate the systemic issues undermining women's career advancement. These issues are all the more deep-rooted for women from marginalised backgrounds.

The Chief Executive Women's Senior Executive Census found that women account for less than 8% of ASX300 CEOs in Australia.[2] At the current rate of change, it will take over half a century before gender balance in CEO positions is achieved in the Australian private sector.

As of 2025, women accounted for 37% of corporate board members. The vast majority (91%) of female directors are from Anglo-Celtic backgrounds. Although women directors make up just 19% of the total, they occupy 45% of the board seats held by women.[3] Put simply, there is a lack of cultural diversity and an over-concentration of opportunity, wealth and power amongst a selective and broadly similar group of women on corporate boards.

The stark under-representation of diverse women in boardrooms merely serves to perpetuate the status quo and path dependency in the corporate sector.

The women that have made it on to corporate boards is to be commended. However, the prospects of this being replicated by women from minority backgrounds is fraught with structural challenges. Women on ASX boards tend to be more educated than men. The 2025 Watermark Board Diversity Index, for example, found women directors have higher completion rates of undergraduate degrees, master's and PhDs than their male counterparts. Put another way, it would seem that women need to be more exceptional than men in order to get onto boards in the first place. Furthermore, they also need to be the 'right fit'.

Coupled with this, the Chief Executive Women 2024 Census found that of the 25 current women CEOs in the ASX300, 84% of them had P&L experience. However, 8 in 10 pipeline roles are still held by men. These statistics suggest that in order for women to get a seat at the table a very specific formula must be followed, notwithstanding the bias and systemic challenges they may face along the way.

This matters because leadership that does not mirror the rich tapestry of our broader society risks inadvertently perpetuating exclusion and discrimination, both internally and externally, further entrenching social disparities and overlooking the needs and perspectives of marginalised populations.

The overly homogenous nature of boardrooms reinforces the stereotypical notion that leadership qualities reside predominantly within a narrow demographic.

In other words, women from socially and culturally diverse backgrounds are deemed to lack the essential attributes to ascend to board-level positions. Although this perception may not be spoken aloud it is acutely sensed and undermines the self-esteem and aspirations of women as they do not see themselves reflected in the corridors of power.

A Different Economic Argument

Despite the progess that has been made in relation to women represented on boards, this has not been done with sufficient care or diligence. Creating space for women is a good first step but to have done so under the guise of ESG without much focus on diversity and lived experience has prevented true progress.

There is a need to move beyond positioning gender equal boards as simply a corporate ESG benefit. Rather, serious consideration needs to be given to the ethics and opportunity costs of not having diverse women on boards.

Under-investing in minority persons progressive career pathways not only denies representation at the board table, but has major impacts on their short- and long-term economic outcomes. Furthermore, it reinforces perceptions of where power belongs, who makes decisions, and, who participates in building the future.

The economic argument can be summarised in a simple premise. Based on the average salary in WA, employee earnings over 40 years amount to approximately $4.5m. We know that in single parent households, incomes tend to be less stable nd the majority of earnings are swallowed up by cost of living expenses. Furthermore, these groups are much less likely to occupy higher paid roles. Consequently, home ownership levels and superannuations balances tend to be much lower.

By contrast, director lifetime earnings, combining the employee phase, executive phase, and board member phase, total approximately $7.8m, not accounting for additional financial oportunities made available through networks, experience or access to investments. The lifetime earnings difference between directors and employees is about $3.3m.

SDGs and Heterogeneity - Not Another Glass Cliff

The primary argument for women on boards has been to improve ESG outcomes. Interestingly, due to a relatively small number of women on boards, plus a lack of systemic empirical data on the impacts of women on boards, this ESG claim is somewhat questionable. Ultimately, there is risk of creating another stereotype - the failed superwoman.

Appointing women onto boards in the faint belief that this will be enough to turn around a corporation's decision-making, risk appetite and value set in relation to ESG is unfair and unwarranted. There is a danger in assuming gender is some kind of panacea for ESG progress.

When women appointed to boards come predominantly from the same backgrounds and circumstances this raises serious questions about the diversity of thought around the board table, the ability

to understand and advocate for marginalised groups and the implications this has for ESG outcomes.

Policy Proposals/ Recommendations

In order for change to begin, a two-fold solution is necessary.

First, organisations should take meaningful steps to identify talented diverse women to fill executive roles and ultimately the CEO role. This will take some rethinking about traditional views of leadership potential, assured pathways and a challenging of corporate leadership identity.

Secondly, boards need to rethink traditional governance pathways and play a part in reshaping what directors look like, and as such, address their policies and processes in order to support diverse applicants.

However, organisations and their boards should not be singly charged or relied upon to change the trajectory for diverse women. Far beyond being a corporate issue this is a governance issue, a policy issue, and a societal issue. Government can support the progression of marginalised women onto corporate boards and advocate for their complete acceptance as full, equal, and remunerated participants.

1. **Funding research** for working class origin, LGBTQIA, culturally diverse and disabled women in leadership.
2. **Funding governance credentials** for minority women.
3. **Providing grants** for governance leadership programs for diverse women.
4. **Incentivising corporate boards** to participate in mentoring and traineeships.
5. **Requiring mandatory reporting over and above gender pay gaps** reporting in relation to diverse women's executive leadership and career progression, as well as diversity hiring processes at executive and board levels.

Endnotes

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Environmental Heat Exposure and Pregnancy Outcomes in the Face of Climate Change

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Dr Aster Gebremedhin, The University of Western Australia, UWA School of Human Sciences

Dr Aunty Mara West, Telethon Kids Institute

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Framing the issue: climate crisis

Climate change is recognised as the biggest global health threat of the 21st century, and efforts to combat it present an unparalleled opportunity for global health development. A broad set of factors such as gender, age, socioeconomic status, education, and indigeneity determine vulnerability to climate change. One of the foremost issues concerning climate change is its potential to exacerbate existing social and health inequities; women, girls, and gender-diverse people are disproportionately affected by the consequences.

While integrating gender considerations into climate action is crucial, it is noteworthy that no Sustainable Development Goals (SDGs) have health indicators that specifically address the issue of environmental change on sex and gender-related health outcomes. Instead, this issue is at the intersection of targets related to maternal and reproductive health (SDG 3), gender equality (SDG 5), poverty (SDG 1), and climate change action (SDG 13).

The consequence of climate change increasing heatwave severity imposes significant human health implications. The Australian Climate Service's National Climate Risk Assessment underscores the escalating health risks driven by increasing heatwave events. The effects of heat exposure take the largest toll on vulnerable groups including pregnant people. Pregnancy is a time in the life-course that is especially susceptible to environmental exposures, particularly heat exposure. Such exposures not only put maternal health and fetal development at risk but also likely impact long term health outcomes.

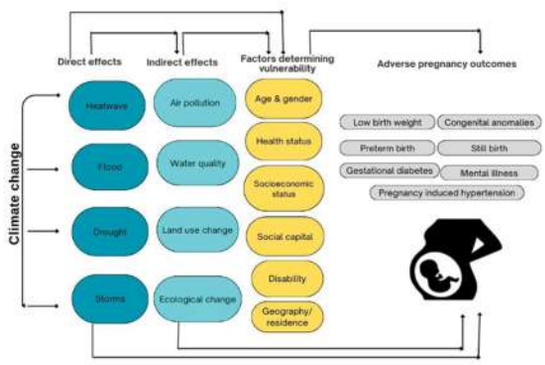
This contribution presents the impacts of heat extremes on pregnancy outcomes, highlighting evidence gaps, and proposing policy and practice considerations.

Extreme heat exposure and pregnancy outcomes: Unveiling Evidence Gaps

Heatwave frequency, duration, and intensity is increasing globally. Associations of health data with climatic conditions, including in Australia, reveal that heat exposure adversely impacts pregnancy outcomes. These include but are not limited to, increased risk of congenital anomalies, preterm birth, stillbirth, low birth weight, miscarriage, gestational

diabetes, pregnancy-related hypertension, perinatal mental health conditions, and maternal mortality. These risks are further pronounced in certain populations including low socioeconomic groups, people with chronic conditions, and Indigenous and rural communities (Figure 5.4).

FIGURE 5.4 THE DIRECT AND INDIRECT EFFECTS OF CLIMATE CHANGE ON PREGNANCY OUTCOMES [1]



While these health associations are becoming increasingly well established, the key physiological mechanisms that underpin these associations are poorly understood. In addition, the epidemiology behind many adverse pregnancy outcomes is diverse in methodological approaches. Thus, there remains considerable uncertainty regarding how the pregnant body responds to heat, what heat exposure conditions are of concern, and how heat affects pregnant biology such as changes in placental blood flow, pathways in labour onset, inflammation, and infection.

Collectively, these observations indicate both a gap in biological understanding and a lack of engagement with people who are living with extreme heat. Indeed, embedded policy and health interventions to prevent pregnancy complications during extreme heat are challenging to put into practice. While ultimately biological pathways that are altered lead to the pregnancy complications, the overlay of socio-economic and cultural characteristics have a profound impact.

Divergence between policy and community requirements

Heat-related health complications are avoidable and the current health advice and embedded policy around heatwaves are logical. These include: staying indoors; using air-conditioning or a fan; wearing light

coloured clothing and; drinking more water. However, not all people or communities have equitable access to the cooling strategies.

Energy insecurity and high costs are pressing issues across Australia; one in five Australians are underserved, with remote and Aboriginal and Torres Strait Islander communities more likely to be affected.[2] Indeed, in remote Northern Territory communities, households with high energy use had a one in three chance of electricity disconnection during very hot or cold days.[3] Further, low-wealth households are disproportionately impacted by heatwaves due to their inability to access energy efficient homes.

Additionally, while many would assume that Australia meets SDG 6 Clean Water for All. This is not the case, with over 600,000 Australians accessing drinking water that does not comply with health-based or aesthetic guideline values for good quality drinking water. Alarmingly, 40% of locations with health-based non-compliances are remote Indigenous communities.[4] This highlights the urgent need for stakeholders to come together to ensure policy and health recommendations align with community requirements.

The Australian Context

Australia is one of the most vulnerable countries to climate change. Extreme events such as heatwaves are projected to become more widespread and more intense nationally. The continent consists of strikingly diverse climate zones which are changing rapidly. Further, Australia has a diverse population, with 3.8% of Australians being of Aboriginal or Torres Strait Islander descent, and 29% were born overseas—proportionately the highest migrant population in the OECD.[5] This context highlights the complex considerations for mitigating the effects of extreme heat on pregnancy complications in Australia.

Policy Proposals/ Recommendations

With the changing climate, it is imperative to deepen our understanding, identify and respond to the damaging effects of heat exposure, and develop and implement effective, evidence informed, and inclusive adaptation policies.

1 **Narrowing the evidence gap** by addressing the biological unknowns of how extreme heat is contributing to pregnancy complications and understanding the physiological processes involved aid in directing future research—for prevention and targeted interventions, clinical management and the formulation of policy decisions.

The Wellcome Trust has funded a group of researchers worldwide (including Extreme Heat and Pregnancy Complications (EHPC) a project led by UWA's Assoc. Prof. Caitlin Wyrwoll) to establish the biological vulnerability to extreme heat in pregnancy. For this knowledge to be useful for informing preparedness, response, and secondary prevention for pregnancy health complications in extreme heat, it is critical to be working directly with priority populations to co-design the required health interventions and communications.

2 **Ensuring policies align with community requirements.** Policies designed to address climate change should be closely aligned with the needs, priorities, and values of the community they impact. In addition, there are growing calls for transformative adaptation to the impacts of climate change. Community-led initiatives are vital for understanding the specific needs and risks of vulnerable communities and innovating more equitable solutions.

An example of how this can be achieved is through the Communities of Practice (CoP) embedded within the Healthy Environments and Lives (HEAL) Network, Australia's first nationally funded research network at the nexus of climate-health.[7] Within the CoPs embedded in each state, research, policy, and service provision is co-designed by bringing together people with diverse lived experiences, community organisations, policymakers, service providers, academic researchers, and other stakeholders. This ensures that those most affected by climate change lead change and improve the health and wellbeing of their communities. In Western Australia (WA), the HEAL WA Aboriginal steering group, chaired by Dr Aunty Mara West, provides cultural advice, leadership, governance, and recommendations to the HEAL Network and projects such as EHPC.

3 **There is an urgent need for disaggregated data,** Given the limited availability of gender-related environmental statistics. International organisations such as the United Nations (UN) Women and UNICEF report that there is a near total absence of gender disaggregated data related to the environment or environmental policymaking.[7] Such data is a crucial foundation for evidence-informed policymaking and the achievement of gender-transformative climate goals. While the work outlined here focuses on female-specific context of the impact of climate change on health in pregnancy, it provides a template for consideration of other points in the life course and broader gender-related health issues. A critical example is the impact of extreme climatic events and increased rates of domestic violence. In Australia, data on this issue remain scarce. Given that violence against women and girls has been declared a national emergency by the Australian Government, addressing this knowledge gap is urgent. Integrating gender-sensitive strategies into disaster response planning is essential to ensure that the needs and vulnerabilities of women and girls are adequately considered during extreme events.

FIGURE 5.5 CONSIDERATIONS FOR POLICY AND PRACTICE

Conclusion

Climate change is increasing the risk of extreme heat, which is having critical public health implications for pregnancy care. Unlike previous strategies, addressing climate change induced health crisis will require a data driven research approach, undertaken by a transdisciplinary team and codesigned with communities to incorporate local knowledge and perspectives. In addition, policies that consider an inequality lens and gender disparities to the links between climate change and health should be in place.

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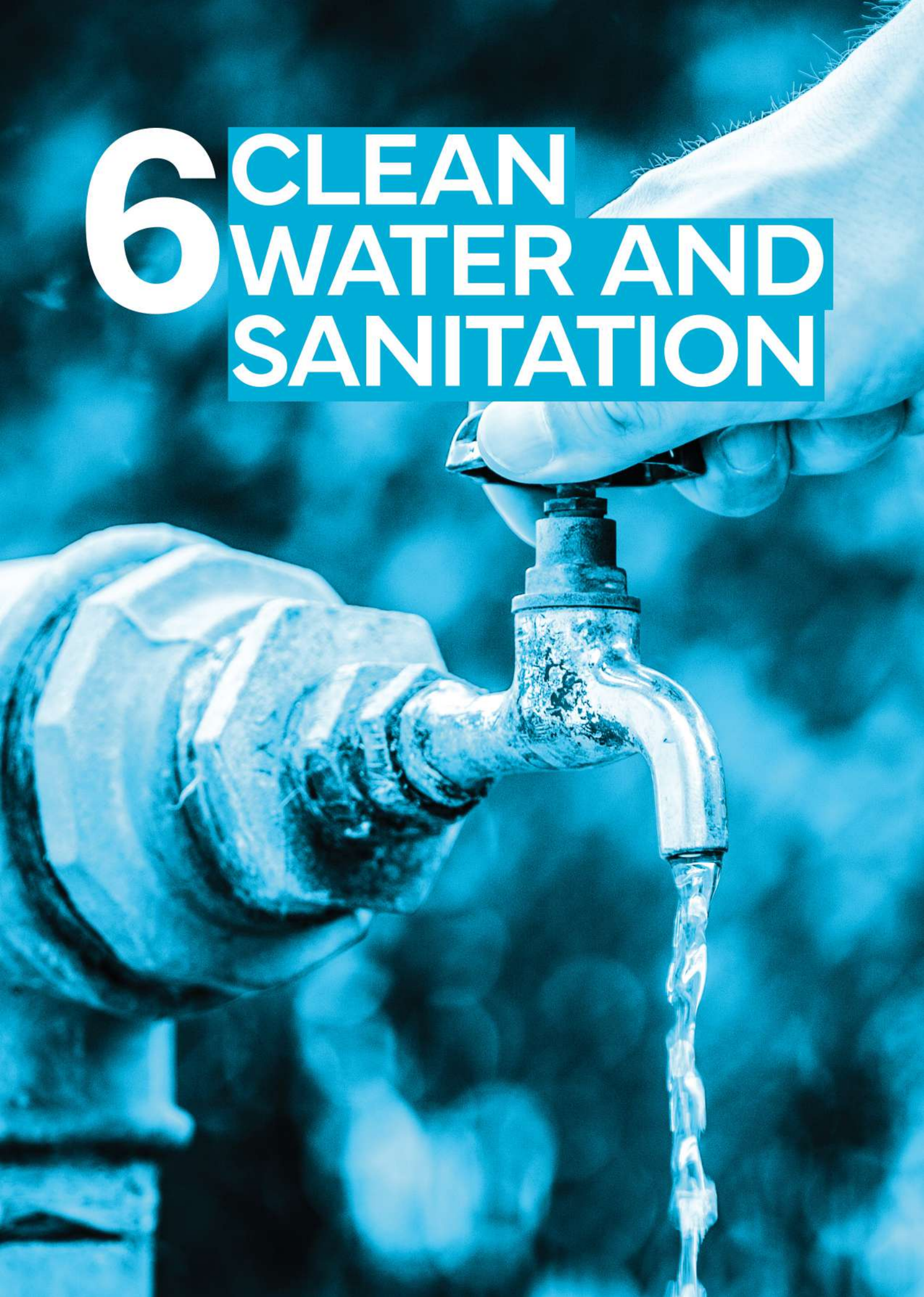

6 CLEAN WATER AND SANITATION

Cut the Crap: 'Partnership' is a Buzzword, Not a (Current) Reality

Dr Dani Barrington, The University of Western Australia, School of Population and Global Health

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Introduction

Every year, 1.4 million people—mostly young children—die from diseases attributed to unsafe water and sanitation. Beyond deaths, the global burden of poor water and sanitation on both physical and mental health contributes to the loss of tens of millions of years of productive, healthy lives.[1] Yet 2.2 billion people still lack access to safe water, 3.5 billion to safe sanitation and 2 billion to basic handwashing facilities in the home.[2]

Water and sanitation are recognised by the United Nations as human rights and form the basis of Sustainable Development Goal 6 (SDG 6) Targets 6.1 - Achievement of clean drinking water and 6.2 - Safe sanitation for all. Good water and sanitation are a prerequisite for reducing infectious disease spread, improving living standards, and building physical and social resilience of communities. Since the introduction of SDGs in 2015 it has been recognised that SDG 6 influences, and is influenced by, many—if not all—of the other SDGs, highlighting its ubiquity in everyday life.[3]

Whilst there has been progress towards universal water and sanitation, in order to achieve it by 2030 there will need to be: a sixfold increase in current rates of progress for safely managed drinking water; a fivefold increase for safely managed sanitation; and a three-fold increase for basic hygiene services.[4] This is not only due to lack of investment, but often the failure of water and sanitation programming to meet the needs of intended users, do no harm in its application, and be financially, environmentally, and socially sustainable in the longer term.[5] The United Nations Human Rights Council recently called upon member states:

> "To identify patterns of failure to respect, protect or fulfil the human rights to safe drinking water and sanitation for all persons without discrimination and to address their structural causes in policymaking and budgeting, while undertaking comprehensive planning aimed at achieving sustainable universal access to safe drinking water and sanitation, including in instances where the private sector, donors and non-governmental organizations are involved in service provision."[6]

Why is it so hard to provide taps and toilets?

A common misconception of Targets 6.1 and 6.2 is that they are a technical issue—that they can be met by piping more water and building more toilets. But water and sanitation are complex systems issues requiring not just 'hard' components (taps and toilets) but also 'soft' ones (legislation, regulation, monitoring, financing, planning, etc.). Even more commonly overlooked is that water and sanitation are about people.

For water and sanitation to improve physical, mental and social wellbeing, people must use them in perpetuity. Individuals and communities have different water and sanitation requirements based on physical environments, mental and physical abilities, age, gender and personal preferences, as well as differing priorities for where to spend their time and money (e.g., with a limited budget, they may prioritise schooling costs over toilets). People need access to water and sanitation in the home, school, work, recreational, and public spaces, each with their own requirements and challenges.

How is water and sanitation programming funded?

In most high-income countries (HICs), water and sanitation programming is funded by users (via tariffs, charges, and taxation) and managed by utility companies, who are held accountable by regulators, governments and the public.[7] In general, this successfully provides near-universal, sustainable, long-term water and sanitation access. By contrast, monetary contributions to water and sanitation programming in low- and middle-income countries (LMICs) are via households themselves, domestic governments, repayable finance and external sources (i.e., Overseas Development Assistance, ODA).[8]

ODA funding and partnership rhetoric

Water and sanitation programming funded by ODA is via taxation in HICs (i.e., from the HIC Government bilaterally to other countries, or via transfers to multilateral organisations such as UN agencies and the World Bank) or not-for-profit organisations that fund programming (e.g., donations to charities or purchases from social enterprises - think Who Gives A Crap toilet paper). This is how most of us in Australia contribute to improving water and sanitation beyond our borders.

Water and sanitation programming funded by ODA tends to be in the form of time- and budget-constrained projects and often lacks consideration of the complexity of these systems. Like international development programming more generally, it is incredibly hierarchical. Power is concentrated with funders, and intended users have limited agency to influence programming.[9] Despite this hierarchical structure, there is a sector rhetoric of 'partnership' between funders, implementers and the intended users of water and sanitation services.

Power imbalances combined with the projectisation of programming means there is: poor engagement with and commitment to intended users; idealistic, poorly coordinated and under-resourced programmes by implementers; inappropriate technologies; unrealistic funder expectations; and an unacknowledged power imbalance between the different actors, which prevents the needs of the users, and the challenges that they face in their everyday lives, being given sufficient attention.[10] This inevitably results in water and sanitation programming which may seem 'successful' at completion (e.g., many toilets and sewer connections have been built) but is often not sustainable in the longer term (e.g., the toilets are not used and/or maintained, the waste from them is not properly treated).

Intended users of water and sanitation services have limited say in what is funded and can rarely hold funders and implementers accountable for project outcomes. This means that the organisations who implement water and sanitation programming are held accountable to funders rather than those they purport to be 'helping', and the funders themselves are not held to account for the failures in programming that they contribute to.

Partnership Issue 1: Lack of understanding and consideration of intended user needs and desires

When water and sanitation is projectised, even though the 'partnership' buzzword is emblazoned on documentation, the participatory components of projects are often the first to be cut when implementers recognise that they cannot complete them given the time and budget constraints.

Intended users often aren't involved in the design of programming from inception, nor the technologies and services to be delivered by the project yet are expected to operate and maintain them to achieve 'sustainability'. This means that water and sanitation services may not meet the needs and capabilities of intended users, particularly in the longer term.

Partnership Issue 2: Lack of trust in implementers

The project format also provides limited flexibility for implementers. Physical, social and regulatory conditions may change, or implementers may learn more about these conditions in the process of executing the project, but pivoting is often impossible due to time constraints and mandated funding conditions. Despite the sectoral rhetoric of partnerships between funders and implementers, implementers often aren't given the flexibility to manage programme budgets and timelines as needed; are often tied up in knots of bureaucracy (e.g., excessive, frequent reporting requirements) that stall progress and stop them from shifting projects to better meet the needs of intended users, local utilities and the complex environment within which water and sanitation happen; and lack the necessary power to influence how funders understand and fund projects.

Towards genuine partnerships: Policy Proposals/ Recommendations

If programming funded by ODA is to sustainably contribute to achieving SDG Targets 6.1 and 6.2, funders and implementers must reconsider the ways in which they partner with one another and intended users:

1. **Meaningful engage intended users.** The intended users of water and sanitation services must be properly engaged in designing programmes, from inception (probably through long term relationships with implementers – and ideally, funders). It should not be assumed that intended users will be willing or able to self-manage services, or that local implementers or international not-for-profits 'know' what intended users will want. Their engagement is a core component of successful programming, not a 'nice to have' that can be cut when the going gets tough.

2. **Build trust.** Trust must be built between funders, implementers and intended users. Onerous bureaucratic processes rarely improve programming outcomes; they waste resources. Genuine conversations that recognise inherent power imbalances and contradictory narratives between donor fantasies and intended users' realities, in a format which works for all parties (hint: this is rarely through filling in a form), can lead to a better understanding of one another's needs and priorities, resulting in more sustainable programming.

3. **Be accountable.** Funders and implementers must be accountable to the intended users of water and sanitation services, not just their own contributors (i.e., taxpayers and donors). This applies not only to organisations, but professionals within the sector, as well: there is too much deference to the organisational stance rather than being accountable for our own actions.

> If a person has chosen a career in water and sanitation programming, then they must be fiercely transparent in their actions and recognise that their greatest professional responsibilities are to intended users.

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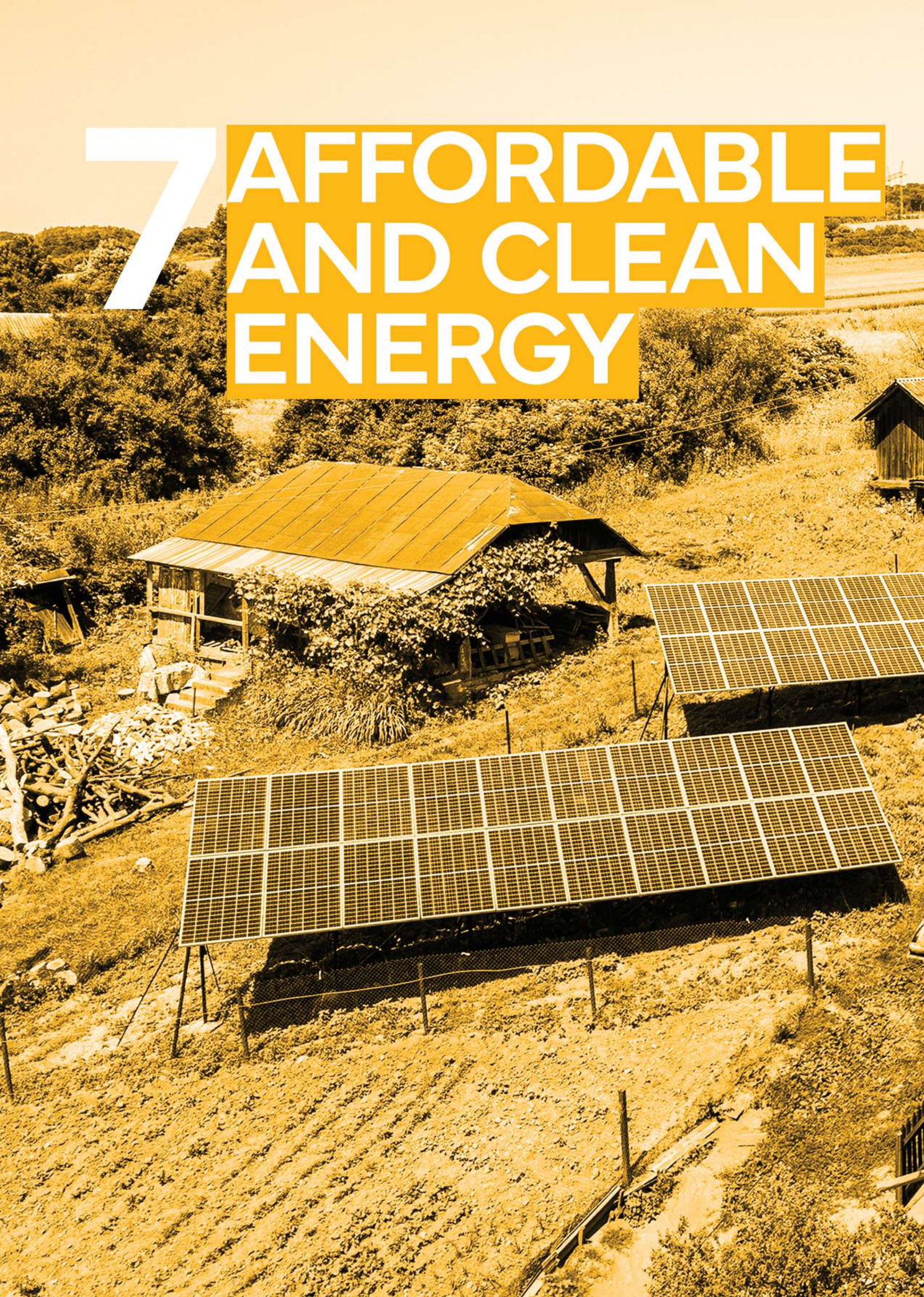
7 AFFORDABLE AND CLEAN ENERGY



Harnessing Wave Power for a More Sustainable Future

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Dr Jana Orszaghova, The University of Western Australia, School of Earth and Oceans
Professor Christophe Gaudin, The University of Western Australia, School of Earth and Oceans

Introduction

Sustainable Development Goal 7 (SDG 7) calls for affordable, reliable, sustainable, and modern energy for all. Most progress to date has centred on wind and solar, whose widespread deployment has driven major gains in emissions reductions and energy access. Yet in the global push to transition energy systems, wave energy remains largely overlooked—despite its vast, predictable resource, and potential to complement existing renewables.

Wave energy has not yet received the same level of investment or strategic planning as other energy technologies.[1] Australia has the highest and best wave energy potential in the world, presenting a significant opportunity for national and regional leadership in this space. This contribution offers a short reflection on the science and potential of wave energy, and considers how it could form part of a more diverse and resilient energy future.

What is Wave Energy?

Waves transport enormous amounts of energy, generated by winds blowing across the ocean surface. Throughout this process, energy is naturally concentrated: a single metre of wave crest off southern Australia has the same average power resource as around 280 square metres of solar resource at the same latitude. Waves continue to travel even after the weather that created them has passed, carrying energy far away with minimal loss. These characteristics give wave energy distinctive qualities—high-density, relative predictability compared to other intermittent renewable sources, and a much weaker link to local weather, with important implications for reducing the risk of energy droughts.

Wave energy converters (WECs) are devices designed to capture the energy of ocean waves. The fundamental feature of waves is oscillation—the water moves back and forth continually instead of flowing like the wind. Therefore, WECs come in many forms—some float on the surface, others sit just below; some pitch and roll, others flex or surge. Each design seeks to extract useful power from wave motion and convert it into electricity, usually via hydraulic, mechanical, or electrical systems.

The scientific principles behind wave energy have been well understood for some decades[2], with the fundamentals established when the energy crisis in

the 1970s drove a search for alternative energy sources. Maximum power absorption occurs when a WEC resonates with incoming waves—that is, when the natural period of the WEC matches the dominant period of the waves. Because ocean waves exhibit a range of periods rather than a single value, the goal is to design devices that can work well across a range of wave conditions, while minimising cost.

Despite many decades of conceptual development, underinvestment has meant that wave energy has not yet reached full commercial maturity. Designing machines that can survive, perform efficiently, and remain cost-effective over time is an ongoing challenge in an environment that has been constrained by funding—but one where research is making tangible progress.

Supporting the industry and bolstering fundamental knowledge: Research at UWA

At the University of Western Australia (UWA), we have been working on multiple fronts to enable industry progress and expand the fundamental knowledge base.

FIGURE 7.1 THE M4 WAVE ENERGY CONVERTER IN ACTION AT THE ALBANY SITE

In the summer of 2024–25, UWA achieved a major milestone with the successful deployment of a reduced-scale M4 wave energy converter in King George Sound, Albany (Figure 7.1). The project was supported by the Blue Economy Cooperative Research Centre (CRC) and State Government of WA and is a world first in providing open access to critical field data to validate numerical models[3] and assess WEC performance in real sea conditions. It also demonstrates the feasibility of marine operations, such as installation and retrieval, in Southern Ocean environments. The initiative supports the development of local supply chains and infrastructure for future ocean energy markets, including potential integration with aquaculture and other offshore industries.

Meanwhile, UWA is working in partnership with leading European technology developer CorPower Ocean to develop and apply fundamental hydrodynamic knowledge to improve the control and operation of WECs. As CorPower Ocean's lead scientist, Dr Jørgen Hals Todalshaug, notes:

> Numerical modelling underpins much of wave energy engineering, and new advances in the field will play a key role in driving down technology costs... the collaborative nature of this research project ...enables us to operate at the sharp edge of innovation.

Collaborations with developers such as CorPower Ocean allow us to apply research insights developed from bespoke laboratory experiments (Figure 7.2) and advanced numerical models to real-world designs. These partnerships are essential for moving from theory to practice—connecting academic research with the development, testing, and eventual deployment of functional systems in Australian waters.

FIGURE 7.2 SETUP OF LABORATORY EXPERIMENT AT UWA'S COASTAL AND OFFSHORE RESEARCH LABORATORY TO INVESTIGATE NONLINEAR INTERACTIONS BETWEEN WAVES AND A WAVE ENERGY CONVERTER

Our findings reveal that certain nonlinear effects—particularly those that scale strongly with wave height—can significantly influence device performance. These effects, often related to buoyancy changes, are not well represented by standard engineering assumptions. UWA's work[4] has shown how simplified models can predict these effects accurately, offering a stronger foundation for WEC design and control.

At UWA, we are technology agnostic and are interested in how to design devices that respond efficiently to waves. We consult multiple developers and work with students using both physical testing and mathematical modelling to investigate how shapes, motions, and strategies affect performance. Our aim is to help identify and refine concepts that make better use of an ocean footprint to interact with the waves and hence maximise energy capture capacity. One example is the development of wave energy devices with flexible surfaces.[5] Flexibility enables devices to move in ways not previously imagined, offering new opportunities for efficiency and adaptability.

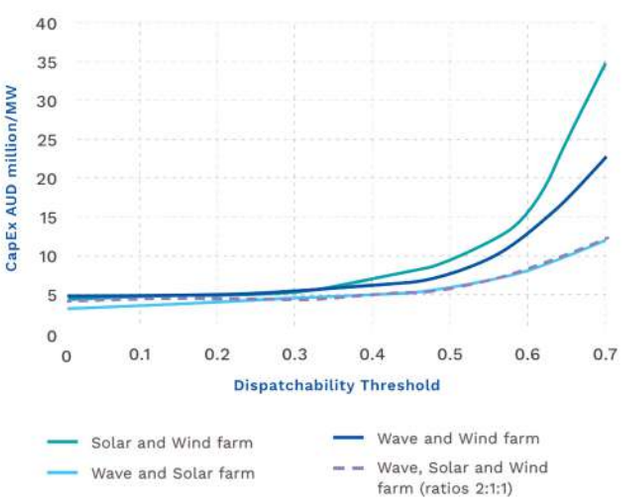
Why Wave Energy Matters

While wave energy is not yet commercially mature, the potential for Australia to benefit and lead in its generation remains significant.

According to the International Energy Agency,[6] ocean energy technologies, which include wave energy, could supply 300 GW (the electricity needs of around 300 million homes) of renewable energy globally by 2050.

A recent national report on wave energy in Australia[1], led by UWA, assesses the state of the wave energy industry in Australia. The report highlights that, on the current trajectory, Australia will need to overbuild wind and solar, and invest massively in batteries, to achieve 2050 targets. Wave energy can reduce these costly efforts, by providing a complementary, highly dispatchable resource in an integrated system (see Figure 7.3).

FIGURE 7.3 ESTIMATED 2050 CAPEX PER MW OF AVERAGE POWER FOR VARIOUS HYBRID RENEWABLE ENERGY CONFIGURATIONS, AT DISPATCHABILITY LEVEL UP TO 0.7. CASE STUDY LOCATION: CARPENTER ROCKS, SOUTH AUSTRALIA



Ongoing research with the CSIRO is aiming to better quantify this value. This shows how wave energy can advance SDG 13 Climate Action by offering low-emission baseload generation, particularly where other renewables are variable.

Wave energy can also contribute to other SDGs. It supports SDG 11 Sustainable Cities and Communities by enabling clean, local energy for coastal and remote areas.

Investments in wave energy also align with SDG 9 Industry, Innovation, and Infrastructure, fostering capabilities in robotics, offshore engineering, and digital systems. When carefully integrated into marine planning, wave energy development can support SDG 14 Life Below Water, minimising adverse impacts and enabling co-location with sustainable ocean uses.

The Albany M4 trial provides a compelling case: rich in wave energy, close to existing infrastructure (Figure 7.4), and home to communities with specific energy needs. Importantly, the M4 WEC was built and deployed in Albany using local capability; the IEA targets suggest that 680,000 jobs, many in regional communities, could emerge globally by 2050.[6]

Additionally, the M4 deployment highlights the value of engagement with local communities to pursue social and cultural license to operate. Such principles, highlighted in the report,[1] will be necessary to ensure a just transition. UWA is working towards Albany becoming Australia's national wave energy testing site, with conversations about further deployments already under way.

Policy Proposals/ Recommendations

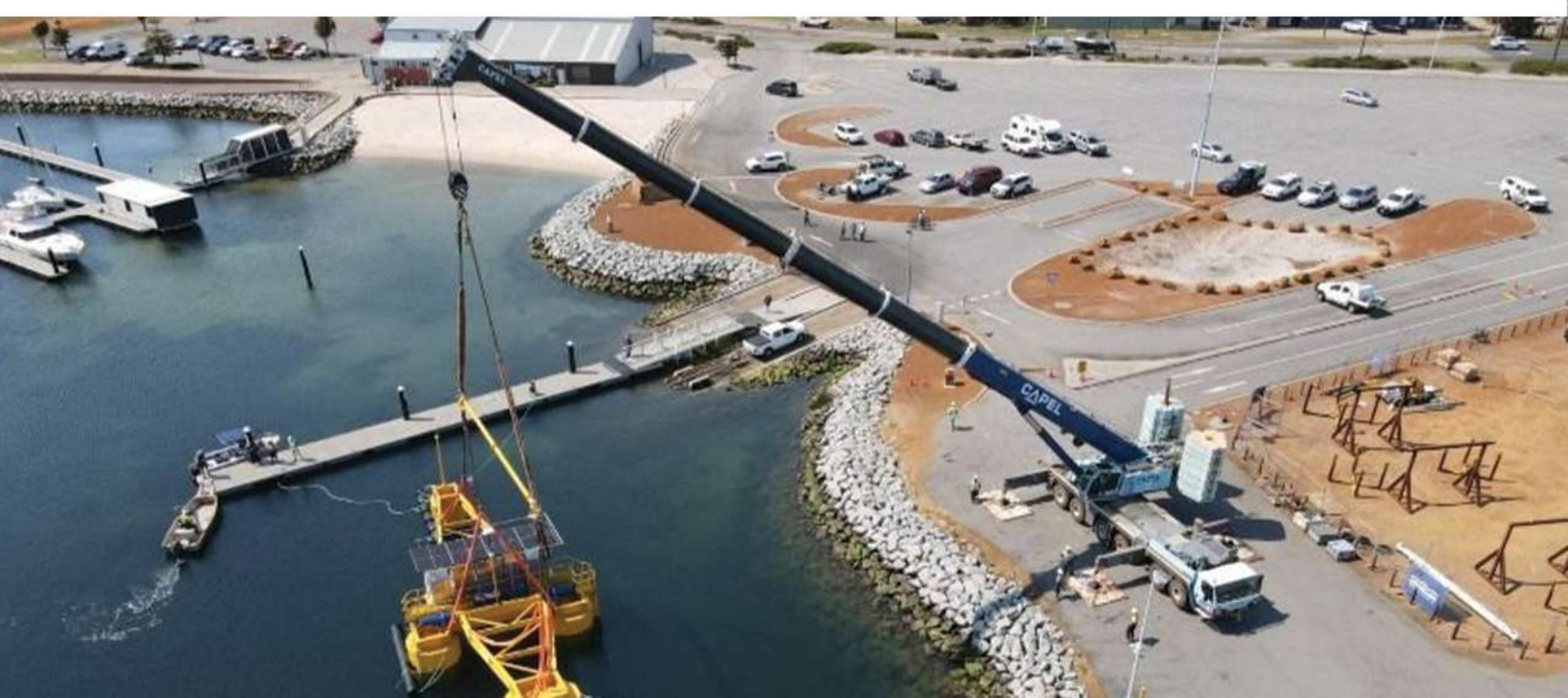
There is no single solution to the clean energy challenge. A resilient and inclusive energy transition requires a diverse portfolio of technologies. Wave energy can help address interconnected goals: decarbonisation, regional equity, industrial capability, and environmental stewardship.

This reflection has focused on the technical and scientific promise of wave energy, but its practical impact depends on strategic support. Even proven technologies need pathways for deployment. For wave energy, that means recognition, demonstration, and integration.

1. **Recognise ocean energy in national energy plans.** Include wave energy in national and state-level strategies, with clear targets and dedicated support.
2. **Support demonstration projects**—such as the Albany deployment—through long-term funding that enables learning-by-doing, technology validation, and supply chain development.
3. **Encourage cross-sector integration** by aligning wave energy with offshore aquaculture, hydrogen production, and marine research in coordinated blue economy strategies.

These are not radical or expensive steps—but they are necessary. By including wave energy, Australia can make fuller use of its natural strengths and contribute to a cleaner, more resilient future.

FIGURE 7.4 THE M4 WAVE ENERGY CONVERTER BEING LIFTED INTO THE WATER AT THE ALBANY MARINA



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Towards a Clean, Affordable Hydrogen Production Beyond the Hydrogen Rainbow

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Introduction

Significant increases in global energy consumption across the last century have fuelled breakthroughs in technology, infrastructure and healthcare that have seen global average human life expectancy more than double.[1] However, the global energy mix remains dominated by fossil fuels—in 2024 energy sources comprised over 76% from coal, oil and natural gas combined. Meanwhile, global average surface temperatures have increased more rapidly since 1970 than during any other 50-year period in the last 2000 years, with the World Meteorological Organisation recently confirming that 2024 was the warmest year on record—the previous record was in 2023. Human activities, principally through the emission of greenhouse gases (largely carbon dioxide), are unequivocally credited with causing this rapid recent increase in global surface temperatures. Such emissions are a direct result of our use of fossil fuels.

United Nations Sustainable Development Goal (SDG) 7, Affordable and Clean Energy, aims to highlight and improve upon ongoing global efforts in ensuring access to "affordable, reliable, sustainable and modern energy for all".[2] Central to this goal is the scale-up and utilisation of energy technologies that provide low-emission alternatives to the conventional application of fossil resources. Such efforts are critical to international global warming mitigation agreements to limit the increase in average global surface temperature to well below 2°C relative to pre-industrial levels—the central target of the 2015 Paris Agreement.

Hydrogen is a hot topic in this regard and has taken centre stage in efforts to achieve net-zero carbon emissions, with over 55 countries and regions having now published long-term hydrogen strategies and roadmaps. However, hydrogen is not a simple blanket solution, and care must be taken in understanding the potential greenhouse gas emissions associated with its large-scale application within the global energy mix.

The Hydrogen Rainbow

Whether through direct combustion to provide heat, or it's use in fuel cells to provide electricity, hydrogen releases zero direct carbon dioxide emissions at its point of use, and hence presents significant potential for decarbonisation efforts. It is particularly attractive as a decarbonisation route for hard to abate industries, such as heavy vehicle transport and shipping, where reliance on battery technology is seen as unfeasible,

and in the decarbonisation of heavy manufacturing processes like the production of iron and steel. However, the utility of hydrogen under SDG 7 requires efficient and low-emission technology across the entire hydrogen value chain; encompassing large-scale production, storage, transportation and utilisation. From an Australian context, this clearly includes the potential for the export of hydrogen.

Importantly, hydrogen cannot be considered a resource. While hydrogen the element (H on the periodic table) is the most abundant element in the universe (making up 75 % of all known matter), hydrogen the molecule (consisting of two hydrogen atoms bound together to make H2) is a rare terrestrial find, with essentially all of Earth's hydrogen locked away in other molecules and solids. Despite a growing number of projects searching for naturally occurring hydrogen, industrial hydrogen must currently be synthesised by chemical means. This can proceed via a number of reaction processes whereby the hydrogen source, together with the source of energy used in the reaction, is assigned a colour.

This array of colours is termed the hydrogen rainbow.

A subset of colours with direct relevance to Australia's emerging hydrogen economy include:

Black/Brown hydrogen: a high-emissions technology which involves the heating of black/brown coal to produce both hydrogen and carbon dioxide.

Grey hydrogen: a high-emissions technology which involves the reaction of high temperature natural gas with water to produce hydrogen and carbon dioxide.

Blue hydrogen: a low-emissions technology which also involves the reaction of high temperature natural gas with water to produce hydrogen and carbon dioxide. The carbon dioxide is captured and sequestered underground or used for other chemical processes.

Green hydrogen: considered the holy grail in low-emissions hydrogen production, green hydrogen uses electricity to split water into oxygen and hydrogen gas (electrolysis). The electricity must come from renewable sources, such as wind or solar.

These production routes have significant influence over the cost of hydrogen production, and hence the potential price for consumers. Current production cost estimates for fossil-based hydrogen (black, brown and grey) range from 0.8-4.6 US$/kg, while green hydrogen is estimated to range from 3.8 to over 12 US$/kg.[2] While the International Energy Agency (IEA) forecasts that the cost of green hydrogen may fall to 2 US$/kg by 2030 [3], fossil-based hydrogen is expected to remain by far the lowest cost route for large-scale production. Concerns over the high costs associated with green hydrogen production have resulted in the cancellation of multiple high-profile projects, including several in Australia.[4]

> Transparency on the emissions intensity of hydrogen production can bring much needed clarity and facilitate investment. Using colours to refer to different production routes, or terms such as "sustainable", "low-carbon" or "clean" hydrogen obscures many different levels of potential emissions." [5]

Hydrogen Emission Intensities

Hydrogen emission intensities are compared quantitatively in terms of carbon dioxide equivalent emissions per kg of hydrogen produced (kg CO2-eq/kg H2), which encompass both the direct emission of carbon dioxide, e.g. in the production of grey hydrogen, as well as the emission of other greenhouse gases (such as methane), for which a carbon dioxide equivalent value is calculated based on global warming potential.

Various terms which might be considered beyond the hydrogen rainbow, such as "clean", "low-carbon" and "low-emission" hydrogen are all in use to describe various reported ranges of these emissions values, but their definitions and value ranges vary considerably—an issue highlighted by a 2023 IEA report.[6] As conflicting examples, the China Hydrogen Alliance defines low-carbon hydrogen emissions to be ≤ 14.5

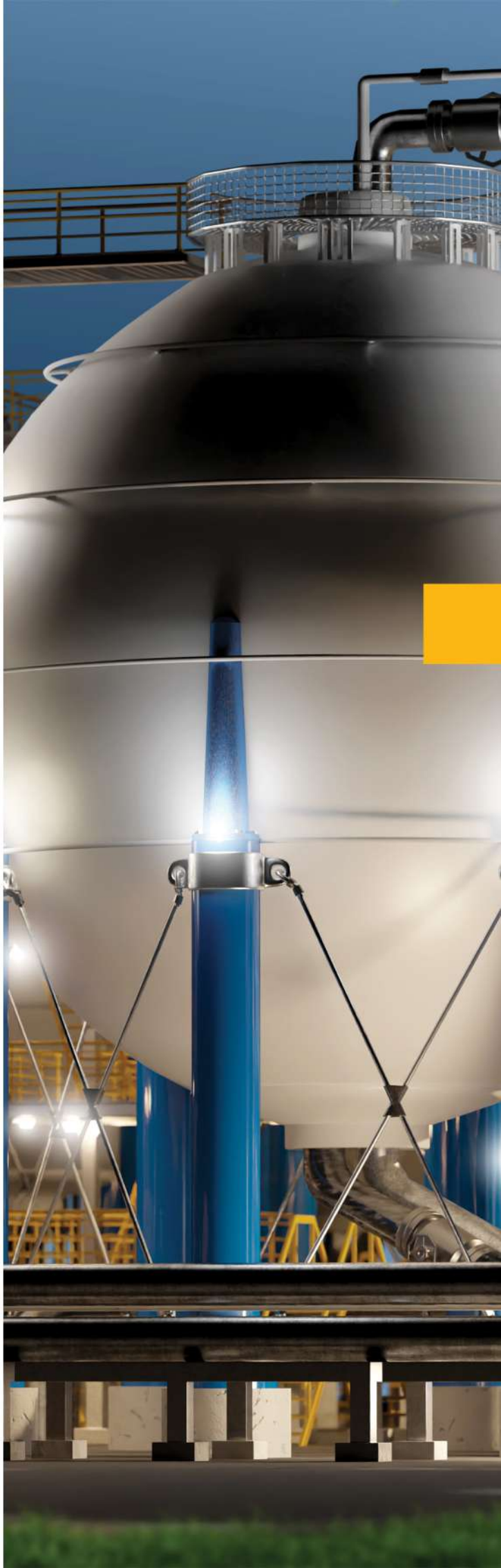
kg CO2-eq/kg H2, while the UK Low-Carbon Hydrogen Standard defines ≤ 2.4 kg CO2-eq/kg H2. The 2022 US Inflation Reduction Act provided a variety of definitions for "clean" hydrogen production with emissions up to 2.5 kg CO2-eq/kg H2, with the lowest band covering emissions ≤ 0.45 kg CO2-eq/kg H2. For comparison, grey hydrogen generates around 9 kg CO2-eq/kg H2—a comprehensive collation of emission definitions is available from the IEA.

The 2019 Australian National Hydrogen Strategy defined "clean hydrogen" as "produced using renewable energy or using fossil fuels with substantial carbon capture", but gave no quantitative emissions or carbon capture ranges.A renewed Australian National Hydrogen Strategy was published in 2024 and focused on production, with a target of 15-30 million tonnes of Australian hydrogen by 2050, together with a 2 AU$/kg tax incentive.In 2025, the Australian Government launched the Guarantee of Origin Scheme—a voluntary certification framework to track the emissions intensity of low-carbon products including hydrogen, but only when generated with electrolysis.

Policy Proposals/ Recommendations

As Australia's energy ecosystem is set to feature hydrogen from a range of production routes,clear and consistent reporting on the emissions associated with its production—beyond the hydrogen rainbow—is critical in achieving real impact associated with SDG 7.

1. **For investment and policy decisions, emission intensities should be prioritised over hydrogen colours or production routes.** Limited umbrella terminology, which encompass useful emissions ranges, should only be employed when discussing hydrogen energy technology with non-technical audiences.
2. **Australia must adopt robust and transparent definitions for low-emission hydrogen,** which must align with evolving global standards. These must feature within the evolving National Hydrogen Strategy.



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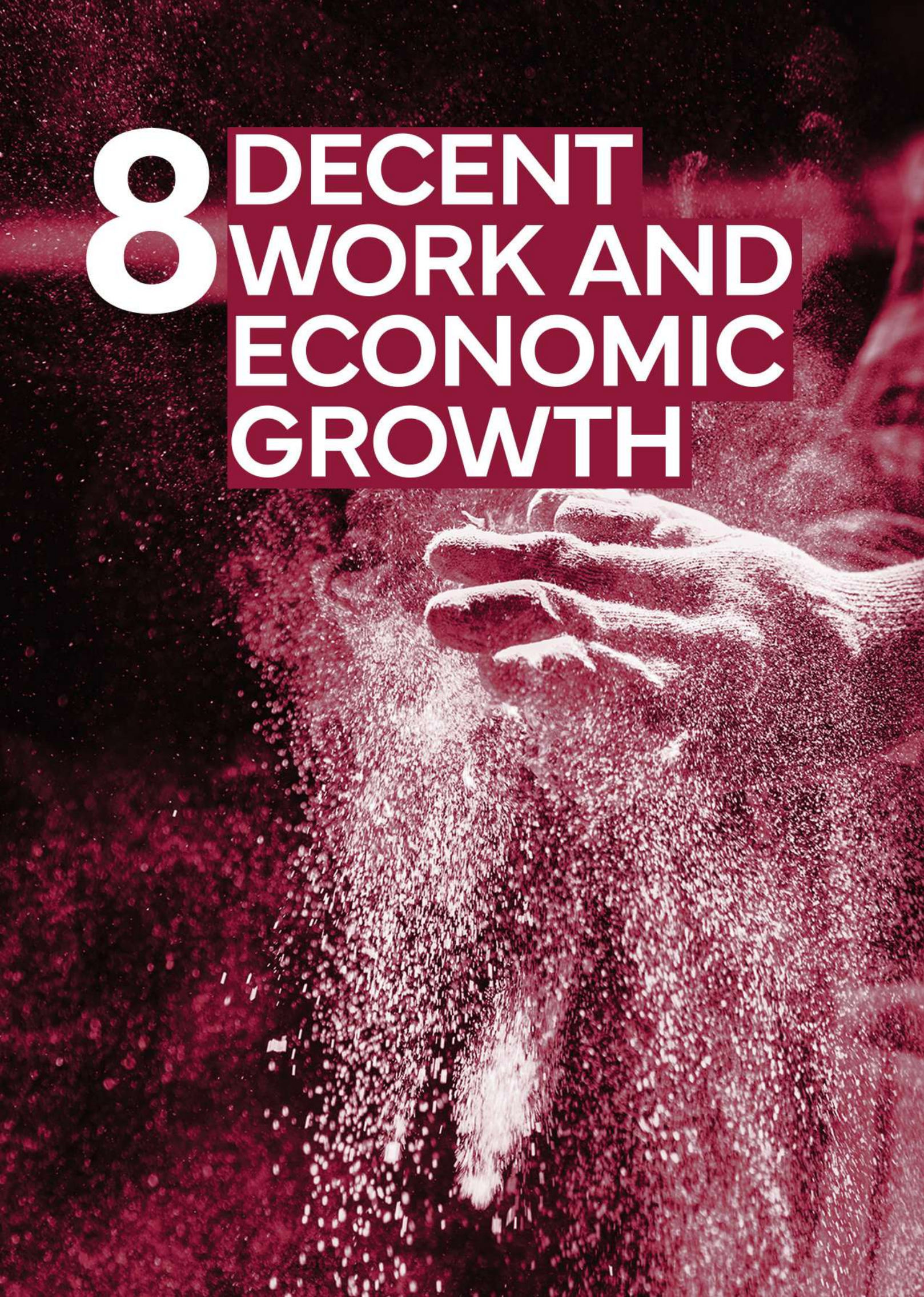

8 DECENT WORK AND ECONOMIC GROWTH

How Do We Get Decent Work in a Greened Economy?

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Introduction

The transition to a net-zero economy is faltering in Australia and around the world. Fossil fuels still drive 80% of global energy production,[1] indeed, Western Australia's emissions continue to increase, primarily driven by the LNG sector.[2] The need to intensify the transition to a low-carbon economy is urgent. Governments in Australia, however, are facing opposition to the shutdown of fossil-fuel industries on the one hand and the roll-out of clean-energy infrastructure on the other. These issues are particularly acute in communities that have long supplied coal for electricity supply.

Across Australia approximately 20 coal-fired power plants are scheduled to close by the mid-2040s.[3] This will also mean the end to the mines that feed them and the jobs of several thousand people.

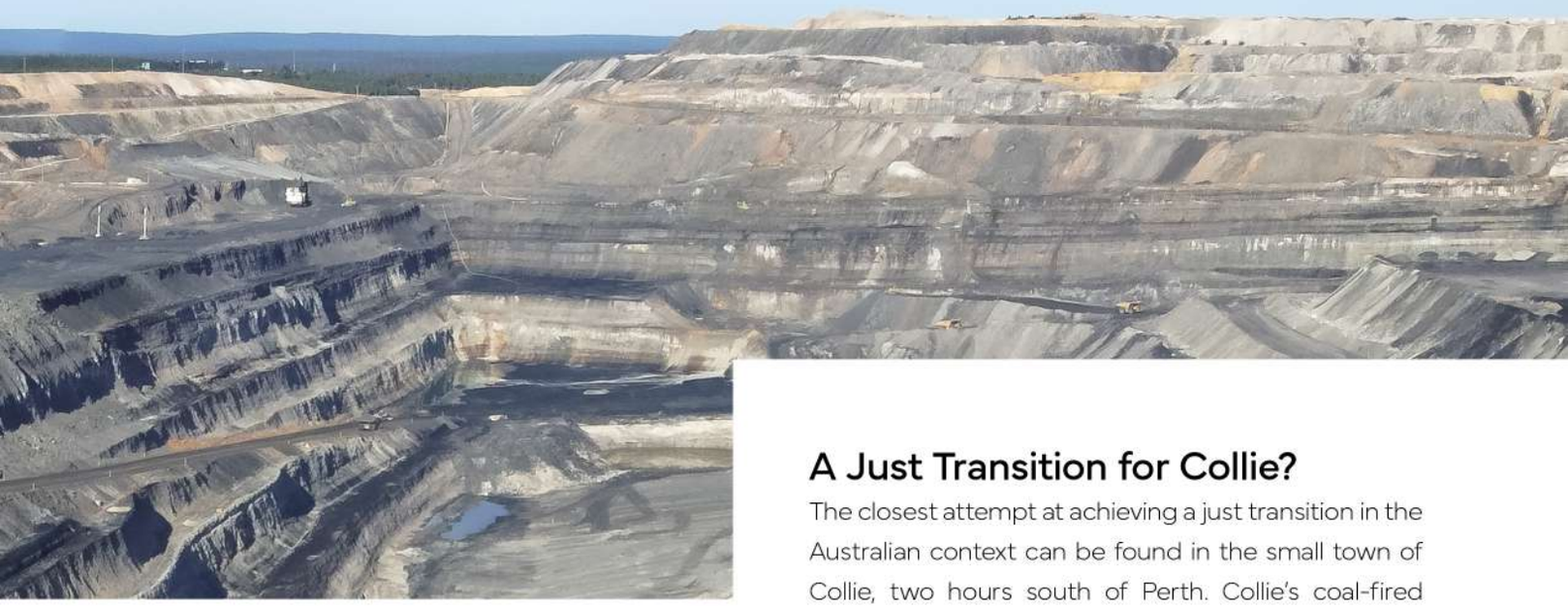
How do we best resolve the fundamental tension between rapid emissions reduction required for effective climate transition and supporting the decent work and economic growth targets central to Sustainable Development Goal 8 (SDG 8)?

Our research into the Just Transition initiative in Western Australia offers important lessons to ensure the switch to a clean energy future does not leave fossil fuel workers and communities behind.[4]

Smoothing out the road to a net zero economy

> By the end of this decade 30 million clean energy and associated jobs are forecast to be created across the global economy - outstripping jobs lost in fossil fuel industries

A rapid transition to a low carbon economy is forecast to create a jobs windfall in the clean energy economy. By the end of this decade, 30 million clean energy and associated jobs are forecast to be created across the global economy—outstripping jobs lost in fossil fuel industries.[5] Nevertheless, there are major pitfalls and policy puzzles associated with building a bridge for workers and communities between actively shutting down carbon intensive industry to the low-carbon economy. Where will the jobs be? What will they look like? Who will fill them? What new skills will workers need? We only need to look at communities in New



South Wales, Victoria[6] or the Appalachian region in the United States to see how poorly planned and co-ordinated transitions led to bad socio-economic outcomes.

So how do we build that bridge? The predominant policy response, including within the Paris Climate Agreement, is to create a 'just transition' policy framework. This involves strategic planning and social dialogue led by government and involving employers, unions, workers and community. Planning and social dialogue should lead to agreements about provisions for managed early retirements, retraining and redeployment programs for fossil-based workers, and a recognition that regions that are dependent on fossil-based extractive industries can diversify.

The most-cited example of actively supporting workers and communities while rolling out economic transformation for a net-zero economy is in Germany—co-ordinated through the 'Coal Commission'. Australia, however, lacks the institutional, policy and industrial structures found in Germany that support the collaborative approach used. In short, we are not Germany, but can we create an Australian just transition approach?

A Just Transition for Collie?

The closest attempt at achieving a just transition in the Australian context can be found in the small town of Collie, two hours south of Perth. Collie's coal-fired power stations and coal mines, which provide around 40% of WA's domestic energy, are due to be shut down by 2029. Coal has been mined in Collie for over 100 years and coal energy generation has been present in Collie for close to 90 years. It is a community and workforce deeply intwined with fossil fuel.

The community, unions and the largest employer in the town, Synergy, the state-owned power company, and the state government have been working on how to achieve a just transition for Collie and its workers in a carbon-constrained world. There are three dimensions to Collie's just transition:

1. To work through the challenge, something very unusual in the Australian context was agreed upon. A quadripartite body of unions, employers, government and community representatives, called the Just Transition Working Group (JTWG) was created in 2017. The JTWG was created by the WA Government to develop Collie's Just Transition Plan and monitor its implementation. The group meets monthly to develop ideas and work through problems with the shut-down, while exploring opportunities for new industries and jobs.

2. The state government has allocated $600 million, primarily to industry diversification, the most promising of which are green steel manufacturing, and the processing of new critical minerals associated with clean energy.

3. Synergy, the power company, through consultation with the unions, has committed to developing a specific transition package for each worker. This includes retraining during work hours, job transfer opportunities and through offering early retirement incentives.

Collie represents a modest attempt to reconcile jobs, economic growth and the climate crisis. While the transition is far from finished, the basic transition ingredients we identified through our research demonstrate that it is possible to get beyond the toxic politics of transition through ongoing tripartite and local engagement that focuses on the possibilities and mutual benefit of a low carbon future. Nonetheless, there are still concerns that the promised high-skill, high-wage jobs are still in the 'development' phase.

Collie reflects an exceptional case, both in Australia and even more so in Western Australia, where, as noted above, emissions continue to rise. Policy planning around how we shift key drivers of Western Australian (Australia's) emissions, such as, LNG and the big mines, the workers, as well as the communities who rely upon them, to a low-carbon future are non-existent or not considered necessary because 'WA is unique'[7]. WA might be 'unique', but, it will inevitably need to grapple with the transition challenge to ensure that decent jobs and economic growth are sustained into the future.

Policy Proposals/ Recommendations

1. In line with growing momentum both globally and nationally, such as the Albanese Government's 'Future Made in Australia' policy, **Western Australia needs to engage in strategic government industry policy to develop well paid job-rich industries**. This is partly about leveraging WA's unique resource endowments (such as in critical minerals) and moving up the supply chain. It is also a matter of thinking creatively about existing policies and industries, for example, strategically reframing WA's gas reserve policy and future access to such resources to support green industry.

2. **Develop long-term shut-down plans now**. While key stakeholders (government, industry and unions) may think particular industries, notably LNG, have 30 plus years to run, the economic and social pressures to shift to a zero-emission economy will only grow as the consequences of climate inaction are realised.

3. **To develop long-term planning and support workers' adjustment to a low-carbon economy current industrial relations laws need revision**. Our research in Collie shows that worker voices and rights are critically important to smoothing the transition to a net-zero economy. Therefore, the federal government should remove the restrictions on enterprise bargaining in the Fair Work Act 172(1) which narrow the scope for workers and employers to develop just transition planning in industrial agreements.

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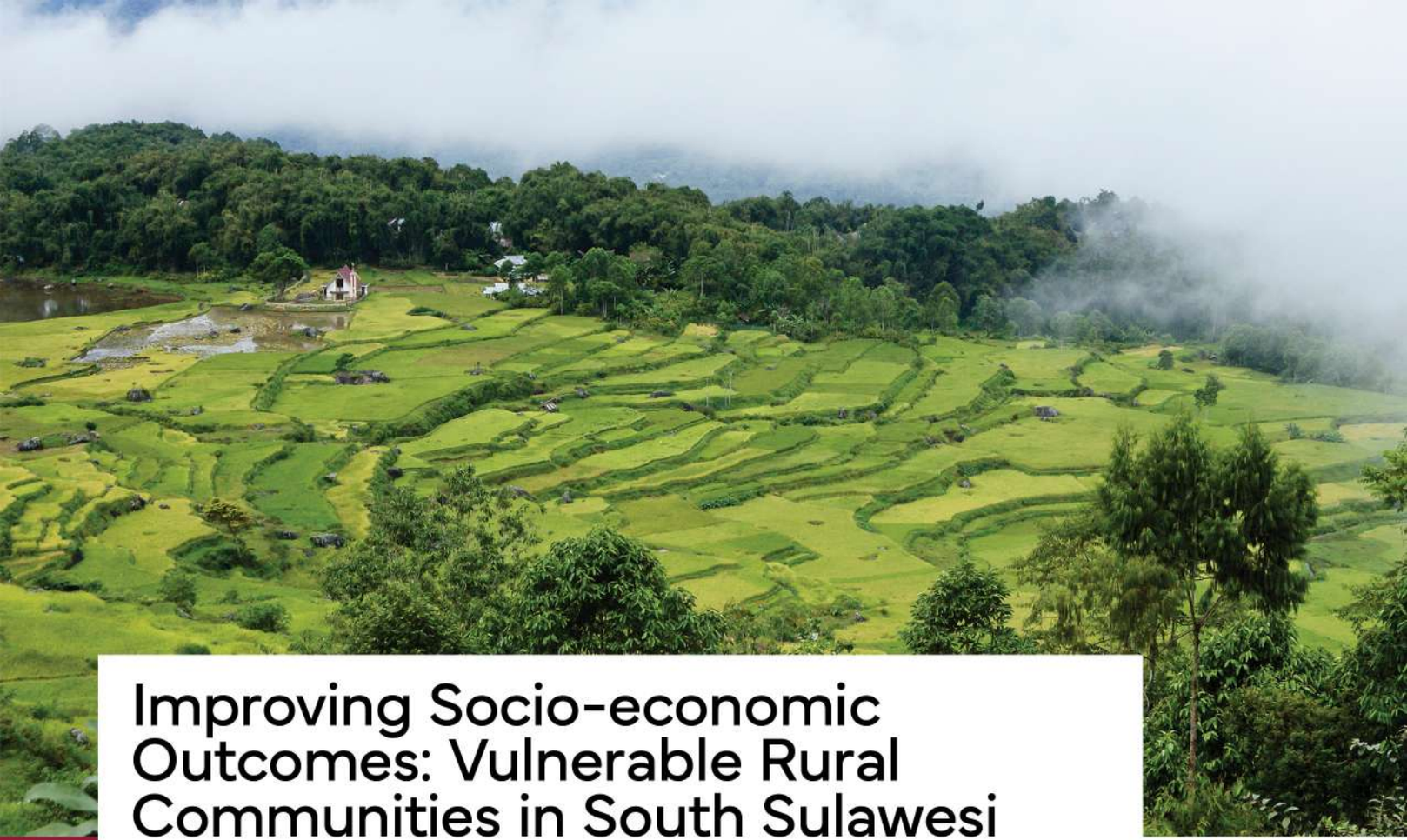

Improving Socio-economic Outcomes: Vulnerable Rural Communities in South Sulawesi

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Introduction

Sustainable Development Goal (SDG) 8 works across the four sustainable development pillars of social, economic, environmental and governance to benefit community and individuals irrespective of gender, age or disability. At its core, it seeks to promote sustained economic growth which is inclusive, especially for marginalised and vulnerable populations. The SDG's principles inform research design, contextualise trends and identify challenges, which in turn can inform evidence-based solutions and policy development. Benefited areas include social protection and working environments, worker productivity, innovation and entrepreneurship. The success of SDG 8 depends on international cooperation and partnerships to address the societal grand challenges relating to inequality, poverty, connectivity, inclusivity, socio-economic well-being, and access to the critical public infrastructure of education, transport, and healthcare.

> Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

This contribution explores how the core principles of SDG 8 were used to inform the research design and quantitative measures of a project conducted under the Australia-Indonesia Centre's Partnership for Australia-Indonesia Research (PAIR) program and was a collaboration between the University of Western Australia, the Australian Department of Foreign Affairs and Trade, Hasanuddin University and the Provincial Government of South Sulawesi, Indonesia.

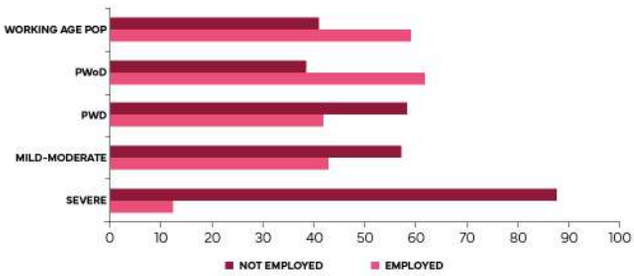
The PAIR program had two main aims. First, to improve the socio-economic wellbeing and work capacity of communities along the first build of the Trans-Sulawesi Railway. Second, to facilitate the evaluation of the Government of Indonesia's (GoI) Special Schools' Education program and Vocational Schools Revitalisation policy on improving the employment outcomes and wages of persons with disabilities (PWD).

Project findings and outcomes were used to guide Sulawesi local, regional and Provincial government economic development strategic initiatives and policy development.

Inclusive economic growth and decent work in Indonesia

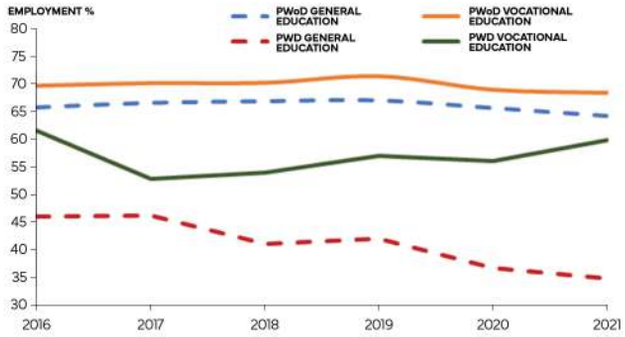
Inclusive and universal economic growth and decent work are core principles in SDG 8. One way to measure this is through the education levels and employability of certain groups in a population, such as persons with disabilities (PWD). The difficulties in finding decent work for PWD is exacerbated in locations, such as South Sulawesi, where this cohort is a significant proportion of the working population (14.4%). Figure 8.1 illustrates the employment status of PWD and persons without disabilities (PWoD) in South Sulawesi. While 62% of working PWoD reported working last week, only 43% of PWDs with a mild to moderate disability and 12% of those with a severe disability had work. Persons with severe disabilities were at high risk of being unemployed.

FIGURE 8.1 EMPLOYMENT IN SOUTH SULAWESI BY DISABILITY STATUS, 2016-2021 SAMPLE MEANS [1]



Access to education and skills training is a key factor influencing the employability of PWD. To this end, Special Schools for PWDs were first introduced by the GoI in 2003 alongside a revitalisation of the Vocational Education system in 2016. In assessing the success of both programs in increasing the employability of PWD in South Sulawesi, attending special schools was found to be negatively correlated with employability, as the segregation of PWDs from the mainstream education system created negative perceptions and employment barriers. In contrast, for PWD, vocational programs were positively correlated to employability and wages. Indeed, as seen in Figure 8.2, PWD with vocational education were significantly more employable than those who only attended general schools. The success of vocational education saw enrolments increase from 7.3% to 10.3% between 2016 to 2021.[2]

FIGURE 8.2 EMPLOYMENT RATES OF PWD AND PWOD WITH VOCATIONAL AND GENERAL EDUCATION 2016-2021 [1]



Employment vulnerability and marginalised communities

Delivering full and productive employment requires regional development policy to support employment for those who are most marginalised and vulnerable. Constructing composite and standardised indices to measure this vulnerability can provide insights into the comparative disadvantages of different regions, industries and demographic groups.

Figure 8.3 compares standardised (via z-scores) indicators of three measures of employment vulnerability. These measures are:

1. Spatial vulnerability given the disadvantages found in Indonesia Statistics data of the three communities of Barru, Pangkep and Marru compared to the larger adjacent cities of the capital of Makassar and port of Parepare.

2. Gender vulnerability given the patriarchal society of the South Sulawesi region where culturally women have less job opportunities.

FIGURE 8.3 INDEX OF VULNERABILITY WITH COMPOSITE INDICATORS OF REGIONALLY MARGINALISED COMMUNITIES [3]

INDICATOR OF	BARRU	PANGKEP	MAROS
% persons in Agriculture, Forestry and Fishing	-0.05	1.02	-0.97
% persons in Water Supply, Sewerage, Waste Management and Remediation Activities; Education; Other Services	1.10	-0.23	-0.86
% persons in Wholesale and Retail Trades; Accom and Food Services	-0.48	-0.67	1.15
% employment status is unpaid or precarious	-0.64	1.15	-0.52
% women with less than high school education	-1.04	0.08	0.96
Dependency ratio: respondents who worked last week	-0.71	1.14	-0.44
Dependency ratio: number in household with income or work	-0.71	-0.21	1.09
% industries where 50% or more are female workers	1.09	-0.22	-0.87
% females in precarious or unpaid work	0.87	0.22	-1.09
% persons less than high school education	-0.32	-0.80	1.12
% persons with over three dependents	-0.92	1.07	-0.15
% persons with young children (under 16)	1.12	-0.80	-0.31
% persons at or just above poverty line	1.06	-0.13	-0.93
% persons working in the most vulnerable industries	0.99	0.02	-1.01
INDEX OF VULNERABILITY	**1.37**	**1.63**	**-2.84**

Employment vulnerability given the domination of certain industries in a region, such as agriculture and transport, where worker incomes are less than the National poverty line.

The sum of these indicators provides an index of vulnerability to compare the three regions, where a higher number indicates greater vulnerability. Accordingly, Pangkep was found to be the most vulnerable region at 1.63, followed by Barru (1.37) and Maros (-2.84).

This vulnerability was found to be associated with the following drivers:

- Those households with a high number of dependents (young children or older family members) which meant women were needed for carer duties at home.
- Workers in the most precarious industries, namely agriculture, forestry and fishing.
- Workers whose incomes were just above or below the national poverty line.

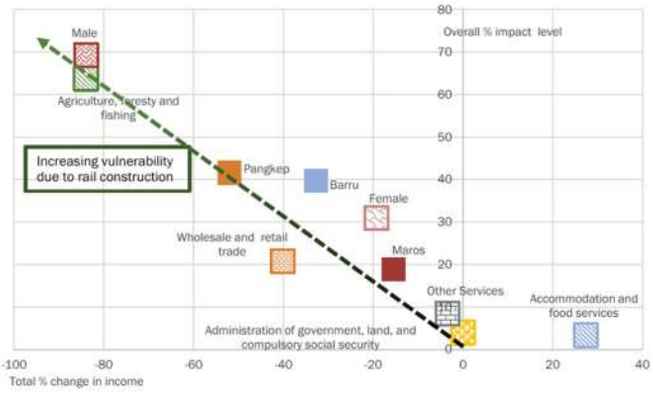
Unequal impact of infrastructure investment

The better connectivity of regions and people is frequently associated with improved access to job opportunities, which in turn promotes sustained, inclusive and sustainable economic growth, as well as full and productive employment. This motivates governments to invest heavily in infrastructure that will connect regions and economic markets, such as railway, airport and port infrastructure. For Sulawesi, as noted in the Australian-Indonesian Centre report:[3]

> Building of the Trans-Sulawesi railway aims to address some of the challenges around connecting key cities, towns, ports and rural areas so that people and businesses have more opportunity. The rail infrastructure is also seen as a way to lift the overall living standard and improve socio-economic conditions.

However, not all groups benefit from major infrastructure equally, or indeed at all. For example, in a study of the impact of the first build of the Trans-Sulawesi railway, and as shown in Figure 8.4, some groups were more vulnerable than others. This included people who were displaced from farmlands or lost land and income to the rail, or who found it difficult to continue working during construction or because environmental changes impacted their farmlands.

FIGURE 8.4 IMPACT ON BUSINESS AND INCOME ON THE MOST VULNERABLE COMMUNITIES [3]



The most vulnerable demographic was found to be males, as the largest proportion of the workforce, and of those working in agriculture, where the land use was most impacted by railway construction. This was followed by the regions of Pangkep and Baru, having the most vulnerable populations, overall.

Policy Proposals/ Recommendations

Government initiatives and policy supporting the economic inclusion and employability of the most vulnerable groups in a region is critical to the effective delivery of SDG 8 targets related to decent work and economic growth for all. Often, this involves large infrastructure investment, such as railways and education facilities, connecting people, places and markets and ensuring employability through appropriate skills and training.

However, the economic benefits of such infrastructure are varied. A robust impact analysis is crucial to understand where vulnerabilities lie with a population and how best to develop infrastructure policy that is responsive to disproportionate costs, while progressing the SDG 8 targets. As such, we recommend the following:

1. **Proper statistical analysis of the communities involved,** with specific focus on measures of the employability and vulnerability of different demographic or spatial groups.
2. **Evaluate the impact of large infrastructure investment** both in terms of the cohorts it benefits and the cohorts displaced or disadvantaged by infrastructure construction.
3. People with disabilities (PWD) face greater vulnerability as they intersect with older age, rurality, and gender. Policy efforts should be directed towards **greater investment in vocational schools to improve employment outcomes for PWD**, particularly those with severe disabilities.

Endnotes

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Sustainable Development Goal 8.7 and Eradicating Modern Slavery in Australia

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Modern Slavery

Slavery, thought to have been abolished, continues to exist around the world. 'Modern slavery' has gained increasing attention in recent years, not least since the respective introduction of the United Kingdom and Australian modern slavery legislation. Sustainable Development Goal (SDG) 8 aims to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Within that, SDG Target 8.7 requires signatory countries to:

> Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2050 end child labour in all its forms.

This is a significant target given the scale of the problem.

According to Walk Free's latest Global Slavery Index,[1,2] there are an estimated 49.6 million people in modern slavery worldwide,[3] and an estimated 41,000 in Australia.[4] The Global Slavery Index and academic scholarship define modern slavery as including forced labour, forced or servile marriage, debt bondage, forced commercial sexual exploitation, human trafficking, slavery-like practices, and the sale and exploitation of children.[5] These conceptions of modern slavery are reflected in the Modern Slavery Act 2018 (Cth)[6] and the Criminal Code Act 1995 (Cth).[7] The theme of exploitation runs through these forms of modern slavery.[8]

FIGURE 8.5 ESTIMATED PREVALENCE OF MODERN SLAVERY BY COUNTRY [3]

Rank	Country	Prevalence
1	North Korea	104.6
2	Eritrea	90.3
3	Mauritania	32.0
4	Saudi Arabia	21.3
5	Türkiye	15.6
6	Tajikistan	14.0
7	United Arab Emirates	13.4
8	Russia	13.0
9	Afghanistan	13.0
10	Kuwait	13.0

Regulation and management of modern slavery

Australia's Modern Slavery Act 2018 (Cth) took effect in January 2019 and requires businesses and Commonwealth entities with an annual turnover of $100 million to report on risks of modern slavery in their operations and supply chains, and on the steps taken to mitigate those risks.[9] The Act has been widely criticised for its lack of enforcement mechanisms and for low compliance rates.[10, 11]

The requirement to report on supply chain risks[12] has brought a focus on supply chain management and procurement policies. Many companies and government entities have sustainable procurement policies in place, which seek to screen suppliers with detrimental social and environmental impacts; some also monitor suppliers using audits, questionnaires, and using whistleblower hotlines.

According to the Commonwealth public procurement rules, when assessing value for money, consideration is to be given to not only the price, but also other factors including environmental sustainability of the goods and services to be supplied. These means, for example, that the energy efficiency and environmental and climate change impact must also be taken into consideration in evaluating bids.[13] However, since cost is always a key procurement consideration, many large companies still source from suppliers in countries renowned for poor labour, safety, health and environmental laws and practices and in other cases, there are limited options for the supply of particular commodities, such as critical minerals.

Australia typically relies on economies in Asia for at least half of its imports. However, as Figure 8.6 shows, the region (in this case, Asia and the Pacific) is high-risk for modern slavery.

Organisations often choose a coercive (the 'stick') or collaborative (the 'helping hand') supply chain management approach, or a combination on a continuum between these two extremes. A coercive approach emphasises supplier audits and, discontinuation of supplier contracts when suppliers do not meet procurement standards. A Good Practice Toolkit on Strengthening Modern Slavery Responses notes that this should not be the first response.[14] In contrast, a collaborative approach involves working together with suppliers to solve problems and improve working conditions, environmental impact, quality and efficiency.

An important question is how buyers manage a problem with a supplier, such as an indication of the presence of modern slavery. For example, severing ties with the supplier may mean that the modern slavery continues, and the supplier simply services another buyer. Severing ties with the supplier may put the supplier out of business and lead to hundreds of workers losing their jobs and facing poverty. Interviews with procurement managers of large listed Australian companies indicated that they are aware of these consequences of severing ties and prefer to work together with suppliers in the first instance to eradicate a discovered problem. An interesting comment from an investment analyst was that there is an element of 'wilful ignorance' by procurement and other managers of buyers about the operations at risky suppliers.[15] Managers may not wish to look too deeply because once you identify an issue (e.g. modern slavery) you 'can't unknow'.

FIGURE 8.6 MODERN SLAVERY IN ASIA AND THE PACIFIC [3]

Does corporate reporting help?

For decades, large listed companies have engaged in voluntary ESG (Environmental, Social and Governance) reporting to the public through their annual reports, sustainability reports and on their websites. In the last decade, there has been a significant global surge in mandatory ESG reporting, starting with the European Union (EU) Commission's Non-financial Reporting Directive in 2014,[16] which made reporting on certain ESG aspects mandatory for large EU companies.

Since then, further mandatory ESG reporting requirements have spread globally, such as the mandatory climate-related disclosures recently introduced in Australia for large companies.[17] The introduction of the EU Corporate Sustainability Due Diligence Directive (CSDDD)[18] in March 2024 places additional due diligence obligations on large businesses. Although the scope of the Directive remains under discussion, it is likely to have a significant influence on global corporate regulation in this area.

The difference between laws requiring reporting (like Australia's Modern Slavery Act) and due diligence laws like the EU CSDDD, is that due diligence laws require businesses to do something, not just report on it.[19] This begs the question: do laws on modern slavery which require reporting (or on other ESG matters, such as climate-related risks) bring about changes in practices and indeed make the world a better place? Interviews with those preparing modern slavery statements found there were mixed views on the benefits of mandatory modern slavery reporting.[15] One detraction is when such reporting becomes a 'tick-box' exercise for compliance purposes, rather than reporting to improve practices. Another interviewee commented that the compliance aspect of mandatory reporting takes resources away from actually improving practices.

A further consideration is that the continuous disclosure obligations in Australia under the Australian Corporations Act 2001 (Cth) and Australian Stock Exchange (ASX) Listing rule 3.1 require listed companies to keep the market informed continuously of material price-sensitive information. Arguably, significant modern slavery and other ESG issues should be reported under these rules. Disclosure under this regime is consistent with the requirement in the ASX Corporate Governance Principles and Recommendations, Principle 3, for listed entities to report on the requirement to 'instil and continually reinforce a culture across the organisation of acting lawfully, ethically and responsibly.' However, ESG reporting practices in Australia are inconsistent and under-developed.[20] Consistent with this, other interviewees supported targeted mandatory modern slavery reporting and believed it led to improved practices. Australian report preparers and analysts also highlighted the genuine difficulty of supply chain leaders knowing what is happening in complex, global supply chains. For example, in the case of manufacturers who have 30 tier-1 suppliers, each tier-1 supplier may have five further suppliers, and so forth. As such, reporting is an important source of information on the status and nature of modern slavery which may inform the Australian Government on legislation and policy-making on modern slavery.

Also importantly, the Modern Slavery Act requires the responsible Minister to prepare a modern slavery statement in relation to noncorporate Commonwealth entities.[21] However, this reporting focuses on operations and supply chains and does not extend to areas of government policy, such as the intersection of migration law and modern slavery. Temporary visas and criteria for the grant of visas generally can lead to the exploitation and abuse of migrants.[22] Migrants, depending on the category of visas they hold, can have limited access to government services. Yet, the Australian Government has acknowledged that '[m]igrant workers can be particularly vulnerable to exploitation, either by those who facilitate their journey to Australia or by employers once they arrive. This may be because of … their reliance on their employer for their immigration status.'[23]

Corporate reporting, even partial or incomplete, can also serve as an important information tool for shareholders and interested stakeholders. Increasingly, Australian shareholders are using their participatory rights and powers to promote corporate transparency on ESG matters and drive changes to corporate practices. Typically this is done through shareholder resolutions and strikes against a company's remuneration report.[24] While the focus of shareholder activism has been primarily on environmental issues, in 2019, the ACCR filed the first ever modern slavery resolution globally,[25] leading the way for further development in this area.

Finally, requirements for corporate reporting can help elevate modern slavery issues to board level. With Australia's corporate regulators declaring a focus on 'greenwashing', expanded in 2025 to include 'misleading conduct involving ESG claims',[26, 27, 28] the risks of incomplete or misleading disclosure are increasingly apparent. The requirement to consider and publish information about a company's modern slavery footprint may in turn, directly or indirectly, lead to a shift in the balancing of stakeholder interests, as directors consider the consequences of reputational damage and the conduct required by their duties to the company.[29, 30, 31]

Where to from here?

SDG Target 8.7 aims to eradicate forced labour, modern slavery, human trafficking and the worst forms of child labour. The Modern Slavery Act was a useful first step in raising awareness of the risks of modern slavery in Australian businesses and their supply chains, but much remains to be done. A recent statutory review of the Act made some important recommendations to strengthen its effectiveness;[32] and the recent introduction of an Anti-slavery Commissioner could provide some much-needed momentum.[33] The reporting requirement under the Act is a useful starting point, but it must not end there. The Australian Government must use the data from the reports to take pragmatic steps to address modern slavery in Australia.

Endnotes

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9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Reframing Industrial Development: How Social Enterprises Can Expand Finance Access in Small-Scale Industry

Ben Perks, The University of Western Australia

Introduction

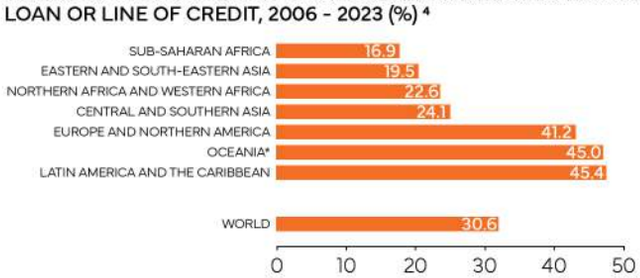
Sustainable Development Goal 9 (SDG 9) focuses on building resilient infrastructure, promoting inclusive and sustainable industrialisation, and fostering innovation. Within this framework, one of the critical, albeit often underexplored, areas is the role of small-scale industry in advancing equitable and sustainable economic growth.

In this context, SDG Target 9.3 calls for an increase in small-scale industry and other enterprises as a share of employment and total industry value added, while ensuring inclusivity, sustainability and improved access to loans or lines of credit.[1]

In many countries, small-scale industries (comprising many small- and medium-sized enterprises (SMEs)) are vital contributors to employment, income, and resilience in developing economies. The enterprises therein contribute to around 90% of all businesses and provide almost half of the world's employment. Moreover, they present critical pathways for local employment and help build distributed, community-based industrial capacity. Yet their growth is frequently constrained by limited access to finance, weak institutional support, insufficient training and underdeveloped market links.[2]

Between 2006 and 2024, only around 31% of small-scale industrial enterprises reported having a loan or line of credit. In regions, such as sub-Saharan Africa, the figure falls to 18%, while in Latin America and the Caribbean the rate is around 46%, highlighting the stark disparities in financial access and inclusion.[3]

FIGURE 9.1 PROPORTION OF SMALL-SCALE INDUSTRIES WITH A LOAN OR LINE OF CREDIT, 2006 - 2023 (%) [4]



Meanwhile, World Bank estimates indicate that the finance gap in developing economies is approximately USD$5.7 trillion, or about 19% of GDP in developing economies or 20% of global private sector credit. Overall, 40% of small-scale enterprises are credit-constrained, with the gap expanding even as the global supply of credit increased by 7% to 2023.[5]

These figures suggest that, despite SDG 9.3's aim of increasing access to credit and value-chain inclusion for small enterprises, significant structural barriers remain; particularly in lower-income and more vulnerable contexts where risk and volatility are higher.

In this light, improving financial inclusion and implementing targeted policy support are essential steps if small-scale industries are to thrive amid today's economic uncertainties.

Rethinking small-scale industry development

Small-scale industries can contribute to addressing a breadth of SDGs by virtue of their structure and motivations. As such, overlapping Goals include reducing inequalities (SDG 10), promoting decent work and economic growth (SDG 8), fostering sustainable communities (SDG 11), and supporting responsible production (SDG 12).

Traditional understandings of industrial development emphasise scale, efficiency, and integration into global value chains. While these models have generated economic growth, they have often overlooked community strengths, excluded marginalised groups, and imposed industrial systems upon communities rather than building from within them. This has led to critiques that mainstream industrialisation does not always serve the broader aims of sustainable development.

Social enterprises, however, present a compelling alternative in many cases. Positioned between the market and the community, they embed social, cultural, and environmental values into their operations while engaging in productive economic activities.

Social enterprises as an opportunity for alternative small-scale industrial development

Industrial policy and financing (both public and private) in many contexts remain compliance-heavy and risk-averse. Access to funding is often mediated through top-down, funder-managed schemes prioritising formalisation over flexibility. While these ensure accountability, they can stifle the responsiveness and cooperative ownership that drive community-level innovation.

SDG 9.3 calls for expanding access to financial services and credit for small-scale industries. Yet strict eligibility, collateral demands, and slow approvals often exclude small-scale, informal or community-based enterprises. The paradox is clear: systems designed to empower small industry can instead restrict it, diverting resources from innovation and local impact.

In Malaysia, many SMEs rely on personal savings or informal lending, limiting viability and growth. Conventional industrial policies further favour export-oriented sectors, disconnecting industrial progress from community well-being. For SDG 9 to succeed, small-scale industry must be supported as both an economic and social development engine.

Social enterprises offer a complementary path. By embedding social goals within viable business models, they can draw on hybrid financing (i.e. earned income, cooperative pooling, and reinvested profits) reducing reliance on credit and building resilience through diversified funding. These approaches can lower financial risk, and over time, improve readiness for formal credit without requiring it upfront.[6]

Such enterprises demonstrate that diverse, socially rooted financing can strengthen resilience, promote initial community-based capital growth and eventually open pathways to formal finance. Social enterprise models thus broaden what 'access to finance' under SDG 9.3 means beyond loans to include enabling environments where adaptive, bottom-up growth can support sustainable industrialisation.[7]

The case of KOKULAC Mushroom Cooperative in Malaysia

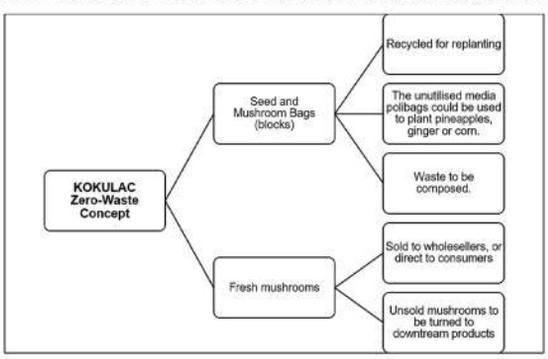
KOKULAC, based in Kg Melor, Kota Bharu (Kelantan, Malaysia), is a cooperative social enterprise specialising in mushroom cultivation. Since its inception, the enterprise has pursued a model that unites business growth with community development, embedding social, environmental, and economic objectives into its operations. By mobilising local labour, repurposing agricultural by-products such as rubber-wood sawdust as substrate, and developing small-scale processing capacity, KOKULAC has balanced effective

operational scaling with value that remains within the community.

The cooperative's financing and risk management approach is distinctive. By pooling member contributions, reinvesting earnings, and drawing on limited government seed funding, KOKULAC avoids the dependency and inflexibility associated with formal debt. This hybrid, multi-sourced model enhances cash flow stability and operational flexibility while insulating the enterprise from the credit constraints faced by many small industries. It also demonstrates how diversified local financing can reduce exposure to market volatility and position small enterprises for sustainable growth. Within the broader Malaysian mushroom sector (where production can fall by up to 90% during severe droughts) KOKULAC's integrated model provides a measure of resilience rare among comparable producers.[8]

Its operational model is likewise grounded in sustainability and diversification. The cooperative follows a zero-waste approach: spent mushroom substrates are reused to cultivate other crops such as pineapples and ginger or composted to enrich soil quality. These practices reduce input costs, minimise environmental impact, and facilitate new and viable markets, while generating approximately RM10,000 (USD$2,278) in monthly sales. As cash reserves grew, the community owners were able to invest further capital funding into production and scale different facets of the business. Given the localised format, similar capital investment may soon extend to adjacent local industries, negating top-down financing in the initial start-up stages for other enterprises.

FIGURE 9.2 THE KOKULAC ZERO-WASTE OPERATIONAL SYSTEM [8]



KOKULAC's model expands its impact beyond income generation. Through targeted training and inclusion programs, it creates employment and skills development opportunities for marginalised groups, particularly women and people living in rural areas. The cooperative structure ensures that profits are reinvested locally, and that governance remains participatory, reinforcing both social cohesion and economic empowerment. Therefore, its contribution also aligns closely with SDG 1 No Poverty.[9]

Partnership and collaboration form the final pillar of KOKULAC's long-term sustainability strategy. A 2021 Memorandum of Understanding with Universiti Teknologi MARA (UiTM) Penang has strengthened its research capacity and technical innovation, allowing for improvements in productivity and resource efficiency. These partnerships have established valuable knowledge flows and reduced operational risk, thereby, creating a feedback loop between community practice, institutional expertise and risk management.[10]

FIGURE 9.3 FUNGICULTURE FACILITY, CAMERON HIGHLANDS, MALAYSIA [11]

In sum, KOKULAC exemplifies how social enterprises can serve as agents of sustainable industrialisation and financial risk management under SDG 9. Its cooperative ownership, diversified income streams, and partnerships across research and community sectors illustrate an alternative pathway to industrial development that represents a viable inroad to more secure lines of credit in the future.

Small-scale industries require localised enabling conditions to thrive

Despite KOKULAC's success in the Malaysian context, the collaborative financing and supply model may not be a viable approach in all cases. Small-scale industry, particularly social enterprises, are more susceptible to economic disruptions, which poses a salient risk to businesses and credit lenders.

While social enterprises provide a strong model for inclusive and sustainable industrialisation, their success depends on supportive conditions, such as access to markets, local infrastructure, and technical assistance, that they often cannot generate alone in many industries. Community-based and cooperative industries thrive when operating within ecosystems that recognise their realities and remove structural barriers that limit scaling and sustainability.[12] It is also the case that some industries require significant upfront capital investment that cannot feasibly be generated at the community-level.

Governments therefore have a crucial steering role: not as direct controllers, but as adaptive enablers who recognise the diverse contexts of small-scale industries. Effective policy should differentiate between enterprises needing foundational support, those ready to scale, those best placed for private sector credit and those that thrive independently.

By tailoring financing frameworks, infrastructure investment, and compliance requirements to these varying conditions, governments can bridge the gap between small-scale enterprises and emerging financing instruments, such as early-stage quasi-equity or partial credit guarantees. Such context-aware governance would protect grassroots dynamism while aligning it with broader sustainable and industrial development goals.

Policy Proposals/ Recommendations

Aside from traditional industrialisation, SDG 9 calls for a rethinking of how industrialisation is understood and pursued. While conventional approaches have emphasised growth and scale, they have often neglected community needs, inclusivity, and sustainability in local context. Social enterprises offer an alternative model; one that expands opportunities for small-scale industry financing by utilising local strengths to generate revenue opportunities and reduce borrowing risk.

As such, social enterprises should be seen not as peripheral actors but as central to the achievement of SDG 9 and its related goals. By elevating their role in policy, investment, and innovation strategies, a more inclusive, sustainable, and community-responsive model of industrial development can be financed into the future.

Building from the lessons of KOKULAC, three recommendations can be made for advancing SDG 9 through social enterprises:

1. **Recognise and integrate social enterprises in industrial policy.** Governments should explicitly include social enterprises within industrial and innovation strategies as an important form of small-scale industry. Recognising them in SDG 9 frameworks, extending finance access, and supporting capacity-building will help embed social value in industrial growth and diversify how risk and value are understood across industries.
2. **Better enable investment in community-driven and diversified financing models.** Public and private financiers should prioritise small-scale, community-rooted industries through blended finance, cooperative funds, and outcome-based mechanisms. In local settings where collaborative and multi-sourced financing reduces exposure and dependency, risk should be re-evaluated to reflect the resilience created through social and community ownership.
3. **Foster cross-sector collaboration and knowledge exchange.** Governments and private partners should develop platforms linking non-competing social enterprises, for-profit SMEs, universities, and traditional industries to share technology, innovation, and financing expertise. Regional SDG 9 hubs and open-source knowledge commons can strengthen the adaptive capacity of social entities, lowering systemic risk while advancing inclusive and sustainable industrialisation.

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The Roads to the Future Project

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Associate Professor Kwadwo Adusei-Asante, Edith Cowan University, School of Arts and Humanities

UWA has recently launched the Centre for Sustainable Development in the Indian Ocean (CSDIO). CSDIO is a university-wide entity which leads UWA's cutting-edge research, policy work, and research translation in International Development.

UWA is now ranked number one for Development Studies in Western Australia. The QS World University Rankings 2024 place UWA in the world top 100 for the first time. This recognises the strength of UWA's research and teaching in Development Studies, which is university-wide, and the commitment of our staff and students. Across the university, UWA academics are tackling real world problems, and teaching on the most challenging issues, to advance the Sustainable Development Goals (SDGs).

CSDIO's work is urgent, as governments, civil society and industry throughout the region seek collaborative solutions for addressing the worst effects of Human-Induced Climate Change (HICC), and its concomitant disruptions to our environments, economies and societies. So too, states and their citizens demand more coordinated approaches for responding to broader challenges of inequality, democratic deficit, pandemics, natural disasters, conflict, population displacement and cultural rights.

The UN has dubbed the current decade (2020-2030) as the 'decade of delivery', in which solutions must be found, and must be implemented, for all these challenges, if the SDGs are to be ultimately achieved, to secure a common future for the Indian Ocean region. The UWA CSDIO exists as a platform to rapidly find, and to implement, these solutions, through evidence-based approaches, and effective translation.

One of CSDIO's flagship projects is the ARC-funded Roads to the Future project, which is focused on SDG 9: Industry, Innovation and Infrastructure.

Over the past 15 years or so, Indian Ocean Rim (IOR) development agendas have changed dramatically, as governments across the region—especially the governments of developing countries—have adopted ever more ambitious National Development Plans.

These plans, which are usually framed in terms of some 'Vision' of the country's future—as in: *Vision 2030 (Kenya), Vision 2040 (Oman), Vision 2045 (Indonesia),* etc—aim for rapid economic take-off, and structural transformation, through infrastructure-led growth or infrastructure-based development.

In this model, major new investments are made into national transport and energy infrastructures, with a view to accelerating the industrialisation of agriculture, the growth of manufacturing, and expansion of the technology sector. The aim is that these sectors will in turn boost the SDGs, by generating improvements in food security, widen access to quality healthcare and education, and generally reduce inequality.

In pursuit of these vision plans, various governments in the Indian Ocean region have poured billions of dollars into new infrastructure projects. These investments have been funded by vast amounts of new development finance, especially from China, but also from other 'new' donors, including Russia, India, the Gulf States, South Korea and Turkey, and from international financial institutions such as the World Bank and the Asian Development Bank.

In 2023, Australia adopted a new international development policy which pivots significantly towards infrastructure investment as a key priority for its Overseas Development Assistance spending (i.e. 'aid'). Although a majority of Australia's annual aid budget is focused on the Pacific region, it also includes recipients in the IOR region.

> In many IOR countries, infrastructure investments have been also significantly boosted by new mining revenues.

All of these monies have been used to finance various kinds of new infrastructure projects, from ports, railways and airports, to dams, rural electrification projects and urban sanitation schemes. However, in country after country across the region, the vast majority of new investment has gone into just one thing - roads.

In consequence, the IOR region is now experiencing a veritable explosion of new road building projects, and road upgrades schemes. In one country alone, Kenya, over the past 20 years the road network has expanded by over 400%, to 161,451 km. Indonesia has embarked on the most expensive road building project in the nation's history, the 2,800km Trans Sumatra Toll Road (JTTS). And India has launched what may be the most ambitious highway infrastructure project in history: the so-called 'Golden Quadrilateral' scheme, which aims to link up the four mega-cities of Delhi, Kolkatta, Chennai and Mumbai with a continuous network of 4- or 6-lane highways.

To date, much of the new road investments have gone into major highway schemes, one result of which is that plans for trans-continental road corridors—which for decades, have been little more than pipedreams—are now becoming a reality. Yet, the past decade has also seen a vast expansion of investment in all kinds of provincial and local feeder roads, and in all manner of urban bypasses, expressways, ring-roads, flyovers, and laneways.

> Recent years across the IOR region has seen a boom in the construction of private roads. It feels as though everywhere one looks, new roads are being built - or will soon be built.

Yet why such an emphasis on roads? Certainly, following several decades of austerity-driven structural-adjustment programmes, the continent's road network was of insufficient size, and quality, to support the region's expanding economies. In short, IOR roads were in chronic need of new investment. Moreover, roads are always and everywhere a good economic prospect, as they inevitably facilitate improved mobility of raw materials, goods and labour. Yet so too, in many developing countries road-building programmes have proven to be politically expedient, in enabling governments to project an image of 'progress' among their voting public.

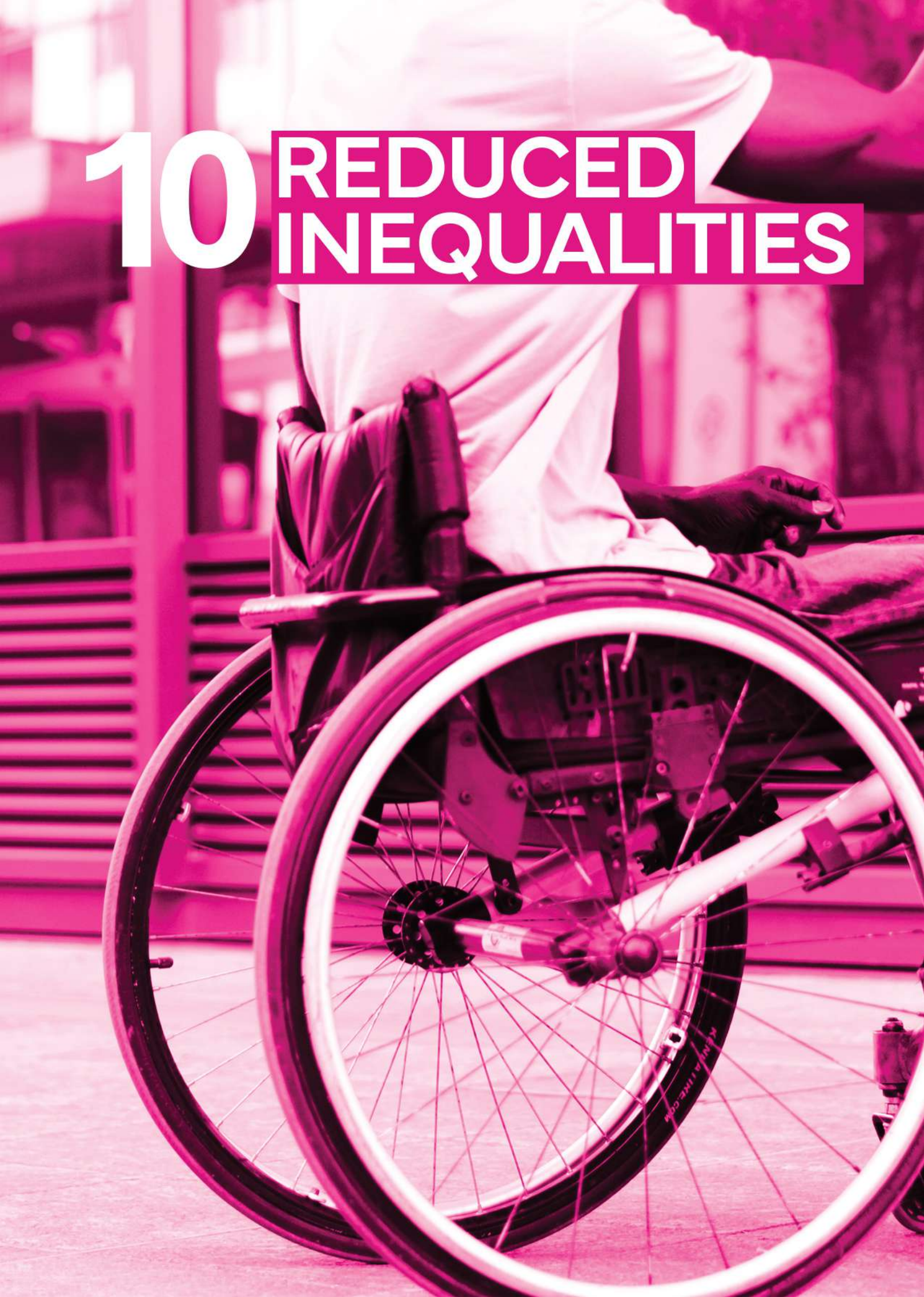
However, beyond these straightforward economic and political benefits, surprisingly little is known about what wider impacts all of these new roads are having, especially for the people who live alongside them. In particular, more research is needed to understand the (apparently) wide range of ways in which new roads may disrupt livelihoods—in both positive and negative ways—for different demographics, and especially for women. New models are needed to understand how

roads may facilitate improved health outcomes, yet also act as vectors of disease (for example, our existing models frequently failed to predict how COVID-19 moved along highways).

New research is also urgently needed to understand new roads' environmental impacts, and to develop more effective strategies for the future 'greening' of these new road projects. Central here will be pathways for achieving the broad scale adoption of electric vehicles (EVs). So too, it will involve the adoption of more sustainable building materials, the increased use of smart technologies, and the adoption of new modes of mobility for road users (including ones that don't use cars at all).

The Roads to the Future project is looking at all of these questions. It is comparing new road building projects in countries throughout the IOR region, to understand precisely how new roads do contribute to development goals and could more effectively contribute to them in the future.

The project is an important example of what can be achieved through a 'Team WA' approach. The project is led by CSDIO@UWA, with partners at Murdoch University, Curtin University and Edith Cowan University. It also includes six PhD projects across the four WA universities. The project also has partners across the IOR region, and with some of the leading Indian Ocean studies centres around the world. It is taking a case study approach, which already includes, for example: Kenya, Sri Lanka, Madagascar, South Africa, and Indonesia. However, we are keen to add further case studies from across the IOR region, especially through additional funded PhD projects.



10 REDUCED INEQUALITIES

Disability Data in Southeast Asia and the Pacific: Challenges and Opportunities

Associate Professor Michael Palmer, The University of Western Australia, UWA Business School

The Rising Importance of Disability Data

As people live longer and fertility rates decline, populations across Southeast Asia and the Pacific are aging—leading to a natural increase in the prevalence of disability. Longer lives often entail years lived with functional limitations, particularly in older age. At the same time, countries are also experiencing rising rates of disability among non-elderly populations, such as psychosocial disabilities including ADHD and autism spectrum disorder.

Across the region, there is growing awareness of disability and of the significant disadvantages faced by persons with disabilities. Encouragingly, many governments and policymakers have expressed a willingness to address these gaps. One critical barrier, however, remains the lack of robust population-level disability data. Without such data, it is difficult to measure the extent of disability in the population or the inequalities experienced by those with disabilities. Inclusive public policy must be underpinned by reliable and comparable data.

Measuring disability, however, is challenging for several reasons. For many years, definitions and data collection methods varied widely across and within countries. A major advancement in recent years has been the development of the Washington Group Short Set (WG-SS) on functioning, which offers a standardised tool for measuring disability in censuses and household surveys.[1] The measure facilitates comparison of outcomes between people with and without disabilities across key areas of economic and social inclusion—directly supporting SDG Goal 10 on reducing inequality.

Disability and Human Rights: The CRPD and SDGs

The need for disability data is rooted in international legal and development frameworks. Article 31 of the United Nations Convention on the Rights of Persons with Disabilities (CRPD) obliges states to collect disaggregated statistical data to inform policies and monitor the fulfilment of rights. Similarly, the Sustainable Development Goals (SDGs), with their commitment to "leave no one behind," require data that identifies which population—including persons with disabilities—are being excluded from progress.

Improving Measurement: The Washington Group Questions

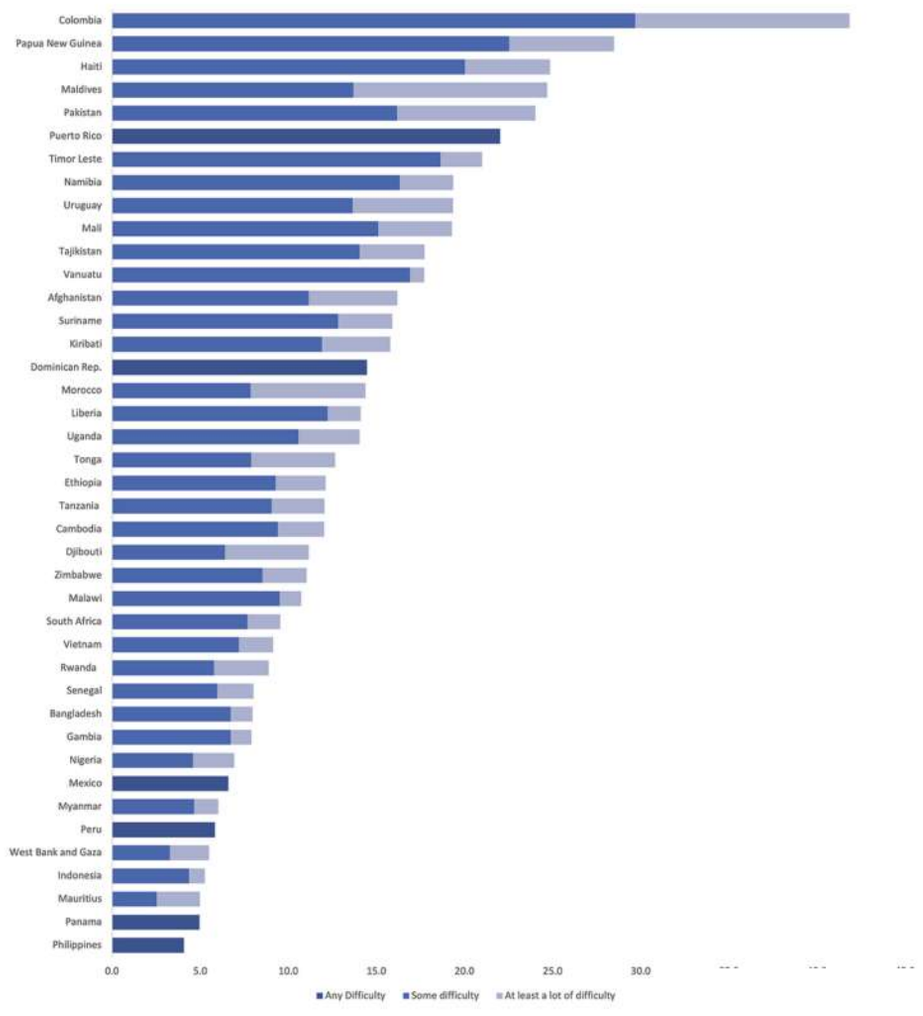
The WG-SS captures functional difficulties in six domains: seeing, hearing, walking, cognition, self-care, and communication. Responses are measured on a graded scale ranging from "no difficulty" to "cannot do

at all." This approach moves beyond medical diagnoses and aligns with a social and functional model of disability. It also allows countries flexibility in setting cutoffs—for instance, identifying individuals with at least "a lot of difficulty" in any domain as having a disability.

Prevalence & Inequalities: What the Data Shows

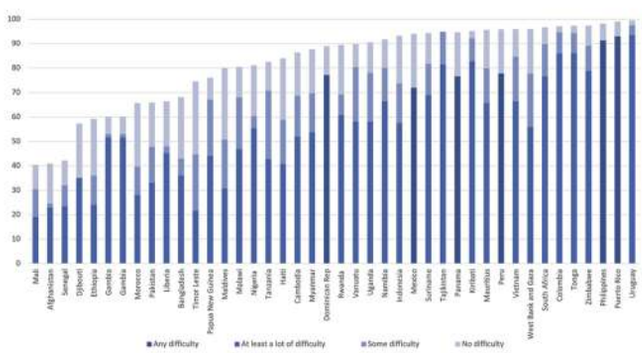
Disability prevalence, as measured using the WG-SS, varies by country and threshold. While the share of adults (15+) reporting some difficulty in at least one domain can reach up to one-quarter of the population or more, the proportion reporting at least a lot of difficulty is more consistent and generally below 10% (Figure 10.1). In countries in our region, such as Cambodia, Indonesia, Myanmar, Papua New Guinea, Timor-Leste, Tonga, Vanuatu and Vietnam, the rate of more severe functional difficulty is around 5% or lower.[2]

FIGURE 10.1 PREVALENCE OF ADULTS WITH FUNCTIONAL DIFFICULTIES (%) [2]



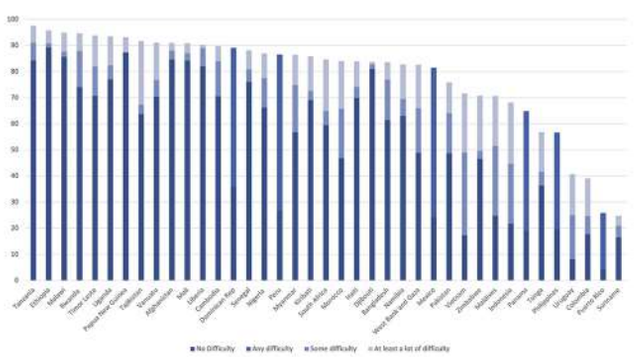
Among the most persistent and consequential disparities are those in education. In every country with available data, persons with disabilities are significantly less likely to have ever attended school. As shown in Figure 10.2, the gap in school attendance between individuals reporting no difficulty and those with at least a lot of difficulty exceeds 30 percentage points in countries such as Papua New Guinea, Timor-Leste, Vanuatu, and Vietnam. Educational exclusion has lifelong consequences, affecting future employment, earnings, health and autonomy.

FIGURE 10.2 RATES OF SCHOOL ATTENDANCE BY DISABILITY STATUS (%) [2]



People with disabilities are also more likely to experience multidimensional poverty—defined as deprivation across multiple domains, including health, education, employment, and standard of living (Figure 10.3). These disadvantages frequently intersect and reinforce one another, compounding marginalisation.

FIGURE 10.3 MULTIDIMENSIONAL POVERTY BY DISABILITY STATUS (%) [2]



The Disability Data Revolution: A Foundation for Inclusion

The Disability Data Initiative (DDI), with nine regional teams, has played a transformative role in monitoring disability rights.[2] By leveraging publicly available household and census data, the DDI enables governments, advocates, and researchers to document inequalities and track progress against CRPD and SDG commitments. As the former regional co-ordinator for Southeast Asia and the Pacific, I had the privilege of hosting annual webinars with stakeholders across the region to disseminate DDI findings and support evidence-based advocacy and policymaking aimed at improving the lives of persons with disabilities.

Policy Proposals/ Recommendations

The disability data revolution has equipped us with the tools to document inequalities and advocate for inclusion. But data alone is not enough. The persistent gaps highlighted across countries must now be addressed through concrete policy actions, targeted investments, and the development of administrative systems that support the meaningful participation of persons with disabilities in society. We have a long way to go—but thanks to better data, we are starting from firmer ground.

1. **Integrate disability measures into national data systems.** Ensure measures such as the WG-SS are consistently included in censuses and household surveys to capture and monitor inequalities between people with and without disabilities.
2. **Design responsive programs and policies.** Develop and implement initiatives that directly address the identified inequalities, in line with national commitments and international obligations under the CRPD.
3. **Develop disability-inclusive administrative systems.** Build systems that can accurately identify persons with disabilities who are eligible and most in need of support. This remains a significant and on-going challenge for governments, given both the complexity of classifying disability status and the rising prevalence of disability in societies.

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Between Support and Stratification: How COVID-19 Relief Policies Impacted Inequality in China's Craft Porcelain Capital

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Introduction

The COVID-19 pandemic has ushered in an era marked by unparalleled challenges, compelling industries globally to navigate through a complex landscape of disruptions. Amidst this upheaval, the creative and cultural sectors emerge as particularly vulnerable, with the crisis starkly exposing and exacerbating existing inequalities. In response, governments worldwide have launched various initiatives, ranging from financial support to the creation of digital platforms, to mitigate these challenges. While commendable for their intention of supporting creative industries, these efforts inadvertently risk deepening existing disparities, highlighting the critical need for nuanced analysis.

This contribution examines the impact of COVID-19 relief policies, with a focus on Sustainable Development Goal 10 (SDG 10), which aims to reduce inequality. The case study of Jingdezhen, China's renowned "capital of craft porcelain," examines the complexities of the interaction between relief efforts and pre-existing inequalities among craft practitioners. The findings reveal that, without an explicit focus on equity and inclusion, even with the best intentions, policies may fail to address the intricate dimensions of inequality.

A shift in perspective is urgently needed among policymakers towards recognising creative workers not merely as contractors in an ordinary industrial sector but as a valuable labour force generating significant public goods. By aligning COVID-19 recovery efforts with SDG 10 objectives, this contribution calls for the development of policies that foster a more equitable and inclusive recovery of the creative sector. Such an approach is essential for reducing inequalities, ensuring that the creative and cultural sectors emerge from the pandemic stronger and more equitable than before.

China's Craft Porcelain Capital under COVID-19

As a centuries-old hub for craft porcelain production, Jingdezhen embodies the intricate fusion of traditional craftsmanship with modern economic dynamics. Its global reputation for exquisite porcelain artistry makes it an ideal microcosm for examining broader shifts in contemporary China's cultural and creative sectors. The city's diverse ecosystem of artists, from time-honoured masters to emerging talents, and its blend of state-owned, private and individual workshops offer a unique lens through which to observe the reach and limits of pandemic-related public policy interventions.[1]

Through a collaborative effort involving Professor Benjamin Smith and extensive field research led by Dr Yawen Xu, insights were gathered from over forty craft porcelain practitioners in Jingdezhen from 2018 to 2023.[2,3] We found that COVID-19 caused significant economic turmoil in Jingdezhen, resulting in financial devastation, the closure of businesses, and a steep decline in international trade. The pandemic severed traditional revenue lifelines of the craft porcelain industry, including tourism and the bustling trade fairs integral to the city's creative economy. For example, the annual Jingdezhen Porcelain Expo, once a magnet for international buyers and a crucial sales event for local craft practitioners, experienced a marked drop in attendance, profoundly impacting their ability to attract new clients and sustain their operations. Once teeming with buyers from around the globe, the city's porcelain markets grappled with a new, stark reality as international trade fairs were cancelled or moved online, stifling opportunities to foster new business relationships and exacerbating the industry's plight.

The Achievements and Limits of Financial Relief Policies

Facing the unprecedented challenges brought on by the COVID-19 pandemic, the Chinese central and local governments implemented a series of financial measures to mitigate the economic shockwaves affecting the cultural and creative sectors.

Among these were financial subsidies and tax concessions, pivotal in offering immediate relief and stabilising the craft industry. Financial subsidies proved to be a vital support system for the sector, designed to mitigate immediate financial hardships and ensure operations could continue, with jobs preserved. In Jingdezhen, for instance, direct financial subsidies were provided to porcelain workshops, mainly within the policy framework applied to small and medium businesses. Tax concessions also played a crucial role, with reductions in value-added tax, corporate income tax, property tax, and building fees for cultural activities to lessen the financial burdens on these industries. These steps were designed to help the cultural and creative sectors navigate the pandemic, ensuring their continued vital contribution to the to the nation's cultural diversity.

However, the application and impact of these policies were not without challenges. A significant concern was the inequitable distribution of benefits, predominantly favouring larger, well-established businesses over smaller, independent ones. This discrepancy highlighted structural imbalances within the sector, where access to resources and support often favoured those with the advantages of scale and established networks. Consequently, less-established and less-experienced craft practitioners encountered significant hurdles in accessing government aid, exacerbating pre-existing disparities within the industry and revealing a divide that deepened under the pandemic's strain.

FIGURE 10.4 A CRAFT PORCELAIN PRACTITIONER IN JINGDEZHEN [4]

Digital Pivot Unequal Opportunities

The COVID-19 pandemic also catalysed a policy- and market-driven metamorphosis towards digital marketing and online sales platforms, ushering in a digital pivot within the craft industry. For instance, the Chinese government has made significant strides in advancing the digital transformation of the cultural and creative sectors during the pandemic. Notably, policy initiatives such as "Promoting High-quality Development of the Digital Cultural Industry" (launched by the Ministry of Culture and Tourism in

2020) and "Promoting the Implementation of the National Cultural Digitisation Strategy" (announced by the State Council in 2022) underscore a strategic push towards cultivating a digital ecosystem. This ecosystem is designed to support the entire value chain of the cultural and creative industries, encompassing production, distribution, and consumption.

However, while critical, the journey towards digitalisation unfolded within a complex landscape of challenges. The pivot towards digital marketing and online sales platforms, intended to open new avenues for cultural engagement and commercial success, inadvertently introduced a digital divide. Smaller practitioners, who are often integral to the fabric of cultural diversity and innovation, found themselves at a significant disadvantage. The requisite technological proficiency and resources needed to engage effectively in these digital platforms remained out of reach for many older practitioners, exacerbating pre-existing inequalities. This scenario highlights the urgent need for policy measures that are sensitive to the nuanced realities of the cultural and creative sectors. Addressing this digital divide demands a comprehensive approach that champions the benefits of digital transformation and ensures equitable access and support for all practitioners, safeguarding the vibrancy and inclusivity of the cultural and creative landscape.

Policy Proposals/ Recommendations

The case of Jingdezhen demonstrates that COVID-19 relief policies, despite their well-intentioned origins, may not uniformly benefit all practitioners within the cultural and creative sectors. While providing short-term advantages, these measures, if left unamended, could entrench or even exacerbate existing disparities, thereby impacting the long-term evolution of the industry. In response, policymakers must recognise that the craft and creative sectors extend beyond their economic significance. They are essential cultural foundations contributing invaluable public goods to society. Therefore, it is a mistake to regard craft practitioners merely as conventional business contractors and support them through a one-size-fits-all policy approach. Instead, targeted and practical policy strategies should be developed to enable established and emerging craft practitioners to thrive post-pandemic, promoting a future marked by resilience and dynamism, including:

1. **Target assistance for emerging craft practitioners.** Implementing specific support measures for nascent and less-established craft practitioners is essential. This policy measure could take the form of grants, low-interest loans, or subsidies tailored to the unique needs of early-career craft practitioners, enabling them to overcome the disproportionate impacts of the pandemic and the digital divide.
2. **Augmenting digital literacy and technological adaptability.** Bridging the gap between traditional craftsmanship and the digital marketplace is critical. Investment in training programs that enhance digital skills among artisans can facilitate their successful navigation of online platforms, ensuring they are not left behind in the digital shift. Additionally, subsidising access to necessary technological tools and platforms can remove significant barriers to digital entry.
3. **Fostering inclusive policy dialogues.** Crafting policies that effectively address the nuanced challenges of the craft and creative sectors requires the input of those it aims to support. Establishing forums or platforms for dialogue among policymakers, industry stakeholders, and practitioners ensures that a diverse range of perspectives are considered. These dialogues can foster a deeper understanding of the sector's needs and pave the way for more effective and inclusive

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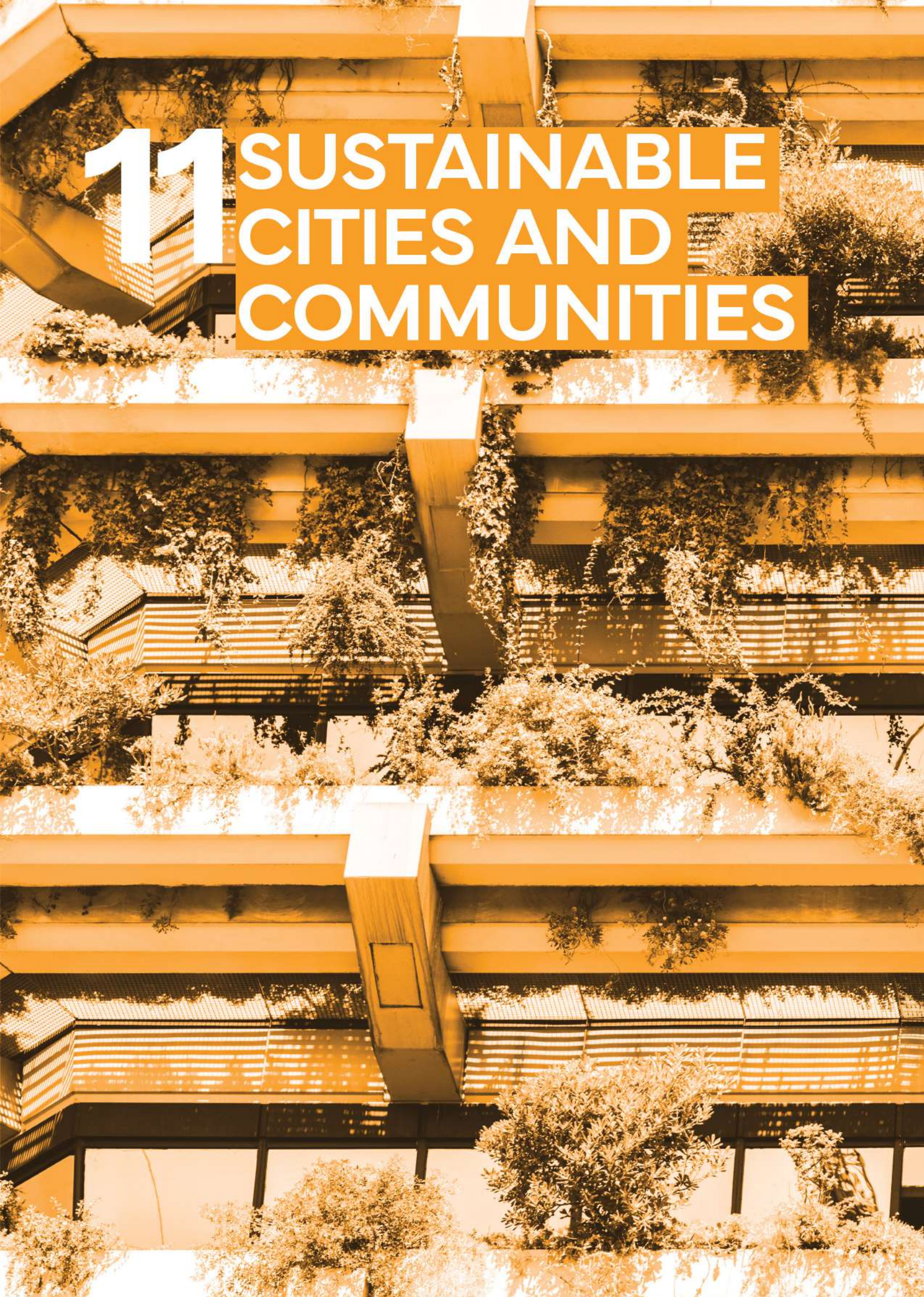
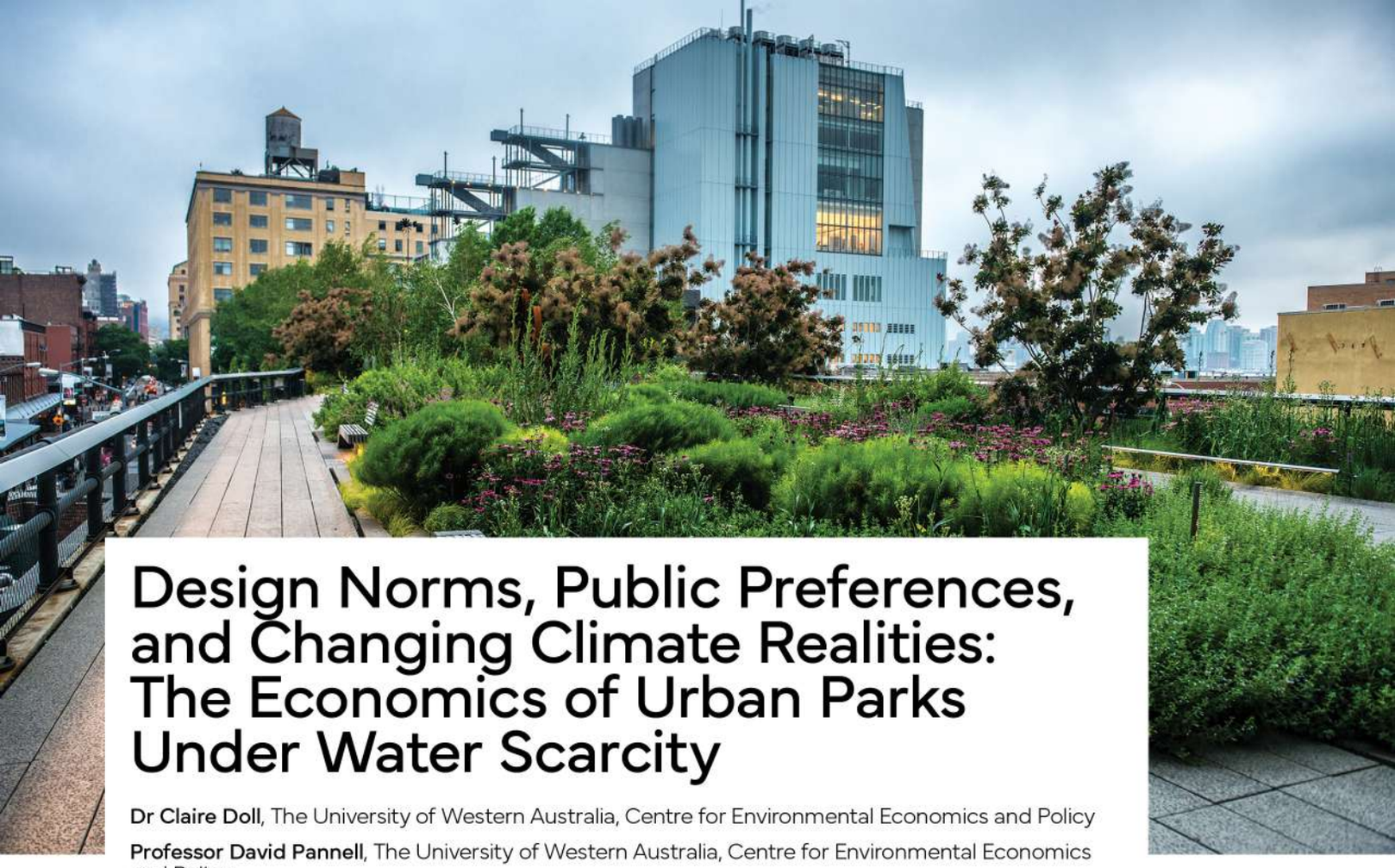


11 SUSTAINABLE CITIES AND COMMUNITIES



Design Norms, Public Preferences, and Changing Climate Realities: The Economics of Urban Parks Under Water Scarcity

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Introduction

Around the world, climate change is modifying baseline climate conditions and causing more extreme weather events. Many arid and semi-arid regions are experiencing increased occurrences, length, and intensity of droughts, alongside shifts toward hotter and drier summers. Meanwhile, water demands are increasing. By 2050, the global population living in urban areas is expected to rise to approximately 6.7 billion,[1] and the proportion of large cities that are based in water-scarce regions is projected to increase to 50%.[2] These trends highlight the importance of efficient water resource use in developing sustainable cities.

Achieving success in SDG 11 involves implementing policies and plans to adapt to climate-change impacts and build resilient cities. In response to rising water scarcity, and in support of SDG 11, this contribution provides an overview of research applying economic tools to assess community impacts of reducing urban park irrigation.

Urban parks and water use in Perth

Public parks are urban amenities that enhance community wellbeing through the provision of social, health, and environmental benefits. They are a key component of liveable cities (Figure 11.1).

FIGURE 11.1 EXAMPLES OF BENEFITS PROVIDED BY PARKS

SOCIAL	HEALTH	ENVIRONMENTAL
· Cultural and educational experiences · Recreation activities · Community connectiveness	· Physical activity · Opportunities for restoration and relaxation (mental health)	· Cooling · Air quality · Stormwater management · Noise pollution

SDG 11 includes a target for universal access to safe, inclusive and accessible green public open spaces by 2030. Sustainably meeting this target requires park planning and policy processes that foster efficient resource use. As a result, park design standards may change.

Landscapes featuring expanses of watered grass dominate urban greenspaces in cities across many parts of the world. This norm remains prevalent in Perth, where park maintenance typically involves regular irrigation. An example of a water-intensive Perth park design is represented in Figure 11.2, with 80% watered grass and 20% mulch cover.

FIGURE 11.2 EXAMPLE OF A GRASS-DOMINATED LOCAL OR NEIGHBOURHOOD PARK DESIGN IN PERTH

Considering modifications to water use in Perth's parks is critical because of stresses to its water system. Groundwater has historically been the primary source of water for many urban uses, including park irrigation. However, groundwater levels have faced substantial declines over the past 50 years.[3] With projected further declines in water availability, state and local governments have set targets and directions for increased water conservation and water use efficiency, towards the development of water-wise cities.

> Groundwater has historically been the primary source of water of for many urban uses, including park irrigation. However, groundwater levels have faced substantial declines over the past 50 years.

Local governments in the Perth region are considering strategies to reduce water use in parks, including replacing water-intensive lawns with native, drought-resistant vegetation. This park design change would help water-scarce cities meet their water conservation goals, while also supporting urban floral and faunal biodiversity. Together, these environmental benefits contribute to SDG 11's vision for climate-resilient, sustainable cities. However, before implementing changes to water allocations, it is important to investigate the community well-being impacts associated with possible park management and design changes.

What is the optimal mix of different groundcovers in urban parks?

We used a survey to elicit members of the Perth public's preferences for park designs that differ in their watering requirements. Our survey is based on a choice experiment, where respondents are faced with making repeated choices that involve trade-offs between different park groundcover compositions (watered grass, non-watered grass, drought-resistant native vegetation, and mulch), different extents of tree cover, and the council rates they would have to pay to see those park designs in real life. This method allows us to identify the most preferred groundcover mix in urban parks.

Analysing the results of over 1500 survey responses, our research shows that the ideal park design features extensive native vegetation cover.[4] The park groundcover mix that is most preferred by the Perth public includes 44% watered grass and 56% native vegetation (Figure 11.3), representing a substantial deviation from existing park design norms.

> The park groundcover mix that is most preferred by the Perth public includes 44% watered grass and 56% native vegetation.

FIGURE 11.3 A NEW VISION FOR PERTH PARKS? THE OPTIMAL MIX OF PARK GROUNDCOVERS INCLUDES >50% NATIVE PLANTS

Our survey results provide a measure of the non-market benefits associated with changing urban

park designs from watered grass-dominated spaces to designs that help conserve water by putting native vegetation into the mix. Respondents indicated they would be willing to pay approximately $200 per household per year to change from the baseline, watered-grass dominant park, to the optimal park design with over 50% native vegetation.

Shifting to the perspective of governments wanting to build resilient cities that support residents' wellbeing, we look to the financial implications of making this change to park designs. Through benefit-cost analysis and using cost estimates for different establishment and maintenance costs associated with alternative park groundcovers, the optimal park design is found to consist of 60% native vegetation and 40% watered grass.[5] This result is driven in part by the relatively high maintenance costs of maintaining irrigated lawns (e.g., costs associated with mowing, fertilizer, irrigation infrastructure), as well as by the public's willingness-to-pay for park designs with more native vegetation cover.

Policy Proposals/ Recommendations

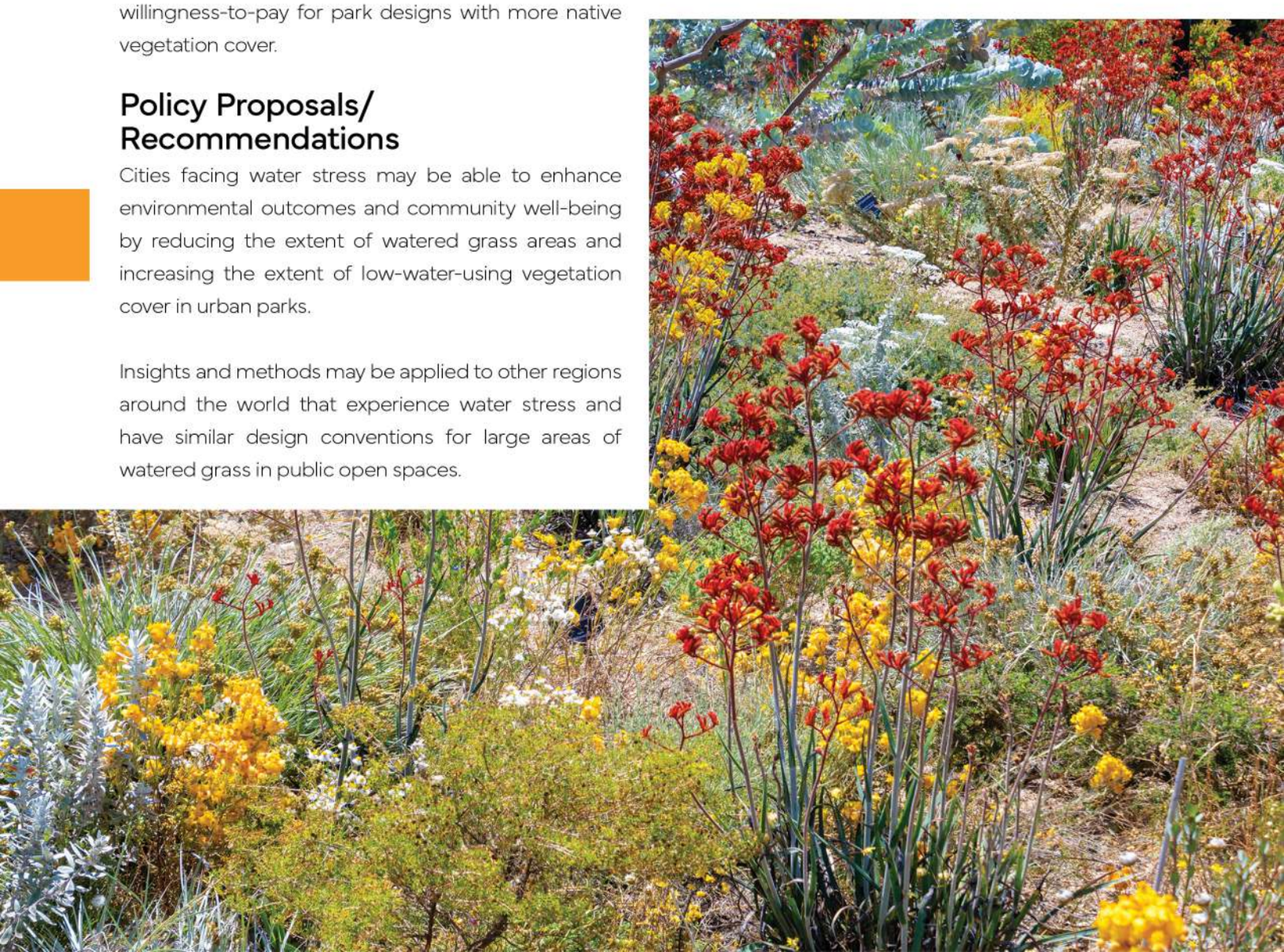
Cities facing water stress may be able to enhance environmental outcomes and community well-being by reducing the extent of watered grass areas and increasing the extent of low-water-using vegetation cover in urban parks.

Insights and methods may be applied to other regions around the world that experience water stress and have similar design conventions for large areas of watered grass in public open spaces.

In working to achieve SDG 11, and towards sustainable cities in Perth, this research leads to the following policy recommendations:

1. **Update state planning standards** to require that new park developments include a groundcover mix comprising of approximately 60% native vegetation and 40% watered grass area.
2. **Encourage local governments to develop native vegetation policies** to guide the conversion of more watered grass area towards increased native vegetation cover with park retrofits and upgrades.

This research provides a unique example of an environmental management change that can enhance community well-being, save councils money, and contribute to water conservation and biodiversity goals. It serves as a reminder of the importance of questioning environmental and planning norms under climate change and shows that research questioning norms can be instrumental in helping build sustainable cities.



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Improving Adaptive Capacity to Create Resilient Coastal Communities through Nature-based Solutions

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Introduction

The coastal zone contains an intersection of people, terrestrial and marine environments. The social and cultural values these environments support, and their critical private and public infrastructure, face increasing risks from coastal hazards, especially coastal erosion and inundation driven by rising sea levels and storm events. The abundance and diversity of stakeholders in coastal regions (e.g., local communities, recreational users, industry) and their desire for access to resources make the impacts of hazards especially challenging to manage in coastal zones. In response, SDG 11 has set targets to implement more holistic and inclusive planning and management that reduce loss of human lives, support infrastructure, maintain economic outputs, and enhance environmental, social and cultural values.

Globally, more effective planning and management solutions are required to increase the resilience of coastal communities in the face of mounting coastal hazards. This need is especially pronounced in nations with a profound connection to the coast, including Australia. Australia is well recognised as a coastal nation, with seven of its eight capital cities and 87% of its population located in the coastal zone. Left unchecked, it has been estimated that sea level rise could lead to $226 billion in infrastructure damage by 2100.[1] This estimate excludes significant impacts on other social, environmental and cultural values.

Coastal adaptation planning has historically focused on protection of coastlines through using engineered structures, such as seawalls, groynes and breakwaters. While these traditional 'hard' or 'grey' approaches can be effective at protecting communities and critical coastal infrastructure (e.g., ports, roads, etc.) at immediate risk from sea level rise, they are expensive, short-term solutions and can often 'shift' the problem elsewhere; for example, attempting to address local erosion may contribute to increasing erosion at locations outside the planning boundary.

In addition, artificial modification (armouring) of shorelines can deplete or degrade the natural assets[2] also valued by people for recreation, aesthetics, habitat that supports flora and fauna, and commercial opportunities (e.g. tourism, fisheries). Reductions in these ecosystem services from prioritising hard protection of infrastructure over natural assets will exacerbate challenges for communities to meet broader sustainability goals.

The role of nature-based solutions

Nature-based solutions (NbS) for coastal hazard adaptation aim to harness the natural coastal protection function of marine habitats (Figure 11.4).[3] These living 'structures' may be more adaptable to change and can self-repair by regenerating after damage caused by hazard events. This self-sustaining ability provides stability in ecosystem service provision, increasing the resilience of dependent human communities (Figure 11.5).

NbS may be unsuitable where coastal sites lack substrates for species to establish, or where other pressures that have led to historical habitat loss are still present and cannot be mitigated. Where they are appropriate, habitat enhancement projects can be as expensive as hard solutions to implement; but they have the advantage of providing benefits in perpetuity once successfully established, relative to the finite capacity of hard structures.

FIGURE 11.4 RESTORATION AND ENHANCEMENT OF COASTAL HABITATS

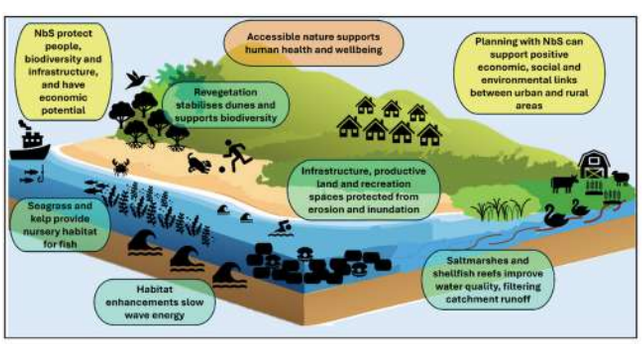
The establishment of oyster reef (Portarlington, Victoria, Australia)

Planting mangroves (Mubarraz Island, Abu Dhabi, United Arab Emirates)

Dune strengthening and revegetation (Emilia Romagna, Italy)

Granite rock sill in combination with salt marsh revegetation (Swansboro, North Carolina, US)

FIGURE 11.5 NATURE-BASED SOLUTIONS FOR COASTAL COMMUNITIES



Nature-based solutions (NbS) can help coastal communities meet a range of SDG targets by restoring or strengthening ecological processes that help to protect coastlines, noting that many of these naturally occurring processes have diminished over time due to significant habitat loss from climate change and other anthropogenic pressures.

Why aren't nature-based solutions proliferating?

NbS seem like an obvious approach in light of the long-term benefits they can provide, and their potential to improve the resilience and sustainability of coastal communities. However, there are significant barriers to overcome.

Coastal governance systems do not support transformative change. Coastal planning and management has high inertia, driven by a set of connected issues:

History | The precedent of conservative approaches to armour the coastline is reinforced through decades of practice that provide certainty about effectiveness, suiting the risk-averse preference of governments and stakeholders.

Expense | Decision making is preoccupied with cost-effectiveness, such that more inclusive values and longer-term benefits are discounted. Adaptation responses tend to focus on short-term needs.

Coordination | Multiple agencies are often involved in coastal decision making, each with their own (sometimes competing) objectives, and changes in practice are hampered by a lack of coordination, cross-sector policy, shared responsibility, and collective funding mechanisms.

Together, these challenges entrench the use of hard structures for adaptation. Hard structures have established planning, approval and implementation pathways and deliver certain and immediate outcomes for a known cost. Rigid modifications to the coastal environment then lead to persisting rigid conditions for future planning: adaptation pathways become locked in to maintaining the status quo and leave little room for innovation.

The opportunity: solving the barriers to enable nature-based solutions

Overcoming the inertia present in coastal planning and management is key to transforming the way coastal communities respond to coastal hazards, allowing for innovation through NbS to deliver increased climate resilience. Transformational change will require an approach that draws on science, includes communities, develops practical tools to guide implementation, and aligns with governance structures.

SCIENCE TO SUPPORT ROBUST, REGIONAL SCALE, LONG TERM PLANNING

While there has been substantial growth in knowledge on how to restore habitats in recent decades[3], guidance on where to do what and when remains limited. Continuing to invest in our understanding of the biophysical, spatial and temporal factors that predict effectiveness of NbS for coastal protection will provide the confidence that decision makers are currently lacking as they seek to mitigate the risks of shifting away from tried-and-tested traditional adaptation responses.

An under-utilised tool exists in understanding the roles of people in social-ecological systems. By modelling the ways in which people and their behaviours affect environments and ecosystem provision, and vice versa, we can improve our predictive capacity to inform the mix and scale of NbS. Combining this information at the regional scale together with understanding what is technically possible, based on the natural and physical conditions of the coast in different locations, can enable a more complete set of guidance on how, where, what and when.

SHIFTING THE POLICY FOCUS: RECOGNISING VALUES

Even with adequate technical, spatial and temporal guidance, the cost of rolling out NbS at scale can be prohibitive. It is possible that such guidance will reveal that traditional approaches are more effective at ensuring specific protection outcomes, for comparative levels of investment, continuing to support their implementation. However, guidance will likely also reveal that a wider set of beneficial ecosystem service outcomes can be achieved and delivered to coastal communities through NbS.

Ensuring that the full range of social, environmental

and financial values associated with adaptation are accounted for in coastal planning will help to inform decision makers about the trade-offs implied by decisions to use NbS, hybrid or traditional options.[8] Integrated economic assessment frameworks, such as benefit-cost analysis, are ideally suited to guide such investment decisions as they evaluate the overall net benefits of options by accounting for all relevant outcomes produced by each option rather than simply identifying the cheapest option to deliver a particular outcome.

Importantly, these frameworks have the capability to integrate social and environmental benefits and costs in a way that is commensurate with financial ones, allowing for quantitative comparisons between often-competing sets of values. This allows for adaptation planning to set the less-tangible community benefits (e.g., from cultural ecosystem services associated with natural environments) on a level playing field with the more-tangible benefits (e.g., of protecting built infrastructure), such that the latter do not unfairly skew decisions toward traditional protection measures.

Integrated frameworks can be data intensive. However, the emergence of complementary global initiatives such as Nature Positive and Environmental Economic Accounting will see relevant datasets to support inclusion of social and environmental values build over time, increasing the feasibility of using these frameworks to their full potential.

The inclusion of representative values in planning will help to identify cases where traditional measures are still required, for example, to protect critical infrastructure, and highlight the cases where coastal communities stand to benefit most from the ecosystem service provision of NbS. In addition, where different benefits and costs can be attributed to different stakeholders, there will be greater transparency about who gains and who loses from different adaptation responses, presenting opportunities for governments to diversify funding support where it becomes apparent that the private sector is benefitting.

TRANSFORMING GOVERNANCE TO ENABLE INNOVATION

While technical guidance and inclusive prioritisation frameworks are needed, prioritisation can only occur among adaption options that have been proposed for evaluation. In the absence of an innovative, transformative mindset, we will continue to see traditional approaches being proposed, evaluated, and subsequently prioritised. Transformation towards meeting SDG 11 requires a commitment by all stakeholders to a new vision—one that embraces equity, sustainability and change. Regulators and policy makers have a leadership role to play in encouraging transformation.

There are social barriers to overhauling coastal governance, including a decline in integrated coastal management in favour of hazard management[9], tensions between public and private interests[10], and a general view that the coast is stable and unchanging. Governments, communities, and private stakeholders alike need to more clearly understand the pressures, risks and opportunities afforded to coastal communities under a changing climate and articulate transformative visions for their coastal future.

With collective acceptance of visions that encapsulate NbS, decision makers will be motivated to revise governance systems to enable smoother pathways for their implementation. This includes a need for decision makers to: (i) commit to longer term planning, that surpasses political cycles and, ideally, generations; (ii) invest in inclusive consultation, that reaches marginalised groups and captures representative understanding of community values, to balance the perspectives of privileged vocal stakeholders; and (iii) explicitly acknowledge risks and risk preferences in decision making, noting the bias toward familiar decision outcomes.

Policy Proposals/ Recommendations

NbS are an important tool for bolstering the resilience of coastal communities as they respond to coastal hazards, but are under-utilised at the scales required to make a difference.

To affect the required transformative change the following actions need to be adopted:

1. **Improving coastal literacy of hazards and alternative adaptation options** should be a goal supported by all coastal stakeholders, and championed by governments, in order to allow for informed, shared visions of future coasts to develop and drive the transformation required.

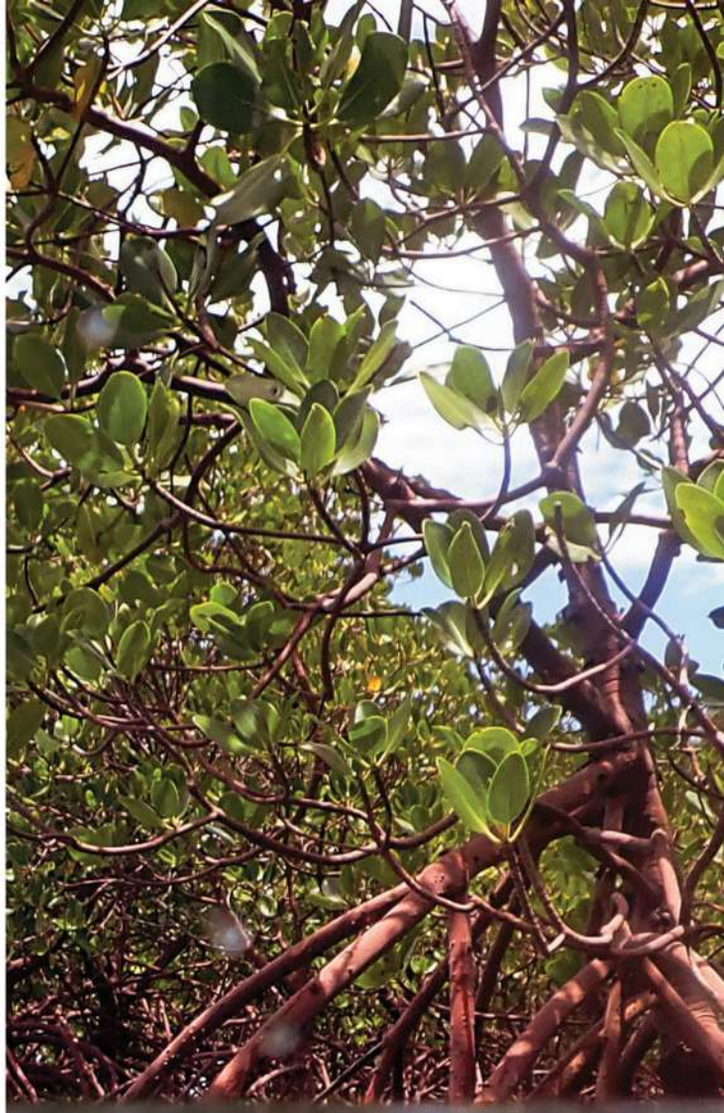
2. **Planning timeframes need to be long-term** recognising that when traditional adaptation pathways are adopted now they can limit the ability to implement more sustainable pathways in the future.

3. **Scientists need to deliver the technical guidance to support decision makers** on which NbS options are feasible, in which locations, when they are needed, and how a network of NbS should be implemented at the regional scale to maximise coastal resilience.

4. **Adopt transparent prioritisation frameworks** that are inclusive of social, environmental and financial dimensions of value to clarify which technically feasible options represent the best investment overall.

5. Through the above actions, **new opportunities to build enterprise** should be articulated, for example, through hybrid projects that support commercial activities (tourism, aquaculture, fisheries, etc.), that will help to identify funding to support further implementation of NbS.

Utilising the science and policy decision support identified above can assist decision makers in their transition to follow these recommendations. Importantly, coastal nations such as Australia can take the lead in advancing implementation of NbS at scale, in order to support learning and adoption of NbS in Small Island Developing States where building adaptive capacity is even more crucial.



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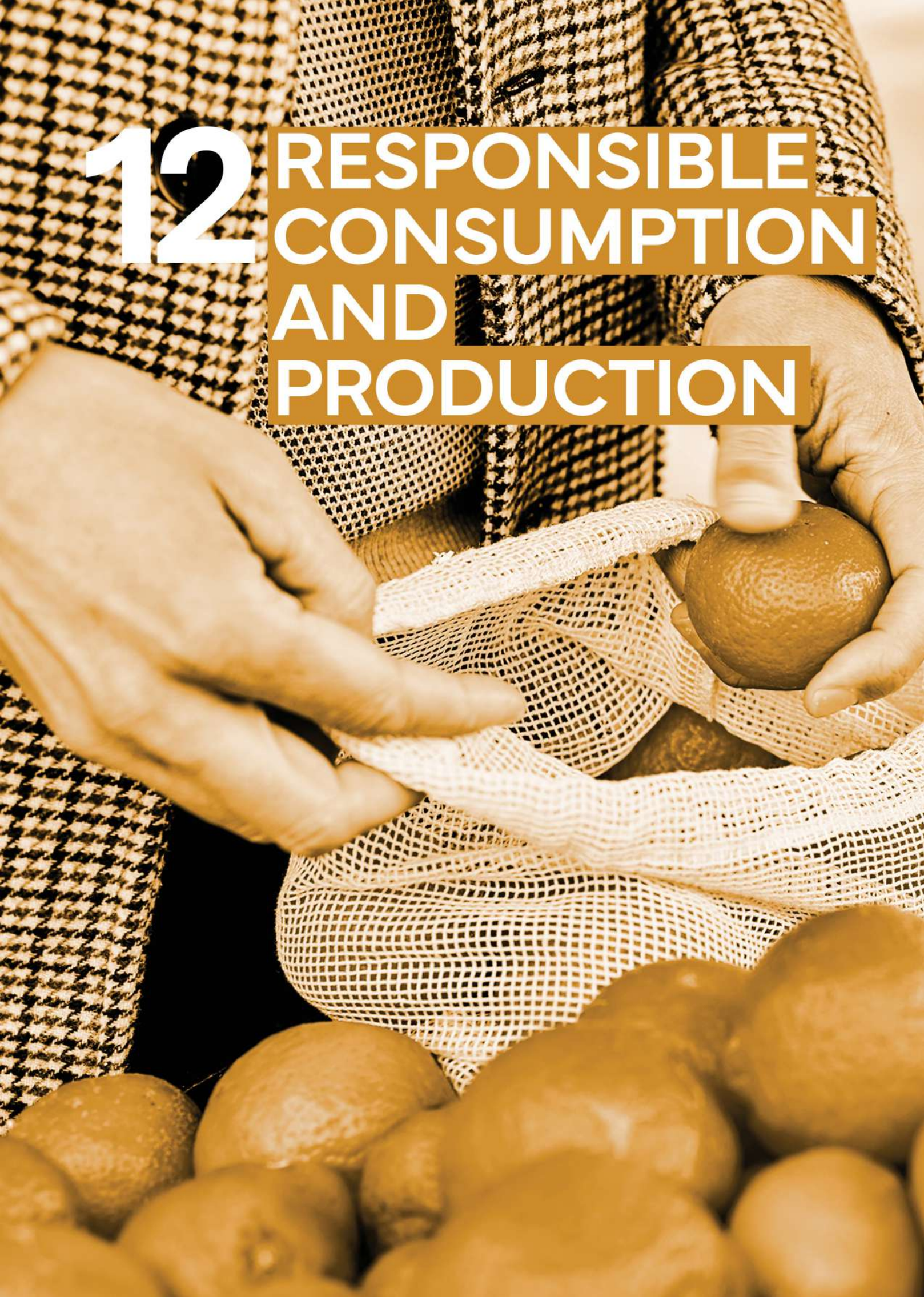

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

From Waste to Resource: How a Building Puts SDG 12 into Practice

Associate Professor Richard L. Gruner, The University of Western Australia
Dr Roberto Minunno, Curtin University

Circular Building and the Future of Reuse in Western Australia

Sustainable Development Goal 12 (SDG 12) calls on nations to ensure responsible consumption and production. In Western Australia (WA), this is especially urgent in the construction sector, which dominates material use and generates about one-third of total waste.[1] Yet building still follows a linear "take–make–dispose" model: extract resources, use them once, then discard. Even recycling often reduces value (concrete is crushed for road base, plastic is down-cycled, timber is chipped or burned), wasting the embedded energy and labour invested in their original form.

By contrast, the circular economy offers a different model. Rather than focusing only on end-of-life recycling, it prioritises reducing waste at the design stage and extending the useful life of materials and components through reuse.[2] Buildings become not end points but material banks, repositories of components ready for new cycles of use. This shift is central to SDG 12 and offers a path for WA to reduce its ecological footprint while creating new markets for circular products and services.

Positive Practice: The Legacy Living Lab

A strong local demonstration of circular construction is the Legacy Living Lab (L3) in Fremantle. Developed by Curtin University Sustainability Policy Institute and partners, L3 is more than just a building: it is a working prototype of how design for disassembly and reuse can transform the sector.

The Lab was built as a modular, prefabricated structure comprising eight modules, bolted together rather than welded or glued. Steel frames were salvaged from other projects and integrated into the design. Even the foundations were designed with reuse in mind, adopting reusable steel micro piles in place of several tons of concrete (735 kg of steel versus 20,000 kg of concrete). Internal finishes were attached with screws, not adhesives, allowing them to be removed and reused. Open-plan, flexible interiors enabled the space to be adapted for different uses (from classroom to exhibition hall) without generating demolition waste. Every detail was planned with the idea that the building would not end its life in landfill but could instead be dismantled, relocated, and rebuilt elsewhere.

Research Findings

To test its impact, researchers conducted a life-cycle assessment (LCA) comparing L3 with a conventional modular building. Notably, greenhouse gas emissions were reduced by 88%. Fossil fuel depletion fell by nearly 90%. Acidification and eutrophication impacts were also cut by similar margins. During refurbishment, waste was close to zero, as walls and ceilings could be accessed without destruction.

The findings show that the environmental benefits of reuse can outweigh recycling. Recycling still generates waste and energy costs, while reuse preserves the embedded value of entire components (See Figure 12.1).

FIGURE 12.1 ENVIRONMENTAL IMPACT - CONVENTIONAL VS CIRCULAR DESIGN

INDICATOR		L3 (LINEAR*)	L3 (CIRCULAR)	REDUCTION
GREENHOUSE EMISSIONS	GAS	44.5t CO_2-eq	5.4t CO_2-eq	88% lower
FOSSIL DEPLETION	FUEL	5,460 MJ	750 MJ	87% lower
ACIDIFICATION POTENTIAL		179kg SO_2-eq	23kg SO_2-eq	87% lower

*LINEAR L3 - ALSO A MODULAR BUILDING BUT BUILT CONVENTIONALLY, I.E., FROM VIRGIN MATERIALS, MELDED AND NOT BOLTED, CONCRETE FOUNDATIONS ETC.

Looking Ahead: Towards a Building's a Second Life

L3 has already shown that reuse-first design can sharply reduce environmental impacts. But its most important contribution is still ahead. Unlike a typical building headed for demolition, L3 was designed with its end in mind: one day, it will be taken apart, not torn down (See Figure 12.2).

That disassembly, planned for the end of 2025, creates a unique research opportunity. Every material, from the salvaged steel frame to carpet tiles and cladding, can be followed into its next stage of life. Some will move directly into new projects, others will be recycled into fresh products, and a small share may still end up as waste. Tracing these flows will give a rare, real-world picture of how WA's circular economy performs beyond models and policy papers.

At the same time, the building has been designed to be relocated as a whole. In practice, this means separating it into its eight modules and reassembling them elsewhere, complete with their existing interiors and even the current furniture. The only exception may

FIGURE 12.2 THE LEGACY LIVING LAB: PLANNED REASSEMBLY BY THE END OF 2025

be the foundations, which will be reused if their condition allows when the building is lifted. This approach means the relocation of L3 will be far quicker and more economical than constructing a new equivalent building from scratch.

The process will also act like a kind of diagnostic scan of material flows. Just as an X-ray or ultrasound reveals how systems work inside the body without harming it, disassembling and relocating L3 will show how materials circulate (or leak) through WA's construction sector. The lessons will reach beyond a single building, highlighting where reuse markets are strong, where regulations get in the way, and which materials most often escape circular loops.

Globally, very few buildings are monitored from construction through to disassembly. Making L3 one of the first would place WA at the forefront of circular building practice. If documented and shared, the process could inform new standards for material passports, inspire similar projects across Australia, and support reuse-based policies across the Asia–Pacific.

The disassembly of L3 also links with new research, such as the WATCH project[3], which is mapping waste and resource stocks across WA, much of it tied to buildings. While L3 will generate detailed data from a single project, WATCH provides a system-wide view of material flows across industries. Together, they point to a future where demonstration projects connect with digital tracking platforms, giving policymakers real-time tools to monitor, benchmark, and strengthen WA's circular economy.[4]

Conclusion

The building sector is central to delivering SDG 12. The L3 shows that circular design can cut emissions by nearly 90%, eliminate demolition waste, and create flexible, adaptable spaces. Its planned disassembly will provide policymakers with a rare, real-world dataset, showing not just how circular design performs in theory but how it functions in practice.

If WA invests now in data infrastructure, market incentives, and collaboration hubs, it can scale lessons from the L3 and become a leader in sustainable construction across the Asia-Pacific. By doing so, the state could transform buildings, one of its largest waste sources, into a cornerstone of its circular economy, making SDG 12 tangible, measurable, and actionable (See Figure 12.3).

FIGURE 12.3 POLICY LEVERS FOR CIRCULAR BUILDINGS

CHALLENGE	POLICY RESPONSE
UNKNOWN MATERIAL FLOWS	STATE ACCOUNTS AND MONITORED DISASSEMBLY
WEAK REUSE MARKETS	PROCUREMENT TARGETS AND TAX INCENTIVES
CERTIFICATION BARRIERS	CIRCULAR HUB AND STANDARDS DEVELOPMENT

Policy Proposals/ Recommendations

If WA wants to scale the benefits of reuse-first construction, three broad policy contributions stand out.

1. **Build a circular data infrastructure:** Knowledge gaps remain the biggest barrier to circular construction. WA lacks comprehensive accounts of material flows, and there is no consistent system for tracking components across building lifecycles. Establishing state-wide material flow accounts would allow policymakers to identify where waste occurs and where interventions could be most effective. Introducing digital material passports for new buildings, recording composition, location, and reuse potential, would ensure future generations know what can be salvaged and directly reused. The planned relocation of L3 could serve as a demonstration of how such systems might work in practice.
2. **Incentivise reuse markets:** Designing for disassembly only works if there are markets for salvaged materials. Public procurement is a powerful lever: governments could mandate targets for reused and recycled content in infrastructure and housing projects. Tax incentives and grants could support firms that invest in modular and reusable design. Over time, these measures would normalise reuse, making it commercially viable to resell salvaged steel beams, cladding panels, and fittings.
3. **Create a WA Circular Building Hub:** Circular construction requires collaboration across sectors, including builders, demolition firms, regulators, and researchers. A Circular Building Hub could coordinate these efforts, providing standards for safe disassembly, certifying reused components, and brokering supply and demand. By creating a trusted marketplace, WA could ensure salvaged materials re-enter circulation rather than drifting to landfill.

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Embedding Effective Sustainability Procurement into Government Systems

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Introduction

Public procurement remains one of the most powerful but under-utilised levers for achieving the Sustainable Development Goals (SDGs). As a major consumer, public sector procurement, on average, accounts for around 12% of GDP and 29% of total government expenditure in OECD countries.[1] Therefore, harnessing that expenditure to shift markets toward low-carbon, inclusive, and circular production is central to SDG 12's ambitions.

With that sizable influence in mind, SDG 12 Sustainable Consumption and Production Target 12.7 calls on governments to "promote public procurement practices that are sustainable, in accordance with national policies and priorities."[2] Sustainable public procurement as defined as government purchasing of goods and services that are considered environmentally, socially or economically sustainable.

Yet progress on SDG 12 has been uneven. The United Nations 2025 SDG Progress Report again found most indicators under the goal remain off track or stagnating, with material consumption and waste generation rising faster than efficiency gains allow. Although more countries now report having formal sustainable procurement policies (SPP), global adoption rose by only five percentage points between 2017 and 2021[3], and many of those frameworks remain at the policy statement or pilot stages.[4]

Varieties of Sustainable Public Procurement Initiatives

Across the world, national governments have developed distinct strategies to embed sustainability and social value in procurement systems. Some of the most promising cases include:

Sweden's National SPP is authorised across three Acts and overseen by the National Agency for Public Procurement. The SPP strategy, informed heavily by European Union directives, integrates lifecycle costing, explicit system-wide considerations and mandatory reporting on procurement decisions across all central-government agencies. However, recent reviews have found repeated integrity failings in procurement decision-making across a variety of areas.[5]

Australia's Commonwealth Procurement Rules and Environmentally Sustainable Procurement Policy outline the environmental and social procurement

guidance for commonwealth entities. Although consisting of an explicit evidential component, application of the guidance is on a discretionary and/or threshold basis, resulting in limited uniformity across agencies and limited uptake of measurement.[6]

South Africa's Preferential Procurement Policy Framework Act mandates socioeconomic weighting in public tenders, supporting historically disadvantaged suppliers and advancing inclusive development goals. A recent evaluation found that these weightings were often applied inconsistently across government areas due to a lack of clear procurement criteria detailed in the Act.[7]

Each of these national frameworks demonstrates progress toward SDG 12.7. They have advanced procurement beyond preferred practice toward systematic procurement policy, but still face challenges of departmental consistency, cultural barriers, or incomplete monitoring.

Subnational systems like Cape Town's Sustainable Procurement Initiative and Victoria's Social Procurement Framework illustrate the value of design quality and measurement. Both embed sustainability and social equity directly into procurement scoring, centre harm prevention, link officer training with supplier engagement, and maintain feedback loops through functional monitoring. Their structure and accountability mechanisms provide a clear demonstration of what effective local implementation can achieve within a national context.[8]

South Korea's Green Public Procurement System

South Korea provides one of the most advanced and measurable examples of progress under SDG 12.7. Its Green Public Procurement (GPP) system demonstrates how sustainability can be embedded at every stage of government purchasing—through legislation, digital infrastructure, market standards, and continuous policy iteration. The results have meant a transformed public sector approach to procurement, billions of dollars in green purchases, hundreds of thousands of tonnes of CO_2-equivalent savings, and a diversified, competitive supplier base.

POLICY DESIGN: FROM PRINCIPLE TO MANDATE

South Korea's approach is statutory, much like the Swedish and South African cases. The Act on the Promotion of Purchase of Green Products legally obliges heads of public institutions to prioritise green products in procurement, and establishes clear definitions, criteria, exceptions, and enforcement provisions. Notable legislative aspects include:

- **Article 6** codifies the public institution obligation to purchase green products.
- **Article 8** mandates annual implementation plans and performance reporting.
- **Article 9** requires all heads of public institutions submit procurement purchasing records annually with any unexpected deviation requiring justification.
- **Article 14** creates a national data system for procurement records and ministerial powers to request procurement information.
- **Article 17** enables professional education and training in the purchasing of green products.

Under the Act, the Minister of Environment is empowered to coordinate standards, request inter-agency cooperation, and assess procurement performance, making sustainability a rule-based default and an inter-agency performance measure configured through proactive ministerial oversight rather than a voluntary objective.[9]

The Korean Environmental Industry and Technology Institute (KEITI)—the implementing institute under the Ministry of Environment—is a dedicated governing body that manages a eco-label certification process for supplier goods, data collection, annual monitoring, and internal capacity-building programs. Through the institute, each public body is required to submit an annual plan, outlining process reviews and forecasted procurement proportions, and report against explicit benchmarks.

MARKET RULES AND STANDARDS THAT FACILITATE INFORMATIONAL SYMMETRIES

In parallel, the GPP enforces the Minimum Green Standards (MGS). These are criteria, designed through extensive consultation processes, and cover energy efficiency, hazardous substances, recyclability, and other environmental factors. Importantly, only products that meet these standards are eligible for central purchasing, when the GPP applies. Over time, the eligible list has expanded to more than a hundred categories, including office appliances, HVAC systems, and LED lighting. By setting the 'green' specification as the default, the GPP removed discretion at the transaction level and simplified decision-making for procurement officers.

The MGS work in tandem with South Korea's eco-label and Good Recycled Mark certifications (also administered by KEITI) to align supply and demand. Suppliers know exactly how to qualify, and procurers can easily identify compliant goods. This structure has driven private-sector innovation and expansion, with tens of thousands of certified products now available.

Furthermore, predictable government demand and clear certification standards have encouraged supplier investment in cleaner technologies, strengthening South Korea's industrial competitiveness and reducing the perceived cost-risk of sustainability transitions.[10]

DIGITAL INFRASTRUCTURE AND MEASURABLE OUTCOMES

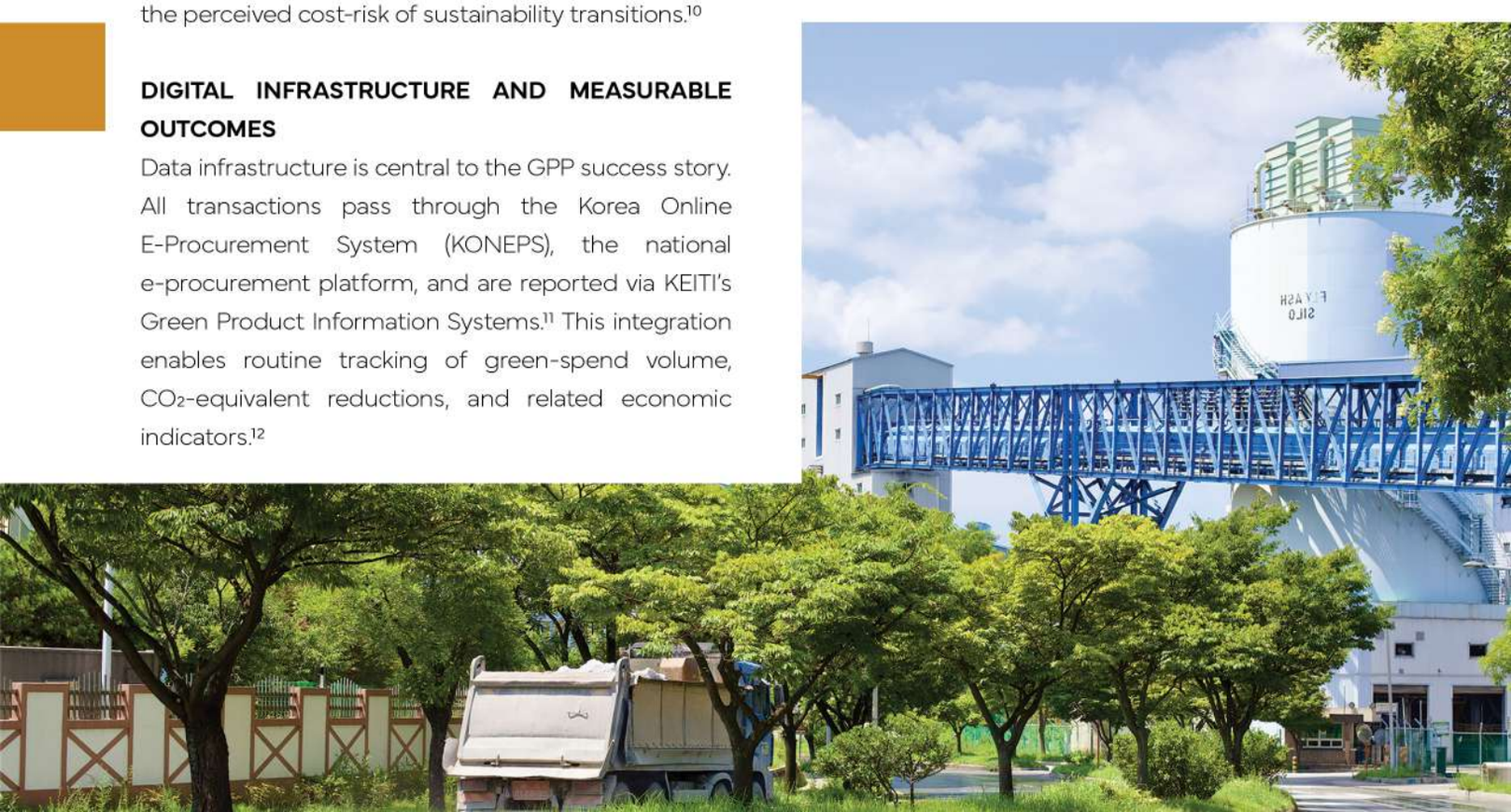
Data infrastructure is central to the GPP success story. All transactions pass through the Korea Online E-Procurement System (KONEPS), the national e-procurement platform, and are reported via KEITI's Green Product Information Systems.[11] This integration enables routine tracking of green-spend volume, CO_2-equivalent reductions, and related economic indicators.[12]

A UN decade-long review of the program shows steady expansion of green purchasing, as well as the associated benefits:

- Total green procurement expenditure increased from USD $759 million in 2006 to USD $3 billion in 2017, accounting for 48% of all purchases in categories covered by eco-labels and recycled marks.
- The share of green products in procurement rose from 1% in 2010 to a high of 18% in 2023, stabilising around 16% to 19% from 2020.
- Estimated CO_2-equivalent reductions reached around 665,000 tonnes in 2017, with a value in pollution savings of USD $35 million.[13]

Overcoming Institutional Barriers

The success of the GPP lays in making sustainable procurement administratively rational. By realigning institutional incentives, the government transformed sustainable procurement from a normative goal into a routine function of public administration. The transition from voluntary guidance to statutory obligation, reinforced through ministerial oversight and performance reporting, reframed green purchasing as a compliance and performance requirement.



Similarly, standardisation, through national eco-labels and MGS, reduced uncertainty and market asymmetries, while embedding sustainability into procurement catalogues made green purchasing both efficient and predictable. These reforms replaced fragmented discretion with consistent expectations, measurable indicators, and a clear accountability framework for procurement officers, as well as senior agency leaders.

Equally significant were the incentive mechanisms that sustained behavioural change within agencies. The KONEPS and KEITI data systems linked procurement outcomes to agency evaluations, creating reputational and managerial rewards for robust performance. Continuous training and the emergence of a professional procurement cadre consolidated new norms of stewardship, while a five-year rolling master plan institutionalised explicit, well-defined objectives, learning and adaptation throughout the implementation and subsequent evaluations.

Collectively, the Korean GPP approach—the explicit use of sustainability metrics, ministerial oversight, meaningful accountability mechanisms, robust data assets and well-defined green product labels and defaults—shifted the bureaucratic logic of procurement from rule-following to green purchasing-based performance benchmarking. The essential ingredient for this success was the alignment of institutional incentives (i.e. budgetary, professional and administrative) with the legislative outcomes. A UN review of the GPP stated that sustainability had successfully become an operational norm through which efficiency, competence and legitimacy were now defined and recognised across the Korean government.[14]

Policy Proposals/ Recommendations

The Green Public Procurement approach exemplifies how Target 12.7 can be operationalised through a binding legal framework, clear and incentive-driven governance structures, and investment in functional monitoring. It fully aligns with United Nations Environment Programmes' Sustainable Public Procurement Guidelines, integrating lifecycle assessment, supplier engagement, and data-driven accountability.

For governments seeking to move beyond pilot projects, Korea offers a replicable model of institutionalised sustainability, demonstrating that green procurement can deliver measurable national impact and sustained progress toward SDG 12.7.

The activities recommended below translate South Korea's lessons into actionable policy reforms, offering a blueprint for governments to strengthen their sustainable procurement policies.

1. **Legislate clearly defined procurement obligations.** Make sustainability a legal requirement, not an optional target. Embedding sustainability objectives in procurement law ensures continuity beyond political cycles and provides institutional accountability. Legislation should require departments to prepare annual procurement plans, disclose performance data, and align their performance with purchasing practices that are in line with national sustainability targets.
2. **Standardise and simplify sustainability criteria.** Establish a consistent set of national sustainability standards and approved eco-labels for public procurement. Centralised minimum criteria remove ambiguity and reduce administrative burden. Regular updates should reflect advances in technology and environmental policy, ensuring that suppliers clearly understand qualifying benchmarks.
3. **Build an integrated digital and data infrastructure.** Transparent, data-driven systems are essential for tracking and verifying outcomes. Governments should adopt integrated e-procurement platforms capable of automatically recording sustainability metrics, contract values, and lifecycle impacts. This enables evidence-based evaluation, improves departmental accountability, and helps to quantify emissions reductions, cost savings, and broader social benefits for better 'value for money' decision-making.
4. **Professionalise public sector procurement capability and supplier engagement.** Sustainable procurement depends on skilled practitioners and informed markets. Governments should invest in a central coordinating body, and provide ongoing guidance and training to procurement officials. The body would also facilitate structured supplier outreach, especially to small- and medium-sized and social enterprises, to build inclusive and predictable markets that accelerate innovation in sustainable goods and services.

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13 CLIMATE ACTION

Climate Change Impacts on the Blue Economy of the Indian Ocean SIDS

Associate Professor Sheereen Fauzel, University of Mauritius

Introduction

The "Blue Economy (BE)" also referred to as the ocean economy or marine economy, highlights the importance of sustainably using and conserving the world's oceans and water resources.[1] As per the United Nations, the BE is defined as an ocean economy aiming at improving human well-being and social equity, while reducing environmental risks and ecological scarcities significantly.[2] On the other hand, the World Bank considers the blue economy as "the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem.[3]"

Referring to the United Nations Sustainable Development Goals (SDGs), the BE principally aligns with SDG 13 Climate Action, as well as SDG 14 Life Below Water. Both of these SDGs give emphasis to climate adaptation and the conservation and sustainable use of ocean resources.[4] The targets under these SDGs include: protecting marine ecosystems, ensuring sustainable fisheries management, protecting marine biodiversity and developing sustainable ocean-based economies.

The Indian Ocean Small Island Developing States (IO SIDS) face unique challenges and opportunities regarding the BE, sustainable development, climate change adaption and environmental risk management. The IO SIDS include: the Comoros Island; Madagascar; the Maldives; Mauritius and; Seychelles. All these islands have registered increased growth over the past decades (See Figure 13.1). However, economic growth has also been accompanied by a rise in pollution, as measured by carbon emission per capita. Figure 13.2 shows the level of CO2 emissions for each SIDS.

FIGURE 13.1 GDP PER CAPITA (IO SIDS) [5]

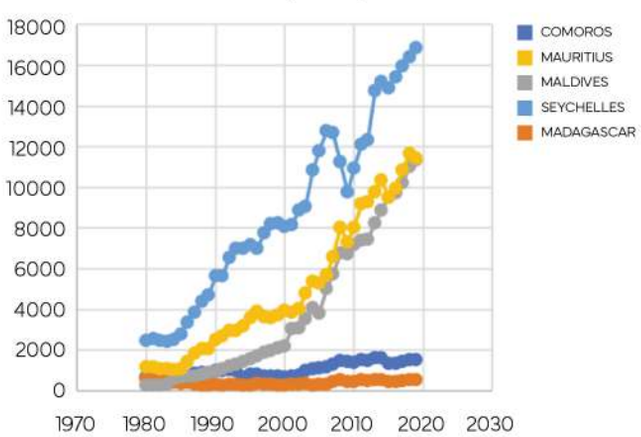
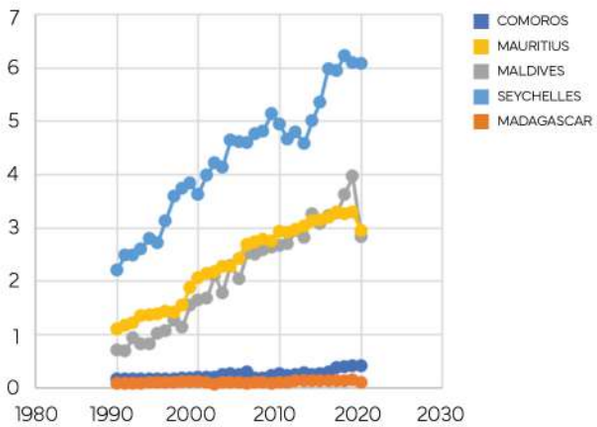
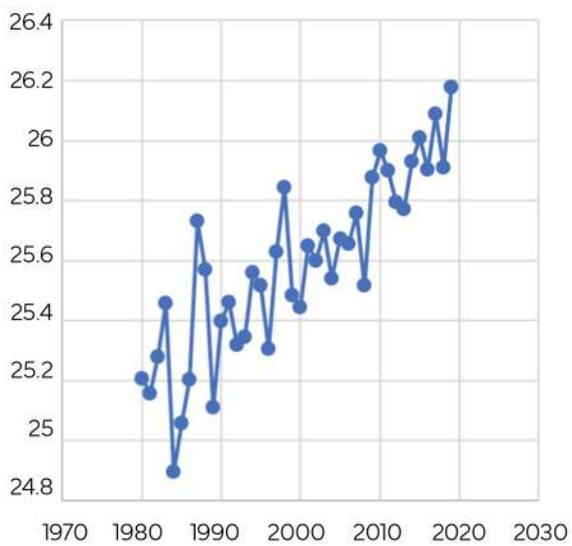


FIGURE 13.2 CO2 EMISSIONS (METRIC TONS) PER CAPITA (IO SIDS) [5]



Moreover, the IO SIDS have experienced increasingly extreme weather conditions including anomalies in temperature and precipitation, storms, coral erosion, unusual droughts and flooding, and increases in sea level. On average, the temperature has increased by around one degree over the past decade (see Figure 13.3). Such changes in climatic conditions pose threats to the economies of IO SIDS.

FIGURE 13.3 AVERAGE ANNUAL TEMPERATURE FOR IO SIDS [6]



Climate Change Impact on the BE of the Indian Ocean SIDS

The Maldives is famous for its sandy beaches, extraordinary marine biodiversity and pulsating coral reefs. The BE is an important pillar for the Maldives as the island relies heavily on tourism and fisheries. The island has registered remarkable growth rates (see Figure 13.1) with significant improvements in infrastructure, as well as social development in terms of health and education. However, this economic development has placed significant pressure on the environment. The carbon dioxide emissions over time have increased (See Figure 13.2). The island faces major challenges from a rising sea level, coral erosion and extreme weather events. Unfortunately, these threaten the key BE sectors of the Maldives namely, tourism and fishing—significant contributors to its economy.[7]

Another Indian Ocean SIDS is Seychelles which is mostly known for its beautiful beaches, lush forests and high biodiversity value. The island has high GDP per capita and was classified as a high-income economy in 2015 by the World Bank. Much like the Maldives, the economy is highly dependent on tourism and fishing sectors.[8] However, the island faces tremendous environmental risks from climate change which pose threats to its water resources, fisheries and human health.[9] Although, Seychelles is advocating for marine conservation through dedicated marine protection areas and sustainable fisheries management policies, it is also controversially involved in issuing more hydrocarbon contracts and including more carbon intensive industries within its BE.[10] As of 2022, Seychelles is the biggest polluter in comparison to the other Indian Ocean SIDS.

Mauritius is known as a paradise island with a diversity of culture, beautiful beaches and vibrant marine ecosystem. The government has been progressing a strong growth-oriented developmental path, undergoing a striking economic transformation from a low-income country, mainly premised on agriculture, to a relatively diversified economy. The main economic pillars are the services sector, tourism and financial services. The economy has also consolidated its industrial and information and communications technology (ICT) sectors and promoted new growth sectors such as the ocean (or 'blue') economy activity, renewable energy, outsourcing and medicine.[11] Also, it is surrounded by a vast exclusive economic zone of 2.3 million square kilometres wherein blue economic activities—apart from coastal tourism—constitute 10% of the country's GDP employing around 7000 people.

The Mauritian government is aiming to increase the share of GDP of the blue economy to 20% in the medium term.[12] However, the island faces various challenges in terms of coral erosion, marine pollution and severe climate change impacts. Changes in climatic conditions in the island pose severe threats to the development of the BE. There have been severe climate related stressors registered in terms of sea level rise, intensified rainfalls, rising temperatures, as well as ocean acidification. As blue economic activities are highly affected by climate change factors, marine tourism is at risk due to sea level rise, storm surges, tropical cyclones and non-tropical cyclone floods. Marine ICT can be affected by increasingly strong tropical cyclones. Marine finance and renewable energies are also threatened by storm surges and tropical cyclones.[13]

The two remaining Indian Ocean SIDS—Comoros and Madagascar—have registered relatively lower growth. Comoros is a volcanic archipelago and the island depends heavily on the ocean. While the BE activities are confined to fisheries, the coastal population rely on it for subsistence. Given the natural beauty of the island in terms of white sand beaches, turquoise seas and exceptional conservation areas, Comoros can develop its coastal tourism sector.

Several opportunities have been identified in terms of scuba, snorkelling, reef and wreck diving, deep-sea fishing and all types of water sports. However, just like the other SIDS, Comoros faces the impacts of climate change in terms of an increase in sea level, extreme climatic events, coastal erosion and ocean acidification. All these hazards are seriously threatening the fisheries sector, hence, potentiating poverty and food insecurity on the island.[14]

Likewise, Madagascar which is located off the southeastern coast of Africa, also possess an extensive coastal area with a rich biodiversity and a diverse ecosystem. These natural assets have the potential to contribute to the expansion of the island's BE and ultimately contribute to its sustainable development. Figure 13.1 shows that growth rate has been quite low for Madagascar as compared to the other Indian Ocean SIDS. Like Comoros, the coastal population are dependent on the fisheries sector for their livelihood and is an important sector generating income and employment for its people. However, climate change is affecting the blue economic activities of the island. There have been extreme weather events, changing precipitation patterns and sea level rise among other challenges. Such changes in the climatic conditions pose several risks to the coastal communities and disrupts the fish stocks and marine ecosystems.

Overall, it can be observed that the BE presents numerous opportunities for the Indian Ocean SIDS. These are mainly in terms of sustainable economic growth, employment creation, ensuring food safety and alleviating poverty. However, climate change poses several threats that undermine the realisation of these opportunities.

Policy Proposals/ Recommendations

Even though the islands considered here face various challenges due to climate change, several policy actions combining mitigation, adaptation and sustainable development can be implemented to turn these weaknesses into strengths. These are mainly in terms of the following:

1. **Establishing a highly qualified BE unit** in the islands is crucial for overall governance of this sector.
2. **Ensure coastal protection** through the planting of mangroves or seawalls and adapt measures for lagoon rehabilitation. Also, adopt an integrated coastal zone management framework.
3. **Review potential financial protection instruments** to mitigate the socio-economic damage of extreme weather conditions.
4. **Sustainable fisheries management** is also important to prevent overfishing and preserve the fish stock and protect the marine biodiversity.
5. **Monitor and evaluate** the costs and benefits of various climate-smart landscape measures to ensure adaptation, mitigation, and overall economic and social development.

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Climate Change and Sustainable Development: The Case of Small Indian Ocean Islands

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Introduction

Small Island Developing States (SIDs) face multiple crises including, but not limited to, soaring living costs, mounting debt burdens, changing global power dynamics, the aftermath of the COVID-19 pandemic and the escalating climate crisis. These crises intersect leading to compounding and cascading negative effects on economic development outcomes. In addition, SIDs face inherent challenges stemming from their insularity, geographic remoteness, small size, high dependence on agriculture, fishing and tourism activities, as well as weak adaptive capacity to the changing climate.[1] However, this list is non-exhaustive, as SIDS have many peculiar characteristics which exacerbate their collective vulnerability to climate change. Although, SIDS account for only 1% of total Green House Gas (GHG) emissions, they are highly vulnerable to shifting climatic conditions with ripple effects on socio-economic progress.

From 1970 to 2020, SIDS lost US$153 billion due to weather, climate and water-related hazards. This represents a significant value given an average GDP of US$13.7 billion.[2] SIDs in the Indian Ocean Region (IOR) are also affected by changes in climate. There are, however, ongoing initiatives aimed at enhancing readiness to withstand shocks and stresses, while concurrently fostering adaptive and resilience-building measures to tackle climate-related impacts.

Climate Change and Sustainable Development

Progress towards sustainable development remains a challenge for small islands in the IOR due to their unique characteristics of smallness, remoteness, high dependency on a few sectors and challenging natural environments and fragile ecosystems. They also face specific challenges in unlocking the investment required for sustainable development and to achieve the Sustainable Development Goals (SDGs). This contribution focuses on four SIDs in the Indian Ocean, namely Comoros, Mauritius, Maldives and Seychelles and analyses their sustainable development pathway by examining relevant SDG indices across the 17 dimensions (see Figure 13.4).

Across the four islands, Comoros has the lowest SDG index, followed by Mauritius, Seychelles and Maldives. The higher poverty headcount ratio, higher income inequality (as measured by the GINI coefficient), lower life expectancy rate in addition to the limited access to basic sanitation services and internet jointly reduce Comoros' performance in comparison to the other three Indian Ocean islands. Consequently, this lowers Comoros' ranking to 154 out of the 189 SIDs. The SDG Index for SIDs stood at 61.3. compared to a global value of 65.4 in 2023 (UN, 2023).[3] While Mauritius, Maldives and Seychelles' SDG indices exceed both the world and SIDs average, the same does not hold for Comoros.

Within the SDG dimensions, SDG 13 is measured in Figure 13.4 via CO2 emissions from fossil fuel combustion and cement production as denoted as total CO2 per capita. Comoros has the lowest CO2 per capita of 0.4 relative to the high value of 5.4 for Seychelles followed by Maldives (4.1) and Mauritius (3.4). However, in terms of Ocean Health Index (SDG 14), Comoros does not perform well with an index of 35.0 compared to 77.2 for Seychelles, 69.2 for Mauritius and 50.7 for Maldives. The indicators highlight the large gaps towards attainment of the SDGs for Comoros and hence the urgent need to address these gaps to improve the livelihoods of the Comorian population.

Achieving sustainable development through the 17 dimensions by 2030 remains a major challenge for the Indian Ocean islands, as they are face varied structural and multidimensional vulnerabilities including vulnerabilities to climatic change. The Multidimensional Structural Vulnerability Index (MSVI)[4] and the INFORM Risk Index[5] are used to assess vulnerability of the four island economies in different pillars (see Figure 13.5). The INFORM Risk index has a value between 0 and 10 where the higher the value, the greater the level of risks. The data shows that the MSVI tends to be highest for Maldives followed by Seychelles, Comoros and Mauritius. The MSVI covers economic, development and environment dimensions of vulnerability. Maldives is first across all vulnerability pillars with the environmental pillar having the highest score mainly due to rising sea levels and the relocation of Maldivians to different regions. Seychelles follows next in the environment dimension while Comoros does not fare well in the economic and development pillars after the Maldives. With respect to the INFORM Risk Index, Comoros has the highest level of risk of 3.3 relative to the other islands. This risk level can be explained by its high INFORM socio-economic vulnerability and lack of coping capacity. This is supported by the dimensions of the SDG index in Figure 13.4. In contrast, Mauritius and Maldives have a high INFORM natural hazard index of 3.0 and 2.8, respectively compared to Comoros.

FIGURE 13.4 SDG PERFORMANCE AND OVERALL INDEX FOR COMOROS, MALDIVES, MAURITIUS AND SEYCHELLES IN 2023 [6]

		COMOROS	MALDIVES	MAURITIUS	SEYCHELLES
SDG	**INDICATOR**				
	SDG INDEX	**53.6**	**74.1**	**71.5**	**73.2**
	SDG RANK (ON 189 COUNTRIES)	**154**	**49**	**69**	**57**
1	POVERTY HEADCOUNT RATIO AT $2.15/DAY (2017 PPP, %)	18.7	0.0	0.8	-
2	PREVALENCE OF OBESITY, BMI ≥ 30 (% OF ADULT POPULATION)	7.8	8.6	10.8	14.0
3	LIFE EXPECTANCY AT BIRTH (YEARS)	67.4	79.6	74.1	73.3
4	LOWER SECONDARY COMPLETION RATE (%)	43.7	111.2	102.6	102.7
5	SEATS HELD BY WOMEN IN NATIONAL PARLIAMENT (%)	16.7	4.6	20.0	22.9
6	POPULATION USING AT LEAST BASIC SANITATION SERVICES (%)	35.9	99.2	95.5	100.0
7	POPULATION WITH ACCESS TO ELECTRICITY	86.7	100.0	99.7	100.0
8	UNEMPLOYMENT RATE (% OF TOTAL LABOUR FORCE, AGES 15+)	8.9	4.9	7.1	-
9	POPULATION USING THE INTERNET (%)	27.3	85.8	67.6	81.6
10	GINI COEFFICIENT	45.3	29.3	36.8	32.1
11	ANNUAL MEAN CONCENTRATION OF PARTICULATE MATTER OF LESS THAN 2.5 MICRONS IN DIAMETER (PM2.5) (µg/m³)	20.4	6.8	14.2	19.8
12	MUNICIPAL SOLID WASTE (KG/CAPITA/DAY)	0.3	1.3	1.0	1.4
13	CO^2 EMISSIONS FROM FOSSIL FUEL COMBUSTION AND CEMENT PRODUCTION (TCO^2/CAPITA)	0.4	4.1	3.4	5.4
14	OCEAN HEALTH INDEX: CLEAN WATERS SCORE (WORST 0 - 100 BEST)	35.0	50.7	69.2	77.2
15	RED LIST INDEX OF SPECIES SURVIVAL (WORST 0 - 100 BEST)	0.7	0.8	0.4	0.7
16	CORRUPTION PERCEPTIONS INDEX (WORST 0 - 100 BEST)	19.0	40.0	50.0	70.0
17	STATISTICAL PERFORMANCE INDEX (WORST 0 - 100 BEST)	-	61.8	77.3	66.0

FIGURE 13.5 MULTIDIMENSIONAL STRUCTURAL VULNERABILITY INDEX FOR COMOROS, MALDIVES, MAURITIUS AND SEYCHELLES IN 2023 [7]

	MULTIDIMENSIONAL STRUCTURAL VULNERABILITY INDEX			
	COMOROS	MALDIVES	MAURITIUS	SEYCHELLES
OVERALL VULNERABILITY INDEX	**64.3**	**87.3**	**50.5**	**73.8**
ECONOMIC PILLAR	65.0	67.6	53.1	61.7
DEVELOPMENT PILLAR	82.2	94.3	62.4	76.6
ENVIRONMENTAL PILLAR	45.5	100.0	36.0	83.1
INFORM INDEX				
	COMOROS	**MALDIVES**	**MAURITIUS**	**SEYCHELLES**
INFORM RISK INDEX	**3.3**	**2.2**	**2.1**	**1.5**
RISK CLASS	MEDIUM	LOW	VERY LOW	VERY LOW
RANK (ON 191 COUNTRIES)	**94**	**154**	**157**	**182**
INFORM NATURAL HAZARD INDEX	2.0	2.8	3.0	2.2
INFORM SOCIO-ECONOMIC VULNERABILITY	7.0	2.9	3.0	1.5
LACK OF COPING CAPACITY	7.1	3.7	2.8	2.6

SIDS Responses to Climate Vulnerability

The analysis underlines the multifaceted challenges faced by SIDs in the IOR. The indices highlight the varied development levels and progress made towards the SDGs across the four islands, with Mauritius, Maldives and Seychelles doing much better while Comoros lags with elevated poverty levels, income inequality and limited access to essential services. Climate change exacerbates these constraints, posing significant risks for socio-economic well-being and environmental sustainability. Comoros created the National Committee on Climate Change in 2018 and adopted, in 2019, the Comoros Strategic Plan 2030, which focuses on large-scale projects that will drive structural transformation for the implementation of the SDGs. Comoros plans to reduce its net CO2 emissions by 23% and increase its net CO2 absorption by 47% by 2030. There are various mitigation actions in place like afforestation, development projects for photovoltaic power plants and improvements in waste collection, amongst others. This necessitates around US$1million for mitigation and US$445 million for adaption measures.[8] Maldives is also increasing climate resilience through the development of a National Adaptation Plan aimed to reduce the island's vulnerability to climate change. Since 80% of the land area of Maldives is below one meter above sea level, it is highly vulnerable to coastal erosion. An adaptation plan funded by the Green Climate Fund to the order of US$2.8 million has recently been worked out to boost climate resilience.

Other programmes such as Green Smart Islands pilot project supporting organic farming and increased awareness to enhance the adaptive capacity of farmers and fishers are being promoted. Maldives has put in place a National Adaptation Programme for Action and the Maldives Climate Change Policy Framework to deal with the climate impacts. However, the country has witnessed a large gap between policy and reality, as well as limited government financing capacity and low private sector engagement together with restricted capacity to raise international finance to increase resilience against climate change.[9] Mauritius and Seychelles have also been implementing measures to build climate resilience. Mauritius has been focusing on the blue economy and low carbon economy through the development and implementation of projects on the restoration of ecosystem services through the preservation, conservation and protection of marine and terrestrial ecosystems and the reduction of carbon emissions through energy conservation and renewable energy generation.[10] Lastly, Seychelles' 2019–2023 National Development Strategy has prioritised the regulation of coastal planning and infrastructure, protection of Blue Carbon ecosystems to increase carbon sink from seagrass and mangrove systems by 50% by 2025 and 100% by 2030 and the adoption of an 'all hazard' approach to disaster risk management through the National Integration Emergency Management Plan. The financing needed for coastal resilience and climate change mitigation in Seychelles stood to around US$670 million that is around 30% of Seychelles GDP in 2023.[11]

Policy Proposals/ Recommendations

The impacts of climate change pose significant risks to socio-economic well-being and environmental sustainability across all four islands. Urgent action is required to address these disparities and vulnerabilities, ensuring that no island is left behind in the pursuit of sustainable development.

1. **Adopt both resilience-building structural and non-structural measures.** These structural measures will focus on the protection of coastal regions and the sustainable management of marine and terrestrial systems while non-structural strategies concern early warning systems and community awareness programmes.
2. **Promote private sector engagement** to leverage international climate funds in climate mitigation and adaptation projects.
3. **Integrate climate considerations in sectoral policies and local governance** and ensure greater alignment between SDG targets and climate action strategies.

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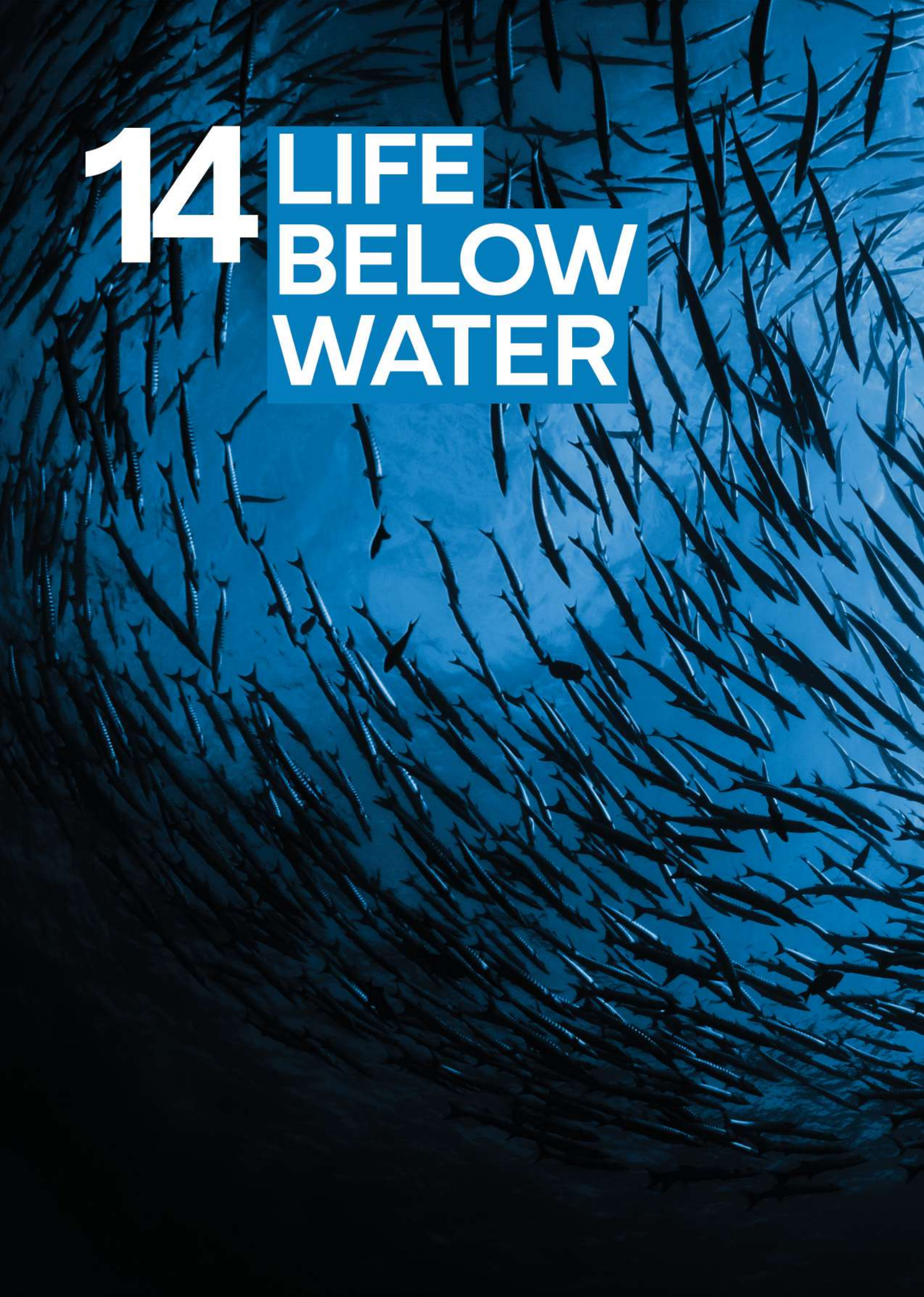

14 LIFE BELOW WATER

Rethinking Fisheries Subsidies for Socio-economic and Nutritional Quality

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Introduction

The decline of wild fisheries catches due to overfishing[1] creates serious consequences for socio-economic and nutritional equity within and among nations. Overfishing disproportionally affects those communities most reliant on the ocean for sustenance and livelihoods such as those in the Global South that cannot readily access alternative sources of food, critical nutrients and income streams.

Fishing fleets around the world receive financial support from their governments in the form of subsidies. In 2018, these subsidies totalled US$35 billion globally.[2] Fishery subsidies can either ease or exacerbate pressures on exploited fish stocks. For example, subsidies for fisheries management can have a positive effect on the sustainability of marine resources. In contrast, taxpayer provided subsidies that fund tax breaks for fuel or reduce boat building costs create perverse incentives that encourage overcapacity and overfishing. These harmful subsidies comprise 60% of global subsidies[2] and are a major threat to resource sustainability, coastal livelihoods, as well as food and nutritional security.

Harmful subsidies fundamentally undermine global socio-economic and nutritional equity as they advantage fisheries based in wealthier countries in the "race to fish"[3] at the expense of poorer developing countries. These subsidies artificially reduce operational costs, enabling large-scale industrialised vessels to catch more fish by operating for extended durations and in foreign waters far away from their home ports.

Ending harmful subsidies that contribute to overfishing and overcapacity is part of the 2030 United Nations (UN) Agenda for Sustainable Development through the Sustainable Development Goal 14.6—end subsidies contributing to overfishing.

> **SDG 14.6.** By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to illegal, unreported and unregulated fishing, and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation.

Here, we illustrate how the elimination of these fisheries subsidies is a crucial matter for socio-economic and nutritional equity between richer and poorer countries. Not just for accessing food from the ocean, but to ensuring the sustainability of fish stocks.

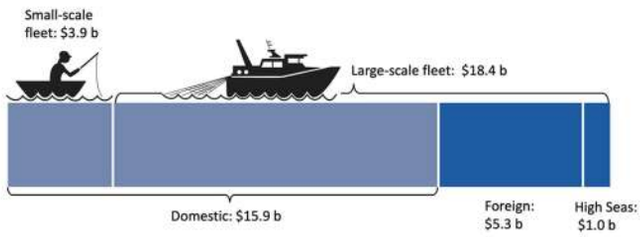
The 2022 WTO Agreement

One mechanism for achieving SDG 14.6 globally is through the World Trade Organization (WTO). After decades spent negotiating, the WTO reached a first Agreement on Fisheries Subsidies in June 2022. This Agreement prohibits member governments from financing: illegal, unreported and unregulated fishing activities (Article 3); the exploitation of already overfished stocks (Article 4); and fishing of unmanaged stocks in the High Seas (Article 5). There is some irony in the prohibition of financing the illegal fishing sector, and moreover, there is little clarity around what constitutes an overfished stock. Fundamentally, the text of the Agreement, although a step forward, fails to call for the complete elimination of harmful subsidies. Consequently, remaining harmful fisheries subsidies continue to pose risks to socio-economic and nutritional equity, as well as resource sustainability.[5, 6]

Global equity compromised by fisheries subsidies

Fisheries subsidies are predominantly provided to the large-scale industrial fishing fleets (Figure 14.1).[4, 7] Harmful subsidies artificially enhance the economic viability of industrial fleets, facilitating their extractive potential.[8] In contrast, small-scale fisheries receive a fraction of the fishery subsidies allocated to the industrial fleets, even though these fisheries provide employment, food security and livelihoods for millions of people.[7, 9] As a result, small-scale fisheries are more vulnerable to fish stock declines due to the repercussions of the "resource-grabbing behaviour"[8] of industrial fleets. These large-scale fleets, in contrast, have the capacity to fish farther away from domestic waters, due to the financial support provided by these harmful subsidies.

FIGURE 14.1 THE GLOBAL DISTRIBUTION OF HARMFUL FISHERIES SUBSIDIES IN 2018 [4]



Harmful subsidies are mainly provided by developed countries to their own fleets, but disproportionally impact the waters of developing, food insecure countries.[4, 8] Therefore, the risks and burdens of overfishing caused by these harmful subsidies unfairly encumber and impact poorer countries that are already vulnerable given their higher dependence on fisheries resources. This exacerbates socio-economic and nutritional inequities.[10, 11] Consequently, the ability to achieve interconnected SDGs such as SDG 1: Reduce Poverty, SDG 2: Zero hunger, and SDG 10: Reduced Inequalities is also undermined by the continued provision of harmful subsidies.

In the Indian Ocean, the volume of seafood exported internationally increases with the amount of harmful fisheries subsidies provided to the industrial sector.[10] As such, export profit is prioritised over livelihoods and food and nutritional security of local populations. The continued provision of harmful subsidies to industrial fleets increases these local and regional inequities, as Indian Ocean Rim countries are deliberately sustaining and empowering their industrial sectors to extract resources that are largely directed towards international export. This situation also highlights the strong lobbying of governments by key corporate stakeholders and industrial fishing and export interest groups.

Policy Proposals/ Recommendations

Given the limitations of the 2022 WTO Agreement on Fisheries Subsidies and the role of harmful subsidies in undermining socio-economic and nutritional equity, we recommend the following actions:

1. **Eliminate all harmful fisheries subsidies** that prevent socio-economic and nutritional equity and drive overfishing. International negotiations and efforts need to continue beyond the 2022 WTO Agreement on Fisheries Subsidies. A ban of harmful subsidies to any distant-water fleets fishing outside their national waters would represent a major first step in this direction. Such actions would transfer the responsibility for managing the impacts of any remaining harmful fisheries subsidies on subsidising countries.
2. **Renegotiate fishing access agreements to national waters** to grant access only to fishing countries and fleets that do not provide harmful subsidies and instead provide beneficial subsidies. That is, subsidies for sustainable fisheries management and implementation, monitoring and enforcement of sustainable and equitable management targets. We recognise that this approach is complex, as it involves implementing, monitoring and enforcement actions, which impose financial and technical challenges on host countries. Such costs should be covered by any foreign entity or fleet that wishes to fish the sovereign resources of a host country. Currently, access agreements have been criticised for their lack of transparency and fairness and have been shown to be financially biased against poorer countries.[12]
3. **Redirect harmful subsidies towards beneficial initiatives** that promote socio-economic and nutritional equity, such as equitable and sustainable fisheries co-management and enforcement strategies. This action would help address the unjust global distribution of the impact of harmful subsidies and support and empower those fisheries that provide essential food and nutritional security and livelihoods to millions of people, particularly in disadvantaged parts of the world.

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More Plastic Than Fish in Our Oceans by 2050? How We Can Tackle Marine Plastic Pollution

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Introduction

When we think of Australia's pristine beaches, marine plastic pollution is likely not the first thought that springs to mind. Yet beneath the surface, the accumulation of plastic waste endangers Australia's marine ecosystems in manifold ways. While assessing the global pollution crisis is crucial, focusing on solutions is key to combating marine plastic pollution and fostering sustainable development. In this context, this contribution looks beyond the status quo of marine plastic pollution, highlighting key efforts for plastic waste management across research, politics, industry, and consumer choices.

> "Problem talk creates problems, solution talk creates solutions."
> - Steve de Shazer

In general, marine plastic pollution poses a threat to life below water through the danger of entanglement and ingestion. By travelling all the way through the food chain, marine micro- and nano-plastics ultimately contaminate products intended for human consumption, such as sea food and sea salt. Moreover, the enduring nature of plastics in the environment makes marine plastic debris an ideal transport vehicle for pathogens, toxins, and invasive species over long distances.[1]

Hence, effectively addressing the issue of marine plastic pollution gives us the tools to protect life below water (as outlined in Sustainable Development Goal 14), enhance human health (SDG 3), and promote responsible consumption (SDG 12).

Marine Plastic Pollution: a Status Quo

Every year, 130,000 tons of plastic waste leak into marine ecosystems from the Australian coastline alone.[2] With this, Australia contributes to a worldwide litter trend that sees the equivalent of one truckload of plastic waste dumped into our oceans every minute.[3] Consequently, the extent of pollution has reached a point where there are five hundred times more plastic particles in our oceans than the number of stars in our galaxy.[3] Projections indicate that, by 2050, the mass of

plastic in our oceans will surpass that of fish.[2] In Perth's metropolitan region specifically, scientists from the UWA Oceans Institute have counted up to 60,000 plastic pieces per square kilometre, showing that most plastic debris in our rivers and ocean stems from a local source.[4]

FIGURE 14.2 MARINE PLASTIC POLLUTION ALONG THE SWAN RIVER ESTUARY IN PERTH, WESTERN AUSTRALIA [5]

Today, most plastic waste is still managed in landfill or incineration plants, squandering finite resources and significantly contributing to the proliferation of carbon emissions. A mere 9% of global plastic waste undergoes recycling, with Australia lagging further behind at only 7%.[6] This reality underscores the urgent need for a more sustainable, circular approach to plastic waste management.

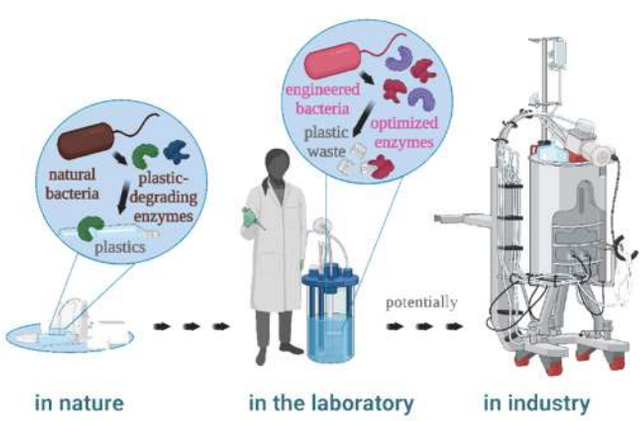
Research around Microbial Plastic Degradation

One potential solution for sustainable plastic waste management lies in the abilities of certain microbes that have evolved in nature to break down specific types of plastic. For the breakdown process to occur, these microbes produce specific enzymes, which are proteins acting on plastics like molecular scissors. This phenomenon, known as microbial plastic degradation, has notable examples, such as the discovery of the bacterium Ideonella sakaiensis at a recycling facility in Japan.[7] The bacterium I. sakaiensis can degrade polyethylene terephthalate (PET), a common type of plastic used to make drinking bottles and food containers. PET, like other plastics, is composed of long molecules of repeating units which can be dismantled by microbes using their specific enzymes. The plastic degradation products are then often consumed as a food source by these special microbes.

However, microbial plastic degradation in nature is a slow process, prompting scientists to diligently work on enhancing its efficiency through various approaches (Figure 14.3). Efforts include boosting the activity and stability of plastic-degrading enzymes, even utilising machine learning to craft new versions of these molecular scissors.[8] Additionally, these enzymes have been produced in larger quantities using novel bacterial hosts in the laboratory. Research efforts to promote microbial plastic degradation in saltwater environments have recently succeeded for the first time, by deploying the fast-growing marine bacterium Vibrio natriegens.[9,10] This research marks the first successful demonstration of PET plastic degradation in marine conditions, sparking optimism that microbial plastic degradation could potentially become a viable recycling method in saltwater. The advancing of microbial plastic degradation in saltwater could eventually enable the use of seawater in industrial-scale recycling, conserving valuable freshwater resources.

> As a result, we are in the process of better understanding microbial ocean life as one factor in the fight against plastic pollution, thereby contributing to the protection of life below water (SDG 14).

FIGURE 14.3 MICROBIAL PLASTIC DEGRADATION IN NATURE, RESEARCH, AND INDUSTRY [11]



Limitations and Opportunities

To date the effectiveness of microbial plastic degradation as a sustainable recycling approach remains very limited.[12] Nevertheless, research over the past decade has highlighted potential not only in understanding the associated chemical and biological processes of microbial plastic degradation but also in enhancing and implementing these processes. Further investigation is needed to assess the feasibility and limitations of microbial plastic degradation and to determine whether it can be applied as a less labour- and energy-intense alternative or addition to existing recycling methods. Increasing research efforts over the next decade will help us understand whether microbial plastic recycling could potentially also be turned into a blue technology to transform plastic waste into valuable resources.

Joint Efforts to Tackle Marine Plastic Pollution

Enhancing sustainable recycling methods can prevent plastic waste from becoming marine litter and thus significantly decreasing further marine plastic pollution in the future. While developing sustainable recycling methods is vital, this alone will not sufficiently address the complex issue of marine plastic pollution (Figure 14.4).

FIGURE 14.4 MEASURES TO TACKLE MARINE PLASTIC POLLUTION [13]

Policy Proposals/ Recommendations

Besides focusing on the circular usage of valuable plastic resources, we must:

1. **Implement legal frameworks** that hold the international community, national governments, and corporations accountable for plastic management. Examples for such measures include the United Nations Plastics Treaty Zero Draft, the Australian Government's Recycling and Waste Reduction Act 2020, and the Western Australian Plan for Plastics. These measures respectively aim to create an internationally binding legal instrument on plastic pollution, implement waste export bans, and phase out certain types of plastic items.
2. **Sustainable financing for anti-pollution measures** needs to be improved while the production of new petroleum-based plastics must be drastically cut.
3. **Businesses should take responsibility for their plastic products** across their entire lifecycle and waste management should be integrated into production and consumption processes to prevent plastic leakage into the environment.
4. **Product redesign** should prioritise minimalistic material usage, recyclability, and end-of-life considerations, while the availability of alternative materials must be increased. In this context, it is crucial to focus on the responsible usage and production of sustainable plastic alternatives that are reusable, truly recyclable, or biodegradable at the end of their life cycle. One viable alternative to petroleum-based plastics are certain types of biodegradable plastics, which can be biotechnologically produced by engineered bacteria from a range of waste materials, for example.

In summary, addressing plastic pollution requires individual commitment from small businesses and consumers, as well as systemic action that compels large industrial entities and governments to ensure sustainable options are the most accessible choices. Raising awareness about the challenges of plastic pollution is essential across society, industry, and politics. Thus, by tackling marine plastic pollution, we can protect life below water, enhance human health, and enable the responsible consumption of limited resources.

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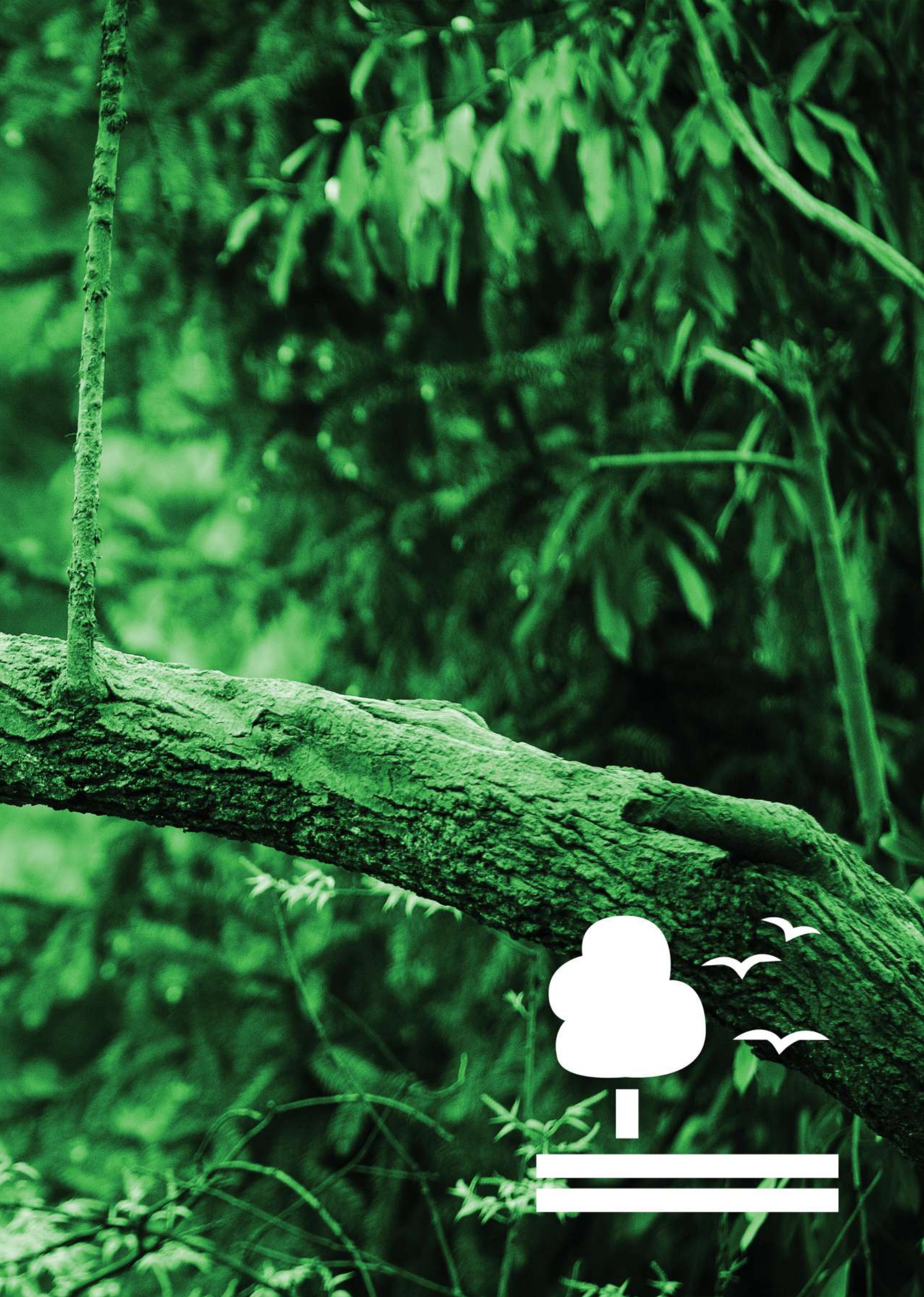
15 LIFE ON LAND



Sustainable Development of Mountains and Mountain People in Chittagong Hill Tracts, Bangaladesh

Professor Amir Mohammad Nasrullah, University of Chittagong, Bangladesh and Former Chairman, Department of Public Administration

Introduction

Nearly one-tenth of the global population depends directly on mountain resources, the majority of which are from diverse ethnic groups. The environment of mountains represents major ecosystems which are vital to the existence of the global environment, as well as to the people living there. However, the mountain scenario has been changing rapidly due to severe environmental degradation and low local adaptive capacity to the effects of climate change. Globally, the mountain regions including Chittagong Hill Tracts (CHT) in Bangladesh are the most disadvantageous and lag in almost all development indicators, such as poverty, income, food security, health, education, infrastructure, and peace and stability. Therefore, globally sustainable development of mountains and mountain people is very important.

Although CHT faces many challenges, it has great potential that can be yoked to improve the lives of the mountain people and the mountains. The Sustainable Development Goals (SDG) provide a framework for addressing various socio-economic and environmental challenges globally, including those related to mountain development and the well-being of the mountain people of CHT in Bangladesh. The SDGs emphasise the sustainable management, conservation, and use of all natural resources, including forests, and mountains, and the protection of biodiversity, ecosystems, and wildlife, which has a great impact on the socio-economic development of a country. Specifically, SDG 15 focuses on protecting, restoring, and promoting sustainable use of terrestrial ecosystems, sustainable forest management, combat desertification, stopping and reversing land degradation, and stopping biodiversity loss. Target number 1 of SDG 15 explicitly mentions mountains among the ecosystems to be conserved, restored and sustainably used in line with international agreements.[1] In this context, the development of mountains and mountain people of CHT is very much linked with SDG 15.

Chittagong Hill Tracts (CHT): A Brief Overview

The Chittagong Hill Tracts (CHT) is a region located in southeastern Bangladesh, bordering India and Myanmar. It is characterized by hilly terrain, lush forests, and diverse ethnic communities that cover an area of approximately 13,295 square kilometers, making up about one-tenth of the total land area of Bangladesh. The region is primarily mountainous, with peaks

reaching heights of 1,000 meters above sea level. It is known for its scenic beauty, including rivers, waterfalls, and dense forests. The population is approximately 1.8 million with 13 ethnic communities including the Chakma, Marma, Tripura, Mro, and Baum among others. All possess diverse cultures, languages, and traditions that contribute to the region's rich cultural heritage.[2]

But, more than 60% of families of CHT live below the poverty line which is much higher than the national average. More than half of families do not have access to safe drinking water and/or sanitation amenities. Most people are engaged in subsistence farming, which is locally known as Jhum farming. Although the CHT posses huge natural resources, it remains one of the most susceptible regions in the country and lags economically.[3, 4]

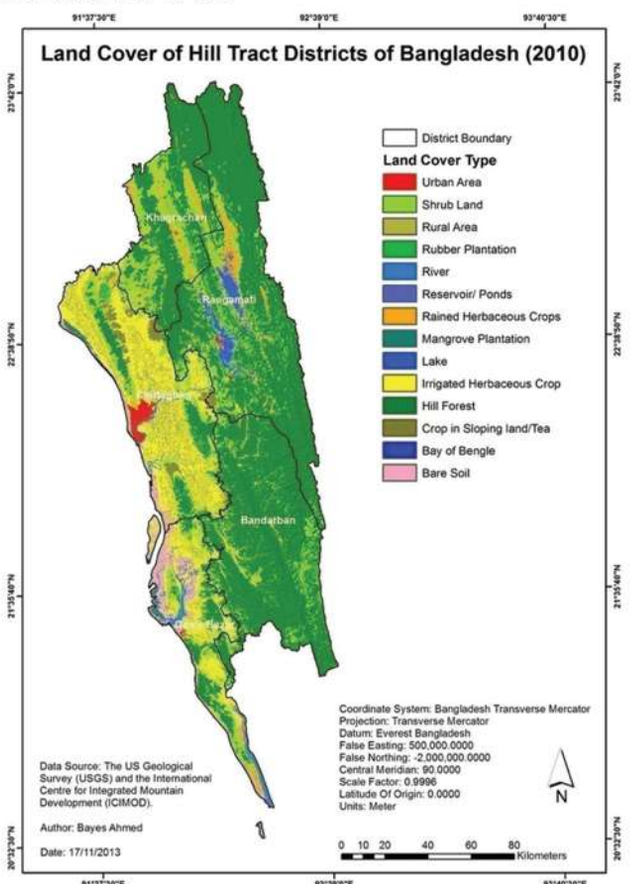
CHT has diverse natural resources such as hills, forests, rivers, lakes, various flora and fauna, and areas with exceptional scenic beauty (See Figure 15.2). With each resource playing a significant role in national economic development. Nearly 40% of forest land exists in CHT which contributes to biodiversity conservation, regional environment protection, erosion prevention, water quality maintenance, regulation of water flow, reduction of the severity of floods, and regulation of local and regional climate in Bangladesh.[5]

Policy Strategies Toward Development of CHT

Bangladesh has taken several policy strategies for the development of mountains and mountain people in CHT since its independence. In 1976, the CHT Development Board Ordinance was adopted, and the Chittagong Hill Development Board (CHTDB) was established to strengthen the capacity of the institutions in planning and implementing development activities. In 1989, three Hill District Councils (HDC) were established to look after civil administration, law and order, and development activities in CHT. In 1997, a Peace Accord was signed to reduce ethnic tensions, establish peace and security, and inclusive development.

FIGURE 15.1 MAP OF BANGLADESH

FIGURE 15.2 MAP OF CHT



Following the peace accord, the Chittagong Hill Tracts Regional Council (CHTRC)—a top politico-administrative body to coordinate and oversee the activities of HDCs—was tasked with addressing the apprehensions of the mountain people, as well as reducing ethnic tensions, alongside a Land Commission; and the Ministry of Chittagong Hill Tracts Affairs (MoCHTA) were established.

In 2013, the Chittagong Hill Tracts Regional Council Rules were passed, and again in 2014, the Chittagong Hill Tracts Development Board Ordinance replaced the ordinance of 1976. But, still, there is a lack of appropriate directions for the sustainable development of mountains and mountain people in CHT.

Why Sustainably Develop the CHT?

The reasons for the sustainable development of mountains and mountain people in CHT are manifold. Mountains provide the natural resources upon which all mountain livelihoods depend. But globally, mountains are experiencing severe environmental degradation. The CHT continue to face many development challenges, including poverty, inadequate infrastructure, limited access to education and healthcare facilities, and environmental degradation.

People of the CHT face poverty due to limited access to resources, infrastructure, and economic opportunities. They face additional challenges related to food security and nutrition due to factors such as limited agricultural productivity, land degradation, and inadequate access to markets.

Moreover, they have limited access to healthcare services which leads to poor health outcomes, lack access to quality education, as well as access to clean water and sanitation facilities which are crucial for improving living conditions and preventing waterborne diseases. Electricity inaccessibility continues to also hinder overall economic development and quality of life.

Unplanned urbanisation, hill cutting, and population growth in CHT lead to environmental degradation. Overall, the CHT is highly vulnerable to climate change impacts such as landslides, and changes in precipitation patterns.[6] However, globally, mountains are often regarded as areas with less potential, so the existing potential of these regions remains underused. As a result, mountains have sluggish economic growth, imperfect economic opportunities, and poorer socioeconomic conditions than the adjacent plain lands of the country.[7,8]

Most national policies for the development of mountains and mountain people including Bangladesh have been developed as an extension of national policies which are found sometimes inappropriate. As a result, areas like CHT are lagging and create a history of social tensions.

Potential for Sustainable Mountains and Mountain People Development in CHT

The CHT in Bangladesh has enormous prospects for sustainable development that, if used properly and managed sustainably, will improve the living standards and quality of life of the mountain people of CHT, as well as maintain equity, dignity, and cultural identity. Specifically, CHT has scope for growth in horticulture, beekeeping, livestock, fisheries, high-value agricultural products, agriculture-based micro-enterprises, forestry, and water resources management. Developing a value chain with agroindustry may also enhance livelihoods. It has significant tourism potential due to its natural beauty, cultural diversity, and opportunities for adventure activities such as trekking, hiking, and river rafting.[9]

Moreover, the CHT is situated in the southeast part of Bangladesh. It has boundaries with India and Myanmar. Bangladesh has repeatedly enquired about maturing economic and trade relationships with countries in the East, especially Myanmar, Thailand, and China. So, CHT may provide an ideal gateway for developing an economic corridor across the region.[4]

Governance Challenges

The CHT has a large degree of decentralisation and devolution of power. These institutional interventions could support sustainable development through the provision of clearer policy targets. Moreover, CHT is currently experiencing significant socio-economic changes. Specifically, formal education, construction of communication networks, and internet connectivity have been altering the aspirations of the mountain people and augmenting their opportunities in CHT.[11]

Yet, the region is often subject to governance challenges, which are related to politico–structural, socio-economic, and local apprehensions.[7]

Politico–structural challenges include lack of transparency in national government, lack of due process, lack of participation in decision making, contradictory policies, lack of enforcement of environmental regulations, and lack of political commitment to sustainable use of natural resources.

Socio-economic challenges include the presence of highly valuable non-renewable natural resources, a large gap between the rich and poor, extreme poverty, and external control over the natural resources, while challenges related to local governance apprehensions include lack of employment, low income, environmental degradation, increasing vulnerability, and economic recession.

Concluding Remarks

We are living in an age of continuously better connectedness and economic integration. With better connectivity, the CHT can gain knowledge about effective livelihood practices from other global mountain regions and can implement them where suitable. Economic integration of CHT with the rest of the country, as well as globally can provide a path for transforming the poverty of the mountain people into prosperity.[9] In this context, an economic corridor between Bangladesh and the neighboring countries to the east can be established (CHT is the gateway) through regional cooperation. It may create a favourable environment for the sustainable economic development of CHT through better trade shipment.

The Agenda 2030 is not merely about safeguarding from vulnerability, but also for the broader socio-economic and political transformation. So, for sustainable development of mountains and mountain people, all the nations need to reinforce cooperative actions with the involvement of relevant stakeholders and adopt a long-term vision and a holistic approach. It is also necessary to incorporate mountain-specific policies into national sustainable development strategies.[1]

However, considering the spatial drawbacks, as well as the development potential, cultural diversity, and opportunities for CHT, a long-term vision and appropriate action plans are needed. The engagement of various stakeholders such as government, local communities, development organisations, private sector organisations, NGOs, academia, and research organisations may contribute to the successful implementation of these action plans effectively.

Policy Proposals/ Recommendations

Considering existing situation of CHT the following recommendations may be put forward:

1. **The country must explore the opportunity for increasing its effectiveness in adopting mountain-specific policies** at different levels in CHT. These policies need to focus on the qualitative adaptations in mountain livelihoods, and diversified landscapes to overcome the hurdles and take advantage of the distinctive prospects of the mountains.
2. **Agroforestry,** an alternative land use system could be applied to grow diverse species of woodland perennials in association with field crops, which is specifically suitable for the mountain regions like CHT where shifting cultivation is widely practiced. It may help to control soil erosion, and reverse environmental degradation through the biological interactions of trees, crops, and livestock, and increase income from farmland.
3. **Indigenous knowledge of the environment** is extremely important to understand and learn what can protect the hills and mountains. So, to stop hill-cutting and landslides, indigenous environmental knowledge must be incorporated into the development plan of the country.

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Increasing Connections Between People and Nature

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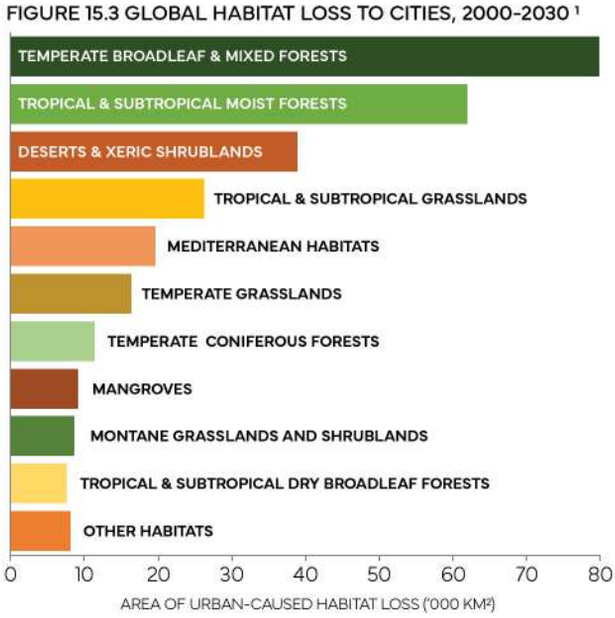
Introduction

Almost every global index tracking the condition of ecosystems has documented a continuing decline in the quantity and quality of natural habitats. While Sustainable Development Goal 15 (SDG 15) emphasises the importance of preserving terrestrial ecosystems and species, there is limited mention of the relationships between people and nature. Urban areas are absent from SDG 15, even though cities have a large direct and indirect ecological footprint (Figure 15.3). Between 2000-2030, global urban growth is predicted to clear an area the size of New Zealand, placing increasing strain on global ecosystems.[1]

FIGURE 15.3 GLOBAL HABITAT LOSS TO CITIES, 2000-2030 [1]



By 2050, the UN predicts that nearly 70% of people will live in urban centres. In Australia, 75% of the population already live in cities of 100,000 or more people. Having opportunities for people in cities to connect with nature can increase the likelihood of adopting 'pro-environmental' behaviours (such as more sustainable consumption choices) that could help address global biodiversity decline.[2] The importance of urban nature is made clear in Target 12 of the Convention on Biological Diversity's COP15 targets for 2030.

Protecting the remnant vegetation in urban areas is crucial for biodiversity. To augment urban nature beyond strengthening conservation programs and nature reserves, we provide examples of how initiatives in urban ecology and the use of nature-based solutions in planning and design can help foster beneficial human-nature connections, build 'nature-positive' cities, and progress conservation goals and SDG 15.

Engaging with Wildlife in Cities

Globally, cities and urban areas are home to a diverse range of plants and animals. Urban landscapes provide a mosaic of complex habitats that can be used by common and threatened wildlife. Within Australia, 30% of threatened species are present within cities[3], and three state capital cities (Perth, Brisbane, Sydney) are set within global biodiversity hotspots. Additionally, engaging with urban nature can provide people with a range of psychological, cognitive and physiological benefits.[4]

Recent research in southwest Western Australia (WA) has demonstrated the value of residential areas and wildlife-friendly gardening for biodiversity and human wellbeing.[5] Based on almost 16,000 wildlife observations completed by 243 citizen scientists, residential gardens in the region were found to support over 200 vertebrate species (i.e., birds, mammals, reptiles and frogs), with 77 species making use of habitat structures installed by householders (such as refuges and water sources, see Figure 15.4).

FIGURE 15.4 URBAN BIRDS USING ARTIFICIAL STRUCTURES [6,7]

Semi-structured interviews with participating citizen scientists demonstrated that gardening for wildlife is also gardening for wellbeing, offering opportunities for outdoor activities, sensory engagement, physical movement, relaxation, meditation and social connections within the community.[3] For some, urban gardening provided a platform for taking affirmative action and alleviating feelings of eco-grief or eco-anxiety, while others enjoyed the hands-on experience in identifying species, learning about ecology, observing wildlife responses, and adapting gardening practices based on new knowledge. Similar human-nature connections have been identified by residents in the of planting native flora species along road verges in Perth.[8]

By providing habitat resources and supporting reproductive opportunities for plants and animals, wildlife-friendly gardening can actively benefit biodiversity, help species adapt to habitat loss and climate change, and contribute to human well-being.

Designing cities with nature

Beyond the household-scale actions exemplified by wildlife gardening, urban biodiversity, and by extension SDG 15, can be supported through urban planning and landscape design initiatives that deliberately incorporate nature. Ecologists, landscape architects and urban planners are increasingly working together to adopt 'nature-based' solutions and green infrastructure for liveability and biodiversity.[9]

Until recently, urban landscapes in Australia reflected European design with mostly non-native plants, many of which are not well adapted to hot summers and scarce water. Contemporary approaches to landscape architecture seek to mimic natural processes that emphasise naturally occurring biodiversity, rather than reduce the number of plants used in landscape planting.[10] Approaches such as biophilic urbanism seek to bring people and nature together.

Further, there is a growing interest in landscape design that embraces Indigenous knowledge, culture and spirituality. This approach is exemplified in two public gardens in southwest WA, designed around the six seasons of the Noongar nation[11] (Figure 15.5).

FIGURE 15.5 SIX SEASONS OF THE NOONGAR NATION [12]

The Ballardong Noongar six seasons garden in the town of York represents koora-korra (the past), yey (the present) and mila (the future) of Budjar (Country). The Muminbulah Wilak six seasons garden in the Perth suburb of Jandakot features plants that traditionally provided food, medicine, shelter and other resources during each season.[11] Indigenous landscaping reflects deep understanding of Country, culture and nature. By engaging with Indigenous landscape designers, those who know how best to care for Country lead urban greening projects and efforts. Such initiatives honour Indigenous traditions, aid in restoring Country through nature-culture connection, and provide an inclusive, cross-cultural space for community members.[11, 13]

Biodiversity sensitive urban design (BSUD) embraces the concept of incorporating on-site benefits for biodiversity in urban development (rather than offsetting the impacts of urbanisation elsewhere), resulting in increased environmental justice and social equity when people have everyday access to nature.[14] Design frameworks can help to identify where designing for biodiversity aligns with other urban development goals, while providing a site-specific, step-by-step process for identifying target species and any potential threats that need to be mitigated.

Successful urban biodiversity conservation not only needs to identify novel design solutions for restoring and enhancing natural resources but also coordination, habitat restoration and protection based on evidence-based priority-setting. Spatial planning tools have been developed based on ecological connectivity, to help planners assess the merits of different urban planning and design scenarios to bring nature back into cities and allow for wildlife to move between habitats.[15]

Policy Proposals/ Recommendations

Cities have a key role in societies becoming 'nature-positive'. This being an initiative promoted by the UN Convention on Biological Diversity—a net-gain in nature by 2030. Achieving nature-positive cities will help drive progress towards SDG 15, as well as several other related SDGs, namely, climate change (SDG 13), sustainable cities (SDG 11), water availability (SDG 6), inequality (SDG 9) and health (SDG 3).

Effective partnerships (SDG 17) between community, government, research and industry will be needed to restore and conserve urban nature. Here, we outline a number of practical recommendations.

1. **Community members and land managers should add simple habitat substitutes to the urban form,** providing crucial resources for urban wildlife. These elements can include insect 'hotels', bird and bat nesting boxes, biodiverse retaining walls, elevated bird baths, ponds and rock (or log) shelters.
2. When designing public spaces (including parks, parklets, street verges and open spaces, **agencies and developers should seek out a diverse range of local native plant species;** including groundcovers, low and medium shrubs, plants that flower across the year, and canopy trees for shade.
3. **Planners, developers and landscape architects should seek to bring people and nature together in new and refurbished outdoor spaces,** through embracing Indigenous landscaping, including opportunities for nature education, and evaluating impacts on community health and wellbeing.
4. **Coordinating biodiversity actions across local governments, developers and communities** will overcome the complexity of land use planning in urban contexts, where changing responsibilities during development can lead to tension and trade-offs.

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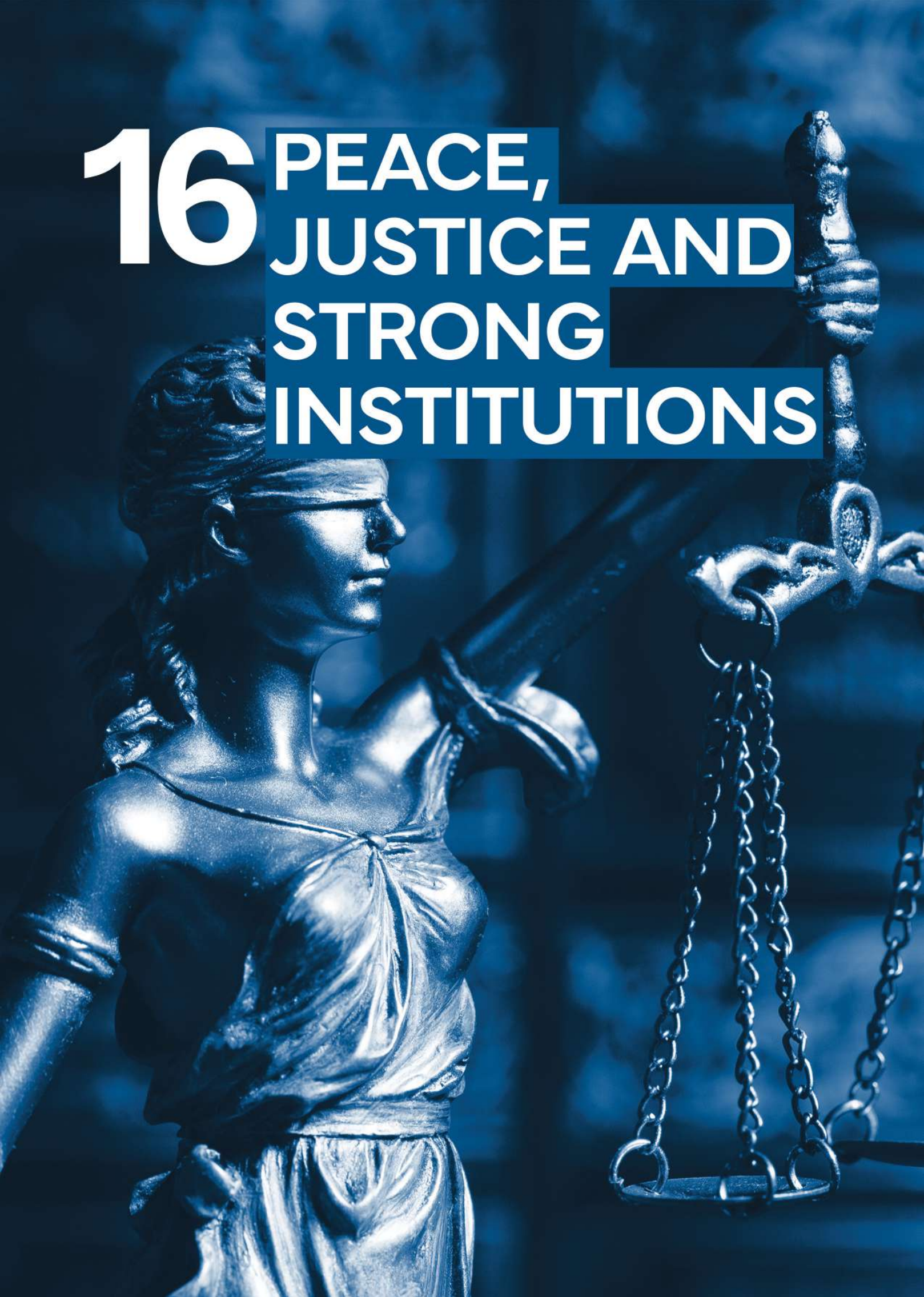

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Mandatory Vaccination in Australia: Towards a More Transparent, Accountable, and Participatory Approach to Policymaking

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Introduction

United Nations Sustainable Development Goal 16 (SDG 16) is broad in scope, concerned with promoting peaceful and inclusive societies, providing access to justice for all, and building effective, accountable and inclusive institutions at all levels. While key focal points of SDG 16 are based in issues of armed conflict, violence and crime, persecution and discrimination, the goal also encompasses issues of institutional trust, enhancing social cohesion, and promoting access to information and formal processes institutions. As such, it is important that Australia does not become complacent on our progress towards SDG 16 targets.[1]

To highlight this, we focus on targets 16.6 (develop effective, accountable and transparent institutions at all levels), and 16.7 (ensure responsive, inclusive, participatory and representative decision-making at all levels). We do so with reference to mandatory vaccination policy, drawing on findings from studies we are undertaking as part of MandEval, a multi-disciplinary project exploring the impacts of COVID-19 vaccine mandates to better inform future policy in both pandemic and routine vaccination contexts.

Vaccine mandates and COVID-19

Vaccine mandates are policies that impose consequences for choosing not to accept recommended or required vaccines, e.g., financial penalties or limited access to public spaces. During the COVID-19 pandemic, mandates were put into place by many countries as part of a suite of measures such as wearing masks, social distancing, lockdowns, and border closures. These policies had multifaceted goals, including protecting individual and public health, mitigating burden on health systems, preserving economies, and maintaining state capacity to continue to deliver essential services. Vaccine mandates specifically were employed with the aims to drive vaccination uptake and regulate how the unvaccinated could engage with the community in order to limit the spread of disease.

Such pandemic management policy decisions were made by governments at a time of intense global crisis, where problems and information were ever evolving. This necessarily meant that policymaking efforts to manage the crisis had to be dynamic and were often both proactive and reactive in nature. Experts warn that future global pandemics are

inevitable; in the words of the WHO Director-General, "It could happen in 20 years or more, or it could happen tomorrow. But it will happen, and either way, we must be ready. This is not a theoretical risk; it is an epidemiological certainty."[2] Consequently, it is vital to understand how vaccine mandates affected the community and what we can learn from the experiences of the pandemic more broadly as we move forward.

> It could happen in 20 years or more, or it could happen tomorrow. But it will happen, and either way, we must be ready. This is not a theoretical risk; it is an epidemiological certainty.

Mandates: Public opinion and policy frameworks

Despite being a common feature of governments' pandemic responses, mandates are controversial for several reasons: (a) they function by removing or restricting choice and individual liberty,[3] (b) evidence for their effectiveness is mixed, [4 5] and (c) they can have unintended effects, including reactance or anger,[6] in turn reducing trust in government and vaccination and contributing to social polarisation.[7]

Our current research indicates that public opinion about vaccine mandates remains mixed and complex in post-pandemic Australia. In a recent survey of over 1000 Australians on their beliefs about mandates, less than a third of respondents thought that the government should have the power to require people to be vaccinated (32%), or could ethically require it (27%). However, despite these ethical qualms almost two thirds of respondents still trusted that the government would implement a future pandemic mandate in a reasonable way (66%), make sure a vaccine was safe before implementing a mandate (66%), and keep a mandate in place only as long as necessary (65%). Ultimately, a majority were in favour of mandatory vaccination policies, not only in another pandemic (58%), but also for the flu (51%) and other vaccines officially recommended by the government (55%).

> ...less than a third of respondents thought that the government should have the power to require people to be vaccinated, or could ethically require it... (but) a majority were in favour of mandatory vaccination policies, not only in another pandemic, but also for Flu and other vaccines...

Such examples paint a complicated picture of tensions between ethics, trust, protection, and pragmatism in public attitudes towards vaccination mandates. It is critical that policymakers understand these concerns, and, moreover, the obligation of governments to actively develop policies that seek to reflect public priorities, are demonstrably effective, and minimally infringe on individual freedom.

To be prepared for future pandemic scenarios, and to develop effective routine vaccination policy, Australian policymakers need to not only understand the effects of mandates and public attitudes to them, but to have a clear protocol for effective, justifiable, yet minimally intrusive policy intervention. Adopting such a framework would facilitate efficient and effective decision-making; codify minimum conditions for the justifiability of mandates; and create transparency in how and why these policy decisions are made.

Such guidelines have been developed and recommended, both by the UN through the WHO,[8] and by independent researchers,[9] but have yet to be implemented in Australia. The adaptation and implementation of such a framework, through incorporating new Australian-specific research, public consultation findings, and participatory policy feedback, would create a framework for mandatory vaccination policies that is not only a transparent and effective tool for policymakers, but is also representative of public priorities (SDG indicators 16.6.2 & 16.7.2). Policy that embodies community perspectives and experiences ultimately contributes to better informed policy, improved institutional accountability and processes, greater community representation, and builds public trust in governance.

Compensation for vaccine injury

To ensure accountability for mandate policy decisions and to preserve public trust, governments must also implement mechanisms to manage potential unintended negative consequences of vaccination. Specifically, where vaccines are recommended or required, governments should also enact no-fault compensation (NFC) schemes to assist and support those who experience a serious adverse reaction.[10] Schemes of this type align with SDG target 16.6 by contributing to institutional accountability on occasions where harm is suffered by an individual complying with government policy. NFC for vaccine adverse events is further advocated as a mechanism to upholding the social contract created when an individual contributes to the public health by accepting a vaccination. NFC for these cases is a matter of justice and fairness.

Many countries around the world have ongoing NFC schemes, however Australia does not. The pandemic response appeared to be an impetus for policy reform on this matter; Australia did introduce a COVID vaccine claims scheme, allowing claims dating back to February 2021 when the COVID vaccination commenced. This appeared to be a step in the right direction, however, submissions to the COVID-19 response inquiry highlighted that the scheme was administratively burdensome for many who sought to submit a claim, while its narrow, inflexible, and technical criteria meant individuals who experienced serious adverse events following COVID-19 vaccines were often excluded from receiving compensation.[11] It is argued that the restrictive scheme design and heavy burdens could be considered as administrative exclusion, with the scheme being constructed in such a way as to be seen to be providing a safety net and accountability, but not actually delivering meaningful action or accountability.[12]

Moreover, the scheme ceased in September 2024, and no further steps towards NFC have been made in Australia. While COVID-19 vaccination is no longer mandated, this policy gap means that individuals who accept COVID boosters, or other recommended vaccinations (including children who are required to complete the national scheme to comply with federal and state 'No Jab, No Pay', and 'No Jab, No Play' policies) do not have access to redress in cases where a serious adverse event occurs.

> ...this policy gap means that individuals who accept COVID boosters, or other recommended vaccinations do not have access to redress in cases where a serious adverse event occurs.

To ensure population satisfaction with vaccination policy (SDG target 16.6.2), meaningful representation for those who suffer a serious adverse event (SDG indicator 16.7.2), sufficient institutional responsiveness and accountability for the small number of cases that occur, and community trust in systems, the Australian government should enact a permanent, general (i.e. not vaccine specific) NFC scheme.

Policy Proposals/ Recommendations

In light of the above considerations, we recommend that the following policies concerning mandatory vaccination be implemented in Australia to ensure progress on the SDG 16 targets, developing effective, accountable and transparent institutions, and ensuring responsive, inclusive, participatory and representative decision-making in our nation.

1. **Adopt a transparent framework of decision making criteria** for the ethical use of vaccination mandates in routine vaccination and pandemic contexts.
2. **Implement a comprehensive and ongoing no-fault compensation scheme** to ensure accountability for injury from officially recommended vaccines and to foster community trust in robust vaccination policy and systems.
3. **Establish a feasible and inclusive framework** for participatory policymaking and public co-creation in the design of routine and crisis context vaccination policies and pandemic protocols, to ensure they are representative of public priorities and responsive to key concerns.
4. **Fund further research** into the effectiveness and (side)effects of vaccination mandates to better inform future decision-making.

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Amplifying Youth Voices: Building Inclusive Institutions for SDG 16

Youth Affairs Council of Western Australia (YACWA)

Introduction

Effective, inclusive, and accessible institutions are the cornerstone of a peaceful and inclusive society. Sustainable Development Goal 16 (SDG 16) for Peace, Justice, and Strong Institutions, outlines 12 targets that address various aspects of violence, justice, and corruption.[1] Target 16.7 emphasises the importance of representative and participatory governance to enable sustainable development and peace.

Children's and young people's disempowerment dominates most countries—including Australia—political climate.[2] Only 17% of young people in Western Australia (WA) felt they had the opportunity to give insight into their local council or electorate.[3] Despite this, an overwhelming majority of young people want the government to value their perspectives in decision-making processes.[4] Considering that young people represent almost one fifth of West Australia's population, mechanisms for supporting young people's participation are vital to ensure government decision-making is representative of all members of a society.

The Youth Affairs Council of Western Australia (YACWA) is the peak non-government youth organisation in WA. YACWA advocates for the needs of young people, the youth sector, and their communities, ensuring all young people are represented in Government decision-making. YACWA creates systemic change through youth leadership, youth sector development, and policy work. Through their advocacy efforts, YACWA offers accessible pathways for young people in WA to be directly involved with policy and decision-making.[5]

YACtivate: Building connections and new skills for young people

YACtivate is an event organised by YACWA to bring youth advisory groups (YAGs) and councils from across WA to learn new advocacy skills and connect with like-minded young people.[6] YAGs are vital for the inclusion of young people in decision-making governance, giving them a platform to connect directly with each other, governments and sector bodies.[7] YACtivate 2025 was a statewide event that reignited youth engagement by bringing together 80 young people and 25 staff from 30 YAGs across WA to connect, learn, and lead collective action. Young people provided crucial insights to improve the effectiveness of YAGs (and similar initiatives), in empowering young people and ensuring government and community institutions are inclusive of, and responsive to, young people's needs. YACtivate

provides a meaningful forum through which young people voice what matters to them and improve the advocacy pathways in their communities. This serves as a catalyst for continued youth-led engagement across WA.

The Youth Pride Network

The Youth Pride Network (YPN) is a group of young people between the ages of 12-25 who are passionate about creating change in WA for young LGBTQIA+ people.[8] Auspiced by YACWA and funded by the WA State Government, YPN provides young LGBTQIA+ people with the opportunity to create change through educating others, working with the community, and systemic advocacy. YPN provides a valuable platform for LGBTQIA+ young people to connect directly with ministers and policymakers to influence government decisions.[5]

Recently, YPN contributed to the development of Western Australia's first whole-of-government LGBTQIA+ Inclusion Strategy, capturing the perspectives of more than 600 LGBTQIA+ young people across WA.[10] Facilitating and supporting numerous engagement activities with young people, YPN heard what young people believed would create more inclusive community spaces and how the Inclusion Strategy can improve the lives of young people. They shared ways in which the WA government can meaningfully engage with young people to create long-term change for LGBTQIA+ youth. YPN's contribution to the LGBTQIA+ Inclusion Strategy enabled LGBTQIA+ youth, a historically under-represented cohort, to directly inform future government policies that influence their lives.

Policy Proposals/ Recommendations

1. **Expand the number of youth advisory groups** to include young people in all aspects of government decision-making. Make available adequate resourcing to enable young people to engage with all levels of government, particularly at regional and local levels, to deliver place-based youth initiatives. Youth advisory groups must be informed by the National Principles for Child Safe Organisations, and their work must centre the perspectives of young people.
2. **Commit ongoing funding to youth-led lived experience programs.** Co-design mechanisms that incorporate young people's lived experience into the development of plans, policies and services. Programs that have young people's lived experiences at the forefront, such as YPN and the Youth Homelessness Advisory Council (YHAC), are invaluable to enabling inclusive and responsive decision-making that affects young people from marginalised communities or those experiencing complex or compounding challenges.
3. **Lower the voting age to 16 years.** The current voting age limit of 18 years excludes many young people from participating in formal democratic processes, limiting the representation of children and young people.[11] Lowering the voting age to allow 16- and 17-year-olds to vote voluntarily not only offers immediate benefits to the enfranchisement of young people, but it is an investment into the representation and inclusion of young people in political decision-making, encouraging continued civic engagement through the establishment of long-term civic and political engagement at an early age.[12] A similar commitment has occurred in the UK recently.

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17 PARTNERSHIPS FOR THE GOALS

Sustainable Development Goals Update: An Urgent Call for Stronger Inter-faith Relations Globally

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Michael Sheldrick, Global Citizen

Introduction

Nearly a decade after the UN launched the Sustainable Development Goals (SDGs), we are alarmingly off-track to achieve the 17 goals by 2030. A recent UN report revealed that only 12% of targets are on course, with progress on the remaining 88% lagging far behind expectations. This shortfall is concerning. The SDGs represent our best chance to comprehensively elevate the world's condition and benefit humanity at large.

While the SDGs were crafted by some of the world's brightest minds, they remain a work in progress. Implementation strategies are required to continually adapt to our ever-changing global landscape. Amidst ongoing wars in Europe, the Middle East, and Africa, as well as rising geopolitical tensions, there is a real risk of the SDGs becoming overshadowed by current events. This underscores the importance of Goal 17, which is designed to foster diverse partnerships involving the private sector, civil society, and governments. It acknowledges that governments alone cannot address the challenges of achieving the SDGs.

Although not explicitly mentioned in the text, SDG 17 implicitly recognises the critical role of interfaith partnerships. Since religion influences approximately 85% of the global population, faith communities arguably represent the largest transnational actors in civil society worldwide.[1] These communities have been pillars of support for centuries, aiding the vulnerable, sick, and the poor. The modern Jubilee movement, originating in the 1990s, exemplifies this. It began as an interfaith initiative by Jewish, Christian, and Muslim groups calling for debt cancellation, which successfully secured debt cancellation for many impoverished countries worldwide two decades ago.

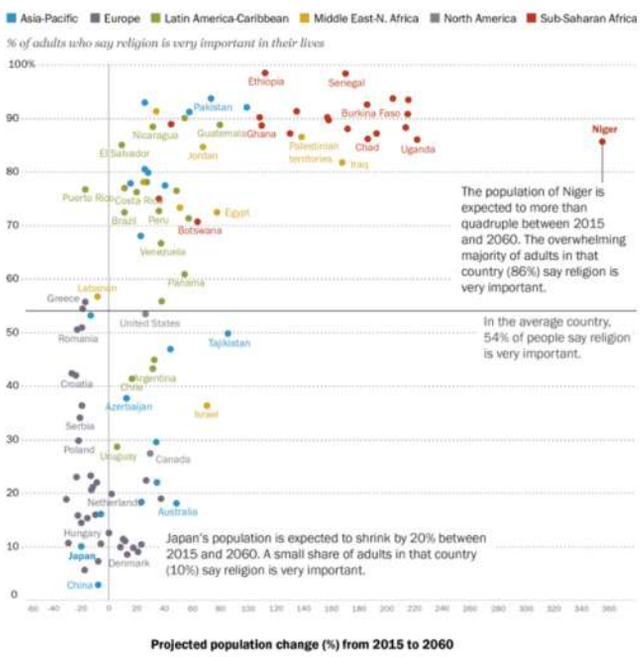
Ban Ki-Moon, the 8th UN Secretary-General and one of the chief architects of the SDGs, made it clear that religious collaboration was essential to sustainable development, stating, "I have long believed that when governments and civil society work towards a common goal, transformational change is possible. Faiths and religions are a central part of that equation."[2] Despite this recognition, religious partnerships have received scant attention in mainstream discussions on SDG implementation following the adoption of the Goals, even as many faith-based organisations continue their crucial work providing development services.

Now, with rising tensions in inter-faith relations, religion finds itself in the spotlight for troubling reasons. Yet, if we tackle discrimination and bigotry head-on, interfaith collaboration could harness its longstanding power for good, as it has been for millennia.

Religiosity Rising Globally

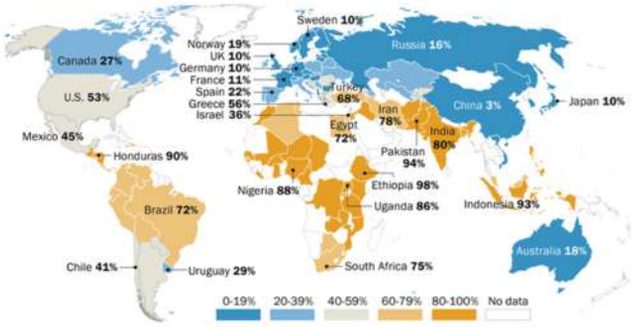
Surveys such as the Pew-Templeton Global Religious Futures Project reveal a diverging trend in religious identification (Figure 17.1). While people in North America, Europe, and Australia increasingly distance themselves from religion, those in Southeast Asia, South Asia, the Middle East, Africa, and Latin America are embracing it fervently.[3]

FIGURE 17.1 THE FASTEST-GROWING COUNTRIES ARE HIGHLY RELIGIOUS, WHILE THOSE WITH SHRINKING POPULATIONS TEND TO BE LESS RELIGIOUS (PEW RESEARCH CENTER) [3]



Moreover, religiosity appears to rise alongside modernity in these regions (See Figure 17.2). As the middle class expands—characterised by higher education and material well-being—its members often grow more devout. In some countries, many people prioritise their religious identity over their nationality.

FIGURE 17.2 RELIGION IS VERY IMPORTANT TO PEOPLE IN AFRICA, THE MIDDLE EAST, SOUTH ASIA, LATIN AMERICA (PEW RESEARCH CENTER) [3]



Religious Insecurity is on the Rise

This matters because religion profoundly influences politics, foreign policy, development, and peace in the Western world and the Global South. In France and the Netherlands, far-right politicians like Jean-Marie Le Pen and Geert Wilders have garnered significant electoral support by exploiting fears over national identity and immigration by manifesting distrust towards Muslims. Steeped in exclusion and bigotry, their campaigns echo similar sentiments that have surfaced globally in various intensities and forms.

Religious insecurity and conflict are not new but are part of a historical and global pattern affecting the Abrahamic religions—Islam, Christianity, and Judaism—which collectively boast over 4.3 billion followers today. Unfortunately, the trendlines are moving in the wrong direction. According to Pew Research Center's analysis of global religious restrictions, Christians faced harassment in 144 countries, Muslims in 142, and Jews in 87 between 2007 and 2017—the highest levels recorded since the study began. By 2020, Pew found that incidents of religious discrimination and hostility had further increased worldwide.[4]

In a world where most of humanity aligns with a religion, bigotry, including its inherited forms, remains a persistent challenge despite it being condemned by the Universal Declaration of Human Rights.

The issue extends beyond the tension between Abrahamic faiths. In India, rising Hindu nationalism threatens the rights of Muslims. Similarly, in Myanmar, Buddhist nationalism has led to discrimination and

intimidation against Rohingya Muslims, forcing over a million to flee as refugees.

A recent Best Countries survey, polling over 21,000 people worldwide in 2023, revealed that the majority see religion as the primary source of today's conflicts.

The ongoing war in Israel and Gaza has exacerbated these tensions. Though its roots lie in political and territorial struggle, religion remains inseparable from the narratives of identity and legitimacy that drive it—amplifying how both Judaism and Islam are perceived worldwide.

At this year's World Economic Forum in Davos, during a session on anti-Semitism, a panellist highlighted that current levels of anti-Semitism are the highest since World War II. In the United States, Jaylani Hussein, Director of the Council on American Islamic Relations (CAIR), presented a survey indicating that negative sentiments towards Islam and Muslims have reached a peak not seen in the last 30 years, surpassing even the aftermath of the 9/11 attacks.

UN Secretary-General Antonio Guterres has voiced deep concern over the surge in Islamophobia and anti-Semitism following the October 7th Hamas attack and the subsequent Israeli response, calling for global vigilance against these rising hatreds.

Turning the Tide

We need to turn the tide. While comprehensive, systematic global efforts to cure the problem may be elusive, notable initiatives have been undertaken:

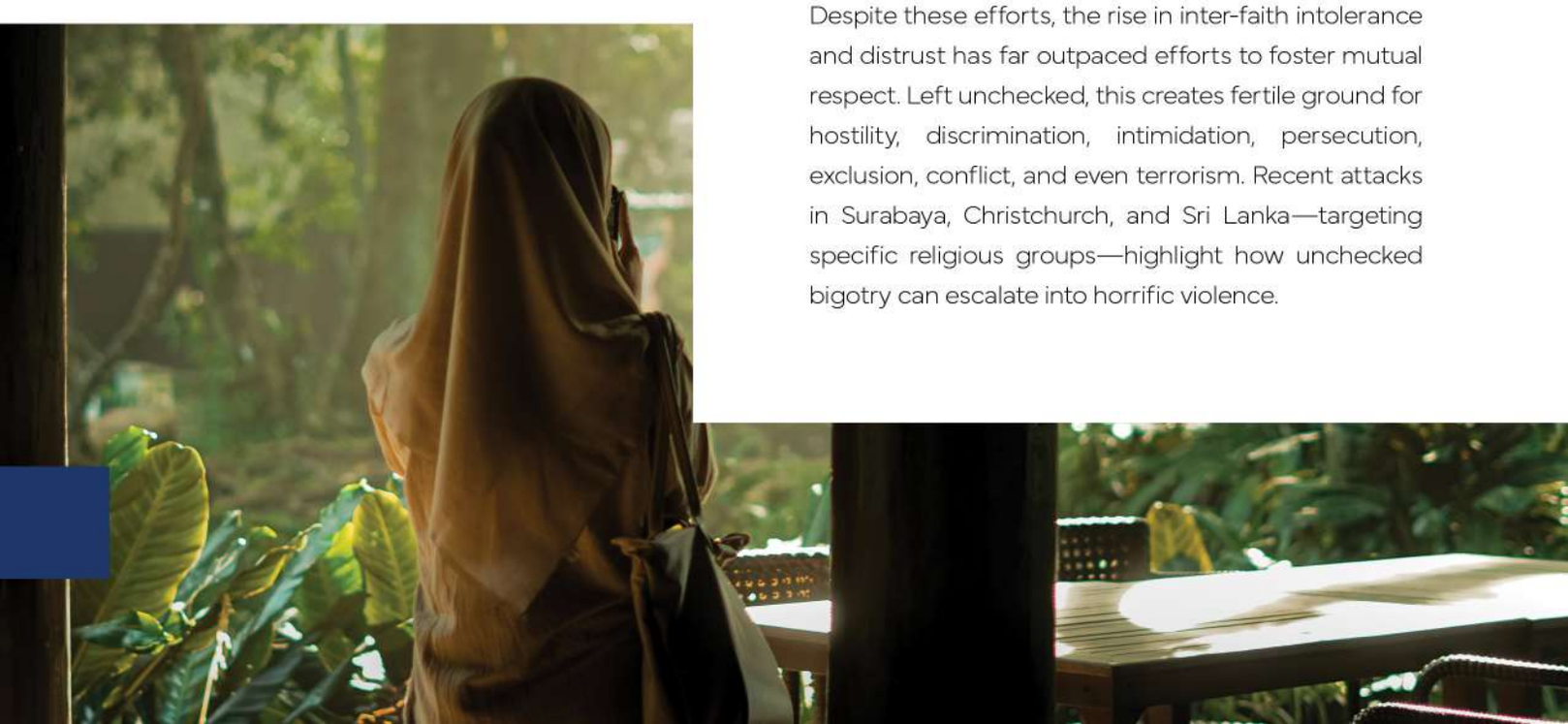
- In 2019, Pope Francis and the Grand Imam of Al Azhar, Ahmad Al Thayeb, made history by signing the *Document on Human Fraternity for World Peace and Living Together* in Abu Dhabi. This landmark agreement set a precedent for interfaith dialogue and cooperation.

- In 2021, the European Commission launched the EU's first-ever strategy to combat anti-Semitism, a critical step even as the continued rise in anti-Semitic incidents across Europe underscores the need for more comprehensive action.

- In March of 2025, the UN General Assembly adopted a resolution marking the International Day against Islamophobia. While commendable, like many UN resolutions, it lacks robust enforcement and monitoring mechanisms.

- Closer to home, the Foreign Policy Community of Indonesia (FPCI) launched the '1000 Abrahamic Circles' program to combat bigotry among Muslims, Christians, and Jews. Despite facing challenges, this grassroots initiative showcases the potential of community-led solutions.

Despite these efforts, the rise in inter-faith intolerance and distrust has far outpaced efforts to foster mutual respect. Left unchecked, this creates fertile ground for hostility, discrimination, intimidation, persecution, exclusion, conflict, and even terrorism. Recent attacks in Surabaya, Christchurch, and Sri Lanka—targeting specific religious groups—highlight how unchecked bigotry can escalate into horrific violence.



Policy Proposals/ Recommendations

It's crucial to ramp up countermeasures against religious bigotry, going beyond convening interfaith conferences, which have lost their impact. Alarmingly, much of this bigotry occurs in countries that formally uphold democracy, human rights, the rule of law, religious freedom, freedom of speech, and multiculturalism.

Here are some measures that could address the problem on inter-faith and secular tensions:

1. **Teach global citizenship and religious understanding in schools.** Governments should add lessons on global citizenship, religious freedom, and mutual respect to school programs. This means teaching students the distinction between freedom of belief and respect for others' beliefs and helping them learn how to coexist in diverse societies. Partner with UNESCO and local education ministries to train teachers and include these lessons in civic or social studies classes.
2. **Strengthen local and interfaith organisations.** Many peace and interfaith projects are run by small local NGOs that lack funding or training. Governments, donors, and the UN should establish small-grants programs to support these groups' growth, offering training in conflict resolution, dialogue, and project management, as well as research support, so they can share effective practices. These build lasting local capacity instead of relying only on top-down or international initiatives.
3. **Make interfaith dialogue more inclusive.** Global and regional interfaith events often involve only senior religious figures. To make them more meaningful, governments and the UN should bring grassroots voices into the conversation—including youth, women, and community leaders. The UN Alliance of Civilizations, regional bodies like ASEAN, and the African Union could host regular community-level dialogues, ensuring that discussions about tolerance translate into real cooperation at the local level.
4. **Engage religious leaders in peacebuilding and climate action.** Religious leaders are often more trusted than politicians and can help bridge divides. Governments and international organisations should involve them directly in peace and climate programs—from conflict-resolution workshops in divided regions to campaigns promoting environmental action and social cohesion. This approach has worked before, such as the late Pope Francis's calls for climate responsibility (credited for consolidating support for the Paris Agreement). It can help build trust where governments struggle to reach people.

The United Nations and governments subscribed to the SDG targets must urgently address inter-faith relations, especially within SDG 16, which focuses on 'peace, justice, and strong institutions.' This is vital for effectively leveraging global partnerships under Goal 17 to achieve the SDGs.

One thing is sure: without mutual respect among followers of the world's religions, lasting SDGs, enduring peace, and inclusive development in the 21st century will remain elusive.

Endnotes

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4 Pew Research Center. In 2017, Government Restrictions on Religion Reach Highest Level Globally in More Than a Decade. Washington, D.C.: Pew Research Center, July 15, 2019; Pew Research Center. In 2020, Government Restrictions on Religion Remained at a High Level in Most Countries. Washington, D.C.: Pew Research Center, September 30, 2022.

The UWA Public Policy Institute

The UWA Public Policy Institute exists to proactively shape Western Australian and Australian policy landscapes, bridging research, expertise, and community insight to inform meaningful change. We aim to act as a conduit between researchers and thought leaders, policymakers, and Australian communities, to ensure that practical and evidence-based policy is implemented.

We envision a future in which public policy is deeply grounded in the real, lived experiences of our communities. Achieving this demands a practical commitment to developing informed, adaptive policies that respond to the unique challenges facing our regions. By championing innovation, fostering inclusivity, and building resilience, we aim to shape a policy landscape that honestly serves and empowers all Western Australians and Australians.

We act as a catalyst for policy innovation, championing forward-thinking solutions that are attuned to the evolving needs of both Western Australia and the broader national context. Through rigorous applied research, meaningful community engagement, and strategic policy development, we play a vital role in shaping responses that are locally grounded, nationally relevant, and globally informed.

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