



GLOBAL EDUCATION MONITORING REPORT

2016

Planet:

EDUCATION FOR ENVIRONMENTAL SUSTAINABILITY
AND GREEN GROWTH



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The cover photos are of school children from the Palau Papan Island in the archipelago of Togeau in Sulawesi, Indonesia. The children, from the Bajo tribe, live in stilt houses and cross a bridge spanning 1.8 kilometres to the neighbouring island of Melange to go to school every day.

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Foreword

In May 2015, the World Education Forum in Incheon (Republic of Korea), brought together 1,600 participants from 160 countries with a single goal in mind: how to ensure inclusive and equitable quality education and lifelong learning for all by 2030?

The Incheon Declaration for Education 2030 has been instrumental to shape the Sustainable Development Goal on Education to “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”.

It entrusts UNESCO with the leadership, coordination and monitoring of the Education 2030 agenda. It also calls upon the Global Education Monitoring (GEM) Report to provide independent monitoring and reporting of the Sustainable Development Goal on education (SDG 4), and on education in the other SDGs, for the next fifteen years.

The ultimate goal of this agenda is to leave no one behind. This calls for robust data and sound monitoring. The 2016 edition of the GEM Report provides valuable insight for governments and policy makers to monitor and accelerate progress towards SDG 4, building on the indicators and targets we have, with equity and inclusion as measures of overall success.

This Report makes three messages starkly clear.

Firstly, the urgent need for new approaches. On current trends only 70% of children in low income countries will complete primary school in 2030, a goal that should have been achieved in 2015. We need the political will, the policies, the innovation and the resources to buck this trend.

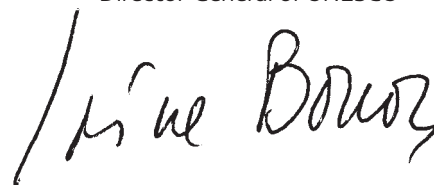
Secondly, if we are serious about SDG 4, we must act with a sense of heightened urgency, and with long-term commitment. Failure to do so will not only adversely affect education but will hamper progress towards each and every development goal: poverty reduction, hunger eradication, improved health, gender equality and women’s empowerment, sustainable production and consumption, resilient cities, and more equal and inclusive societies.

Lastly, we must fundamentally change the way we think about education and its role in human well-being and global development. Now, more than ever, education has a responsibility to foster the right type of skills, attitudes and behavior that will lead to sustainable and inclusive growth.

The 2030 Agenda for Sustainable Development calls on us to develop holistic and integrated responses to the many social, economic and environmental challenges we face. This means reaching out beyond traditional boundaries and creating effective, cross-sectoral partnerships.

A sustainable future for all is about human dignity, social inclusion and environmental protection. It is a future where economic growth does not exacerbate inequalities but builds prosperity for all; where urban areas and labour markets are designed to empower everyone and economic activities, communal and corporate, are green-oriented. Sustainable development is a belief that human development cannot happen without a healthy planet. Embarking upon the new SDG agenda requires all of us to reflect upon the ultimate purpose of learning throughout life. Because, if done right, education has the power like none else to nurture empowered, reflective, engaged and skilled citizens who can chart the way towards a safer, greener and fairer planet for all. This new report provides relevant evidence to enrich these discussions and craft the policies needed to make it a reality for all.

Irina Bokova
Director-General of UNESCO



Foreword

The 2016 Global Education Monitoring Report (GEM Report) is both masterful and disquieting. This is a big report: comprehensive, in-depth and perspicacious. It is also an unnerving report. It establishes that education is at the heart of sustainable development and the Sustainable Development Goals (SDGs), yet it also makes clear just how far away we are from achieving the SDGs. This report should set off alarm bells around the world and lead to a historic scale-up of actions to achieve SDG 4.

The GEM Report provides an authoritative account of how education is the most vital input for every dimension of sustainable development. Better education leads to greater prosperity, improved agriculture, better health outcomes, less violence, more gender equality, higher social capital and an improved natural environment. Education is key to helping people around the world understand why sustainable development is such a vital concept for our common future. Education gives us the key tools – economic, social, technological, even ethical – to take on the SDGs and to achieve them. These facts are spelled out in exquisite and unusual detail throughout the report. There is a wealth of information to be mined in the tables, graphs and texts.

Yet the report also emphasizes the remarkable gaps between where the world stands today on education and where it has promised to arrive as of 2030. The gaps in educational attainment between rich and poor, within and between countries, are simply appalling. In many poor countries, poor children face nearly insurmountable obstacles under current conditions. They lack books at home; have no opportunity for pre-primary school; and enter facilities without electricity, water, hygiene, qualified teachers, textbooks and the other appurtenances of a basic education, much less a quality education. The implications are staggering. While SDG 4 calls for universal completion of upper secondary education by 2030, the current completion rate in low-income countries is a meagre 14% (Table 10.3 of the full report).

The GEM Report undertakes an important exercise to determine how many countries will reach the 2030 target on the current trajectory, or even on a path that matches the fastest improving country in the region. The answer is sobering: we need unprecedented progress, starting almost immediately, in order to have a shot at success with SDG 4.

Cynics might say, 'We told you, SDG 4 is simply unachievable', and suggest that we accept that 'reality'. Yet as the report hammers home in countless ways, such complacency is reckless and immoral. If we leave the current young generation without adequate schooling, we doom them and the world to future poverty, environmental ills, and even social violence and instability for decades to come. There can be no excuse for complacency. The message of this report is that we need to get our act together to accelerate educational attainment in an unprecedented manner.

One of the keys for acceleration is financing. Here again, the report makes for sobering reading. Development aid for education today is lower than it was in 2009 (Figure 20.7 of the full report). This is staggeringly short-sighted of the rich countries. Do these donor countries really believe that they are 'saving money' by underinvesting in aid for education in the world's low-income countries? After reading this report, the leaders and citizens in the high income world will be deeply aware that investing in education is fundamental for global well-being, and that the current level of aid, at around US\$5 billion per year for primary education – just US\$5 per person per year in the rich countries! – is a tragically small investment for the world's future sustainable development and peace.

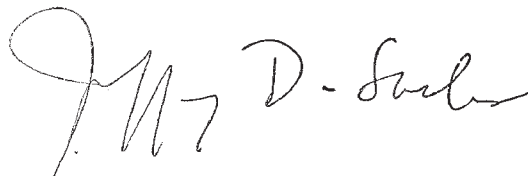
The 2016 GEM Report provides a plethora of insights, recommendations and standards for moving forward. It offers invaluable suggestions on how to monitor and measure progress on SDG 4. It demonstrates by example the feasibility of far more refined measures of education inputs, quality and achievement than the often crude measures of enrolment and completion that we rely on today. Using big data, better survey tools, facility monitoring and information technology, we can get far more nuanced measures of the education process and outcomes at all levels.

Fifteen years ago the world finally recognized the enormity of the AIDS epidemic and other health emergencies and took concrete steps to scale up public health interventions in the context of the Millennium Development Goals. Thus were born major initiatives such as the Global Fund to Fight AIDS, Tuberculosis and Malaria, the Global Alliance for Vaccines and Immunisation (now Gavi, the Vaccine Alliance) and many other examples. These efforts led to a dramatic upturn in public health interventions and funding. While it did not achieve all that was possible (mainly because the 2008 financial crisis ended the upswing in public health funding) it did lead to many breakthroughs whose effects continue to be felt today.

The 2016 GEM Report should be read as a similar call to action for education as the core of the SDGs. My own view, often repeated in the past couple of years, is the urgency of a Global Fund for Education that builds on the positive lessons of the Global Fund for AIDS, Tuberculosis and Malaria. The financing constraint lies at the very heart of the education challenge, as this report makes vividly clear through every bit of cross-national and household-based data.

This compelling document calls on us to respond to the opportunity, urgency and declared global goal embodied in SDG 4: universal education of good quality for all and opportunities for learning throughout life. I urge people everywhere to study this report carefully and take its essential messages to heart. Most importantly, let us act on them at every level, from the local community to the global community.

Jeffrey D. Sachs
Special Adviser to the UN Secretary-General on the
Sustainable Development Goals

A handwritten signature in black ink, appearing to read 'J. Sachs', written in a cursive style.

Introduction

The planet Earth is in a dire state. Natural resources have been overexploited. A significant loss of biodiversity is occurring while a massive rise of carbon levels is leading to climate change and associated extreme weather. Toxic substances are increasingly found in air, water, soil, and flora and fauna. The planet faces desertification, drought and land degradation. Human living conditions have not fared much better. Even though the number of people living in extreme poverty has declined by over 1 billion (United Nations, 2015a), disparities between rich and poor continue to rise. Oxfam recently reported that the world's richest 62 people possess as much wealth as the poorest 3.6 billion (Hardoon et al., 2016). Too many people are trapped in poverty, and lack clean air and drinking water as well as adequate food and nutrition. Many families are forcibly displaced or on the run due to protracted conflict. Wide disparities persist in access to education of good quality. It is out of these concerns that the concept of sustainable development was born.

EDUCATION WITHIN SUSTAINABLE DEVELOPMENT

The 2030 Agenda unites global development goals in one framework. SDG 4 succeeds the MDG and EFA priorities for education. At the World Education Forum in Incheon, Republic of Korea, in May 2015, representatives of the global education community signed the Incheon Declaration, embracing the proposed SDG 4 as the single universal education goal, which commits countries to '[e]nsure inclusive and equitable quality education and promote lifelong learning opportunities for all' (Box 0.3). SDG 4 and its targets advance a model where learning, in all its shapes and forms, has the power to influence people's choices to create more just, inclusive and sustainable societies. To advance progress towards SDG4 and its targets, the global education community adopted the Education 2030 Framework for Action in Paris in November 2015 (UNESCO, 2015a).

Education within the sustainable development agenda is founded on principles drawn from a rich history of international instruments and agreements. These principles state that education is both a fundamental human right and an enabling right, i.e. it enables other human rights; that it is a public good and a shared societal endeavour, which implies an inclusive process of public policy formulation and implementation; and that gender equality is inextricably linked to the right to education for all (UNESCO, 2015a). These principles are inspired by a humanistic vision of education and development based on human rights and dignity, justice and shared responsibility.

EDUCATION IS INTERLINKED WITH OTHER SDGS

The SDGs, targets and means of implementation are thought of as universal, indivisible and interlinked. Each of the 17 goals has a set of targets. In each set, at least one target involves learning, training, educating or at the very least raising awareness of core sustainable development issues. Education has long been recognized as a critical factor in addressing environmental and sustainability issues and ensuring human well-being. (Table 0.1)

The 2013/14 EFA Global Monitoring Report (GMR) analysed interdependencies and connections between education and other development goals. There is strong evidence of the importance of education and learning in supporting social change, as well as the role of education as a crosscutting means of advancing the 2030 Agenda. Increased educational attainment helps transform lives by reducing poverty, improving health outcomes, advancing technology and increasing social cohesion (UNESCO,

TABLE 0.1:
How education is typically linked with other Sustainable Development Goals

Goal 1	Education is critical to lifting people out of poverty.	Goal 10	Where equally accessible, education makes a proven difference to social and economic inequality.
Goal 2	Education plays a key role in helping people move towards more sustainable farming methods, and in understanding nutrition.	Goal 11	Education can give people the skills to participate in shaping and maintaining more sustainable cities, and to achieve resilience in disaster situations.
Goal 3	Education can make a critical difference to a range of health issues, including early mortality, reproductive health, spread of disease, healthy lifestyles and well-being.	Goal 12	Education can make a critical difference to production patterns (e.g. with regard to the circular economy) and to consumer understanding of more sustainably produced goods and prevention of waste.
Goal 5	Education for women and girls is particularly important to achieve basic literacy, improve participative skills and abilities, and improve life chances.	Goal 13	Education is key to mass understanding of the impact of climate change and to adaptation and mitigation, particularly at the local level.
Goal 6	Education and training increase skills and the capacity to use natural resources more sustainably and can promote hygiene.	Goal 14	Education is important in developing awareness of the marine environment and building proactive consensus regarding wise and sustainable use.
Goal 7	Educational programmes, particularly non-formal and informal, can promote better energy conservation and uptake of renewable energy sources.	Goal 15	Education and training increase skills and capacity to underpin sustainable livelihoods and to conserve natural resources and biodiversity, particularly in threatened environments.
Goal 8	There is a direct link among such areas as economic vitality, entrepreneurship, job market skills and levels of education.	Goal 16	Social learning is vital to facilitate and ensure participative, inclusive and just societies, as well as social coherence.
Goal 9	Education is necessary to develop the skills required to build more resilient infrastructure and more sustainable industrialization.	Goal 17	Lifelong learning builds capacity to understand and promote sustainable development policies and practices.

Source: ICSU and ISSC (2015).

2013, 2014b). It can also enable individuals to better cope with, and reduce their vulnerability to, the dangers associated with climate change.

Education is associated with increased environmental awareness, concern and, in some contexts, action. Across the 57 countries participating in the 2006 Programme for International Student Assessment (PISA) of the Organisation for Economic Co-operation and Development (OECD), students who scored higher in environmental science reported higher awareness of complex environmental issues. The more years of schooling, the more a person’s concern for environmental protection increases, according to results from the World Values Surveys. Educated citizens with greater environmental awareness and concern are more likely to get involved in political action to protect the environment. Education also gives citizens skills needed to adapt to the adverse effects of climate change. Farmers in low income countries are especially vulnerable to climate change. A survey in Burkina Faso, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Niger, Senegal, South Africa and Zambia showed that farmers with more education were more likely to build resilience through adaptation.

The links go both ways. Children living in poverty are more likely to have less education and less access to basic services. Access to clean water and improved sanitation is especially important for girls’ education. It influences their education decisions and generates health gains, time savings and privacy. Sustainable consumption and production patterns, such as improvements to the physical environment, green government regulations and changes in consumer demand for greener products and services, increase interest in education for sustainable development. Tackling climate change is essential for overall progress on the SDGs, including SDG 4. SDG 13 aims to promote urgent action to combat climate change and its impact; sustainable development cannot be achieved without this.

The reciprocal ties between education and many SDGs have not been the focus of sustained research. A review of 40 flagship evidence-based UN reports found relatively weak coverage of links between education and SDGs 12 to 15, which address sustainable consumption and production, climate change, oceans and marine resources, and terrestrial ecosystems (Vladimirova and Le Blanc, 2015). Similarly, the evidence base on constraints and challenges to synergies between SDGs tends to be limited or non-existent. This clear gap in knowledge must be addressed: not only the nexus of links between development sectors, but also any unintended adverse effects between them, should be better understood.

WHAT KIND OF EDUCATION IS NECESSARY?

It is taken for granted that education of good quality can help develop citizens who are capable and mindful, which in turn improves their livelihoods and those of others around them. But the Incheon Declaration makes clear that certain knowledge and skills promote sustainable development more than others. Not all education brings the same benefits to everyone. Time, place, situation and context matter (Harber, 2014).

Some scholars suggest that education systems that focus on preparing young people for a lifetime of work and consumption to serve mainly economic ends have adverse effects (Nussbaum, 2010; Orr, 1994). They argue that without critical reflection on the strengths, weaknesses and ultimate purpose of learning, education systems risk becoming an extension of an unsustainable globalizing economy. This concern is powerfully expressed by John Evans, General Secretary of the Trade Union Advisory Committee to the OECD (2015): 'There are no jobs on a dead planet.'

Education and lifelong learning can support the SDGs with at least two approaches. The first tends to focus on literacy acquisition and retention or on specific knowledge to generate behavioural change, showing that education can facilitate changes in values, world views and behaviour at the level of the individual, the community and society as a whole. This works particularly well when agreement exists on common values and the best and most desirable behaviours, e.g. the idea that reducing food waste and energy consumption is important for sustainability and that people can reduce food waste and conserve energy at home.

The second approach focuses on the development of agency, competencies and participation, showing that education can facilitate reflective or critical learning, knowledge and skills acquisition, and greater agency to address complex sustainability issues, e.g. how to create a sustainable school or a carbon-neutral city. This is particularly important where uncertainty exists over what needs to be done or when context-specific solutions need to be identified through collaborative and iterative processes. Both education approaches are complementary for engendering critical learning and sustainability outcomes.

The transformation needed for a cleaner, greener planet requires integrative, innovative and creative thinking, cultivated jointly by schools, governments, civil society organizations and companies. This collaboration calls for education that goes beyond the transfer of knowledge and desirable behaviours by focusing on multiple perspectives – economic, ecological, environmental and sociocultural – and by developing empowered, critical, mindful and competent citizens. Such education can contribute to the realization of new forms of citizenship, entrepreneurship and governance that centre on the current and future well-being of people and the planet.

READER'S GUIDE TO THE REPORT

In the Incheon Declaration, the international education community affirmed the mandate of the Global Education Monitoring Report (GEM Report) as an independent, authoritative report, hosted and published by UNESCO, to serve as 'the mechanism for monitoring and reporting on ... SDG 4 and on education in the other SDGs, within the mechanism to be established to monitor and review the implementation of the proposed SDGs' (UNESCO, 2015b). Relying on 14 years of monitoring experience as the GMR, the renamed GEM Report will continue to provide reliable, rigorous analysis of global progress on the education agenda through systematic and evidence based reporting.

The 2016 GEM Report, the first of a new 15-year series, shows that education will not deliver its full potential to catapult the world forward unless rates of improvement dramatically shift, and education systems consider sustainable development in the way services are delivered. This PLANET publication is an extraction from the full 2016 Global Education Monitoring (GEM) Report: Education for people and planet: Creating sustainable futures for all. It contains three chapters from that Report: Planet, Prosperity and the chapter on Target 4.7 from the fourth goal in the new 2030 Sustainable Development Agenda.



Here students in Indonesia learn about the animals and plants near the beach. The activity is designed to encourage the students to be more environment friendly.

CREDIT: Nur'aini Yuwanita Wakan/UNESCO

CHAPTER

1

Planet: environmental sustainability

We are determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.

– *The 2030 Agenda for Sustainable Development*



KEY MESSAGES

*Living sustainably requires a huge shift in mindset.
Education has to be part of that change.*

1 Education can help people understand and respond to environmental issues.

- a. It helps develop the right knowledge, skills and technical solutions that can change environmental behaviour.
 - b. Education is clearly shown to be the best tool for climate change awareness.
 - c. Education is the most effective means of curbing population growth.
 - d. Education improves disaster preparedness and reduces vulnerability to climate-related disasters.
 - e. Green schools, well-designed curricula and hands-on learning outside of school can strengthen people's connection with nature.
-

2 Outside of school, we must learn through communities and throughout our lives.

- a. Learning among communities encourages people to reflect on their values, and participate more actively in shifts towards sustainable living.
 - b. Traditional – and specifically indigenous – knowledge, passed down through the generations, is a major resource for adapting to climate change.
 - c. Providing instruction in local languages in school helps knowledge be shared among generations and communities outside school.
-

3 Education systems must be careful not to encourage unsustainable lifestyles.

- a. Learning for economic growth alone will not bring sustainable solutions.
 - b. Education systems and curricula must reflect the critical basis of indigenous communities' knowledge, which rests on deep intercultural respect, along with openness to plurality of knowledge systems and cultures.
-

4 Schools need to take a holistic approach to tackling environmental challenges.

- a. Both teachers and students need to learn about climate change and its underlying causes.
 - b. Pedagogy needs to encourage collaboration and participation.
 - c. Schools need to engage with their surrounding communities.
 - d. Green operations and facilities need to be built.
-

5 The private sector must encourage lifelong learning to fight climate change.

- a. Efforts could include workplace learning, joining in multistakeholder partnerships to develop environmental solutions, reducing companies' ecological footprint, and funding greener schools.

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A conclusive body of evidence built since the 1972 UN Conference on the Human Environment shows that the actions and habits of a single species, *Homo sapiens*, are leading to the planet’s unprecedented dysfunction. An increasing part of the world’s population lives beyond the ecological limits set by earth’s finite natural resources and support systems.

Since human behaviour is clearly the problem, people are responsible for solutions to these planetary challenges. The 2030 Agenda for Sustainable Development emphasizes environmental sustainability issues, the need to transform consumption and production to restore balance to life on land and in water, and the need for urgent action on climate change. Furthermore, environmental sustainability is clearly intertwined with social and economic sustainability, as the challenges surrounding equitable and sustainable use of natural resources affect people’s ability to lead peaceful, stable, prosperous and healthy lives.

The relationship between human development and environmental impact is not straightforward. On the one hand, people living in wealthy countries with higher levels of education are more likely to lead lifestyles that leave a harmful footprint on global ecosystems – from increased food waste to higher levels of carbon dioxide from car and airplane use. On the other hand, increases in environmental education and ecological literacy help people change their personal attitudes and behaviour in everyday ways such as recycling, reducing litter and conserving energy, as well as on issues including water sanitation and public health. This means some, if not

most, kinds of education are effective tools in the fight towards environmental and planetary health.

This chapter outlines pressing environmental challenges and the kinds of policies proposed to move towards environmental sustainability. It explores various ways of understanding responsibility for the human behaviour that has contributed to the looming crisis, then turns to ways in which education and learning can contribute to solutions. Finally, it explores how integrated approaches to lifelong learning can help address climate change.

GLOBAL ENVIRONMENTAL CHALLENGES ARE PRESSING

Many climate scientists believe Earth has entered a new geological era, the Anthropocene, where human activities are undermining the planet’s capacity to regulate itself. Until the Industrial Revolution in the late 1700s, global environmental changes were not strongly linked to human actions. They were essentially the product of slow-occurring natural causes, such as variations in the sun’s energy or volcanic eruptions. But since the start of modern manufacturing, while humans have benefited from increased trade, economic growth and longer, healthier lives, the natural world has suffered environmental deterioration (UNEP, 2012).

The scale and pace of biodiversity loss, land degradation, stratospheric ozone depletion and climate change are attributable to human activities. Humans are responsible for the massive release of carbon dioxide and

other heat-trapping gases into the atmosphere. Human behaviour has caused irreversible damage to some plant and animal species. The variety of vertebrates (mammals, birds, reptiles, amphibians and fish) has declined by 52% since 1970 (McLellan et al., 2014). The largest extinction is happening among freshwater species, mostly due to habitat loss and extensive hunting and fishing.

Experts developed the concept of planetary boundaries as a useful way to describe and measure the environmental limits within which humanity and other living organisms on the planet can safely operate (Rockström et al., 2009). Nine planetary boundaries are monitored via indicators for climate change, biodiversity loss, nitrogen and phosphorus pollution, stratospheric ozone depletion, ocean acidification, global freshwater consumption, change in agricultural land use, air pollution and chemical pollution. Six of the indicators have increased significantly since the pre-industrial era; five have remained at or entered high risk zones (**Figure 1.1**). Since all planetary boundaries are closely linked, these trends indicate a threat to the earth's land, water and atmosphere (Steffen et al., 2015).

HUMAN BEHAVIOUR HAS LED TO ENVIRONMENTAL CRISES

While the general consensus is that humans are responsible for global environmental crises, views differ as to the human-related factors most responsible. Experts have identified interrelated ways in which people are pushing planetary boundaries, each associated with a distinct set of policy options and solutions. This section reviews three of the most common explanations: overpopulation, modern lifestyles and individual behaviour.

The demographic problem

This idea proposes that there are simply too many people on the planet. More people use more natural resources, pushing planetary boundaries into risk zones. The global population tripled between 1950 and

“ The global population tripled between 1950 and 2015

(United Nations, 2015), mainly due to improvement in public health, and is expected to grow by another billion to 8.5 billion in 2030. The population is not

FIGURE 1.1:
Global environmental health faces critical thresholds on several fronts
Nine planetary systems, pre-industrial and current levels

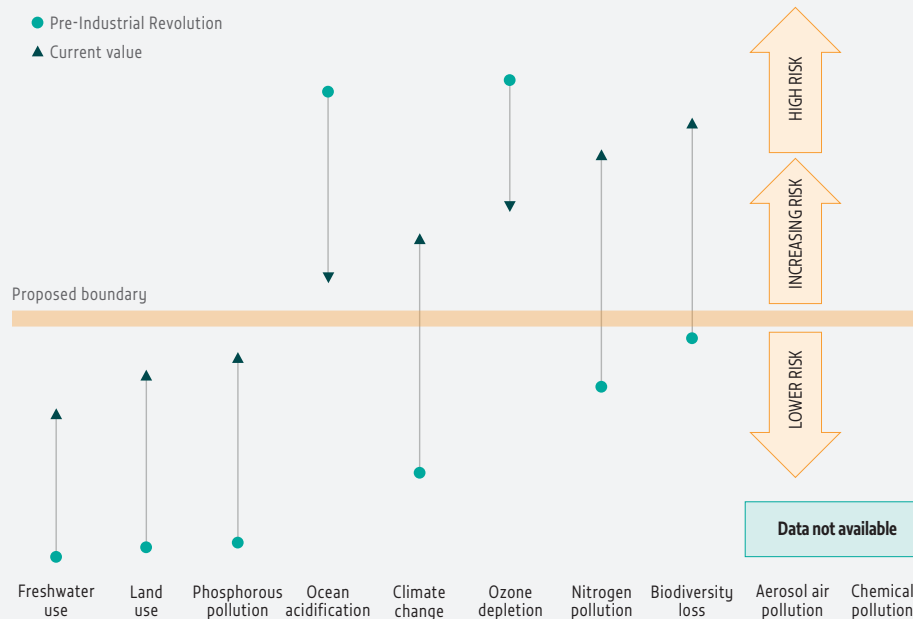


TABLE 1.1:**Population growth is slowing but will remain a challenge in lower income countries***Total population and percentage change, 2000 to 2030 (projected)*

	Total population (millions)			Change 2000–2015	Change 2015–2030
	2000	2015	2030	%	%
World	6 127	7 349	8 501	20	16
Low income	426	639	924	50	45
Lower middle income	2 305	2 916	3 532	27	21
Upper middle income	2 113	2 390	2 567	13	7
High income	1 254	1 373	1 447	10	5
Eastern and South-eastern Asia	2 001	2 222	2 352	11	6
China	1 270	1 376	1 416	8	3
Indonesia	212	258	295	22	15
Southern Asia	1 452	1 823	2 147	26	18
India	1 053	1 311	1 528	24	17
Pakistan	138	189	245	37	30
Bangladesh	131	161	186	23	16
Europe and Northern America	1 041	1 097	1 131	5	3
United States	283	322	356	14	11
Russian Federation	146	143	139	-2	-3
Sub-Saharan Africa	641	961	1 306	50	36
Nigeria	123	182	263	48	44
Latin America and the Caribbean	522	629	716	21	14
Brazil	176	208	229	18	10
Mexico	103	127	148	24	17
Northern Africa and Western Asia	340	463	584	36	26
Caucasus and Central Asia	71	84	96	18	15
Pacific	30	38	46	27	21

Notes: Data for 2030 are projections based on a median prediction interval. Regions and countries are listed by descending order of population in 2015. The countries listed are the ten with the largest populations in 2015.

Source: United Nations (2015).

evenly distributed: Nearly three-fourths of the increase will take place in low and lower middle income countries, especially in sub-Saharan Africa and Southern Asia (**Table 1.1**).

Not only are there more people, but they are also on the move. Two kinds of migration put pressure on the relationship between population and resources: internal migration from rural to urban areas and international migration from poor to wealthy nations. By 2050, two out of three people on the planet will live in urban areas; a large portion of future urbanization will be caused by rural–urban migration (Buhaug and Urdal, 2013). It will take place mostly in countries and regions where urbanization may cause serious environmental problems in cities including water scarcity and contamination, land shortage, polluted air and insufficient sanitation.

Meanwhile, high income countries received an average of 4.1 million net migrants annually from poorer countries between 2000 and 2015 (United Nations, 2015), a trend expected to continue. People living in urban areas and wealthier countries consume more resources per

person (UNEP, 2012), so these trends will put more stress on environmental systems.

The modern lifestyles problem

This approach focuses on the fact that people in urban areas and wealthier countries choose lifestyles entailing less environment-friendly consumption patterns. Resource consumption can be measured through the ecological footprint indicator, a calculation of a country's use of land and water resources compared to the stock of those resources (Ewing et al., 2010).

In 2012, most high income countries had an unsustainable ecological footprint, except those with very low population density. Most middle income countries of Eastern and South-eastern Asia, Northern Africa and Western Asia, and Southern Asia also had a deficit, particularly China. In sub-Saharan Africa, countries with large populations or middle income levels had a deficit. The only region where most countries lived within their environmental means was Latin America, owing to its lower population density and large biocapacity. With some exceptions, available natural resources per capita declined rapidly over 2000–2015,

so that even countries with natural reserves in 2012 are expected to start running a deficit during 2015–2030 (Ewing et al., 2010; Global Footprint Network, 2016).

There is a clear relationship between modern lifestyles and resource consumption. Countries that perform better on the Human Development Index, measured in terms of education, living standards and health, are much likelier to have a much larger ecological footprint (**Figure 1.2a**).

The countries with the largest ecological footprints are mostly in Europe and Northern America. Countries that have experienced rapid increases in education, health and living standards, including the Republic of Korea and Singapore, have seen their ecological footprint nearly double as domestic consumption has expanded. In contrast, countries with low levels of human development, mostly in sub-Saharan Africa, have smaller ecological footprints. For instance, the ecological

footprints of Eritrea and Timor-Leste are less than 5% the size of the largest footprints.

Countries struggle to find balance between human development and sustainable practices. Some, including Cuba, Georgia, the Republic of Moldova and Sri Lanka, have begun to find it, managing to keep production and consumption within sustainable bounds (**Figure 1.2b**). Their citizens have relatively good health prospects, with life expectancy between 68 and 79 years. People go to school for 10 to 12 years, well above the global average of 8 years. Yet, their per capita income is less than the global average, from US\$5,200 a year in the Republic of Moldova to US\$9,780 in Sri Lanka (UNDP, 2015b).

It should be noted that the condition of a country's local environment is not taken into account in comparisons of human development and ecological footprints. Resources are not distributed evenly among countries or even among regions within countries. As a result, it may be

FIGURE 1.2A:

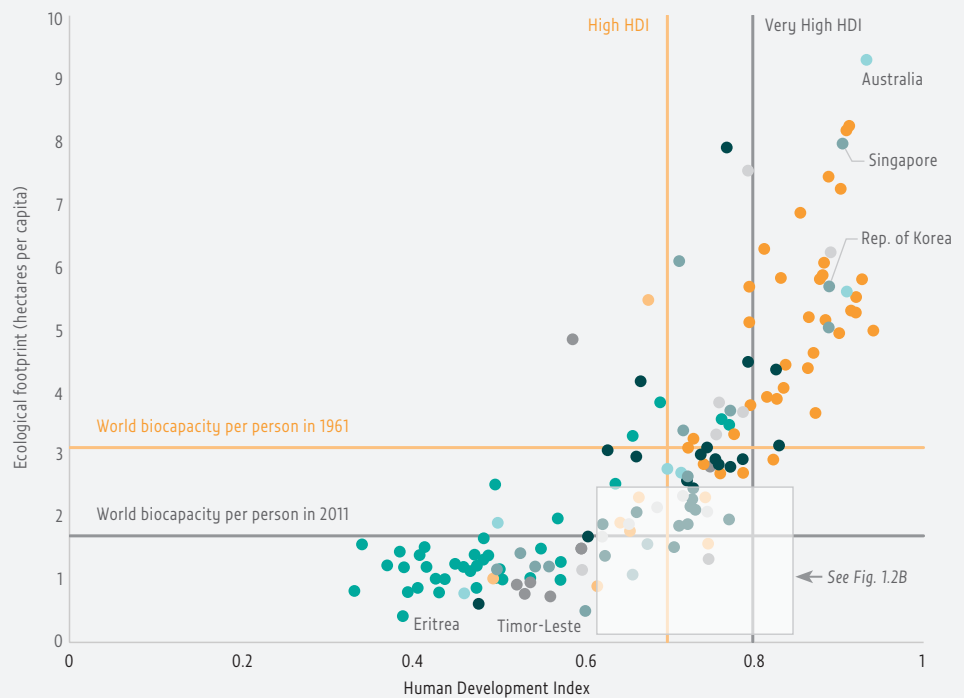
High levels of human development have come at an ecological cost
Total ecological footprint by Human Development Index, by country, 2012

An **ecological footprint** of less than 1.7 global hectares per person, given current population and available productive land and sea area (biocapacity), is sustainable; the earth can replenish a country's resource use.

The **Human Development Index** (HDI, by the UN Development Programme) measures a country's average achievements in health, knowledge and standard of living. An HDI value of 0.8 or more indicates very high human development.

Singapore's high HDI (0.91) is associated with a large ecological footprint per capita (7.97). This means that people in Singapore, although living a good life, also have high resource demand.

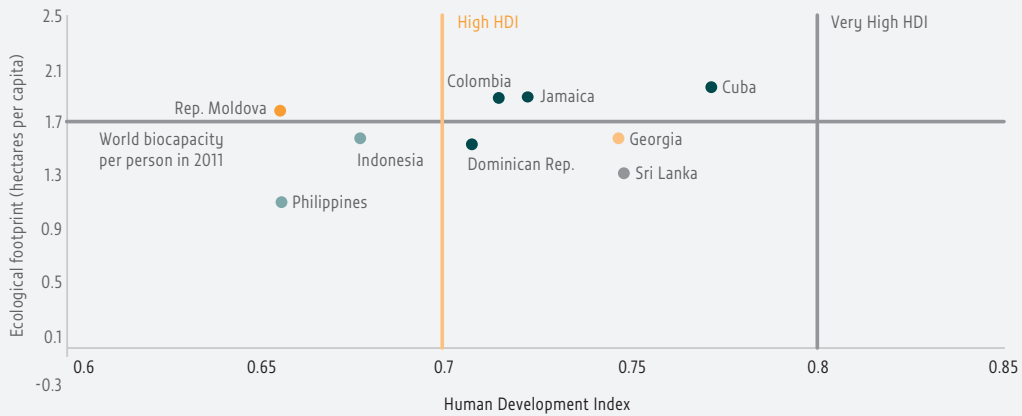
- Caucasus and Central Asia
- Eastern and South-eastern Asia
- Europe and Northern America
- Latin America and the Caribbean
- Northern Africa and Western Asia
- Pacific
- Southern Asia
- Sub-Saharan Africa



Source: GEM Report team analysis based on data from Global Footprint Network (2016).

FIGURE 1.2B:

Some nations have raised the quality of human development while maintaining a low ecological footprint
Total ecological footprint by Human Development Index, by country, 2012



Source: GEM Report team analysis based on data from Global Footprint Network (2016).

easier for some countries, such as Colombia and Finland, to stay within the limits of their available resources than for others, such as Mongolia and Sudan.

The individual behaviour problem

A third explanation focuses on individuals as both the source of environmental problems and their solution. Yet, there is a mismatch between the scale of environmental problems, usually measured globally, and the scale of solutions, generally discussed at the individual or community level. While the impact of human behaviour on the environment can be seen on a large scale, it is necessary to analyse the individual level to see how this impact can be reversed through changes in personal behaviour. More careful analysis at the individual level can help identify factors that encourage or discourage particular types of behaviour.

Proponents of this approach believe large-scale change happens by targeting and influencing individual behaviour – getting individuals to buy fuel-efficient cars, insulate their homes and the like (Swim et al., 2011). Often, individual actions are interdependent. Adopting one type of environment-friendly behaviour can prompt adoption of others or deter negative behaviour, though it can also increase environmentally harmful behaviour (e.g. switching to hybrid cars may encourage people to drive more, offsetting emission reductions). Individual actions can also reflect social norms and cultural values. For example, in a European programme to increase the

use of carpool lanes, those who chose not to carpool often said they valued flexibility over reduced costs or emissions per person (van Vugt et al., 1996).

Because individual actions are interdependent and because they reflect social context, it is important to not only encourage behaviour change, but also provide people with the full set of knowledge, skills and attitudes they need to make comprehensive changes.

DIFFERENT PROBLEMS IMPLY DIFFERENT POLICY SOLUTIONS

The fact that experts emphasize different problems and come from varying perspectives affects their views on the solutions needed to resolve environmental crises.

Some believe technological innovations, such as renewable energy sources, sustainable infrastructure and cleaner production practices, are the answer. Others believe that since Western development trajectories have often caused environmental degradation, lower income countries need to find ways to avoid such paths while still improving quality of life. Those who believe population growth is the major driver of environmental challenges focus on ways to reduce fertility in poor countries, especially in sub-Saharan Africa.

There has also been a strong focus on making the problem an individual one, arguing that societies’ success

in responding to environmental challenges is based on how individuals act, separately and collectively. Proponents of this view believe that when individuals gain more knowledge and when behaviour change is in their self-interest, they start using their power as consumers and voters to support behaviour compatible with sustainable outcomes (Tietenberg and Lewis, 2012).

While differing perspectives on the problems lead to a range of proposed solutions, meeting the Sustainable Development Goals (SDGs) requires recognizing the need for cooperation and solidarity, despite contextual and ideological differences. All people in low and high income countries have to contribute in their own ways to ensure

“ Meeting the SDGs means that all people in low and high income countries have to contribute in their own ways to ensure environmental sustainability for all

environmental sustainability for all. Changing the population pressure faced by the world requires significant emphasis on improving life chances and reducing inequality between and within countries. Changing how economies function,

whether through technological innovation or using local solutions, requires commitment at the national level, with global and local actors also doing their share. The most important task is to recognize that revolutionary changes in lifestyle, not just incremental adjustments, are required (Senge et al., 2008).

TO MEET THESE CHALLENGES, LEARNING IS ESSENTIAL

Education has a key role to play in addressing environmental challenges, whether their cause is believed to be economic or demographic, or global, national or individual actions. Education can be used to mitigate specific environmental issues and respond to their impact, but also to address the behaviour that causes them.

For example, education, especially of girls and women, is the single most effective means of curtailing population growth, by increasing people's autonomy over fertility-related decisions and delaying pregnancy

(see Chapter 3). And education not only improves livelihoods by increasing earnings, but also produces the literate and skilled workers who are essential to ensure the technological transformation of economies and food systems (see Chapter 2).

This section discusses the ways in which education can influence individual and collective environmental behaviour through contemporary, traditional and lifelong approaches to learning: formal education, learning within communities, media and public awareness campaigns, and leadership in a wide range of sectors. Also shown is the need to learn from traditional knowledge systems and local communities.

CONTEMPORARY APPROACH: LEARNING THROUGH SCHOOLING

The primary contemporary approach to addressing environmental challenges via education is through formal schooling. Education helps students understand an environmental problem, its consequences and the types of action required to address it. With improved environmental and ecological literacy, students are more inclined to change behaviour affecting environmental issues. Examples include school-led awareness-raising campaigns and programmes on recycling, minimizing litter, conserving energy and improving water, sanitation and public health. Environmentally literate students are better equipped to see the links between specific issues and global environmental change. Formal education supplies the knowledge, vocabulary and key concepts required for environmental literacy, as well as the historical and philosophical background.

Three main types of relevant education programmes have been identified since the 19th century – nature conservation education, environmental education, and education for sustainable development – each pointing to the connection between humans and the planet (Wals, 2012). Each type is associated with a distinct period and focal area – connecting and reconnecting people with nature, developing ecological literacy to change environmental behaviour and lifestyles, and now capacity-building for sustainable development and global citizenship (Table 1.2). The trend shows increased awareness of the direct links between the environment, lifestyle and livelihoods, and a shift towards incorporating environmental education into the formal school curricula through education for sustainable development.

TABLE 1.2:
Environmental education has evolved over the years
Three types of contemporary environmental education

	Nature conservation education	Environmental education	Sustainability education
Starting period	Late 19th century	Late 1960s, early 1970s	Early 1990s
Main focus	Connecting with nature, understanding web of life, protecting species, raising awareness, knowledge and understanding	Raising environmental awareness about pollution of water, soil and air	Increasing citizen engagement, participation in sustainable development issues and increasing understanding of connections between environment, economy, culture and ecology, and how today's actions affect future generations
Intended impact	Ecological literacy, societal support base for nature conservation through national parks	Changing individual environmental behaviour, developing agency and societal support for environmental legislation	A more holistic or integrated approach of dealing with issues around water, food, energy, poverty and biodiversity, in governance, education and business
Examples	Visitor centres in national parks, public awareness campaigns, nature programmes in schools, school gardening	Environmental education centres in cities, public awareness campaigns, school curricula, teacher training	Multistakeholder platforms focusing on sustainable development issues, whole school approaches to sustainability, corporate social responsibility

Source: Wals (2012).

A *Global Education Monitoring Report (GEM Report)* analysis of 78 national curricula shows that topics associated with sustainable development are widespread – although sometimes framed and defined differently depending on the country – and generally draw on similar types of content: 73% of countries mention ‘sustainable development’, 55% use the term ‘ecology’ and 47% ‘environmental education’ in their curricula. These concepts are embedded in various parts of the curricula.

Some countries have prioritized environmental education programmes. In India, for example, environmental education was mandated by the Supreme Court in 1991, and in 2003 the government directed the National Council of Educational Research and Training to produce extensive content on environmental education (Centre for Environmental Education, 2015). As a result, over 300 million school students in the 1.3 million schools currently receive some environmental education training (Gardiner, 2015).

Evidence shows that curricular design affects student knowledge. In the 2006 Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) test of ‘science competencies for tomorrow’s world’, students in Estonia and Sweden – where sustainable development content is in the curricula – were more likely to answer questions about environmental science correctly than their peers in countries at similar development levels (see Chapter 16).

In 62% of 119 countries covered by the Gallup World Poll conducted in 2007 and 2008, education level and beliefs about the cause of climate change were often

the top predictors of climate change awareness and risk perception (Lee et al., 2015). People with more schooling were better able to identify various environmental issues in 70 out of 119 countries. People with access to communication tools were also more aware, demonstrating the growing importance of information and communications technology in environmental education.

Schooling improves sustainability-related knowledge, skills and attitudes

Education not only increases knowledge and awareness but also improves skills and enables individuals to make better, more environmentally informed decisions.

“ In 31 countries, more education increases the chance that people will express concern for the environment ”

Evidence from the 2010 International Social Survey Programme (ISSP) on 31 mostly high income countries shows that each step on the education ladder, from primary to lower secondary, upper secondary and tertiary education, increases the chance that people will express concern for the

environment, even after taking into account factors such as wealth, individual characteristics and political affiliation (Franzen and Vogl, 2013).

People with more education are also more likely to follow up environmental concern with activism to promote and support political decisions that protect the environment. Analysis of the 2010 ISSP finds that in almost all participating countries, respondents with more education were more likely to have signed a

petition, given more money or taken part in a protest or demonstration in relation to the environment over the previous five years. In the Republic of Korea, one of the countries with the highest emission levels, the influence of education is apparent: 19% of respondents with secondary education had taken such political action, but 30% of those with tertiary education had done so (Clery and Rhead, 2013).

Schooling also teaches values, helping students develop a sense of place, reconnect with nature and build agency and competencies. Place-based experiences such as school garden programmes can build an emotional connection with both the urban and the natural world (Anderson, 2013; Gruenewald and Smith, 2008; Theimer and Ernst, 2012). Direct contact with the land and the living environment, and tangible exposure to the relation between humanity and nature in terms of impact and interdependency, have been key to programmes' success (Mackenzie et al., 2014; Rickinson et al., 2004). In India the concept of "handprint" was developed to emphasize positive actions in support of sustainability, in contrast to traditional environmental discussions on global footprints. The Paryavaran Mitra programme, launched in 2010, builds on this concept by promoting the value of a learning by doing. It developed a network of young 'friends of the environment' and currently reaches over 220,000 schools as well as government and civil society partners (Centre for Environmental Education, 2015).

In younger age groups, overemphasis on awareness of global issues can overshadow teaching of knowledge and skills needed to respond to and engage with local environmental issues and to maximize personal impact. PISA 2006 found that while students in OECD countries had a high sense of personal and social responsibility on environmental issues, they were not optimistic – only 13% to 21% believed the overall situation would improve in the next 20 years (OECD, 2009). As environmental problems can easily lead to feelings of apathy and powerlessness, it is critical for education to develop students' agency, environmental problem-solving abilities and competencies to bring about real change in their own community and everyday lives (Anderson, 2013).

Finally, studies show that engagement in out-of-school environmental activities strengthens in-class performance. The 2009 International Civics and Citizen Survey reported that two-thirds of students in 38 countries had participated in out-of-school civic activities (Schulz et al., 2010). Environmental

organizations were the most common, involving about 30% of students – and more than 50% in Colombia, the Dominican Republic, Guatemala, Indonesia and Thailand. In the Republic of Korea, students who studied and tackled real-life environmental issues tended to perform well upon entering university. And as the place of learning was shifted out of school, beneficial partnerships were created between environmental organizations and school education (UNESCO, 2014).

Leading by example: whole schools

As students spend significant time in the classroom, schools and universities are increasingly called upon to act as role models for sustainable development. The education sector can set an example in environmental stewardship. The 'whole school' approach to environmental education incorporates all aspects of a school: curriculum, extracurricular activities, teacher training, human resources and infrastructure operations and processes (McMillin and Dyball, 2009). The UNESCO International Bureau of Education describes the 'whole school' approach as 'addressing the needs of learners, staff and the wider community, not only within the curriculum, but across the whole-school and learning environment' and says it 'implies collective and collaborative action in and by a school community to improve student learning, behaviour and wellbeing and the conditions that support these (UNESCO-IBE, 2013).'

Aiming to make schools safe, climate-compatible and sustainable, this approach encourages institutions to change buildings, grounds and school schedules accordingly, and to engage with the local community

“ Whole school approaches in England have improved schools' ethos and students' health and learning, and reduced schools' ecological footprints ”

(Anderson, 2012). In addition to rethinking curricula (are emerging subjects and concepts covered and new competencies being taught?), the 'whole school' approach implies reconsidering and redesigning schools' operations and environmental management (does the school conserve water

and energy, provide healthy food, minimize waste and provide green and healthy school grounds?), pedagogy and learning (are teaching, learning and participation in decision-making adequate and appropriate?) and

community relationships (does the school connect with community issues and resources?).

Research on the impact of whole school approaches in England (United Kingdom) has shown improvements in schools' ethos and students' health and learning, and reductions in schools' ecological footprints (Hacking et al., 2010). Unfortunately, however, while the approach is growing in popularity, it remains the exception rather than the rule (Hargreaves, 2008).

At the university level, the International Association of Universities, through its Higher Education for Sustainable Development initiative, promotes sustainability on campuses, including in business and community outreach, student engagement, management, institutional development, research and curriculum. One member, Ryerson University in Toronto, Canada, has developed a Campus Facilities and Sustainability programme to refocus the campus's efforts on developing sustainable operating practices and capital investment strategies (IAU, 2015).

TRADITIONAL APPROACH: LEARNING THROUGH COMMUNITY

While schools are one of the main sources of knowledge on sustainability, formal education does not reach everyone. Thus, another approach is important: learning through community, as done traditionally for generations. Often the groups left behind have the least access to typical resources. Local communities and traditional knowledge hold the key to reaching such groups. Local communities are much more than towns or villages; they are living entities that involve interaction of people with their local environment (Noguchi et al., 2015).

Traditional – and specifically indigenous – knowledge plays an important role in environmental sustainability.

“ Passed from generation to generation, traditional indigenous knowledge has been the basis for activities that sustain societies in much of the world

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Indigenous knowledge is local knowledge that is unique to a culture or society (Magni, 2016).¹ Passed from generation to generation, usually by word of mouth and rituals, it has been

the basis for agriculture, food preparation, health care, education, conservation and many other activities that sustain societies in much of the world.

Indigenous people are the 'first' or 'original' people belonging to land or territories to which they are historically and culturally tied. About 370 million indigenous people live in over 90 countries worldwide (United Nations, 2009). Indigenous communities are stewards of traditional environmental knowledge, which sees nature as a living being and describes a reciprocal, interdependent, balanced and complementary relationship between humanity, nature and the universe. Traditional knowledge is dynamic, representing generations of creativity, innovation, and scientific and logical validity (Battiste, 2002; Maurial, 2002).

Most indigenous peoples share norms and values that are central to sustainable livelihoods (**Box 1.1**). Fundamental

BOX 1.1

Governments have adopted local community practices of *buen vivir*

In Latin America, the idea of *buen vivir* (living well) has been considered by academics, indigenous leaders, communities and politicians as a guiding principle for a new development regimen, incorporating the vision of indigenous peoples as well as traditional knowledge, that must be carried out collectively. Indigenous leaders in the region say *buen vivir* can be considered 'a contribution from indigenous populations to the world'.

Among *buen vivir* principles common to indigenous groups across the region is a relationship between humans, nature and the universe in which nature is considered a living being and has an indissoluble, interdependent, balanced and complementary relationship with the universe and with humans. The ideas of community and communitarianism are also important. The community, rather than the individual, is the main reference for natural and cultural property. Harmony within indigenous communities is reached through a system of equality and respect for all members but particularly women and elders as the primary holders and transmitters of traditional knowledge.

There are unique national and local manifestations of *buen vivir*. Two of the best-known national approaches are those of the Plurinational State of Bolivia and Ecuador. The Kichwa concept *sumak kawsay*, adopted in the 2008 Ecuadorian Constitution, and the Aymara concept *suma qamaña*, adopted in the 2009 Bolivian Constitution, mean living well, in harmony with nature and the universe. The Aymara concept has more emphasis on communitarian life: living well together. In Panama, at the local level, the Ngobe people use the expression *ti ñüle kûin*, which means be happy, live well, with good health, free from concerns and in harmony with nature. In Chile, the Mapuche indigenous group uses the expression *küme mongen*, which refers to a good life resulting from a balanced relationship between a person, the environment and the supernatural.

Sources: Cunningham (2010), Gudynas (2011a).

to these values are notions such as community, equality and complementarity (Gudynas, 2011a; Ibañez, 2011), where the fundamental conditions of well-being are sufficient food; strong family and community values of caring, reciprocity and solidarity; freedom to express one's identity and practise one's culture; and a safe, unpolluted environment (Tauli-Corpuz, 2010).

Indigenous peoples live in some of the most vulnerable ecosystems. Ranging from the Arctic, high mountains, floodplains and tropical rainforests to desert margins, small islands and low coastal areas, indigenous territories are directly affected by the ecological crisis that has brought climate change and loss of biodiversity. Despite hostile conditions, many indigenous peoples thrive, finding ways to resist and adapt to environmental changes, mainly due to their deep knowledge of and relationship with the environment (Nakashima et al., 2012).

Numerous examples of indigenous communities' traditional land management practices are being recognized globally for conserving biodiversity and maintaining ecosystem processes. Conservationists and researchers acknowledge the huge scale of biodiversity-rich terrestrial and marine habitats that are successfully managed outside government-designated protected areas. Estimated to be roughly equal to the size of total protected areas, indigenous and community-conserved areas and sacred natural sites are often managed as well as or more effectively than comparable government-managed areas. For example, research shows that such sites have been more effective in tackling rainforest deforestation by reducing logging and forest fires, thus contributing to rainforests' critical functions as biodiversity hotspots and carbon sinks, places that absorb more carbon than they release (ICCA, 2015).

The practice of sustainable traditional livelihoods is a testimony to indigenous peoples' resilience and their contribution to mitigating the impact of climate change (UNPFII, 2008). It was pointed out at the 2009 Asia Summit on Climate Change and Indigenous Peoples that indigenous groups have applied traditional knowledge to agriculture, agroforestry, coastal and river management, medicinal plants, water management and harvesting, and disaster management, among other areas (Tauli-Corpuz et al., 2009).

Notions like *buen vivir* offer an important contribution to today's world in crucial aspects such as social organization and economic structure. Harmony

between humanity, nature and the universe can be used as a key principle for activities related to resource production and management. However, the discourse remains philosophical in some countries, even the Plurinational State of Bolivia and Ecuador, despite inclusion in their constitutions. On the other hand, Colombia's Council of Sustainable Settlements of the Americas is putting the concept into practice, for example in urban eco-barrio projects, transition towns, traditional sustainable villages, eco-caravans and sustainability education centres (Cunningham, 2010; Gudynas, 2011b; Tauli-Corpuz, 2010).

Traditional, local and indigenous knowledge have proved valuable for the functioning of ecosystems, early warning systems related to disasters, climate change adaptation, and resilience (Sheil et al., 2015). Integrating place-based knowledge with scientific climate models is valuable, as place-based approaches to climate issues can 'bring another level of awareness to consumer societies', and make them more resilient against disasters (Leduc and Crate, 2013).

Lessons from culturally integrated schools

The world can learn from indigenous communities' best practices. The latest Assessment Report of the Intergovernmental Panel on Climate Change identifies indigenous and traditional knowledge as a major resource for adapting to climate change. It highlights the need to integrate such knowledge with existing practices to increase the effectiveness of adaptation (IPCC, 2014). The success of many programmes has rested on deep intercultural respect, along with openness to a plurality of knowledge systems and cultures based on shared fundamental values (Leduc and Crate, 2013; Marika et al., 2009).

Intergenerational learning is critical to integrating traditional knowledge into contemporary society. Traditionally, elders are the custodians of indigenous knowledge and consequently the most valuable source of transmission (Dweba and Mearns, 2011). Successful education initiatives, such as the Alaska Rural Systemic Initiative in the United States, foster interaction of students with indigenous elders. For example, elders play a central role in instructional planning, curriculum design and programme implementation in culturally responsive schools, and lead activities related to knowledge transmission in cultural camps (Barnhardt, 2008).

One crucial way to incorporate traditional knowledge into schools is using the local language as the language of instruction. In Botswana, the Bokamoso preschool

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One crucial way to incorporate traditional knowledge into schools is using the local language as the language of instruction
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programme provides teacher trainees with a system of nature-based educational tools incorporating the traditional knowledge of the San, a major indigenous group in the region. The curriculum of Bokamoso Teacher Training Centre was

developed collaboratively over two years by a team of parents, community members, curriculum experts and members of non-government organizations (NGOs). The project provides trainees with the tools they need to teach pre-school in the San language (Batibo, 2013). Using the mother tongue as the language of instruction has a positive impact on learning across the curriculum, not only in languages (UNESCO, 2016).

The strong Western focus of education systems and institutions around the world impedes meaningful inclusion of indigenous populations and their knowledge and practices within the formal schooling system. Factors involved include curricula that lack local relevance and devalue indigenous knowledge; use of the dominant language for instruction instead of the home language (Batibo, 2009); standardized assessment strategies (Barnhardt and Kawagley, 2005); and faculty attitudes about curricula (Radoll, 2015). These factors often clash with traditional teachings (Nakashima et al., 2012).

Research has documented how formal schooling systems have resulted in the loss of significant background knowledge about nature, culture and values that indigenous children previously acquired in their communities. Examples from countries including Australia, Canada and the United States show an unquantifiable loss of indigenous knowledge from the beginning of the 20th century, when indigenous children were sent to residential schools or put up for forced adoption in an attempt to assimilate them into the dominant society (Reyhner and Eder, 2015). Separating them from their families and consequently from their cultural roots caused ‘irreparable harm to the survival of indigenous cultures and societies’ (Stavenhagen, 2015, p. 255).

However, while education can cause loss of indigenous knowledge, it can also be a cure (UNESCO, 2009). It is essential to foster dialogue and create partnerships

between indigenous populations, civil society, government, development partners and management agencies, as well as scholars from a range of disciplines, to promote conservation of indigenous knowledge and its integration in various initiatives (Gorjestani, 2004).

LIFELONG LEARNING APPROACH: LEARNING THROUGH WORK AND DAILY LIFE

Environmental change requires other types of learning than formal schooling or traditional education in communities. People must act and contribute to environmental sustainability at all stages of their lives, so learning that takes place through work and daily life is crucial.

Lifelong learning comprises all learning activities undertaken throughout life with the aim of improving knowledge, skills and competencies within personal, civic, social and employment-related perspectives (UIL, 2015).

A lifelong learning approach focuses not only on curricula but also on intergenerational knowledge and values created by the community. It fosters synergy and connections between groups in society to tackle environmental challenges. Government agencies, faith-based organizations, non-profit and community groups, labour organizations and the private sector can all contribute to lifelong environmental education.

Governments and intergovernmental bodies

Governments have an important role to play in educating the public about environmental change. Government-backed campaigns raise awareness on an environmental problem, point to its underlying drivers and signal how stakeholders can address it and bring about meaningful change. Public awareness campaigns are most effective when they target groups with shared values and engage with community leaders to convey key messages (Stern, 2007). In 2015, for example, the Ethiopian Ministry of Water, Irrigation and Energy and other partners launched a two-year public awareness campaign aimed at encouraging solar lighting products. Targeting over 12 million Ethiopians, the campaign aimed to discourage households from using kerosene lamps and help them make informed decisions for purchasing off-grid lighting (World Bank, 2015).

A related initiative, Lighting Africa, has enabled more than 35 million people across Africa to have clean, affordable, safe lighting and energy. Currently operating in Burkina Faso, the Democratic Republic of the Congo,

Ethiopia, Kenya, Liberia, Mali, Nigeria, Senegal, South Sudan, the United Republic of Tanzania and Uganda, the programme addresses the lighting needs of rural, urban and suburban consumers without electricity access – predominantly low income households and businesses. It offers an alternative to kerosene lamps and candles, the most commonly used lighting sources among those without grid electricity. The programme has helped households reduce carbon dioxide emissions by about 700,000 tonnes, the equivalent of getting 147,000 cars off the road (World Bank, 2016).

The United Nations University Institute for the Advanced Study of Sustainability launched the first Regional Centres of Expertise (RCEs) on education for sustainable development in 2003 (Fadeeva et al., 2014). RCEs bring together regional and local institutions, build innovative platforms to share information and experiences, and promote dialogue among regional and local stakeholders through partnerships for sustainable development. By 2015, 138 RCEs around the globe were demonstrating the potential of multistakeholder learning and networking between schools, universities, local government, civil society groups and the private sector (IAU, 2016).

One example, RCE Minna, is located in Nigeria's North Central geopolitical zone, a largely rural and agrarian region with low population density and a variable climate. RCE Minna teaches educators, students, youths and community leaders to better manage their natural environment so as to ensure sustainable development in Niger state and its environs in a context of high unemployment and poverty rates, environmental degradation, poor sanitation and waste management systems, poor soil management, poor education, flooding, deforestation and declining freshwater resources (Fadeeva et al., 2014).

Religious and cultural leaders

Religious, cultural and social leaders can help spread environmentally sound values and behaviour (Zaval and Cornwell, 2015). Social incentives and peer pressure

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Religious, cultural
and social leaders
can help spread
environmentally sound
values and behaviour

based on shared values
and norms drive
consumption choices
and environmental
behaviour. Leaders and
role models can shape
social aspirations and
provide models for
sustainable behaviour.

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Religious leaders are often skilled and insightful in using communication techniques to effect behaviour change, especially at the local level. In the United States, the Take Charge Challenge encouraged community members to reduce energy use by making homes more weather resistant and energy efficient. Rather than using conventional awareness-raising techniques, the initiative relied on religious leaders to appeal to community members' values. Local leaders successfully tied green initiatives into deeply held spiritual beliefs and encouraged households to make the right moral choice. It is estimated that communities saved 110.2 billion British thermal unit (Btu) of gas and electricity, about US\$2.3 million in energy savings (Fuller et al., 2011).

Greener businesses and workplaces

People spend a great amount of time in the workplace, making it a useful location for informal and non-formal education. Over the past two to three decades, a series of corporate initiatives have been launched to reduce companies' ecological footprint and educate staff and the public about environmental protection. In addition to cutting costs and improving a company's reputation, initiatives in the realm of corporate social responsibility (CSR) help raise environmental awareness internally and externally.

In a 2008 Economist Intelligence Unit survey, over half of all the global executives who responded considered CSR a high or very high priority – up from 34.1% in 2005 (The Economist, 2008). Over 40% said it was important for their companies to align sustainability with their overall business goals, mission or values (McKinsey, 2014). Allianz Insurance, an international financial services group employing over 148,000 people, publicly committed to a 35% reduction of its 2006 carbon footprint by 2015. To reach its objective, it 'greened' its IT hardware purchasing policy, reduced unnecessary travel and imposed double-sided printing (TUC, 2014). Unilever developed a plan to improve environmental impacts throughout the entire supply chain; it reduced manufacturing carbon emissions by one third while increasing sustainable agricultural sources from 14% to 48% between 2010 and 2014 (The Economist, 2014). Initiatives such as these not only help reduce a company's carbon footprint but also encourage employees to adopt more sustainable practices outside the workplace.

In addition to preserving the environment, manufacturers' and retailers' decisions to market organic products, use environmentally sustainable packaging, ban plastic

bags (**Box 1.2**) and inform consumers about how goods are produced contribute to consumer education and subsequent shifts in habits, allowing consumers to make decisions according to their values and preference (BIO Intelligence Service, 2012; Hertwich, 2003).

Labour organizations can play a key role in mainstreaming and transitioning towards more sustainable practices in the workplace. At the international level, the International Labour Organization (ILO) has an International Training Centre in Turin that delivers a course for worker representatives called 'Green jobs for a just transition to low-carbon and climate-resilient development' (ILO, 2016). Its purpose is to educate labour representatives from around the world about the links between environmental challenges and the world of work, distil lessons and good practices, and explore ways of promoting environmentally sustainable policies adapted to be nationally relevant and socially inclusive.

BOX 1.2

Leading by example: nudging people to act green

'Nudging' is a way of influencing behaviour. In sustainability nudging, more sustainable behaviour is made the default option. The government and private sector can work together to make environment-friendly goods and services the 'green default' for consumers. Positive trends can rapidly be normalized, shifting responsibility to those who actively wish to behave unsustainably. Nudging can also help overcome cognitive bias such as a preference for the status quo, where any change from baseline is perceived as a loss. Nudging can be considered educational when there is transparency and when the desired change is supported by knowledge and information about why the change is deemed important. When there is no transparency, nudging can become manipulation, which may lead to desirable environmental outcomes but is not socially sustainable.

For sustainability nudging to work, the government, public and private sector have to work well together and share a vision of reducing emissions and improving energy efficiency. In Schönau, Germany, a utility provider made its green energy programme the default option, resulting in more than 90% enrolment. Residents could opt out, but few chose to do so. By contrast, participation in clean energy programmes in other German towns was low: Less than 1% of customers chose to participate through voluntary means in 2008, the time of the study.

Source: Zaval and Cornwell (2015).

National and local trade unions also contribute to environmental education. In Argentina, the Construction Workers' Union provides environmental training courses to its members on topics such as solar panel installation, solar cooker construction, and waste management and recycling. A certificate is granted upon successful completion of a course (Fundación UOCRA, 2009).

Non-government organizations

NGOs can mobilize public support for environmental conservation. In countries with poorly resourced formal education sectors, they may be the main source of environmental education. Through public information campaigns, projects on the ground, partnerships and green alliances, NGOs substantially contribute to the shaping of public environment-related behaviour. Their strength, compared to other groups and the formal education sector, lies in their ability to deliver environmental education using more informal methods and channels.

“ NGOs, such as Avaaz, can effectively mobilize public support for environmental conservation. ”

The internet is a crucial, efficient tool for many NGOs (Brulle, 2010). Web-based campaign groups like Avaaz help raise awareness and mobilize 'clicktivists' across the globe. With 44 million members in 194 countries, Avaaz is at the centre of many high profile environmental campaigns.

In 2013, for instance, it launched a two-year campaign to ban bee-killing pesticides in the European Union. The campaign included a petition with over 2.6 million signatures, media-grabbing protests with beekeepers, the funding of opinion polls and the flooding of ministers with messages (Avaaz, 2013).

Senegal's Mekhe Solar Cooker Project, implemented by the Ndop Women's Association, is an example of NGOs' contribution to environmental education. From October 2004 to September 2006, it aimed to reduce environmental degradation by replacing wood-burning stoves with solar cookers. Various modes of education and training were used: Some villagers were trained to build the cookers, others to promote their use. A DVD movie and visits to nearby communities were used to engage households. Each family saved, on average, 3 metric tonnes of carbon dioxide equivalent.

“

If education progress is stalled, it could lead to a 20% increase in disaster-related fatalities per decade

”

The project created 10 jobs and enhanced the capacity of 105 women and 22 men to use a renewable energy source (UNDP, 2015a).

Informal coalitions

Informal platforms and coalitions are characterized by interactive forms of learning. They have been described as participatory, collaborative, social, interactive, experiential and transformative. Examples include community groups in Detroit, United States, that have self-organized to develop urban farms that repurpose vacant property and strengthen community resilience (Greening of Detroit, 2015); participatory budgeting in Porto Alegre, Brazil (Touchton and Wampler, 2013); and urban farming in Hue, Viet Nam, where this practice by the local community has reduced the heat-island effect and has been promoted as an opportunity for ecotourism ventures and organic food production (van Dijk et al., 2012; Phuc et al., 2014).

Promoting sustainable behaviour can also be effective through one-to-one interactions. In community-based social marketing approaches, priority behaviour is selected and local solutions designed to overcome barriers to behaviour change. Programmes are rolled out more widely throughout community networks. Recognizing the power of social psychology, programmes – in areas ranging from promoting reusable mugs and water-efficient showerheads to carpooling and purchasing products with recycled contents – encourage getting public commitment from individuals during personal interactions, as this is known to increase the likelihood of following through on promises (McKinsey-Mohr, 2011).

REVERSING CLIMATE CHANGE REQUIRES AN INTEGRATED APPROACH TO LEARNING

The challenge of climate change demonstrates the complexity of, and urgent need for, using education to address environmental crises. All three approaches described in the sections above are required: learning at schools, in communities and through lifelong learning, along with integration between types of education and collaboration between education and other sectors. Thus deployed, education can contribute to actions to address climate change, including prevention, mitigation and disaster preparedness.

Climate change is by far the biggest environmental crisis facing humanity. Between 1995 and 2014, 15,000 extreme weather events caused more than 525,000 deaths worldwide and losses of nearly US\$3 trillion (Kreft et al., 2015). Climate change poses a fundamental threat to livelihoods. It is directly responsible for the rise in global temperatures and increased frequency and scale of extreme weather and natural disasters such as droughts, floods, aggravated desertification and biodiversity loss. These in turn have a direct impact on global food stocks, human health and well-being, human security, economic growth and jobs. The effects of climate change also have serious implications for the functioning of education systems, and require adaptive strategies (**Box 1.3**).

At COP21 in Paris, the 2015 Convention of the Parties to the UN Framework Convention on Climate Change, a record 195 countries adopted the Paris Agreement, whose signatories agreed, among other things, to keep temperature rises well below 2 degrees Celsius and curb carbon emissions. Since the consequences of climate change are so severe, especially for those living in the areas most sensitive to changes in weather patterns, temperatures and sea levels, it is no surprise there are efforts worldwide to employ education at all levels to help citizens tackle the causes of climate change and to respond to its consequences.

BOX 1.3

Climate change and natural disasters severely affect education systems and outcomes

The growing frequency of natural disasters and extreme weather increases the vulnerability of many low income countries, and such events have multiple direct and indirect effects on education systems and outcomes.

Natural disasters interrupt education continuity by damaging or destroying school facilities, and they threaten communities' physical safety and psychological well-being. For example, the 2015 earthquakes in Nepal devastated the schooling infrastructure – in 11 of the most affected districts, 34,500 of 55,000 classrooms were assessed as unsafe for use, affecting education for over a million children. Natural disasters are a leading cause of internal and external migration globally, affecting both sending-country and receiving-country school systems as populations of young migrants change. In 2015, 19.2 million people worldwide were displaced internally due to natural disasters; twice as many as were displaced by conflict and violence. In addition, climate change is raising temperatures and sea levels, and causing loss of agricultural productivity, seriously affecting children's health, to the detriment of education outcomes.

Bangladesh is one of the world's poorest, most populous and most flood-prone countries. Climate experts project that by 2050, 27 million people there will be at risk from sea level rise. With increasing frequency of floods, many environmental migrants from rural areas become slum dwellers in Dhaka, the densely populated capital. Unsurprisingly, the school system is routinely affected by climate-related challenges. For instance, as a result of Cyclone Sidr in 2007, 849 schools were destroyed in 12 districts, affecting the education of over 140,000 students.

The Solar-Powered Floating Schools programme, developed by a Bangladesh NGO, Shidhulai Swanirvar Sangstha, is one example of a locally relevant education solution developed to adapt to severe weather effects. The "floating schools" (boats) help ensure year-round education and educational resources by collecting students from all over a locality, then docking in one location to provide classes.

Sources: Anderson (2013); Das (2010); Internal Displacement Monitoring Centre (2015); Internal Displacement Monitoring Centre (2016); Save the Children (2008); UNICEF (2015); Walsham (2010); Wheeler (2011); WISE Initiative (2012).

SCHOOLS, COMMUNITIES AND LIFELONG LEARNING WORK HAND IN HAND

Formal education has a particularly strong role in mitigating climate change and responding to its impact. In fact, education expansion is more effective in combating climate change than conventional investment in infrastructure such as sea walls and irrigation systems. Research on disaster vulnerability shows that female education, for instance, is negatively correlated with disaster fatalities. Projections indicate that universalizing upper secondary education by 2030 would prevent 200,000 disaster-related deaths in the 20 years that follow (Lutz et al., 2014).

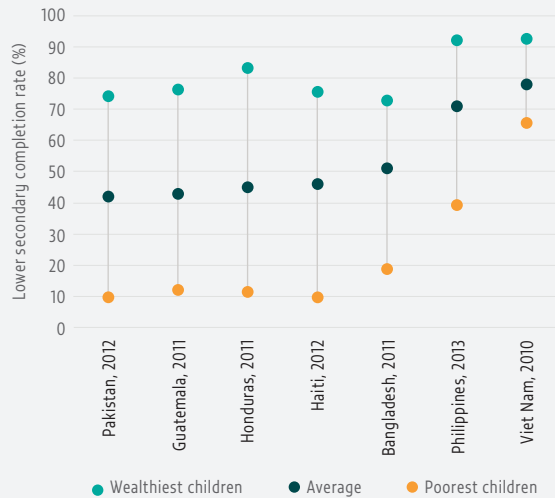
In countries where access to education is weak, or education is not of good quality, integrated action is required to improve the education system as well as use of education for climate action. Reaching all youth, rich and poor, may require climate change education not only in classrooms but through additional government, NGO and private sector programmes.

The communities most at risk from climate-related events are generally situated in low and middle

income countries. Of the 10 most affected countries between 1995 and 2014, 9 were in the low or lower middle income group: Bangladesh, Guatemala, Haiti, Honduras, Myanmar, Nicaragua, Pakistan, the Philippines and Viet Nam. The remaining one was Thailand, an upper middle income country (Kreft et al., 2015). Several of the poorer countries have low baseline educational attainment and wide disparity between the poorest and wealthiest students (**Figure 1.3**). In Guatemala, Haiti, Honduras and Pakistan, only about 10% of poor children complete lower secondary school, compared to 75% of rich children.

Education can be used to raise awareness of climate change, reduce vulnerability to it and mitigate its consequences. Schools can increase knowledge and awareness of the environment and climate change by incorporating environmental sustainability into classroom materials and curricula. In Bangladesh, after the National Curriculum and Textbook Board prepared and endorsed a school manual on climate change and health protection, 1,515 students in 30 schools received classroom training based on the manual while 1,778 students in 30 control schools received a leaflet on climate change and health

FIGURE 1.3:
Poor children in the countries most at risk for climate change disasters are less likely to complete secondary school
Lower secondary completion rate, by wealth



Source: GEM Report team analysis (2016) of household survey data.

issues instead. Six months later, results of a post-intervention test performed at both schools showed that the training led to dramatic increases in children's knowledge of the topic (Kabir et al., 2015).

Education can reduce vulnerability to climate change. A comparative study on Cuba, the Dominican Republic and Haiti focused on the role of formal education in reducing vulnerability, and explored education's potential impact on disaster management and prevention and on post-disaster management. It found that a lack of education and low literacy rates prevented people from understanding warnings. In Cuba, a country with high literacy and enrolment rates, the level of vulnerability to climate-related disasters was reduced (Pichler and Striessnig, 2013).

Education can also help people adapt to climate change effects. In Ethiopia, six years of education increases by 20% the chance that a farmer will adapt by using techniques such as soil conservation, varied planting dates and changes in crop varieties (Deressa et al., 2009). In Uganda, the likelihood that a family will adopt drought-resistant crop varieties increases when the father has basic education (Hisali et al., 2011). And a

survey of farmers in Burkina Faso, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Niger, Senegal, South Africa and Zambia showed that those with education were more likely to make at least one adaptation: One year of education reduced the probability of no adaptation by 1.6% (Maddison, 2007).

To achieve all this requires attention to the quality of the education. Teacher training has been identified as critical in making education more responsive to climate change and related sustainability challenges. Short and circular modules for teacher training appear to hold significant benefits for teachers' understanding and confidence on climate change. In one study, the percentage of prospective teachers who felt climate change was a conceptually difficult subject to teach fell from over 21% to about 7% after less than four hours of training (Anderson, 2013).

As the previous sections showed, formal education is only one approach. Education can also take place within communities. A strong example was shown in disaster preparedness in the Philippines, where partnerships and diverse learning approaches were used effectively. Local communities worked with the Ministry of Education, Plan International and other partners to teach children and youth about climate change adaptation and preparation to reduce disaster vulnerability. Children learned to read rain gauges; undertook disaster simulation and drills; carried out risk mapping; and learned skills in first aid, swimming and water safety. Through theatre and music, children expressed what they had learned, thus delivering to their communities information on potential hazards and practical solutions. Evidence shows that these programmes were effective in building resilience in the community – potentially saving lives. In 2006, after three days of continuous rain, children and adults applied knowledge gained from the adaptation-focused risk reduction strategy to evacuate before landslides covered their homes (Plan International, 2008). Other work connecting formal schooling with community education is found in small island states (**Box 1.4**).

Lifelong learning programmes delivered by government, private industry and civil society are also critical. Effective responses to climate change include governance and legislation cooperation between the education sector and other sectors. National strategies that include awareness-raising and information dissemination on climate change will allow stakeholders to undertake adaptive and mitigating activities. For example, Namibia has produced Initial Communication Booklets on climate change

BOX 1.4

Small island states use the entire education system to prepare for climate change

The Pacific Island region will experience some of the most profound negative effects of climate change considerably sooner than other regions. Funded by the US National Science Foundation, the Pacific Islands Climate Education Partnership (PCEP) aims to educate the region's students and citizens in ways that exemplify modern science and indigenous environmental knowledge, address the urgency of climate change and honour indigenous culture. Students and citizens in the region will have the knowledge and skills to advance their understanding of climate change and adapt to its impact.

The PCEP Strategic Plan incorporates a range of interconnected strategic goals, including promotion of indigenous knowledge and practices, enhancement of learning and teaching about climate change from kindergarten to teacher training, a community-school partnership programme to connect school with community climate adaptation partners, and a focus on the content and skills necessary for students to understand the science of global and Pacific Islands climates, as well as adaptation to climate change effects.

Current activities include revising state and national science education standards to better incorporate climate change; adapting curricula to a wide variety of climate and education contexts; gathering local indigenous knowledge and practices related to climate education and adaptation; providing professional development; and supporting local professional learning communities.

Sources: Sussman et al. (2013); Vize (2012).

translated in local languages to empower citizens and allow them to make well-informed decisions (Mfuné et al., 2009). The United Kingdom is putting more effort into communicating, informing and educating the public, such as by promoting energy conservation measures (DEFRA, 2006). The government is also promoting and funding renewable-based energy technology in all schools in England to reduce carbon emissions and use renewables technology as a learning resource for teaching science, geography, design, technology, citizenship and mathematics (DEFRA, 2006).

CONCLUSION

Education plays a major role in the transformation towards more environmentally sustainable societies and in addressing the impact of environmental crises such as climate change. The challenges are pressing. Human behaviour has led to environmental crises, with various kinds of problems contributing, including overpopulation, unsustainable lifestyles that consume more resources than are available and individual behaviour that harms the environment, such as using fossil fuels or landfilling waste.

Accordingly, solutions to environmental crises vary, and must address issues at all levels: individual, community, regional, national and, cumulatively, global. Approaches to learning will vary. Formal education can contribute at

the macro level, for example by reducing fertility rates, and at the individual level by building environmental literacy. Dynamic approaches are being used in primary, secondary and tertiary institutions to improve sustainable knowledge, skills and attitudes.

Yet, formal education does not reach everyone. Learning, creating awareness and building competencies to take action can take place in communities and through education that is based in the interaction between people and their local environments. Indigenous knowledge and belief systems can inspire better stewardship of the planet. Lifelong learning can help people live more sustainably all their lives. A multistakeholder, collaborative approach should involve government, civil society and the private sector inside and outside schools to shape values and perspectives, and contribute to the development of competencies to reduce or stop unsustainable practices and to adapt to consequences such as climate change due to the overstepping of planetary boundaries by humankind.

ENDNOTES

1. This section draws extensively on Magni (2016).

A man stands in a
crop of cassava that
is being cultivated
using an improved
technique in
Boukoko, Central
African Republic.

CREDIT: Riccardo Gangale/FAO



CHAPTER

2

Prosperity: sustainable and inclusive economies

We are determined to ensure that all human beings can enjoy prosperous and fulfilling lives and that economic, social and technological progress occurs in harmony with nature.

– *The 2030 Agenda for Sustainable Development*



KEY MESSAGES

Education has a key role to play in moving towards environmentally sustainable and inclusive economic growth.

1 Education and lifelong learning are needed to make production and consumption sustainable, to provide green skills for green industries and orient research and higher education towards green innovation.

- a. Creating green industries relies on high-skill workers with specific training.
- b. Greening of industries will require continuing training and education for low- and medium-skill workers, often on the job.
- c. Research can be oriented towards green innovation and growth.

2 Education can help food production and farming be more sustainable.

- a. Agriculture urgently needs to transform to meet environmental and global needs: Agriculture contributes one-third of all greenhouse gas emissions.
- b. Primary and secondary education give future farmers foundation skills as well as critical knowledge about sustainability challenges in agriculture.
- c. Literacy and non-formal education in the form of extension programmes can increase farmer productivity.
- d. Yet many are halting investment in agricultural research at a time when it is urgently needed: In sub-Saharan Africa, the share in global expenditure on public agricultural research declined from 10% to 6% from 1960 to 2009.

3 Education contributes to economic growth.

- a. Educational attainment explains about half the difference in growth rates between East Asia and sub-Saharan Africa between 1965 and 2010.
- b. But education must keep up with the changing face of work and produce more high-skill workers. By 2020, there could be 40 million too few workers with tertiary education relative to demand.

4 Education of good quality can help ensure economic growth does not leave anyone behind.

- a. If 10 recent EU member states met 2020 targets to decrease early school-leaving and increase tertiary participation, they could reduce the numbers of those at risk of poverty by 3.7 million.
- b. Secondary and tertiary education is far more effective than just primary for helping people access decent work and earnings.

5 Education reduces poverty and helps close wage gaps.

- a. Education helps people find work: In South Africa, less than 45% of those with less than upper secondary education were employed in 2005 compared to roughly 60% who completed upper secondary.
- b. If workers from low socio-economic backgrounds had the same education as more advantaged counterparts, disparity in working poverty between the two groups would shrink by 39%.
- c. Education increases earnings by roughly 10% per year of schooling.
- d. Meanwhile, policies are needed to meet the increased global demand for skilled and qualified labour.

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The world economy needs deep transformation in order to implement the Agenda for Sustainable Development by 2030, to prevent the collapse of the Earth’s biosphere on which human civilization depends for survival, and to eradicate poverty – the central goal of the Millennium Development Goals (MDGs) and now of the Sustainable Development Goals (SDGs). This chapter reflects on the roles of education in this transformation towards environmentally sustainable and economically inclusive development.

The statement above from the Agenda for Sustainable Development makes a commitment to human beings enjoying prosperous and fulfilling lives. But as this chapter will explain, economic growth and both national and individual prosperity must occur ‘in harmony with nature’. This requires fundamental changes in the world economy to create clean new industries and ensure that existing ones become greener.

Education and lifelong learning are needed to make production and consumption sustainable, supply skills for the creation of green activities and orient higher education and research towards green innovation. They also have a role to play in transforming key economic

sectors, such as agriculture, upon which both rich and poor countries and households rely.

Education of good quality has been proved to contribute to long-term economic growth. Curricular contents, and the ways they are embedded in the everyday life of schools, need to be transformed to sustain a greener world economy. Investment in education and lifelong learning are also required for countries to adapt to the rapidly changing world of work, with polarization between high- and low-skill jobs, and further shifts to green industry and the service sector.

Just as the economy must become sustainable, so too must it become inclusive. With widespread poverty and inequality, economic growth has not benefited all people. Prosperity must be conceived in ways that leave no one behind. Education of good quality can contribute to this change as well. A better-educated labour force is essential to inclusive economic growth focused

“ A better-educated labour force is essential to inclusive economic growth ”

on human welfare. Education helps reduce poverty by increasing chances of finding decent work and improved earnings, reducing job insecurity.

CURRENT MODELS OF ECONOMIC GROWTH CAUSE ENVIRONMENTAL DESTRUCTION

The type of economic growth experienced thus far could prove unsustainable over 2015–2030 and beyond. Models of economic growth in the 20th century emphasized aspects such as intensive production, industrial advances and exploitation of natural resources. These models legitimized practices and policies that thwart achievement of the environmental SDGs, causing damage to the Earth's biosphere and hence threatening civilization in the longer term.

As Chapter 1: Planet notes, all countries that are ranked very high on the Human Development Index (above 0.8) and have a high per capita income consume more resources per capita than the Earth can renew (Global Footprint Network, 2016). This creates a contradiction. Economic growth is the most powerful instrument for reducing poverty in developing countries (DFID, 2008), but if that growth depletes resources at an unsupportable rate, will it start to increase poverty? For example, poor people suffer the most from environmental degradation as they often live in the most vulnerable areas and their livelihoods tend to be linked more directly to access to natural resources.

Climate change is an example of the effects of economic growth, and the reason a transformation of economic models is necessary. The increased frequency and intensity of extreme climate events, reduced productivity of agriculture and natural ecosystems due to changing temperature and rainfall patterns, and resulting health shocks and reduced labour productivity may slow, stall or even reverse the trend towards eradication of extreme income poverty observed over 2000–2015.

Overall, climate change could cast as many as 122 million people into poverty by 2030, depending on how ecosystems, the economy and geographical features such as coastal areas and glaciers adapt. Climate change could reduce crop yields by 5% by 2030 and 30% by 2080 – even if agriculture adapts by changing crops and culture practices, extending irrigation and developing higher yield crops (Hallegatte et al., 2016).

SUSTAINABLE TRANSFORMATION WILL REQUIRE CLEAN NEW INDUSTRIES AND GREENER EXISTING ONES

The concepts of sustainable development and green growth are similar, having in common the ideas of using less resources more efficiently and limiting the harmful impact of economic activity on the environment by creating green industries and 'greening' existing ones (UNIDO, 2011b). They also mean dismantling the activities that contribute most to environmental degradation, such as coal-intensive industries, and converting them and their employees to greener work.

Green industry is defined by the United Nations Industrial Development Organisations as 'industrial production and development that does not come at the expense of the health of natural systems or lead to adverse human health outcomes' (UNIDO, 2011b). However, green industries are difficult to classify statistically, and there is no universally accepted definition.

Estimates suggest that sectors that fall under the green industry umbrella already employ large numbers of workers – 3.5 million in Bangladesh, 1.4 million in Brazil, 2 million in Germany and, in the United States, 2.5 million in the private sector and almost 900,000 in the public sector. The net impact of green growth on employment is usually forecast as positive, though some industries stand to lose jobs. Sectors such as alternative fuels, building technologies, wind power, alternative fuel vehicles, geothermal energy, water supply and wastewater treatment are expected to drive sustained expansion in green industries globally in coming decades (Hinojosa and Pickles, 2015). Renewable sources may account for almost half the total increase in global electricity generation between 2015 and 2040, with especially large increases predicted in China, India, Latin America and Africa (Hinojosa and Pickles, 2015).

The current concentration of green industries in high income countries, especially in Western Europe, is expected to wane. In 2009, the European Union accounted for 50% of recycling worldwide and 40% of the use of renewable energy sources (Hinojosa and Pickles, 2015). However, between 2005 and 2015, the share of developing countries in global renewable energy investment rose from 27% to 55%, reaching US\$156 billion in 2015 to overtake developed economies (REN21, 2016). Key green businesses, such as producers of

solar photovoltaic panels, have been moving from high to middle income countries. Green industries in developing countries may receive more than US\$6.4 trillion in investment between 2015 and 2025, with China and Latin America each receiving nearly one-quarter of the total (InfoDev, 2014).

Existing industries need to be restructured for efficiency gains. This greening of industries, by the UNIDO definition, includes reducing the environmental impact of processes and products by using resources more efficiently, phasing out toxic substances, replacing fossil fuels with renewables, improving occupational health and safety, increasing producer responsibility and reducing overall risk (UNIDO, 2011). There could be significant benefits in terms of savings: by 2030, an estimated US\$3.7 trillion could be saved annually worldwide from implementation of 130 resource productivity measures and adapted legislation (MGI Global, 2011).

GREEN SKILLS POLICIES CAN FOSTER JOB CREATION

Green growth will greatly affect employment. Jobs will be created in green industries; jobs will be shifted as industries are greened (e.g. with production-based renewables instead of fossil fuels); some will be destroyed; and many will be redefined as skills, work methods and job profiles are greened. The hardship caused by job destruction and redefinition should not be underestimated, as the industries affected – including fishing, forestry, extractive industries, fossil fuel generation and emission-intensive manufacturing (such as the cement and automotive industries) – employ large numbers (Hinojosa and Pickles, 2015).

However, forecasts indicate the net result should be positive. A review of cross country and national studies¹ by the International Labour Organization (ILO) indicates that the adoption of environmental reforms leads to net job gains of 0.5% to 2% of the workforce, translating to 15 million to 60 million additional jobs globally (ILO, 2012). In South Africa, the potential for new green jobs was estimated in 2011 at 98,000 in the short term, 255,000 in the medium term and 462,000 in the long term, especially in natural resource management such as biodiversity conservation, ecosystem restoration, and soil and land management (Maia et al., 2011).

One reason for the positive impact on employment is that green industries tend to be more labour-intensive. For instance, sustainable farming requires more labour than conventional farming, with more diverse crop rotation, integration of crops and livestock to recycle organic waste as soil nutrients, and reliance on biological processes for pest and weed management. Similarly, to improve energy efficiency the construction sector has employed large numbers of workers (Hinojosa and Pickles, 2015; Maia et al., 2011).

The changes in employment and job definitions accompanying green growth will create huge demand for skills development. The creation of green industries will rely on high skill workers with technical training; the greening of existing industries will require continuing education and training for low and medium skill workers, often on the job (ILO, 2013a; UNIDO, 2011b). The balance

“ The creation of green industries will rely on high skill workers with technical training ”

of skills required will vary across countries and industries – but in every context, skills policies can facilitate this transition.

It is difficult to define which skills would be specifically ‘green’ or ‘non-green’, as both green and greening industries use a mix of both. There is therefore very little evidence quantifying what the ‘green skill gap’ might be at the global level, although it is possible to identify skills which green and greening industries demand (**Box 2.1**).

The implications of green growth for education and training policies are complex and often industry-specific. Policy-makers and educators face the challenge of defining which skills to teach, even as the economy is undergoing rapid change. They must also balance current and long-term priorities, deciding, for example, how much focus to give to redefining initial education and training as opposed to up-skilling and retraining the current labour force. They need to develop flexible education and training frameworks in line with the capabilities and aspirations of students and trainees. Specific policy recommendations in this area are found in Chapter 8.

BOX 2.1**Green industries demand particular skills**

Green industries demand particular skills, including basic, technical, and transferable and managerial skills.

- Basic skills, including literacy and numeracy, are indispensable. Green growth reinforces the need for good quality basic and remedial education, both in countries which have not yet reached universal enrolment at the primary and lower secondary levels, and in countries with low levels of basic skills in the adult population.
- Technical skills can be specific to green industries (e.g. diagnostic skills to measure a carbon footprint) or added to existing skills (e.g. up-to-date training in energy efficiency for construction workers with standard skills).
- Transferable and managerial skills include leadership, risk management, design, communication and commercial skills that are necessary to enable firms to make the transition towards green production. For example, those with entrepreneurial skills can seize the opportunities presented by low-carbon technology, and consulting skills can be used to advise consumers about green solutions and spread the use of green technology.

Source: GEM Report team analysis based on Hinojosa and Pickles (2015).

INNOVATION DEPENDS ON COOPERATION IN HIGHER EDUCATION AND R&D BACKED WITH PUBLIC FUNDING

The transition towards sustainable economies can be seen as being on a par with the paradigm shifts brought about by the industrial revolution and the advent of information and communication technology (ICT) (Stern, 2015). Sustainability and green growth require investment in research and development (R&D) to transform production in vast swaths of the economy. They involve refining existing technology to save energy, using renewables and, above all, introducing technology that is only just being developed (Aghion et al., 2009a).

In Cuba, the Centre for Research and Development of Structures and Construction Materials (CIDEM) developed alternative ways to solve a building and energy crisis. Researchers developed low-energy, low-carbon building materials and worked with communities, municipalities and manufacturers

to get them into use building houses. In addition to environmental benefits, the project generated significant socio-economic benefits. In 2010 and 2011, 5,300 houses were built using such materials made by 138 manufacturers, providing livelihoods to many people. Three training centres have been established at universities and this model of developing sustainable building materials has been adopted by other countries in Latin America as well as Africa, Asia and the Middle East (Sarabhai and Vyas, 2015).

While examples of green innovation practices can be found around the world, more is needed to turn practices into a system – that is, an ensemble of actors and conditions that enable the creation and flow of knowledge and technology into the economy. For this, other conditions must be present, such as collaboration between researchers, funders, manufacturers, government and consumers, in a context of change in broader macroeconomic, investment and policy environments (Botta et al., 2015).

The role of education in innovation primarily concerns R&D in new technologies, as well as their dissemination. For higher education systems to provide enough researchers and developers with specialist knowledge and skills in a wide range of fields, diverse and specific curricula are needed along with cooperative study programmes across fields. Major emerging economies such as Brazil and China are expanding their tertiary education systems with that approach in mind. The European Commission estimates that at least 1 million new research jobs will be needed to meet a target of increasing EU R&D expenditure to 3% of gross domestic product (GDP) (European Commission, 2011).

Once developed, innovative knowledge and technology need to be introduced into the economy. Scaling up technology, building capacity and developing markets may require adaptation to local contexts, particularly in poorer countries, where technological transfer presents a hosts of challenges. A rigorous review of research reveals little evidence of the impact of technological transfer in developing countries, although two cases stand out (Oketch et al., 2014). Large state-run corporations in Viet Nam are more likely than small and medium-sized enterprises to demonstrate high levels of technological transfer, probably because of their contact with foreign firms. However, one of the studies reviewed indicated that university-generated research had improved productivity in local agriculture and aquaculture

(Ca, 2006). The small amount of empirical evidence available related to tech transfer and scaling up highlights the need to better understand the relationships between innovation, technology and economic development in poor countries.

Green innovation systems depend on public funding of R&D, as the private sector may be unable or unwilling to invest sufficiently in green technology in the early stages of development, when costs are high, returns are uncertain and the benefits are social rather than private (Aghion, 2009a; OECD, 2011). Unfortunately, total public and private R&D expenditure as a share of GDP has not grown discernibly in the OECD or major emerging countries since 2007. In 2013, it represented slightly less than 2.5% of GDP in OECD countries, ranging from less than 0.5% in Chile to almost 4.5% in the Republic of Korea (OECD, 2014c).

Moreover, public R&D spending in energy and the environment is only a small fraction of total public R&D budgets, averaging less than 12% in OECD economies, and less than 6% in the EU. Moreover, public R&D budgets for energy and the environment have stalled across the OECD in recent years. OECD military public R&D was more than double that of energy and environment in 2012, and approximately 30 times as large in the United States (OECD, 2014c). The International Energy Agency estimates that governments would need to increase annual energy R&D up to fivefold to significantly reduce carbon emissions by 2050 (IEA, 2010). Corresponding data on private R&D expenditure are not available, but the fact that over 2000–2006 only 2.15% of total patents applied for worldwide were environment-related indicates that it is low (Aghion et al., 2009b).

LIFELONG LEARNING ENABLES CONSUMERS AND PRODUCERS TO CONTRIBUTE TO SUSTAINABILITY

While green skills and green innovation can reduce environmental destruction caused by economic activity, the leap towards fully sustainable consumption and production requires a deeper transformation of the economy. The whole life cycle of products needs to be designed to minimize resource use, waste and pollution. Examples include certification of the entire production and consumption chain, and ‘cradle-to-cradle’ design where all products and waste can be used in making other products. Another approach is the service-based

economy where consumers no longer own products but lease the services they provide.

Developing, understanding and working with such approaches requires learning by both consumers and producers, which education policies can best address in a lifelong learning perspective. The United Nations Environment Programme has identified learning-related priorities for sustainable consumption and production. These include new forms of (a) education for industry employees, including sustainability-oriented technical and vocational education and training (TVET) and ongoing training within companies; (b) learning at all levels of supply chains, with attention to empowerment of suppliers and customers, rather than compliance inspections; (c) interdisciplinary scholarship focusing on altering consumer habits; and (d) social learning at the community level (UNEP, 2015).

Relevant international agreements and programmes include the United Nations Decade for Education for Sustainable Development, with topics such as Education for Sustainable Consumption, TVET for Sustainable Development and Higher Education for Sustainable Development. The multistakeholder Marrakesh Process (2003–2011) led to the adoption of a framework at the United Nations Conference on Sustainable Development in 2012 (Rio+20). National sustainable consumption and production initiatives have been launched in countries including Finland, Germany and the United Kingdom (Geels et al., 2015).

Business owners, managers and financiers can be leaders in sustainability. Large and small corporations can develop strategies and analyse their business culture and work systems to make them more sustainable (see Chapter 1: Planet). Studies have shown that business courses increasingly teach the ‘business case’ for sustainability, and that professional networks of business leaders increasingly accept the importance, relevance and willingness of action (Sidiropoulos, 2014), although many of the findings are limited in geographical coverage and trends appear patchy across industries and locations.

Shareholder activism has resulted in movements to divest from fossil fuels and to invest so as to generate a positive social impact along with financial returns. Progress in corporate sustainability has seen the expansion of sustainable finance, with mainstream banks increasingly integrating environmental and social impact

considerations and risk management strategies into loan and investment assessment (UNEP, 2012; OECD, 2016b).

AGRICULTURAL PRACTICES NEED TRANSFORMATION

Focusing on agriculture shows not only the scale of problems to be tackled but also how an economic sector can change and how education can address the changes. Globally, some 70% of people in extreme poverty live in rural areas (IFAD, 2011b) where agriculture is the main source of income and employment, and access to land serves as a tangible source of security despite natural disasters and weak economic opportunity. Solutions for global poverty must address the needs of agrarian societies and ensure the sustainability and productivity of agriculture. Agriculture provides the world's food supply, and major factors affecting it also affect the world's economy and ecosphere.

Agricultural production is the main emitter of carbon dioxide in the global food system (Vermeulen et al., 2012). Increases in carbon dioxide contribute to climate change, which in turn has a negative effect on crops. Yields of wheat, rice and corn are expected to fall in coming years, even as growing populations will need more to eat. By emitting high levels of greenhouse gases, conventional agricultural practices present a barrier to the main challenge they seek to address, potentially leading to food shortages instead of food security.

Education, both formal and non-formal, has a clear role in this context: It is necessary for sustainable food production and vital for the systemic changes required. Agricultural extension services, training and education, and research contribute to sustainable agricultural production through appropriate and affordable technology (such as efficient irrigation, water harvesting and water storage), increased efficiency of land management and reductions to food waste throughout

“ Agricultural extension services, training and education, and research contribute to sustainable agricultural production

”

the food supply chain. Research also helps preserve sustainable practices such as traditional seed supply systems and best practices of indigenous peoples and local communities.

Agriculture worldwide faces an unprecedented challenge over 2015–2030. Of all economic sectors, it is the most directly affected by environmental degradation. Cultivated and arable land is being lost to desertification, soil erosion and salinization, and urbanization. Climate change is altering temperature and rainfall patterns. Extreme weather is causing ever more frequent and intense damage to crops and cattle (Godfray et al., 2010). Groundwater depletion, from China and India to Saudi Arabia and the United States, is affecting harvests and could contribute to significant food scarcity (Wada et al., 2010). These phenomena will intensify, threatening agricultural productivity.

At the same time, population growth requires a huge but sustainable increase in food production to ‘end hunger [and] achieve food security and improved nutrition’ (SDG 2). The global population, as Chapter 1: Planet noted, is expected to reach 8.5 billion in 2030, with nearly four-fifths of the increase taking place in low and lower middle income countries, especially in sub-Saharan Africa and Southern Asia, where the food supply is the most fragile. According to various sources, the productivity of existing crop and pasture land would need to increase by 70% to 100% to feed over 9 billion people by 2050 (Godfray et al., 2010).

Conventional agriculture – the manufacture and distribution of seed, feed, fertilizer and pesticides; the growth and harvesting of crops, livestock, fish and wild foods; and along with primary and secondary processing, distribution and waste disposal – cannot respond to these challenges, as it causes environmental destruction and its future productivity is uncertain. The problem is threefold:

- Along with energy and transport, agriculture is one of the sectors that contribute most to environmental degradation. It occupies 40% of the Earth's terrestrial surface, accounts for 33% of greenhouse gas emissions and causes loss of genetic biodiversity and functional ecosystems. The ‘green revolution’ that took place mainly in Asia in the 1960s and 1970s was ‘green’ only in the sense that it concerned agriculture, not in the sense of environmental preservation. Future increases in food production must not entail unsustainable use of land, water, energy, fertilizer and chemicals (Alston and Pardey, 2014; Dobermann and Nelson, 2013; Pretty et al., 2010).

- Conventional agriculture may be reaching a productivity limit. According to the Food and Agriculture Organization (FAO), the index of per capita net production for agriculture as a whole increased less rapidly over 2008–2013 than over 2003–2008 in the Americas (4.1% vs 10.3%), Asia (7.9% vs 15.3%) and Europe (3.4% vs 5.5%) (FAO, 2016). Increases in agricultural productivity were concentrated in developed countries and Asia. In sub-Saharan Africa and in low income countries in other regions, most growth in production since 2000 was due to use of new land rather than higher factor productivity (Dobermann and Nelson, 2013). Food prices, which had mostly declined steadily since the 1960s, started to increase in the 2000s, and have become more volatile due to speculation on financial markets. Major price increases in 2007 and 2008 especially hit the poor (IFAD, 2011a).
- Food distribution and consumption patterns are compounding the negative impact of food production on the environment. In developing countries, rising per capita income has led to tastes shifting away from cereals, pulses and vegetables and towards meat and dairy products, whose production is much more intensive in use of water, fodder and chemicals (Pretty and Bharucha, 2014). The major concern, however, is food waste, which represents 30% to 40% of food produced globally. In developing countries, most food waste arises on farms and in transport and processing due to deficient food-chain infrastructure. In India, for example, 35% to 40% of fresh produce is lost. This waste could be reduced through improved small storage facilities (Godfray et al., 2010). In developed countries, food waste takes place mostly in retail, food services and homes due to consumer preferences for ‘foods of the highest cosmetic standard’ and inflexible adherence to ‘use by’ dates (Godfray et al., 2010).

EDUCATION CAN SUPPORT SUSTAINABLE FOOD PRODUCTION

Enough food can be produced for the growing world population over 2015–2030 and beyond in an environmentally sustainable and socially inclusive way, but this will require significant changes in agricultural production (Godfrey et al., 2010; Pretty and Bharucha, 2014). With current food production reaching its limits, alternatives to conventional farming must be found. They will involve sustainable intensification of food production through a combination of innovative

farming methods – including agroforestry, conservation agriculture, integrated farming, mixed crop and livestock systems and organic farming – accompanied by reduction of food waste and more equitable food distribution.

Growth in demand for agricultural products will mainly occur in emerging economies, particularly the most populous countries of Eastern and South-eastern Asia, Southern Asia and sub-Saharan Africa. The ways in which these countries, including Bangladesh, China, Ethiopia, India, Indonesia, Nigeria and South Africa, respond to this growth will be major determinants of environmental change at a global scale (Sayer and Cassman, 2013).

Not only is sustainable farming possible, but education plays a key role in the transition. Primary and secondary education can provide future farmers foundation skills

“ Vocational training and skills policies bridge the gap between farmers and new technology ”

as well as critical knowledge about sustainability challenges in agriculture. Vocational training and skills policies can bridge the gap between farmers and new technology. Literacy and non-

formal education in the form of agricultural extension can help farmers increase crop yields. Agricultural research connected with tertiary education helps produce innovation leading to more sustainable systems.

The number of people relying on farming is considerable. In the early 2010s, half the world’s population lived in rural areas and three-quarters of rural people belonged to agriculture-based households: 2.6 billion depended on agriculture for their livelihoods and 1.3 billion directly engaged in farming. However, value added in agriculture accounts for just 2.8% of global GDP (Alston and Pardey, 2014). A majority of farmers depend on farms of less than 2 hectares, of which there are more than 500 million (Dobermann and Nelson, 2013).

Rural development policies which improve agricultural productivity can have strong effects on poverty reduction. In China, for example, agricultural growth is estimated to have been three times more effective in reducing poverty between 1980 and 2011 compared to growth in other sectors of the economy. Similar magnitudes are found in studies examining other

developing regions (de Janvry and Sadoulet, 2010). Among several sub-Saharan African countries, estimates suggest that GDP growth driven by agriculture would be similarly effective in reducing poverty - three to four times more than non-agricultural sectors in Rwanda and Kenya, for example (IFPRI, 2012).

AGRICULTURAL EXTENSION AND RESEARCH ARE VITAL FOR TRANSFORMING PRODUCTION

Agricultural extension programmes aim to educate farmers to apply improved technologies and farming practices, helping improve crop yields, increase food security and reduce poverty. They can take the form of non-formal education and advisory services provided

“ Literacy and non-formal education in the form of agricultural extension can help farmers increase crop yields

by government, multinational agencies and other institutions, such as research institutes and universities. International agricultural research centres, in collaboration with national public

organisations, were instrumental in the widescale introduction of new crop varieties which fuelled the agricultural ‘green revolution’ of the 20th century (Evenson and Gollin, 2003). Bringing new sustainable technologies to farmers over 2015-2030 calls for similar international and national efforts.

Agricultural extension programmes can significantly increase farmer productivity. If not designed carefully, however, they can exacerbate inequality. Research in Mozambique and Ethiopia shows that extension services tend to target wealthier farms that are more likely to adopt existing technology, while extension services that target poor farmers can have a larger impact on productivity (Cunguara and Moder, 2011; Elias et al., 2013).

Like other development policies, extension programmes need to be strategically designed in order to be sustainable. This requires improved links between agricultural research, extension organisations, business development services, farmers and local communities. Programmes which are aware and responsive to the needs of resource-poor households are more likely to result in faster diffusion of innovations (World Bank, 2012).

At the farm level, knowledge and skill requirements are significant. Farming is complex and risky. It depends on the extent and quality of the land, as well as weather, markets, inputs, support services, capital and infrastructure (Dobermann and Nelson, 2013). Innovative farming is even more challenging. Extension programmes thus need to be participatory and incorporate local knowledge. They also need to address their frequent bias towards male farmers (Pretty et al., 2010). Women form a significant share of farmers and agricultural workers, and increasing their productivity could have a large positive impact on family and child nutrition (FAO, 2011).

Farmer field schools are particularly relevant to sustainable agricultural intensification. They have spread since the late 1980s as part of a broader shift away from top-down agricultural extension (Waddington et al., 2014). They now reach over 12 million farmers in some 90 countries with a participatory approach to adult education and learning. Their aims are to provide skills in areas such as cultivation practices and pest management so as to increase yield and revenue while reducing environmental impact (FAO, 2016).

A recent systematic review based on 92 evaluations found that farmer field schools increased farmers’ knowledge by 0.21 standard deviation on average, leading to average increases in yield by 13% and net revenue by 19%. They also reduced environmental impact (an aggregate index decrease by 39% on average) and pesticide use (by 17%). Education quality is vital to this model: Facilitators with strong literacy and numeracy skills, experience with farming, and willingness to use bottom-up training methods, follow a locally relevant curriculum and use the local language obtain the best results (Waddington et al., 2014).

Critical questions about how to move agricultural extension forward remain. For example, how can extension services reach and engage the widest number of farmers to facilitate institutional change and technical innovation, and what are the most effective extension strategies (Pretty et al., 2010)? Increasing productivity is necessary but not sufficient to ensure food security, reduce poverty, improve nutrition and maintain the natural resource base for sustainable development (Sayer and Cassman, 2013). Innovation is needed across a broad spectrum of policies and technologies to confront the complex array of challenges at the agriculture–environment nexus.

In many regions, climate change will result in more frequent drought and low rainfall, making current farming practices less viable. Such conditions call for the introduction of new methods and technologies. This could include the application of sustainable organic farming methods, which have been shown to produce higher yields than conventional agriculture under drought conditions, as well as reduce negative environmental impacts (Reganold and Wachter, 2016).

Agricultural research can help answer some of the dilemmas extension services face. Through a cross-disciplinary lens vital to the systemic change needed, it can bring about more sustainable practices. Generally based at universities and technical institutes, agricultural research includes collaboration by a wide variety of scientists, industrial partners and government agencies. An analysis of more than 1,000 scientific publications by France's National Institute for Agricultural Research provides insight into the types of research taking place: methods and techniques to improve productivity and the environmental, health and socio-economic impact of agriculture, ways to improve coordination between public research and industry, and scientific advice to inform policy-making (Gauband et al., 2015).

Such research highlights a shift from isolated campus research centres towards active engagement with farming communities and industry partners, and public programmes to encourage experimentation and innovation. New research provides insights from many areas, including innovation studies, socio-technical transition studies, rural and political geography, resilience thinking and climate risk management literature (Rickards and Howden, 2012).

The Integrated Agricultural Research for Development (IAR4D) concept is an example of this interdisciplinary approach. IAR4D is based on a systems science approach which includes many of the underlying principles of sustainability science. These include economic growth by linking farmers to markets, conservation of natural resources, biodiversity, limited carbon dioxide production, food security, and social inclusion and equity. This integrated approach to farming facilitates research on rural services and policies in order to understand farmers' access to markets, credit and other key rural services. Empirical evidence for the integrated approach is positive, although still sparse and weak. Impact analyses of household surveys in the Democratic

Republic of the Congo, Nigeria, Rwanda and Uganda show that the IAR4D approach has some benefits for farmer income compared with conventional research approaches (Ayanwale et al., 2013; Nkonya et al., 2013).

Climate change and associated food security concerns are prompting growing calls to reverse reductions in government investment in agricultural research, development and extension. Many countries have halted or reduced investment in agricultural research, whether directly or as donors. The key challenge is in sub-Saharan Africa, whose share in global expenditure on public agricultural research declined from 10% in 1960 to 6% in 2009. By comparison, Brazil, China and India together accounted for 31% in 2009. In 2010, public agricultural and food research worldwide received about US\$35 billion, while private research totalled between US\$20 billion and US\$22 billion, which was heavily concentrated in high income countries and focused on innovations in off-farm sectors such as food processing (Alston and Pardey, 2014; Mellor, 2014). Much more investment is justified – the FAO estimates the returns to public spending on agricultural R&D in Uganda at more than 12% (Dobermann and Nelson, 2013).

EDUCATION AND LIFELONG LEARNING CONTRIBUTE TO LONG-TERM ECONOMIC GROWTH

Mainstream economic analysis has highlighted increased levels of primary and secondary education as a key driver of long-term economic growth. Data show that initial levels of educational attainment explain about half the difference in growth rates between East Asia and sub-Saharan Africa between 1965 and 2010 (UNESCO, 2014).

At the individual level, the knowledge and skills workers acquire through education and training make them more productive. Provision of good quality education can improve the knowledge and skills of a whole population beyond what traditional or informal systems can achieve. For business, educated and highly skilled workers foster productivity gains and technological change, through either innovation or imitation of processes developed elsewhere. At the societal level, education expansion helps build social and institutional capital, which has a strong impact on the investment climate and growth; it also helps in building social trust, developing participatory societies, strengthening the rule of law

and supporting good governance (Acemoglu et al., 2014; Bjørnskov, 2012; Knack and Zak, 2003).

For countries to prosper in their participation in the world economy, investment in education is a must. Low and lower middle income countries need to invest in secondary and tertiary education and expand lifelong learning opportunities to increase high-value added activities in the industrial and service sectors. This is particularly true of sub-Saharan Africa. By 2014, the region's gross enrolment ratio in tertiary education

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Increasing tertiary attainment by one year on average would increase sub-Saharan Africa's long-term GDP level by 16%”

was 8%, far below the second-lowest regional average, that of Southern Asia (23%), and the global average (34%).

Historically, as the estimated benefits to investment in education were lower for higher education than for primary and secondary

education, the World Bank and others discouraged investment in the tertiary level (Basset and Salmi, 2014). But recent evidence on the impact of higher educational attainment on growth, pertaining to 108 countries over 1975–2010, suggests that increasing tertiary attainment by one year on average would increase sub-Saharan Africa's long-term GDP level by 16% and increase growth through technological catch-up by 0.06 percentage points a year (Bloom et al., 2014).

... BUT THE QUALITY OF EDUCATION IS CRUCIAL

The provision of good quality education is central: Increasing enrolment rates will not have as much positive impact on national economic growth if students do not reach sufficient learning outcomes (Pritchett, 2006). Years of schooling is a problematic indicator of workers' actual skills because of differences in school quality within and between countries, in achievement between students of the same social class and in acquisition of skills through other sources.

While results of the Survey of Adult Skills in the OECD Programme for the International Assessment of Adult Competencies (PIAAC) are too recent to correlate with long-term growth, surveys of student achievement conducted since the 1960s by the International Association for the Evaluation of Educational

Achievement (IEA), along with results of the OECD Programme for International Student Assessment (PISA), have been used as a proxy for the quality of education that adults received (Barro, 2013).

This strand of research has provided evidence of a substantive link between skills developed through education and economic growth. It has clearly been shown in relation to skills in mathematics and science. Across 50 countries, the average of mathematics and science test scores available between 1964 and 2003 had a significant and positive impact on economic growth over 1960–2000. A standard deviation increase in test scores was associated with a two percentage point annual increase in GDP growth (OECD, 2015d).

Research also shows that basic and advanced skills have complementary effects on growth. Both the share of students achieving at least basic skills (ranging from 42% in low income countries to 80% in high income countries) and the share achieving advanced skills have a positive impact on growth. However, the impact of the share of advanced skills is comparatively larger in countries with more scope to catch up with the most advanced economies, reflecting the importance of advanced skills for technological diffusion (OECD, 2015d).

The provision or relative lack of good quality education helps explain the East Asian 'miracle' and Latin America's 'lost decades'. Despite relatively high average years of schooling and per capita income around 1960, most Latin American countries have had low test scores in the decades since, whether measured in international surveys or in regional assessments conducted by the Latin American Laboratory for Assessment of the Quality of Education. By contrast, many East Asian countries have had higher test scores than could be predicted based on the same variables. Differences in test scores between the two regions can explain their different growth records. Within the regions, countries with higher scores had more rapid growth, e.g. Brazil and Chile compared with the Plurinational State of Bolivia, Honduras and the Bolivarian Republic of Venezuela, and the Republic of Korea and Singapore compared with Indonesia and the Philippines (Hanushek and Woessmann, 2012).

Analysis of a sample of lower middle income countries found that if all children were to acquire basic skills by 2030, GDP would be 28% higher over the following 40 years compared with what would be expected with current skills levels. The increase in GDP for upper middle

income countries would be 16% and that for non-OECD high income countries 10%, reflecting higher enrolment and skills levels. Even high income OECD countries would gain significantly from bringing all students up to basic skills by 2030, with GDP 3.5% higher than otherwise (OECD, 2015d).

EDUCATION POLICIES WILL HELP COUNTRIES ADAPT TO A FAST-CHANGING WORLD OF WORK

The world of work has undergone rapid change in recent decades. ICT has dramatically changed how we live and work and how economies are structured. This change is especially apparent in more developed regions and in urban areas. In poorer countries, there has been substantial movement from agricultural to non-farm employment. Moreover, greater integration of the global economy has opened up economic and trade opportunities across the world, enabling rapid growth in the now major economies of Brazil, China and India, while displacing industries and occupations in advanced economies through off shoring, particularly among less educated workers (Autor et al., 2014).

Two trends with profound implications can be expected to shape labour markets in many countries in the foreseeable future. First, polarization between low and high skill work and reduced demand for medium skilled employment has been widely documented in industrialized economies, but can also be observed on the global level. Second, stagnation in manufacturing employment makes it uncertain that poor countries can follow the developmental paths which historically have greatly improved working conditions among the poor. These interrelated trends can be expected to significantly shape the scope for decent employment across countries, challenging policy-makers to increase the supply of highly skilled and appropriately skilled workers, while creating conditions in which an educated workforce can be employed and adequately utilized.

Education systems must adapt to job polarization

Recent evidence from high income countries has led to increasing awareness of polarization between high and low skill work. A resulting proposition is that technological changes underpin the large relative drops in medium skill employment and corresponding increases in high and low skill employment across Europe and Northern America. Increasingly sophisticated technology has not only raised demand for high skill workers by complementing

their creative and problem-solving abilities, but has also displaced workers in medium skill jobs whose relatively repetitive and procedural tasks are more easily replicated in computer hardware and code, and overseas (Autor and Dorn, 2013; Autor et al., 2006; Goos et al., 2014; Jaimovich and Siu, 2012).

Evidence suggests that similar processes may also be under way in other regions, although it is premature to draw conclusions. The global employment share of high

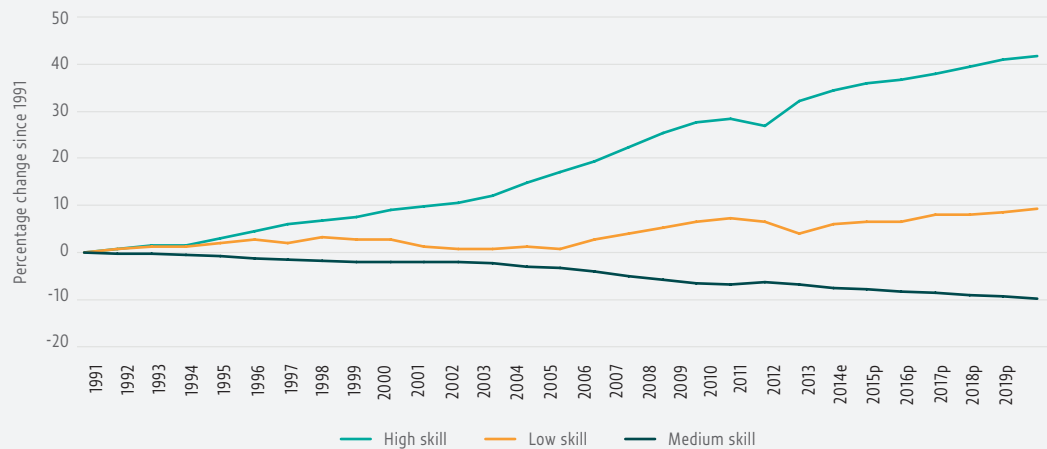
“ The global employment share of high skill workers has increased by almost 40% since 1990

skill workers has increased by almost 40% since 1990, and is projected to have accounted for almost 20% of the workforce in 2015 (Figure 2.1). Over the same period, the employment share

of medium skill work decreased by almost 10%, while the share of low skilled work rose correspondingly. These trends are projected to continue in coming years.

Globally, as in industrialized countries, the majority of employment remains in medium skill occupations, which are projected to have made up slightly less than two-thirds of total employment in 2015 (ILO, 2015c). However, their share may decline significantly in coming decades as increasingly cheap and capable computer programs replace clerical workers and robots displace garment makers and machine operators². In China, for example, automation has had a substantial impact on factory employment, and this trend could accelerate as wages rise and automation technology becomes cheaper. In the context of rising manufacturing wages, President Xi Jinping in 2014 called for a ‘robot revolution’ (Chan, 2015), which already appears to be under way. The consumer electronics manufacturer Foxconn, one of the largest employers in China (and the world), plans to automate about 70% of its factory work by 2018, and already has a fully robotic factory in Chengdu (Lin, 2015).

Education systems face the dual challenge of ensuring that those who enter medium skill work have the skill sets to avoid obsolescence and of meeting the economy’s increased demand for skilled workers, demand that is likely to continue in the foreseeable future given that computer code is no substitute for the creativity and cognitive abilities of high skill workers. Yet evidence suggests that most education systems are not keeping up.

FIGURE 2.1:**Employment is being polarized by skill category on the global level***Percentage change in global employment shares from 1991, by occupational skill level*

Notes: Skilled occupations are classified according to one digit ISCO-08 codes, following the ILO Global Employment Trends (GET) Model Extension (GME) methodology. High skill occupations are those of managers, professionals, technicians and associate professionals. Medium skill workers are clerical support workers, service and sales workers, skilled agricultural, forestry and fishery workers, craft and related trades workers, plant and machine operators, and assemblers. Low skill workers are those in elementary occupations. Data for 2014 are estimates (e). Data for 2015–2019 are projections (p). Source: GEM Report team calculations based on ILO (2015c).

In high income countries such as the United States, an insufficient supply of tertiary graduates is well documented, as evidenced by the rising ‘college premium’ in wages and growing inequality (Goldin and Katz, 2010). On the global scale, by 2020 the world could have 40 million too few workers with tertiary degrees, relative to demand, and up to 95 million too many low and medium educated workers. Advanced economies could have up to 35 million excess workers without post-secondary education. In poorer countries the surplus of workers without secondary education could be as large as 58 million, combined with 45 million too few workers with secondary education (MGI Global, 2012).

Beyond the need for greater tertiary enrolment, what forms of skills development should governments promote? There is a case for expanding TVET at the post-secondary level in middle skill occupations that are less prone to automation (Autor, 2015). Investing in job-specific skills is risky given the uncertainty as to the effects of technological change. Still, capacities promoted by general and comprehensive education – for example, critical thinking, problem solving, team and project work, and solid literacy, communication and presentation skills – are likely to

remain valued in the labour market, including in green jobs, and throughout life.

In addition, education systems could do more to promote high value skills not easily replicated by machines or software. Studies based on analysis of job tasks in the UK and US labour markets show that two attributes in particular are the least likely to be replaced by machines: originality and social intelligence. The former – and most important – attribute refers to creative problem-solving and the generation of unusual or clever ideas about a given topic or situation. The latter entails tacit knowledge of social and cultural contexts enabling one to perform tasks such as negotiation, coordination, teaching and mentoring (Citi GPS, 2016; Frey and Osborne, 2013). Acquiring a wide range of transferable and foundation skills is therefore extremely important for future employment. The challenge for education systems is to discover how to most effectively impart them to students.

Countries need to make the leap to the high skill service sector

The decline of medium skill work, particularly manufacturing employment, has strong implications for lower income economies. In almost every country



By 2020, the world could have 40 million too few workers with tertiary degrees, relative to demand



that has moved from low to high income status, manufacturing jobs provided the route by which poor agrarian workers moved into comparatively stable and better paid work. However, automation and technological developments are reducing demand for manufacturing workers, a trend expected to continue. Without growing manufacturing employment, the challenge of 'leapfrogging' from low skill agrarian to high skill service-sector economies is daunting for poorer countries and regions in which the majority of employment is still agricultural, such as sub-Saharan Africa and Southern Asia (World Bank, 2015).

Over the course of the 20th century, peak manufacturing employment in emerging economies has declined, relative to the historical experience of more advanced economies. Manufacturing employment in the United Kingdom peaked at 45% of total employment, while emerging economies such as Brazil and India saw manufacturing employment peak at no more than 15%. In sub-Saharan Africa, manufacturing employment has stagnated at around 6% for three decades (Citi GPS, 2016).

Countries which have not already developed a strong manufacturing sector face significant barriers. The decreasing cost of automation technology means that the abundance of cheap labour in, for example, sub-Saharan Africa is unlikely to provide sufficient incentive for manufacturing firms to invest (Citi GPS, 2016). So, as a form of 'premature deindustrialization', such nations are transforming into service economies without prior development of an industrial sector (Felipe et al., 2014; Rodrik, 2015).

This is already evident on a global scale: Employment in the service sector has grown substantially (ILO, 2015b). However, many of these jobs are characterized by low productivity and poor working conditions. In Latin America, work in the informal sector³ has grown; in sub-Saharan Africa, urban migrants are crowding into subsistence employment in the informal service sector as well (Rodrik, 2015).

High productivity tradable service industries such as ICT and finance could provide an alternative means of growth in the absence of a manufacturing sector (Rodrik, 2015). So could jobs in growing green industries. But the highly educated and skilled workers upon which these sectors rely are typically in short supply in lower income countries. Nor is the shift to high value services such as ICT automatically positive, as it can have negative effects such as social exclusion and job insecurity (see Chapter 5: Place).

Policy-makers need to extend provision of education and skills beyond the basic literacy and numeracy that were valued in 20th century industry. The extent to which countries create conditions in which services and green industries can productively employ large numbers of workers will largely determine whether governments meet commitments to provide work for all. Countries hoping to emulate the export-led manufacturing growth of 'Asian miracle' economies may need to accept that this model now offers limited guidance.

ECONOMIC GROWTH DOES NOT MEAN PROSPERITY FOR ALL

Achieving a higher level of development has historically been linked with industrialization. But as the Agenda for Sustainable Development was being defined for 2015–2030 and the evidence of prior decades was considered, fundamental flaws became visible in the logic of economic growth reliant on the 20th century model of industrialization. These flaws concerned not only the impact on the environment but also the fact that such models of economic growth have failed to produce development that is inclusive of all (Sachs, 2015).

The previous sections presented evidence that investing in education and lifelong learning contributes to long-term economic growth and that education (and policies on education and skills development) can facilitate countries' ability to expand the higher skill service sector and provide decent work for all. But economic

growth does not necessarily mean prosperity for all, in spite of the great strides made to improve the quality of life around the globe and reduce extreme poverty. The benefits of growth have been unevenly spread. The effects on the environment have meant a poorer quality of life for many, and thus a lack of prosperity. In addition, poverty remains prevalent in many countries.

While the incidence of extreme poverty declined rapidly over 2000–2015, the challenge is far from over. Almost 900 million people lived in extreme poverty in 2012. The share of people living on less than US\$1.90 a day declined globally from 29% in 1999 to 13% in 2012, partly because of rapid economic development in China. Extreme poverty is now concentrated in Southern Asia (19% of the population) and sub-Saharan Africa (43%) (World Bank, 2016).

For those who are in work, earnings are often not sufficient to escape either extreme poverty or more moderate levels. In low income countries, largely in sub-Saharan Africa, 37% of workers are extremely poor and a further 32% moderately poor. More broadly, almost 90% of workers are either poor or close to poverty in low income countries, and nearly 70% in lower middle income countries. Among all developing regions, almost half of workers are poor or near poverty (**Figure 2.2**).

Inequality, as measured by the Gini coefficient, has persisted at an extremely high level globally, and has increased markedly in most countries and regions.

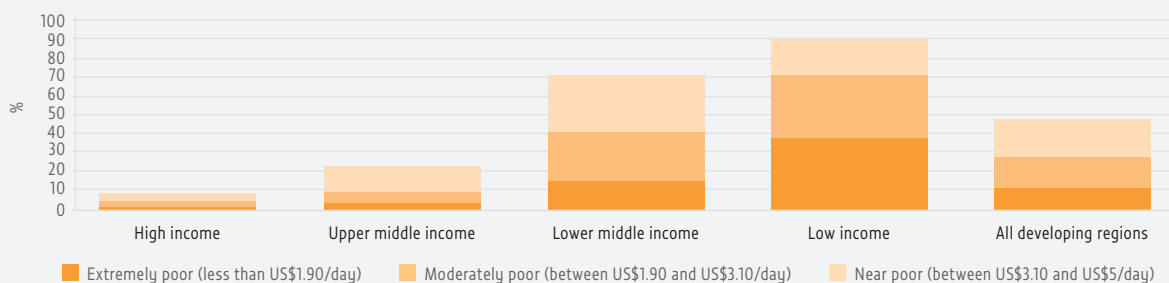
The Gini index measures per capita income equality: The closer the coefficient is to zero, the less the inequality, and the closer it is to one, the greater. The global Gini coefficient was 0.715 in 1998 and had not changed significantly by 2008, at 0.705 (Lakner and Milanovic, 2015).

Between 1993 and 2008, the poor did not benefit from growth as much as the rest of the population: The average per capita income of the world's poorest decile increased by 25%, but the income of the middle deciles grew roughly twice as fast, by over 50%, while the income of the richest 1% grew by 62% (Lakner and Milanovic, 2015).

Within countries, increases in inequality were more pronounced. By income group, average inequality increased significantly between the early 1990s and late 2000s: by 9% for high income countries and 11% for low and middle income countries (**Figure 2.3**). Over 1988–2008, inequality increased rapidly in China (Lakner and Milanovic, 2015).

The evidence on poverty and inequality shows that economic growth has not been equally shared and that the conventional development paradigm needs rethinking. The growth model of the past century is not suited for 21st century sustainability, even if it does include the aim of reducing extreme income poverty by raising GDP. A new concept of prosperity must include social inclusiveness of economic institutions and overall

FIGURE 2.2:
Large proportions of workers remain in poverty
Share of workforce living in or near poverty, 2015



Notes: Excludes North America, Western Europe and the European Union, Australia and New Zealand. Economic classes are defined by estimated per capita per day consumption levels in US\$, 2011 Purchasing Power Parity (PPP).
Source: ILO (2016).

well-being, along with environmental sustainability of production and consumption. A strong economy does not just grow but is also inclusive and sustainable.

In the past, growth has been tracked through gross measures such as increases in domestic product, without careful examination of its impact on the environment or the extent to which the vital economic activities of marginalized groups, such as the poor and women, are included. Looking beyond a nation's averages is critical to understand how all citizens contribute to and are affected by economic growth; doing so helps keep poverty and inequality from persisting at levels that undermine social cohesion (Ravallion, 2015).

In fact, high and rising inequality has stalled progress in much of the world. Drawing on data from OECD countries over the past 30 years, analysis suggests that in relatively rich countries, the single biggest negative impact on economic growth was made by the widening gap in income between the lower middle class and poor households, on one hand, and the rest of society on the other (Cingano, 2014).

EDUCATION CAN HELP INCREASE INCLUSION

Education has an important role in creating a stronger relationship between expanding valued economic activities and promoting social inclusion as part of the process of transition to a sustainable and inclusive economy.

Education drives growth, increases the incomes of the poorest and, if equitably distributed, mitigates inequality. Making primary and secondary education of good quality widely accessible can enable large numbers of individuals and their families to increase their incomes above the poverty line. In lower income countries, achievement of basic education is associated with increased earnings and consumption among rural and informal sector workers. Calculations for the 2013/14 *EFA Global Monitoring Report* showed that if all students in low income countries left school with basic reading skills, 171 million people could be lifted out of extreme poverty, equivalent to a 12% reduction in the world total (UNESCO, 2014).

Higher levels of education reduce the likelihood of households experiencing long periods of chronic poverty or transmitting poverty between generations. If 10

FIGURE 2.3:

Inequality has grown across rich and poor regions
Change in Gini coefficient between early 1990s and late 2000s



Notes: Household income inequality was measured by the population-weighted average for a sample of 116 countries.
Source: UNDP (2013).

recent EU member states⁴ met 2020 targets to decrease early school leaving and increase tertiary participation, they could reduce the numbers of those at risk of poverty by 3.7 million (Ajwad et al., 2015). Education can also help make the labour market more inclusive by facilitating labour force participation and employment, and reduce working poverty as well.

However, assumptions on the role of education in economic development can often be overly reductive. The term 'education' encompasses a wide range of programmes, with differing levels of quality and objectives. The effects of a particular education investment in terms of desirable outcomes will accordingly vary in magnitude. Moreover, these effects will in turn vary across countries, depending on broader economic and labour market contexts. Looking more closely at the effects of levels and types of education across a range of outcomes can therefore be instructive in helping promote more participation in the economy, and more inclusion in its benefits.

EDUCATION'S IMPACT ON INEQUALITY MAY BE MIXED

While expanding education is indispensable to the fight against poverty, its impact on inequality is mixed. Increases in training and skills have not translated evenly into improved prospects for long-term economic growth or reduced social inequality. The impact of education varies by country context. Secondary or tertiary education is becoming key to obtaining decent

jobs and decent earnings, even in low and middle income countries. This trend is reinforced by job polarization and by the rise of the service sector in the context of rapid technological change and continued globalization.

Equitable education expansion over 2015–2030, especially at the secondary and post-secondary levels could help reverse the trend of widening income inequality within countries. Educated people, at all levels of education, receive a substantial payoff in individual earnings (Montenegro and Patrinos, 2014), meaning education reforms can be important in reducing income inequality and earnings disparities between groups. Furthermore, improving education outcomes among disadvantaged groups can improve intergenerational social and income mobility (OECD, 2012).

Generally, to tackle income inequality, education should be expanded and its provision equally distributed. Historical evidence suggests unequal distribution in educational attainment contributes to unequal income distribution (Birdsall and Londoño, 1997; Gregorio and Lee, 2002; Lundberg and Squire, 2003), while higher levels of education, in terms of both quality and quantity, positively affect growth in the income share of the poor (Gundlach et al., 2004). A meta-analysis of 64 empirical studies found that education – based on measures such as years of schooling and education expenditure – is significantly associated with an increased income share of the poor and a reduced income share of the rich. Effects were particularly strong for secondary school expansion, and for education expansion generally in Africa (Abdullah et al., 2015).

While reporting an overall positive effect, the meta-analysis cited above found that education was associated with increased inequality in a large number of studies (Abdullah et al., 2015). In the United States, it is estimated that moving 10% of non-college-educated males to a

“ Where education is unequally distributed and not effectively aligned with labour market designs, it can reinforce inequality ”

degree-level education would have little impact on overall inequality⁵, mainly because many benefits would shift to the upper end of the income distribution (Hershbein et al., 2015).

The overall effect of education expansion on income inequality

(before taxes and transfers) is ultimately determined by changes in the education distribution between levels of education; differences in labour market returns between (and within) these levels;⁶ and whether the education expansion reduces differences in wages between education levels.

The dynamics of education expansion are commonly understood in terms of two sometimes contradictory processes – the *composition* effect and the *compression* effect (Gregorio and Lee, 2002; Knight and Sabot, 1983). The former, through increases in the incomes of beneficiaries, changes income distribution, and in theory can either increase or decrease inequality. For example, on this basis, education expansion in which beneficiaries increase their incomes significantly above average wages (e.g. expanding tertiary education in a country in which only a small proportion of the population has tertiary education) can be expected to increase inequality, all else being equal. On the other hand, education expansion in which a disadvantaged group increases its income to closer to the national average (e.g. moving to universal secondary attainment where attainment is relatively widespread) can be expected to lower inequality. Hence, the composition effect of education expansion at a given level of education tends to increase inequality initially, as more people attain higher income, then lower it over time, as fewer low income people remain.

At the same time, a *compression* effect takes place when the increased supply of workers with a given level of education exceeds the demand for them. This pushes wages down relative to the less educated. So while the composition effect can work to either increase or decrease inequality, the compression effect works to lower inequality. All else being equal, the effect of education expansion on earnings inequality depends on the net composition and compression effect. If, for example, a higher education expansion led to a compositional change – which would in theory widen the income distribution – this would have to be outweighed by a subsequent compression effect across higher education graduates in order to decrease inequality.

Given uncertainty of the future returns between and within various levels of education and labour market demand, accurately estimating the net composition and compression effects of an education reform in advance is challenging.

Education should therefore be viewed as a potential equalizing mechanism, but not as the sole solution to

inequality. The degree to which education can decrease income inequality within countries over 2015–2030 will vary by countries, depending on context. Opportunities for large expansion of secondary education that could equalize income exist in many low income countries. Yet many countries, including in poor regions, will likely experience ever-increasing demand for tertiary education, both as a result of larger numbers graduating from secondary school and from employers wanting skilled workers (Altbach et al., 2011). If changes in the economy raise the pay-off to tertiary education, while tertiary graduation increases alongside, income inequality could widen in many countries.

Governments have an obligation to provide universal primary and secondary education and basic skills to all. But whether increased access to tertiary education improves income distribution over the short and medium term should not ultimately determine its desirability. Education is not the only tool available to policy-makers wishing to tackle inequality. Counteracting inequality with taxes and transfers between those on high and low incomes remains a necessary and often more effective method than education reform alone (Hershbein et al., 2015). Better access to education (leading to declining education inequality), combined with improved health outcomes and redistributive social policies, have been cited as three interventions that help raise the income share of the poor and middle class regardless of the level of economic development (Dabla-Norris et al., 2015).

EDUCATION IMPROVES LABOUR MARKET AND DECENT WORK OUTCOMES

The primary way education promotes economic inclusion is by expanding people’s ability to participate productively in the economy on favourable terms. This objective, implicitly including poverty reduction and greater income equality, is encapsulated in SDG 8: promoting inclusive and sustainable economic growth, employment and decent work for all.

Decent work is both an aspiration and an expectation for the vast majority of working age adults, who depend on a decent wage for their labour (**Box 2.2**). However, widely available measures make clear that decent work remains out of reach for much of the global working population.

Education is widely considered one of the best investments to expand prospects of skilled and

BOX 2.2

What is decent work?

The ILO concept of decent work describes it as work that is ‘productive and delivers a fair income, security in the workplace and social protection for families. Decent work means better prospects for personal development and social integration, and freedom for people to express their concerns, organize and participate in the decisions that affect their lives. It entails equality of opportunity and treatment for all women and men.’

Education primarily promotes decent work by enabling individuals with skills and knowledge to become more productive.⁷ More specifically, it enables individuals to acquire a stock of capabilities (knowledge and skills) necessary to perform certain tasks effectively. Workers apply their skills to bundles of tasks (occupations) in order to produce output. Skilled workers can perform a variety of complex tasks more effectively, thereby producing more value and receiving higher earnings. Due to their relative scarcity, higher skill workers are more employable and demand not only higher earnings in the labour market, but also better working conditions. Higher skill work is often intrinsically more rewarding because of the freedom and creativity often inherent to higher skill occupations.

Sources: Acemoglu and Autor (2011); ILO (2007).

adequately paid employment. But while most policy-makers are aware of the importance of education for productive and decent work, it is less clear what forms of education expansion should be promoted to maximize better job opportunities. In addition, following the earlier discussion, it will be important for education to equip workers with green skills, for the new green economy.

EDUCATION CAN FACILITATE LABOUR FORCE PARTICIPATION AND ACCESS TO EMPLOYMENT

Globally, many individuals remain unable to secure work, or do not participate in the labour market. The share of the population in employment varies significantly across regions. It is systematically lower among women than men, particularly in Northern Africa and Western Asia and Southern Asia (ILO, 2015b).

In 2014, 201 million people globally were considered unemployed: that is, without work, though available for and seeking employment. Youth continue to be

disproportionately affected, accounting for over one-third of the unemployed globally (ILO, 2015b). Some regions display considerable gender disparity, including Latin America and the Caribbean, sub-Saharan Africa and, in particular, Northern Africa and Western Asia, where 21% of women are unemployed – almost double the share of men. Underemployment is also significant. In the European Union, 10 million are underemployed, two-thirds of them women (Eurostat, 2015). Unemployment figures exclude those who have stopped actively seeking work, often because they cannot find employment or have given up. In 2013, the number of these ‘discouraged workers’ was estimated at 23 million globally (ILO, 2014).

Education can have a significant role in facilitating employment, as reflected in lower unemployment rates among the comparatively educated, particularly in richer countries. However, in poorer countries this relationship often breaks down, suggesting both that demand for skilled labour is limited and that education systems are not enabling students to acquire relevant skills (ILO, 2015a; Sparreboom and Staneva, 2014).

In richer countries, low educational attainment has a strong association with unemployment and inactivity. In the OECD, only 55% of adults aged 25 to 64 with less than an upper secondary education were employed in 2013, compared with 73% of those with an upper secondary or non-tertiary education and 83% with a tertiary qualification (OECD, 2015c).⁸ The corresponding rates among those aged 15 to 29 who were not in education were 49%, 73% and 83% (OECD, 2015b).

Evidence across 11 EU countries shows that the probability of long-term unemployment decreases with higher educational attainment (Garrouste et al., 2010). In emerging economies such as South Africa and Turkey, there are large differences in employment rates by educational attainment. In South Africa, less

“ Evidence across 11 EU countries shows that long-term unemployment decreases with higher educational attainment ”

than 45% of the adult population with less than upper secondary education were employed in 2005, compared to over 60% who completed upper secondary, and over 80% with a tertiary qualification (Quintini and Martin, 2013). In the United States, high

school and university completion significantly increases the chance of unemployed workers finding work within a year (Riddell and Song, 2011).

By contrast, unemployment in non-OECD countries is often associated with higher levels of education. In Asia and the Pacific, North Africa and Western Asia, and sub-Saharan Africa the youth unemployment rate increases with the level of education. Youth with tertiary education in these regions are two to three times more likely to be unemployed than youth with primary education or less (ILO, 2015a). In several sub-Saharan African countries, differences are especially large among young adults aged 25-34. In the United Republic of Tanzania, for example, unemployment is almost negligible among those with primary education or less, but almost 17% for those with tertiary education (UCW, 2013). Such outcomes are partly due to the more educated coming from wealthier backgrounds and thus able to sustain periods of unemployment, whereas employment is necessary for survival among the poorer and less educated (UCW, 2013).

High unemployment rates among the relatively educated – particularly among youth – also reflect low education quality, weak skills acquisition and limited labour demand. In Northern Africa and Western Asia, where youth unemployment is pervasive, education quality is low, as indicated by the fact that some 75% of eighth grade students scored poorly on international mathematics tests. Tertiary enrolment is also weighted towards subjects with relatively low labour market demand (particularly law, the humanities and business/commerce). These factors may explain why almost 40% of firms in Northern Africa and Western Asia – the highest share of any region – identified an inadequately educated workforce as a major constraint to growth (Gatti et al., 2013).

TVET is often promoted as a potential solution to youth unemployment, facilitating school-to-work transition by providing skills more relevant to the labour market. However, the evidence is mixed: While some studies indicate that vocational education increases youth employment, the consistency of the finding in different settings and over the life course varies (Hanushek et al., 2011; OECD, 2015b).

There is a limit to the extent countries can educate themselves out of unemployment. In poorer countries, high unemployment rates among the educated likely reflects limited demand for skilled labour, amplified by

large and growing youth populations (ILO, 2015a). In advanced economies, unemployment has always been a feature to various degrees; all else being equal, it is questionable whether educating the unemployed to minimum standards would lead to full employment. So it is important for education interventions to be accompanied by economic policies that aim to increase demand for skilled labour.

EDUCATION, ESPECIALLY SECONDARY AND TERTIARY, CAN ADDRESS PERSISTENT WORKING POVERTY AND JOB INSTABILITY

This chapter has already described how working people's earnings often do not allow them to escape poverty. Almost half of workers in developing regions are in or near poverty, with considerably higher proportions in low and lower middle income countries (Figure 2.2).

Even higher shares of workers are in 'vulnerable employment': they work on their own account or with one or more partners, or they are unpaid family workers. Beyond low income, vulnerable employment is associated with a lack of social protection and unstable working conditions. It was estimated to account for

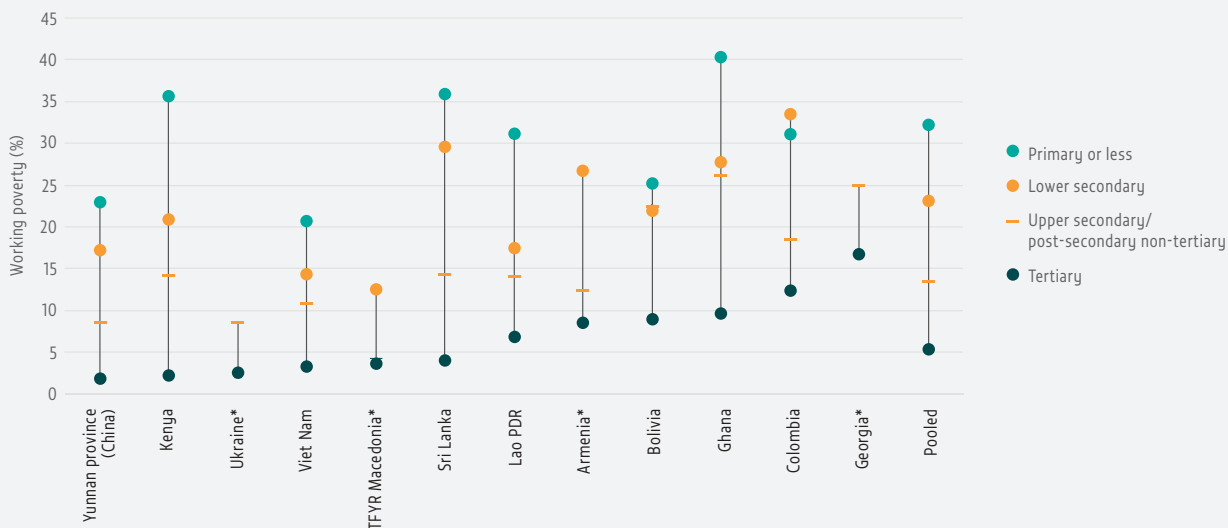
45% of global employment in 2014 (ILO, 2015c), and 75% of workers in sub-Saharan Africa and Southern Asia. Women tend to be over-represented in vulnerable employment in most regions. Even higher proportions of workers are estimated to work informally, operating outside legislative frameworks and lacking employment protection. Evidence suggests that in many low and middle income countries, over half of non-agricultural employment is informal, particularly in sub-Saharan Africa and Southern Asia, as well as many Latin American countries (ILO, 2013b).

Increasing levels of education are progressively associated with lower working poverty rates, as illustrated by analysis of twelve low and lower middle income countries surveyed in the Skills Towards Employment and Productivity (STEP) programme (Figure 2.4)⁹. Attainment of upper secondary education¹⁰ considerably reduces the likelihood of working in poverty compared to lower levels of education. Indeed, this advantage appears clear in comparison to lower-secondary attainment in most countries sampled. Those with tertiary education are least likely to be working in poverty, by a substantial margin.

FIGURE 2.4:

Increasing levels of education are associated with lower working poverty

Working poverty (below 50% of median weekly earnings) by education level in 12 low and middle income countries



Notes: Sample is for urban areas. Sample restricted to full-time workers (at least 30 hours per week) aged 15–64. *Levels of education were excluded due to low number of observations.
 Source: GEM Report team calculations based on World Bank STEP Skills Measurement Surveys (2012–2013).

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Globally, earnings increase by approximately 10% for each additional year of schooling

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The benefits of upper secondary attainment and the equivalent are even more apparent when examining other measures of poor working conditions in low and middle income countries (**Figure 2.5**). Those with upper secondary education are significantly less likely than workers with lower secondary to be in vulnerable employment or to work informally without a contract or social benefits. This would suggest that upper secondary education can increase access to more productive occupations with decent working conditions. For this to hold true, any future increases in upper secondary attainment should be accompanied by growing opportunities in the labour market to productively utilize these skills.

However, vulnerable and informal employment remains sizeable in the low income countries of the sample, even among workers with upper secondary education. In the Plurinational State of Bolivia and Colombia, informality and own-account employment remain relatively widespread even among workers with tertiary education. Informality is partly driven by efforts to avoid

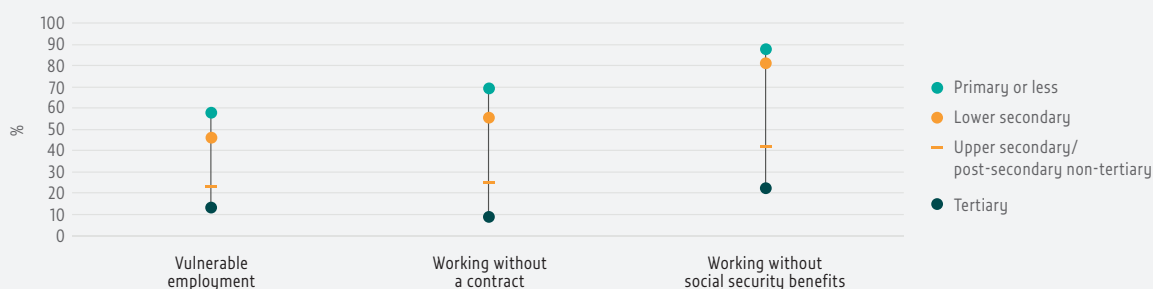
taxes and regulations. But widespread employment in low productivity small and micro-enterprises, largely reflects limited employment opportunities in larger formal sector firms (La Porta and Shleifer, 2014). Unless measures are taken to promote the growth of larger, higher productivity firms (which in addition to offering better working conditions are more likely to comply with regulations), the effects of education expansion may be muted in some countries (Herrera-Idárraga et al., 2015). However, since vulnerable employment has been growing in recent years, including in OECD countries (ILO, 2015b; Jütting and Laiglesia, 2009), it is questionable whether employment can be significantly ‘formalised’ by 2030.

EDUCATION SIGNIFICANTLY INCREASES EARNINGS AND EMPLOYMENT

Beyond reducing poverty, education has a well-established effect on earnings across the income distribution. Globally, in 139 countries, the private return¹¹ per additional year of schooling is 10%. Rates of return are highest in poorer regions such as sub-Saharan Africa,

FIGURE 2.5:

Upper secondary attainment can substantially lower the risk of vulnerable and informal employment
Vulnerable and informal employment in urban areas by educational attainment



Notes: For urban areas of Armenia, the Plurinational State of Bolivia, Colombia, Georgia, Ghana, Kenya, the Lao People's Democratic Republic, Sri Lanka, the former Yugoslav Republic of Macedonia, Ukraine, Viet Nam and China (Yunnan province). Vulnerable employment is defined as the sum of own-account workers and contributing family workers. Data are for 2012–2013, weighted by population.
Source: GEM Report team calculations based on World Bank STEP Skills Measurement Surveys (2012–2013).

reflecting the scarcity of skilled workers (Montenegro and Patrinos, 2014).

In recent years, international surveys directly measuring skills among youth and adults have shown that literacy, numeracy and problem-solving abilities have a significant impact on earnings. For example, in 22 OECD countries, a standard deviation increase in literacy and numeracy skills is associated with an average increase in hourly wages of 17% and 18%, respectively¹² (Hanushek et al., 2013). Among urban populations in eight low and middle income countries, the increase in hourly earnings associated with a standard deviation increase in literacy scores ranges from 9 percentage points in Ukraine to about 25 percentage points in Ghana and Kenya (Valerio et al., 2015).¹³ In both OECD and lower income countries, returns are highest among prime-age workers (35 to 54), who presumably are more able to apply their skills in employment (Chua, 2015; Hanushek et al., 2013).

Differences in returns to literacy skills on earnings between richer and poorer countries suggest their relative scarcity in the latter. For example, in the Plurinational State of Bolivia, Ghana and Kenya, the returns to literacy are the highest in the World Bank

STEP Skills Measurement Survey sample, but the literacy scores are the lowest, with the majority of adults possessing not even basic literacy skills of at least level 2 (Valerio et al., 2015). Nevertheless, there is considerable scope to improve literacy even in OECD countries, where large proportions of adults do not possess more developed skills above level 2 (OECD, 2015a).

Facilitating employment in higher skill occupations is an important route through which education increases earnings. It enables workers to perform a range of complex tasks inherent to higher skill work. In OECD economies, workers in managerial, professional and technical occupations have, unsurprisingly, the highest earnings by some margin compared to those in lesser skilled occupations (De La Rica and Gortazar, 2016). Analysis of STEP survey data shows similar patterns for the low and middle income countries sampled.

However, upper secondary education on its own does not appear to facilitate access to high skill occupations; instead tertiary education is likely a necessity. The education profiles between those in high skill and lower skill work are strikingly different (Figure 2.6). High skill employment largely remains the preserve of those

FIGURE 2.6:
Tertiary education is largely required for employment in high skill occupations
Occupational skill by educational attainment



Notes: Low and middle income countries are Armenia, the Plurinational State of Bolivia, China (Yunnan province), Colombia, Georgia, Ghana, Kenya, the Lao People’s Democratic Republic, Sri Lanka, the former Yugoslav Republic of Macedonia, Ukraine and Viet Nam. High income countries are Germany, the Republic of Korea and the United States. Data are weighted by sample target population. Only urban areas are covered in low and middle income countries. Skilled occupations are classified according to 1 digit ISCO-08 codes, following the ILO Global Employment Trends (GET) Model Extension (GME) methodology. High skill occupations are those of managers, professionals, technicians and associate professionals. Medium skill workers are clerical support workers, service and sales workers, skilled agricultural, forestry and fishery workers, craft and related trades workers, plant and machine operators and assemblers. Low skill workers are those in elementary occupations, such as cleaners, street vendors and labourers in mining, construction, manufacturing and transport.
Source: GEM Report team calculations based on World Bank STEP Skills Measurement Surveys (2012–2013) and OECD PIAAC Survey of Adult Skills.

with tertiary education, while those in medium and low skill jobs are largely educated to the secondary level or below.¹⁵ These patterns are more or less replicated across the sample of poorer and richer countries, suggesting that the education segmentation of high and medium/low skill work may be a general feature of economies regardless of income.

Educational attainment is associated with higher earnings within occupational categories, however. Analysis of prime-aged workers in full-time employment in the STEP countries shows that hourly earnings for low skill work increase with educational attainment. Among medium skill workers, educational attainment is associated with an even greater increase in earnings. High skill workers with tertiary education also earn substantially more than those with upper secondary attainment. On this basis, education expansion should lead to increases in earnings across all occupational groups regardless, but to a greater degree if it facilitates access to higher skill occupations.

The case for expanding tertiary education in developing countries is supported by recent evidence on labour market returns to education. In contrast to earlier research which found that the return to earnings was highest for a year of primary schooling, more recent global estimates show that the private returns to tertiary education exceed those to both primary and secondary education (Montenegro and Patrinos, 2014). This finding is confirmed in a smaller sample of 25 low and middle income countries (Fink and Peet, 2014).

EDUCATION CLOSES GENDER AND SOCIO-ECONOMIC EMPLOYMENT DISPARITY

In many countries, labour market outcomes are generally, and often significantly, worse among women and those with disadvantaged socio-economic backgrounds. Among the urban population of STEP countries, working poverty among women is on average double that of men, and in most countries is significantly higher for those of low-socio-economic background compared to more advantaged counterparts. Large disparities are also found in many OECD countries, such as Austria, Finland, the Republic of Korea and Switzerland, where the incidence of low pay among women is more than double that of men (OECD, 2016b). Wages among those with low socio-economic background are significantly below more advantaged counterparts in a majority of OECD countries (OECD, 2015c).

Gender disparity in vulnerable employment and informality, however, tends to differ by country and region. Among Eastern European and Central Asian countries of the STEP survey, informality is highest among men, but is higher among women in Latin American and sub-Saharan African countries.¹⁶ In the majority of countries, workers from disadvantaged socio-economic backgrounds are more likely to work informally (Chua, 2015).

Differences in education and skills can be a significant source of disparity among disadvantaged groups. In STEP countries, workers of low socio-economic background on average have two years fewer of education than those from a middle socio-economic background, and three years less than those from a high background. Literacy skills are also significantly lower than advantaged socio-economic groups in most countries (Chua, 2015).

Gender disparity in educational attainment and literacy tends to vary by country. Among urban areas in the STEP sample, female workers in Eastern Europe and Central Asia tend to have both higher educational attainment and literacy levels than their male counterparts, while the opposite is true in Latin America and sub-Saharan Africa.¹⁷ In Ghana, for example, men have over two more years of education than women, and score over 40 points higher on a 500 point literacy scale. More broadly, disparities in advanced economies across the world are lower, with men averaging 0.25 years more of education, compared to one year more among developing countries (Barro and Lee, 2013). Among the 22 PIAAC countries, differences in literacy between the genders are marginal, although men have slightly higher numeracy scores (OECD, 2013).

Given the influence of education and skills on labour market outcomes, closing education disparities can increase access to decent work among disadvantaged groups. For the STEP countries, analysis conducted for this report suggests that if workers from low socio-economic backgrounds had the same education as more advantaged counterparts, disparity in informal employment between the two groups could shrink by 37% and that in working poverty by 39%.¹⁸ Within countries where group differences in employment outcomes are statistically significant, the effect of equalizing education outcomes is even stronger. In Colombia, Ghana, Kenya and Viet Nam, educational attainment explains nearly all the disparity in informal

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If workers from poor and rich backgrounds received the same education, disparity between the two in working poverty could shrink by 39%

”

employment between workers from low and high socio-economic backgrounds (Chua, 2015).

In the 22 PIAAC countries, skills account for 83% of the wage gap between low and high socio-economic status groups,¹⁹ and 72% of the gap between foreign and native-born workers (OECD, 2015c). This analysis does not, however, control for educational attainment.

In STEP countries, analysis indicates that literacy does not have a strong effect on some indicators of decent work, independent of educational attainment. Here, differences in literacy explain 16% of the disparity in informal employment by socioeconomic status, reduced to 6% when controlling for educational attainment, while there is no statistically significant impact on disparity in working poverty (Chua, 2015).²⁰

Regarding gender, marked differences in labour market outcomes, such as employment rates and wages, tend to decrease among more highly and similarly educated men and women (Nopo et al., 2012; UNESCO, 2014). In the OECD, differences in cognitive skills account for 23% of the gender gap in wages (OECD, 2015c). However, differences in education and skills between men and women have comparatively limited explanatory power regarding labour market inequality in the low and middle income STEP countries, where closing gaps in either educational attainment or literacy would not have a statistically significant effect on gender disparity in informal employment and working poverty across the pooled sample (Chua, 2015).

Nevertheless, differences in educational attainment account for a significant proportion of employment disparity in the STEP countries where women are most educationally disadvantaged. Analysis suggests that equalizing educational attainment would reduce disparity in informal employment by 50% for Ghana and 35% for Kenya, with working poverty dropping by 14% and 7%, respectively (Chua, 2015).

Other factors affecting labour market outcomes are thus likely to have a far larger effect on gender disparity in many countries. For example, women are more likely to work in part-time employment due to child care responsibilities, or enter industries and occupations which are less well remunerated. Cultural norms and discrimination also limit the extent to which well-qualified women can get access to better-paid occupations and rise within work hierarchies (World Bank, 2011). It is telling that women in high skill occupations in STEP countries commonly have equivalent or higher literacy skills than their male counterparts, yet on average earn substantially less.

While education and skills policies can help reduce differences in wages between men and women, other policy interventions are required. For example, as noted above, the poor are often disproportionately employed in less secure jobs, often in the informal sector. Hence, they tend to benefit more from labour market regulations such as minimum wages and firing restrictions. Labour market deregulation and technological progress thus dampen the income share of the poor. In this context, while policy has a role in making education more accessible, it must also ensure that changes in labour market institutions do not excessively penalize lower income individuals (Dabla-Norris et al., 2015).

EDUCATION POLICIES CAN HELP ENSURE A SOCIALLY INCLUSIVE TRANSITION TO GREENER ECONOMIES

While green growth offers many opportunities for expanding employment, a degree of displacement is inevitable in environmentally unsustainable industries (Bowen and Kuralbayeva, 2015). Expanded lifelong learning policies are needed to promote education and training programmes that enable displaced workers to shift into new jobs without long spells of unemployment or inactivity.

In many countries, green growth may result in increased demand for low skill work. While in some contexts such employment may provide a route out of poverty, it will not necessarily be decent work. For example, some waste disposal and recycling work is precarious and hazardous, often taking place in the informal sector (ILO, 2013a). In such cases, national legislation and industrial policies have an important role in enforcing acceptable working conditions. At the same time, education policies should equip individuals with the skills to move into more favourable occupations considered of higher value to society.

The transition to more environmentally sustainable economies will also likely increase the demand for high skill technical, managerial and scientific occupations, potentially increasing wage inequality and job polarization.²¹ An analysis of the US labour market indicates that occupations in green industries are biased towards higher skills levels than 'brown' industries such as coal and other mining, with work disproportionately made up of higher skill tasks (Vona et al., 2015). Thus, a concerted effort towards green growth may substantially increase demand for high skill workers. Unless education systems adapt to provide the required technical, analytic and managerial skills, wage inequality could increase.

CONCLUSION

Implementing the SDG agenda to 2030 means reorienting education vis-à-vis a fast-changing world economy. It means expanding, interrogating and exploiting education's complex relationship with the economy. For education to contribute most effectively to reductions in poverty and inequality and to better jobs, investments should be made with careful consideration of national contexts, and in combination with wider economic and social policies.

Education and lifelong learning will also play a central part in the creation of a green and inclusive economy with sustainable models of production and consumption, and new and retooled sectors, industries and jobs. It is difficult to predict precisely what education can achieve over the next 15 years, given the uncertainties in the transition towards sustainable economies and major shifts in the world of work. Yet it is clear that education will play a critical dual role of addressing poverty and inequality while supporting the transition to a new model of sustainable development.

For this to occur, all stakeholders, from civil society and non-government organizations – often at the forefront of the fight for sustainability and inclusion – to multilateral organizations, bilateral aid agencies and all levels of government, will need to make concerted efforts to reorient systems of education, skills development, and research and innovation.

Education will remain a central component of prosperous societies. Yet its reorientation and transformation will be necessary to create green industries, to match the massive changes expected in the labour market and to ensure social inclusion. Whether defined as knowledge transmission and skills formation, as research and innovation, or as social and institutional capital, education will largely determine the ability of countries, firms and citizens to transform the economy.

ENDNOTES

1. The countries and regional groupings covered included Australia, Brazil, China, Germany, Indonesia, Norway, Mauritius, the Republic of Korea, South Africa and the United States, as well as the European Union.
2. It is predicted that the decline in medium skill employment will level off at some point, as many of these jobs depend on uniquely human interaction. Displaced medium skill workers can also move into similar level jobs in the same industry. The impact of automatic teller machines (ATMs) in US banking is illustrative: While ATM numbers grew substantially, the number of tellers actually increased slightly as reduced branch costs allowed branches to proliferate and tellers moved into sales and 'relationship banking' roles (Autor, 2015).
3. The World Bank describes the informal economy as activities and income that are completely or partly outside of government regulation and taxation.
4. Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.
5. However, the bottom quartile of income distribution would receive an increased share of income.
6. For example, a society which hypothetically shifted from universal secondary education (but no more) to universal tertiary education would likely be more unequal due to the larger variance of wages among those with tertiary education.
7. Education attainment also acts as a signal of ability to employers, opening the door to more productive (and decent) work irrespective of the actual knowledge acquired during study.
8. The corresponding unemployment rates were 13.7%, 8.1% and 5.3%.
9. Poverty is defined relative to the median as a more comparable measure of economic contexts.
10. In GEM Report analysis of STEP/PIAAC data, upper secondary and post-secondary non-tertiary programmes are merged into a single category, and referred to as 'upper secondary' for brevity.
11. Latest available year, including foregone earnings and excluding income taxes.
12. The effect of problem-solving abilities is slightly lower at 14.3%.
13. This may underestimate the returns relative to PIAAC countries given that STEP data for waged workers are after tax and transfers, while in PIAAC countries they are before.

14. Across the STEP sample, relative to full-time, low skill workers, hourly earnings are 50% higher among medium skill employees on average, and over twice as high among high skill workers. These figures underestimate productivity, as earnings from self-employment, which tends to be higher in lower skill occupations, are reported before tax, whereas earnings from employees are after tax.
15. The value of tertiary education is reinforced by the observation that 65% of those with tertiary education in the low/middle income countries and 74% in the high income countries had high skill employment, compared with 18% and 25%, respectively, of those with upper secondary education.
16. Informal sector workers are defined here as either wage workers without social benefits, unpaid family workers or self-employed workers in an establishment with only one employee.
17. Note that in the developing world, men have on average over a year more of educational attainment (Barro and Lee, 2013).
18. Controlling for experience, gender, literacy and country effects.
19. Parental educational attainment is used here as a proxy for socio-economic status.
20. Relative to educational attainment, skills generally have less (although often significant) power to explain wages among STEP countries, while in PIAAC countries the opposite is true (Hanushek et al., 2013; Valerio et al., 2015).
21. Evidence suggests that the onset of a new wave of technological change initially creates a surge in demand for new skills, which later dissipates as codification and standardization facilitate diffusion of new best practices.

In Cairo, the Recycling School, created with the support of UNESCO, gives children from the Zabbaleen community basic education, as well as health recommendations and practical training to turn recycling into a true profession.

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GEM Report





CHAPTER

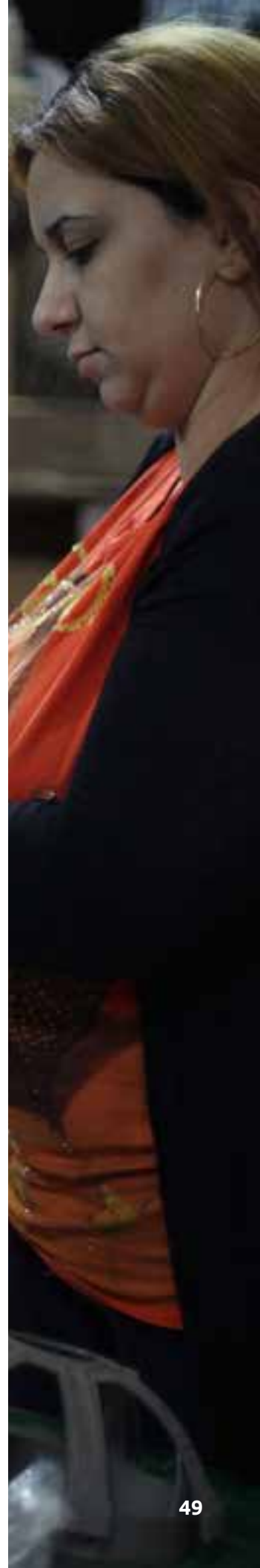
3

Sustainable development and global citizenship

By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development



TARGET 4.7



GLOBAL INDICATOR 4.7.1 – Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment

THEMATIC INDICATOR 26 – Percentage of students by age group (or education level) showing adequate understanding of issues relating to global citizenship and sustainability

THEMATIC INDICATOR 27 – Percentage of 15-year-old students showing proficiency in knowledge of environmental science and geoscience

THEMATIC INDICATOR 28 – Percentage of schools that provide life skills-based HIV and sexuality education

THEMATIC INDICATOR 29 – Extent to which the framework on the World Programme on Human Rights Education is implemented nationally (as per UNGA Resolution 59/113)

KEY MESSAGES

Target 4.7 is closely aligned with the vision of the 2030 SDG agenda. But the proposed ways of measuring progress towards it do not reflect its full ambition.

Curricula are the main way countries promote knowledge and skills on sustainable development and global citizenship to students. Most countries report that human rights education is included in their curricula and education standards. Comprehensive sexuality education, however, is not widely included.

Three-quarters of countries had some emphasis on sustainable development in their curricula over 2005–2015, but far fewer referred to terms related to global citizenship. Only 15% of countries included key terms related to gender equality.

Textbooks are a valuable source of information about national commitment to sustainable development. Close to 50% of secondary school textbooks mentioned human rights over 2000–2013, compared with around 5% over 1890–1913. A regular monitoring mechanism on textbooks is needed.

Teachers need to be trained to teach sustainable development and global citizenship, yet more than two-thirds of European countries do not include these topics in teacher training. The share of countries completely integrating sustainable development in teacher education rose from 2% in 2005 to 8% in 2013.

Monitoring knowledge and skills relevant to target 4.7 is not easy. Few assessments examine understanding of history, politics, geography, science and their interdependence. An assessment of grade 8 students in 38 countries showed that only two-thirds were familiar with the Universal Declaration of Human Rights.

Initiatives to monitor this target must address the tension between national values and commitment to a global agenda. Equally important is the need to evaluate knowledge and skills about sustainable development among adults as well as children and adolescents.

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Target 4.7 introduces education for global citizenship and sustainable development, and several related topics, explicitly linking education to other Sustainable Development Goals (SDGs) and capturing the transformative aspirations of the new global development agenda. More than any other education target, it touches on the social, humanistic and moral purposes of education, and their impact on policies, curricular contents and teacher preparation. It also acknowledges the important role of culture and the cultural dimensions of education.

The Inter-agency and Expert Group on SDG Indicators proposed a broad global indicator to capture the wide scope of target 4.7: ‘the extent to which global citizenship education and education for sustainable development are mainstreamed in national education policies, curricula content, teacher education and student assessment’. This measure embraces indicators relating to inputs and processes, but sidesteps the target’s aspirational intent of ensuring that all learners, young and old, acquire knowledge and skills aligned with the transformative 2030 Agenda for Sustainable Development.

This chapter focuses on the proposed global indicator and examines how global citizenship and sustainable development are included in system-wide interventions, curricular materials such as national curriculum frameworks and textbooks, and teacher education programmes. It addresses themes underpinning target 4.7, including human rights, gender equality, climate change, sustainable livelihoods, sexual and reproductive

rights, health and well-being, and responsible and engaged citizenship.

Target 4.7 is closely aligned with a lifelong learning framework, and does not specify the education levels or age groups to which its themes apply. Yet, the proposed global and thematic indicators mainly focus on children

“ Data gaps for monitoring national and global progress towards target 4.7 outside the formal education system are particularly wide ”

and adolescents in formal education. None of the proposed thematic indicators explicitly capture adult learners in non-formal and informal education settings. Data gaps for monitoring national and global progress towards target 4.7 outside the formal education system are particularly wide. Hence, this chapter discusses

recent initiatives to collect data more closely aligned with the concepts in target 4.7. Given the fluidity of country initiatives to address the many issues involved, it is important to use existing data sources to provide initial benchmarks for national and regional authorities.

Identifying indicators to monitor knowledge and skills that are needed to promote sustainable development – and that have meaning across a wide spectrum of socio-economic levels, political systems and cultural contexts – remains arduous (Fricke et al., 2015). This chapter

examines several initiatives that could be used to monitor acquisition of relevant knowledge and skills.

Individuals may acquire knowledge, understanding and skills but lack the disposition to use them. While target 4.7 does not explicitly say as much, the development of the right attitudes is an important dimension of global citizenship education (GCED) and education for sustainable development (ESD). This chapter thus briefly reviews several approaches to monitoring adolescents, youth and adult attitudes, and highlights challenges in establishing a global monitoring mechanism.

INTERNATIONAL STANDARD-SETTING INSTRUMENTS

Almost all the concepts mentioned in target 4.7 that promote sustainable development are found in international frameworks and conventions, notably the International Recommendation concerning Education for International Understanding, Co-operation and Peace and Education relating to Human Rights and Fundamental Freedoms, adopted by member states at UNESCO's 18th session in 1974. This recommendation lays out a normative framework for countries on issues related to peace and human rights in the goals, policies, contents and teacher training materials of national education systems (Arora et al., 1994; Savolainen, 2010; UNESCO, 2008).

Although compliance is voluntary, UNESCO has monitored member states' implementation on five occasions since 1974 (UNESCO, 2013). These monitoring exercises aimed to track the extent to which human rights materials and principles had been incorporated into the legal, administrative, educational and teaching tools that guide everyday practices in education (Prada, 2011). Response rates were low, however, though they increased from 18% of countries in 2009 to 28% in 2013 (UNESCO, 2009; 2013).

“ The percentage of countries that responded to monitoring exercises of human rights in education, legal and administrative systems rose from 18% in 2009 to 28% in 2013

”

The adoption of the SDGs highlighted strong alignment between the 1974 recommendation and target 4.7 concepts. As a result, the significance of effective monitoring of country implementation of the recommendation became clearer. In 2016, UNESCO initiated a sixth consultation, asking member states to assess implementation of the recommendation over 2013–2016. The terms are relevant to the monitoring of target 4.7. Member states are asked to report whether the following topics are included in their curricula and, if so, at which levels of education and in which subjects: peace and non-violence, human rights and fundamental freedoms, cultural diversity and tolerance, and human survival and well-being. Additional questions monitor the inclusion of these topics in textbooks, teacher education, student assessments/examinations, and programmes outside the school system, including non-formal education, informal education, adult education and media-based education (UNESCO, 2016e). To increase response rates, the 2016 questionnaire includes many more multiple choice questions than before.

Nevertheless, as past low response rates showed, many national ministries are limited in the capacity to respond to such surveys and the resources to prepare high quality national reports. Gathering the information to be included is hampered by the need to coordinate responses across relevant ministries and departments (Yusuf, 2007). It is difficult to assure the objectivity and validity of self-reported information, which can lower its monitoring value. Therefore, more systematic and rigorous approaches to monitoring country progress towards target 4.7 are needed to supplement country reports.

CURRICULA

Curricula are the main way in which knowledge and skills to promote sustainable development and global citizenship are typically conveyed to students. This section reviews mechanisms to monitor the adoption of topics relevant to sustainable development and global citizenship into official curricula. It then discusses a comparative approach for monitoring curricula at the global level.

HUMAN RIGHTS EDUCATION

One thematic indicator proposes measuring the extent of national implementation of the framework on the World Programme on Human Rights Education, in which the Office of the United Nations High Commissioner for

Human Rights (OHCHR), in cooperation with UNESCO, has developed programmes and curricula to teach human rights. This indicator captures elements of target 4.7 as regards human rights, fundamental freedoms and tolerance, among others.

The first phase of the World Programme for Human Rights Education, 2005–2009, focused on integrating human rights education in primary and secondary schools. An evaluation in 2010 analysed implementation of this aspect, relying primarily on responses to an OHCHR questionnaire distributed to 192 member states (UNIACC, 2010).

Most countries, including Australia, Barbados, Chile, Côte d’Ivoire, Indonesia, Namibia and Zambia, reported human rights education as being integrated into national curriculum and educational standards. A few countries teach human rights as a stand-alone subject

“ Most countries report human rights education as being integrated into national curriculum and educational standards ”

but many integrate it as a cross-cutting issue, most often in subjects such as citizenship, civic education and social studies, but also in disciplines such as law, religion, life skills, ethical and moral education, and environment (UNIACC, 2010).

The second phase of the programme, 2010–2014, focused on human rights

in higher education and for teachers and educators, civil servants, law enforcement officials and military personnel.¹ Responses from 28 countries showed that the topic was most often addressed as a core curricular element in university undergraduate and graduate faculties or departments of law, political science, social science and/or international relations, as well as in general humanities and socio-economic courses (OHCHR, 2015).

At the global level, in addition to this programme, the Universal Periodic Review process and the work of Special Rapporteurs help in monitoring human rights education, but response rates are low and responses insufficiently systematic for a clear global picture.

To ensure that governments meet their obligations to report to the international community, review and monitoring activities initiated by local actors are very important. HRE 2020, a civil society coalition to support

and strengthen compliance with international human rights education commitments, recently provided an indicator framework to systematically document national commitments to carry out a comprehensive and coordinated effort for human rights education and training (HRE 2020, 2015).

Other monitoring efforts have been undertaken on specific elements tied to universal human rights frameworks, such as education about the Holocaust (Box 3.1).

BOX 3.1

Monitoring Holocaust education in curricular content

Education about the Holocaust is expected to provide learners with knowledge and skills to help them become responsible and active global citizens who think critically, value human dignity and respect, reject prejudice that leads to violence and genocide, and contribute to a more peaceful, tolerant, inclusive and secure world.

Analyses of textbooks worldwide show that Holocaust education is increasingly taught in the context of universal human rights frameworks rather than as an isolated European historical event, thereby reflecting growing expectations about the humanistic and universal significance of learning about the Holocaust.

A recent study by UNESCO and the Georg Eckert Institute for International Textbook Research analysed Holocaust education in 272 national secondary-level curricula in 135 countries. It showed the Holocaust was part of the curriculum in about half of the countries, with varying contexts and terminologies. National curricula tend to ‘domesticate’ Holocaust history by explaining it in relation to local histories of mass atrocities. The Holocaust is most frequently mentioned in history in the context of the Second World War, but also in relation to human rights and human rights violations. In a comparatively high proportion of curricula in countries in Europe and Northern America, the Holocaust is a compulsory topic.

One-quarter of curricula contain no references to the Holocaust. Yet, while they do not prescribe specific content, they discuss the purpose of the subject and methods to be used in its teaching. About one-third of the curricula do not mention the Holocaust explicitly but refer to its context. For example, in Zimbabwe the curriculum refers to injustices practised by Nazis and atrocities against minorities, and that of the Democratic Republic of the Congo discusses the harmful effects of Nazism.

Sources: Bromley, (2013); Bromley and Russell, (2010); UNESCO (2014c); Carrier et al. (2015).

COMPREHENSIVE SEXUALITY EDUCATION

One proposed thematic indicator for tracking progress towards target 4.7 is the percentage of schools providing life skills-based education on HIV and on sexuality.

“ Out of 28 countries in Asia and the Pacific, 22 included comprehensive sexuality education in secondary school curricula; 12 did at the primary level ”

Comprehensive sexuality education is one of the most pressing and universal priorities for the health, well-being and development of young people. Recent evidence indicates that such education not only plays an important role in preventing negative

sexual and reproductive health outcomes, but also offers a platform to discuss gender issues and human rights, and promote respectful, non-violent relationships (UN Trust Fund and Instituto Promundo, 2012; UNFPA, 2007).

Sexual health, gender equality and human rights are interrelated. The 1994 International Conference on Population and Development's Programme of Action and other international agreements, such as the Ottawa Charter for Health Promotion, reflect this relationship and make clear that sexuality education must integrate these domains (Haberland and Rogow, 2015). The proposed thematic indicator thus responds to five elements of target 4.7: human rights, gender equality, culture of peace, non-violence, and knowledge and skills to promote sustainable development and lifestyles (e.g. by helping reduce early pregnancy and family size and instill values and skills for responsible parenthood).

Several multicountry reviews of comprehensive sexuality education have been conducted. A review of 335 national laws, policies, strategies, curricula and training materials in 28 countries in Asia and the Pacific showed considerable variation in addressing sexual and reproductive health issues. Some countries, including Cambodia, Indonesia, Malaysia, Thailand and Viet Nam, integrated comprehensive sexuality education across primary and secondary education, while there was no or very limited integration in Brunei Darussalam, the Islamic Republic of Iran and Pakistan. Comprehensive sexuality education was included in secondary school curricula in 22 of the 28 countries; 12 did so at the primary level. Information on curriculum integration at tertiary level was scarce (UNESCO, 2012c).

Providing comprehensive sexuality education mainly at the secondary level misses the many adolescents in much of the world who are not in secondary school. It is thus important to track the extent to which children and adolescents benefit from such content in non-formal education. In 17 of the 28 countries, sexuality issues were included in non-formal education, targeting out-of-school youth and others, though the scope and nature of these activities were unclear (UNESCO, 2012c).

In 10 countries of sub-Saharan Africa, an in-depth review of curricula found that most included at least some information on gender, but the messages were sometimes contradictory and reinforced gender inequality. Gender-based and intimate-partner violence were sometimes overlooked, including in South Africa, which has one of the world's highest rates of sexual violence. The inclusion of human rights varied but mostly did not address sexual rights. None of the curricula addressed sexual diversity. The issue of child marriage was omitted or poorly addressed in many of the countries where it is highly prevalent, including Kenya, Lesotho and Malawi (UNESCO and UNFPA, 2012).

The Sexuality Education Review and Assessment Tool provides a framework for assessing the scope, content and delivery of comprehensive sexuality education. Used to assess national sexual education programmes in 13 countries of sub-Saharan Africa, it showed that less than half met global standards for required content across all age groups. The weakest content was related to the coverage of gender and social norms (Herat et al., 2014; UNFPA, 2015b).

In Latin America and the Caribbean, the International Planned Parenthood Federation used a standardized questionnaire to collect data from 19 countries' health and education ministries. Only half of the countries reported comprehensive sexuality education curricula that adequately included lessons on topics including gender equality, sexuality, HIV and AIDS, violence prevention and interpersonal relationships (Hunt et al., 2014).

Where sexuality education has been integrated into curricula, its implementation can vary substantially. The Joint United Nations Programme on HIV/AIDS (UNAIDS) Inter-Agency Task Team on Education has developed 15 core indicators on the education response to HIV. One relates to the percentage of schools that provided life skills-based HIV and sexuality education in the previous academic year at either primary or secondary level. Until 2011, this indicator was gathered through the United Nations General Assembly Special

Session country reporting system (Clarke and Aggleton, 2012). However, there were no standard guidelines for what constituted life skills-based education in response to HIV, and the information was self-reported, making its quality difficult to establish.

Despite such drawbacks, the indicators suggested how life skills-based HIV education was being carried out (Figure 3.1). In 2009, in sub-Saharan Africa, it had been provided in Burkina Faso, Côte d'Ivoire, Liberia and Togo in less than 10% of schools in the past academic year, compared with over 85% in some countries including Botswana, Swaziland and Zimbabwe (UNAIDS, 2011).

The inclusion of this indicator in education management information systems and school-based surveys has been field-tested in some countries, including the United Republic of Tanzania and Zambia, and will allow for better future monitoring (UNESCO, 2015h).

TOWARDS A GLOBAL MECHANISM TO MONITOR CURRICULUM CONTENT

These brief reviews of mechanisms that monitor the integration of human rights and comprehensive sexuality education into curricula show scope for improvement, particularly the need to include additional concepts and improve country coverage in monitoring.

Analysis for this Report reviewed over 110 national curriculum framework documents for primary and secondary education in 78 countries² for 2005–2015, focusing on five topics in target 4.7: human rights; gender equality; peace, non-violence and human security; sustainable development; and global citizenship/interconnectedness. The documents were coded using a standard protocol with a set number of key terms on each topic (IBE, 2016a).

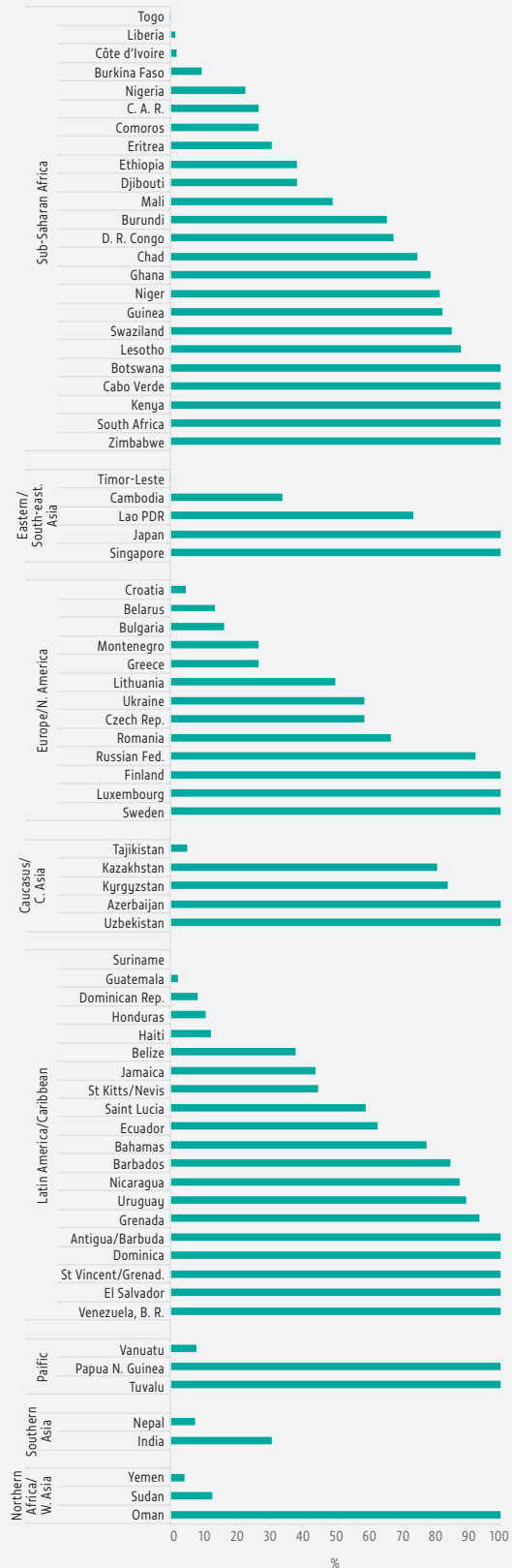
This analysis highlights which topics and themes countries emphasize in their curricula. Elements pertaining to human rights are the most prevalent. Among the 78 countries, key terms such as rights (88%) and democracy (79%) were the most common. There was also some emphasis on sustainable development issues in about three-quarters of the countries, though key terms such as social and economic sustainability were present in less than one-third of the curricula.

Countries make less reference in curricula to key terms related to global citizenship, with only about 10% including concepts such as 'global inequality' and

FIGURE 3.1:

In 32 countries, fewer than half of schools provide life skills-based HIV education

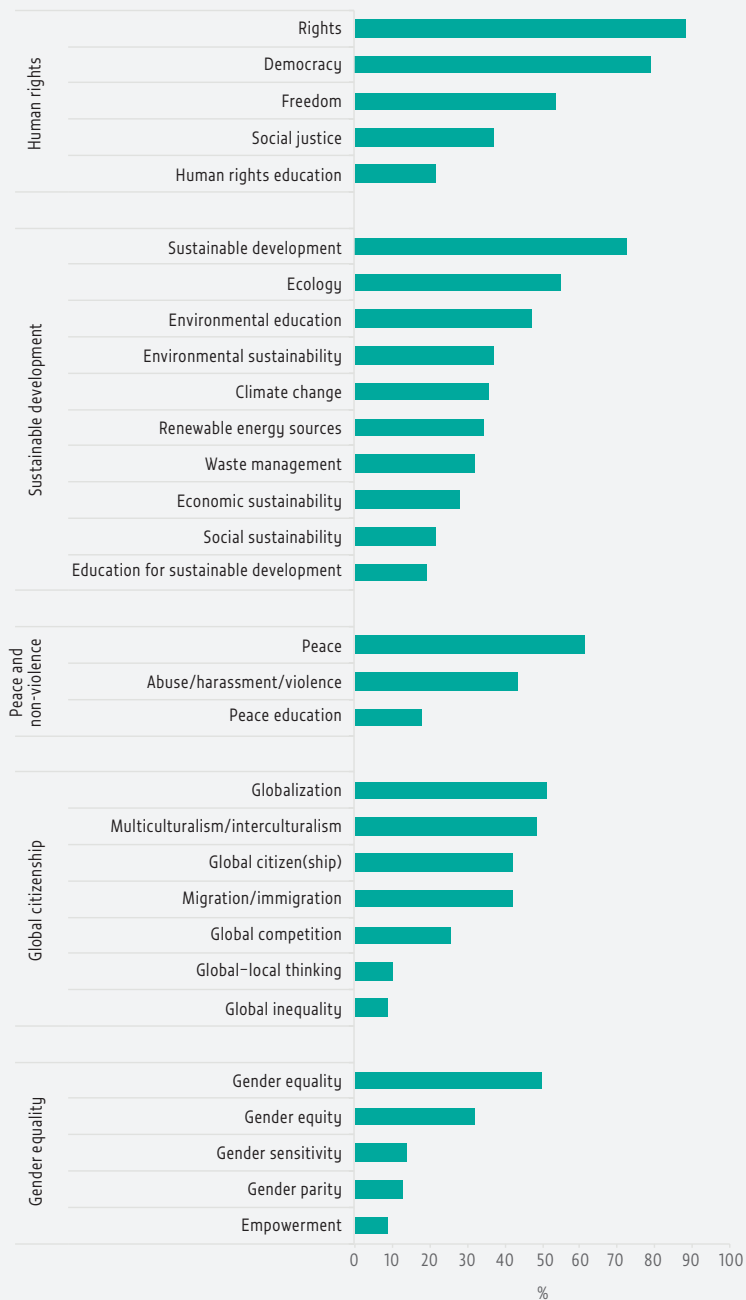
Percentage of schools that provided life skills-based HIV education at either the primary or secondary level in the previous academic year, selected countries, 2009-2010



Source: UNAIDS (2011).

FIGURE 3.2:**Human rights is the most prevalent concept in national curricula**

Percentage of countries including each of the key terms in their national curriculum frameworks, 2005–2015



Note: The analysis is based on a sample of 78 countries.
Source: IBE (2016a).

'global thinking', and half mentioning globalization, multiculturalism and interculturalism. Gender equality is also less prevalent: less than 15% of the countries integrate key terms such as gender empowerment, gender parity or gender-sensitive, while half mention gender equality (Figure 3.2).

In Latin America and the Caribbean, key terms related to sustainable development are common in Guatemala and Nicaragua, but much less so in Argentina, Belize, Dominica and Haiti. In sub-Saharan Africa, almost all key words related to sustainable development are found in Mauritius, but none in the United Republic of Tanzania and 10% in the Democratic Republic of the Congo and Niger. Terms related to global citizenship are much less prevalent. In Europe and Northern America, none are found in the United Kingdom, and only 30% were included in Croatia, France and Hungary (Figure 3.3).

The limited availability of curricular data poses a challenge for monitoring the intended content of education. While data for this new analysis cover many more countries than any other previous study, much less than half of the world's countries were included.

Further research into subject curricula would aid in understanding progress on target 4.7. Systematic lists of national curriculum frameworks and related materials are needed, which would require close collaboration between national education ministries and a leading international coordinating body such as the UNESCO International Bureau of Education (IBE). As national curricula are usually updated every five to seven years, on average, such global monitoring could be carried out in a similar time-frame (IBE, 2016a).

Whole-school approach

Education for global citizenship and sustainable development is not necessarily an additional subject to the curriculum. It is best adopted in a whole-school approach, with these themes explicitly expressed in school-wide priorities and school ethos, involving everyone from learners to the wider community. Whole-school approaches require more participatory and democratic decision-making that engages all stakeholders, including community members, school management, principals, teachers, parents and students (Bourn et al., 2016; UNESCO, 2015f).

The 2016 International Civic and Citizenship Education Study (ICCS) includes items that reflect components of the whole-school approach. Principals are asked about

initiatives to create environments in which sustainable development principles are respected and students experience them by, for example, saving energy, reducing and separating waste, purchasing environment-friendly items and, more generally, having environment-friendly behaviour encouraged. Teachers are asked about their involvement in initiatives and programmes related to environmental sustainability (Schulz et al., 2016). Evaluating implementation of this approach will be challenging, as data will mainly draw on self-reporting and address only some aspects.

Some progress has been made in evaluating participation and decision-making. The 2012 Programme for International Student Assessment (PISA) asked principals the proportion of parents participating in activities including school governance. The results showed less than 5% involved in countries such as Belgium, the Netherlands, New Zealand and the United Kingdom and over 50% in Colombia, Indonesia and Kazakhstan (OECD, 2013b).

International standard-setting instruments are also used to monitor democratic school governance. In 2010, 50 countries adopted the Council of Europe Charter on Education for Democratic Citizenship and Human Rights Education. In 2012, the first monitoring of its implementation involved responses from 40 of the 50 countries, with over 90% reporting that they promoted democratic governance through student participation and parental involvement in decision-making. A follow-up questionnaire will be sent to governments in 2017 (Kerr, 2012).

TEXTBOOKS

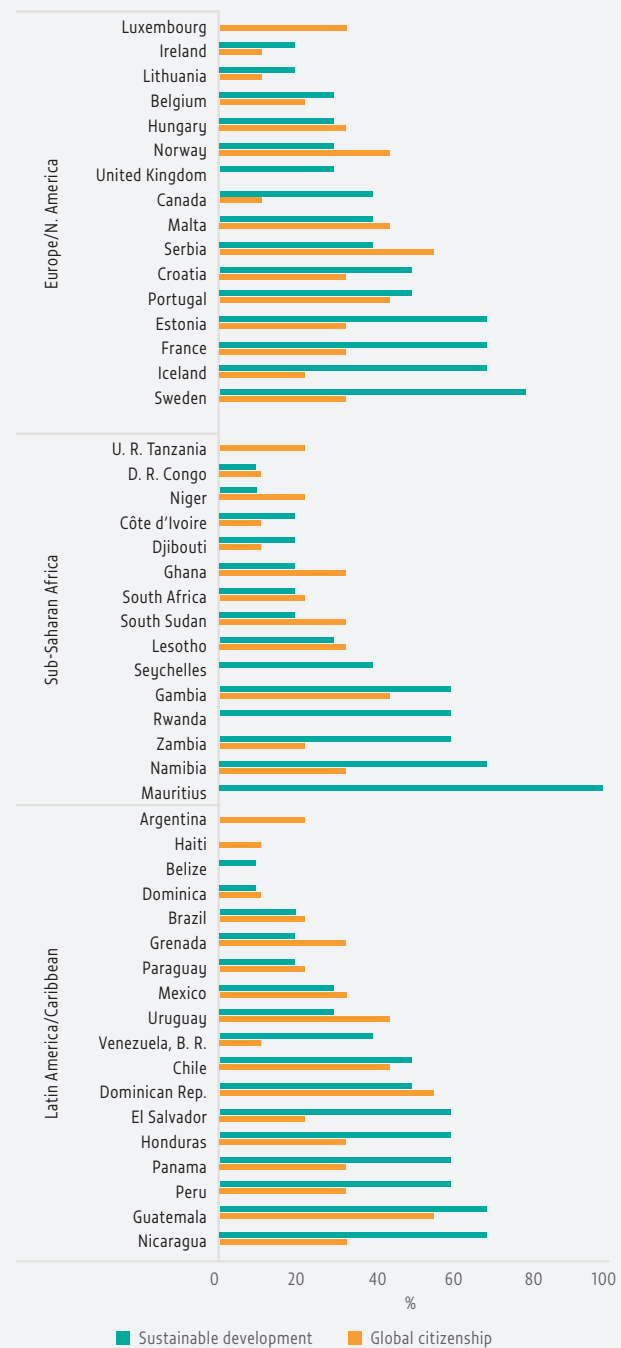
Textbooks are a valuable source of information about national commitment to sustainable development. They tend to reflect classroom reality more closely (in terms of both contents and pedagogy) than official curricular policy statements (Torney-Porta et al., 2001). Recent advances in textbook content analysis are promising for gauging curricular content, especially if applied to large samples of textbooks from many countries.

An analysis of over 500 secondary education history, social science and geography textbooks, spanning 1970 to 2008, found that specific mentions of international events increased from 30% in the early 1970s to over 40% in 2005. While almost none of the textbooks mentioned

FIGURE 3.3:

Prevalence of key terms relating to global citizenship and sustainable development varies across countries

Percentage of key terms related to sustainable development and global citizenship in national curriculum frameworks, selected countries, 2005–2015



Source: IBE (2016a).



Close to 50% of secondary school textbooks mention human rights over 2000–2013, compared with around 5% over 1890–1913



globalization in 1970, nearly 40% did in 2005 (Buckner and Russell, 2013). Between 1975-1994 and 1995-2010, depictions of children as victims of mistreatment more than tripled, and descriptions of discrimination against women more than doubled (Terra and Bromley, 2012).

In the Republic of Korea, a study documented the rapid rise of global citizenship education by describing trends in civic education textbooks, based on the average number of mentions of major national and global themes by page. National citizenship topics and themes remain core elements but emphasis on them has weakened over time, while global citizenship topics and themes have increased, especially in the 1990s and 2000s. In addition, textbook content and presentation have become more 'progressive' and increasingly learner centred, encouraging students to become self-directed, empowered individuals in a global society (Moon and Koo, 2011).

Analysis for this Report took a similar approach. Three data sets on secondary school textbooks in history, civics, social studies and geography were compiled. The vast majority of textbooks were drawn from the most extensive collection of textbooks from around the world, at the Georg Eckert Institute for International Textbook Research in Germany. Textbooks were coded using standardized protocols developed after much piloting and intercoder reliability testing (Bromley et al., 2016).

Analysis showed close to 50% of the textbooks mentioning human rights over 2000–2013, compared with around 5% over 1890–1913. The proportion of textbooks mentioning international human rights documents rose from 12% in the 1950s to 28% in the 2000s. The proportion mentioning women's rights has increased since 1980 (Figure 3.4), but with considerable regional variation, from just above 10% in Northern Africa and Western Asia to 40% in Europe and Northern America and in sub-Saharan Africa (Bromley et al., 2016).

Five indicators were used to measure the extent to which textbooks explicitly emphasized environmental issues,

including if environmental protection or damage was discussed in at least one paragraph, if this issue was linked to rights, and if it was discussed as a global issue. Coverage of issues related to environmental protection or damage has increased: in the 1950s, just under 5% of textbooks discussed the issue in at least one paragraph, while 50% did in 2000–2011 (Figure 3.5).

This analysis shows it is possible to develop valid and reliable measures using textbooks. A regular monitoring mechanism should be established to provide globally comparable data on textbook contents across countries and systems and over time (Bromley et al., 2016).

Data collection needs to take into account subject and grade. There will be trade-offs between breadth and depth. Instead of analysing all textbooks in each subject and grade, the focus should be on the social sciences – civics, social studies, history – and natural sciences, where the relevant topics are taught most explicitly. One approach would be to cover textbooks at the end of primary, lower secondary and upper secondary education. As textbooks rarely change dramatically from year to year, gathering data every five years would be sufficient. It would also be possible to examine past trends.

Ensuring that questions are valid across countries with different languages and cultures will be a challenge, but asking multiple questions on each theme would reduce errors associated with any single question. Questions need to be factual to minimize interpretation by coders. For instance, asking whether textbooks 'discuss human rights' would lead to responses varying with the coder's understanding of this concept. But asking whether textbooks explicitly use the exact phrase 'human rights' would provide more consistent responses.

Cooperation between governments and international organizations is necessary for a global monitoring system to work. National governments should give researchers open access to curricular content and information on how textbooks are developed and

approved. An international coordinating body such as the IBE will be critical to the success of local data collection efforts.

TEACHER EDUCATION

The mainstreaming of sustainable development and global citizenship knowledge and skills in national curricula and textbooks is a prerequisite to monitoring country efforts to meet target 4.7. But it is not enough. Teachers who are prepared to teach in areas related to sustainable development and global citizenship are needed. Are global citizenship, human rights, sustainable development and comprehensive sexuality education included in teacher education? The content of teacher training programmes is seldom readily available, but some information, mostly regional, has been collected.

In teacher training programmes in 10 countries in Asia and the Pacific, information is very limited on how teachers are trained in areas related to global citizenship, including empathy, understanding discrimination, cultural sensitivity, tolerance, acceptance and communication skills. Yet, there are some national examples. After Sri Lanka established a Unit for Social Cohesion and Peace Education in 2008, head teachers, teachers and teacher trainers attended orientation and training in peace and values education. The Republic of Korea reported that policy guidelines on Major Directions for Training of Teacher Personnel encourage local education offices to provide in-service training on human rights (UNESCO, 2014d).

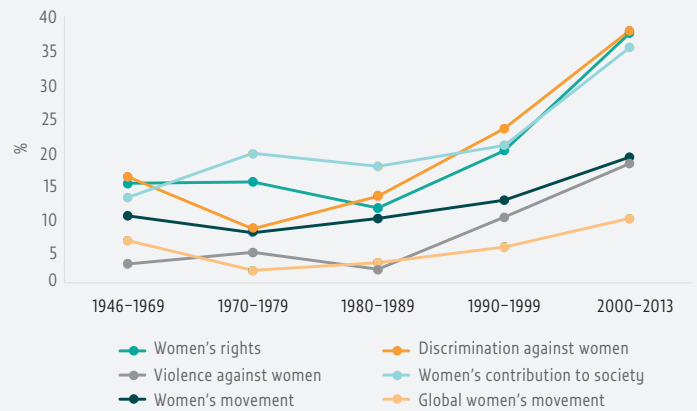
Various forms of in-service teacher education on citizenship education have a component on issues related to global citizenship and sustainable development. Nearly one-third of 36 European countries have programmes to help teachers develop professional knowledge and competencies on citizenship. In Latvia, national in-service training for secondary school teachers includes programmes to develop citizenship education competencies, including values and diversity in society and quality of life and sustainability. Italy's Punteoedu Europa programme offers teachers online courses and regional workshops on topics such as human rights, intercultural dialogue and sustainable development and environment (Eurydice, 2012).

National reports to the OHCHR on the second phase of the World Programme on Human Rights Education

FIGURE 3.4:

Some progress has been achieved in the extent to which textbooks include gender equality

Percentage of textbooks that include an explicit statement on women's rights

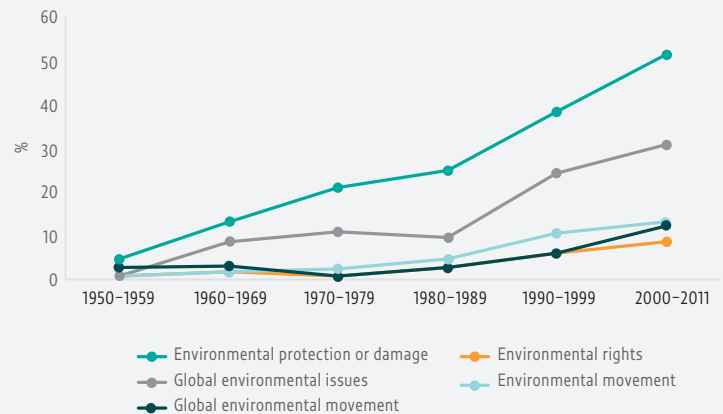


Notes: Sample sizes for each period: 54 textbooks over 1950-1959, 88 over 1960-1969, 108 over 1970-1979, 103 over 1980-1989, 131 over 1990-1999 and 219 over 2000-2011 and 2000-2013. The latest data sets on women's rights and discrimination are for 2000-2011; for the other statements, the data sets are for 2000-2011. Source: Bromley et al. (2016).

FIGURE 3.5:

Environment is a theme of growing importance in textbooks

Percentage of textbooks that include an explicit statement on environment



Note: Sample sizes for each period: 54 textbooks over 1950-1959, 88 over 1960-1969, 108 over 1970-1979, 103 over 1980-1989, 131 over 1990-1999 and 219 over 2000-2011. Source: Bromley et al. (2016).

can help monitor the extent to which countries include human rights in pre-service or in-service teacher education, although the response rate has been typically low. Of the 28 countries that submitted

information in 2015, 7 reported integrating human rights training in pre-service teacher education. In Togo, such training is necessary to obtain the professional qualification to teach in schools. In Honduras, a course helps teachers detect human rights violations, identify people in vulnerable situations and use appropriate methods to teach human rights in public schools. For in-service teacher education, 13 countries, including Estonia, the Gambia and Seychelles, reported that human rights training was an essential element of their programmes (OHCHR, 2015).

In some countries, civil society organizations have been involved in monitoring teachers' preparedness to teach human rights. In 2012, the Danish Institute for Human Rights conducted a mapping study of human rights education in primary and lower secondary schools and teacher training programmes. It found that human rights were not incorporated adequately in teacher training at universities and colleges. In focus groups, teachers and teacher trainers reported lacking theoretical knowledge on adapting human rights education for different grades. International and regional instruments on human rights education were also largely unknown (Danish Institute for Human Rights, 2014).

The quality of comprehensive sexuality education also depends ultimately on teachers' knowledge of the subject matter and their confidence and skill in its delivery. A review of policy documents and mapping of teacher training institutions in 21 countries in sub-Saharan Africa found that more than half the

“ In sub-Saharan Africa, more than half of countries integrated comprehensive sexuality education in pre-service teacher education curricula ”

countries integrated comprehensive sexuality education in pre-service teacher education curricula. In Ethiopia, it was included in cross-cutting subjects that all trainees studied. In seven countries, including the United Republic of Tanzania, it was a specialization

option. Only eight countries, including Lesotho, Malawi and Namibia, made comprehensive sexuality education a compulsory module (UNESCO, 2015a).

Information on teacher preparation in life skills-based HIV education comes from the 2011–2012

Education Sector HIV and AIDS Global Progress Survey, commissioned by the UNAIDS Inter-Agency Task Team. Of the 39 countries surveyed, 74% reported providing pre-service teacher education on generic life skills and 62% on HIV education at the primary level. At the secondary level, the respective percentages increased to 79% and 72%. This survey is, however, relatively limited in scope, mainly reflecting self-reported data from national education ministries and civil society (UNESCO and UNAIDS, 2013).

In sub-Saharan Africa, 6 of 13 countries that used the Sexuality Education Review and Assessment Tool had strong ratings for more than 40% of elements of their teacher training programmes. The other 7 did not explicitly prepare teachers in areas such as addressing embarrassment when talking about sexuality, avoiding bias caused by personal norms and beliefs, and not pressuring learners to talk about sensitive topics (UNESCO, 2015b).

A recent analysis of teacher education programmes for primary and secondary school found changes over the past decade in attitudes, acceptance and discourse on education for sustainable development in teacher education. The analysis, based on 66 survey responses as part of a UNESCO assessment of the UN Decade of Education for Sustainable Development (2005–2014), found the share of countries completely integrating sustainable development in teacher education rose from 2% in 2005 to 8% in 2013. In pre-service teacher education, climate change, environment and human rights were the prevalent themes. They often integrated local issues, such as illegal logging and deforestation in Indonesia and disaster risk management in Japan, Pakistan and Viet Nam (McKeown and Hopkins, 2014).

More work is needed to develop system-level indicators that accurately capture teacher training needs for teaching knowledge and skills to promote sustainable development. One example is the UN Economic Commission for Europe framework for integrating ESD in teacher training curricula. It identifies key competencies for teachers and educators, including integrative thinking, inclusivity, dealing with complexity, critical analysis, active engagement in contemporary issues, creative thinking about alternative futures, and transformative pedagogy (UNECE, 2012).

The data collection tools presented above, which all serve different purposes and respond to different needs,

are too infrequently applied to fill the data gaps. Nor do they follow a systematic format that would ensure country comparability. Monitoring in this area, whether for teacher competencies or classroom interactions, will be challenging (**Box 3.2**). Therefore, stronger efforts are urgently needed to assess concepts in target 4.7 for teacher preparation and training. The application of a standard coding protocol – as for curricula and textbooks – to teacher training institutions' curricula or to the possible inclusion of global competence as a theme in future rounds of the Teaching and Learning International Survey (TALIS), for instance, would make it possible to analyse the effectiveness of professional

BOX 3.2

Monitoring classroom interactions on sustainable development is challenging

In GCED and ESD, participatory, learner-centred and inclusive teaching and learning practices are central. Qualitative tools have been used to track progress in adopting such practices. A study in 10 countries in Asia and the Pacific used qualitative techniques, such as classroom observations, to examine if teaching methods were conducive to a participatory and interactive learning environment. As part of this project, a study of 18 classes in 6 schools across 3 districts observed that in about half the classes, teachers relied on teacher-dominant and teacher-centred methods, while in the remaining half, teachers tried to make classes more interactive.

Methodological limitations and implementation costs make it unrealistic to look for global measures of classroom interactions. Yet, some cross-national assessments have looked at classroom practices in relation to GCED and ESD.

The 2009 ICCS, for instance, measured the climate for classroom discussion, within the limitations of self-reporting. Students were asked whether they expressed opinions in class even when their opinions differed from those of most other students, for example, and whether teachers presented several sides of an issue when explaining it in class.

Across the participating countries, 52% of students, on average, often observed that teachers encouraged them to express their opinions, and 11% reported that students often brought up current events in the classroom. Students were more likely to report an open classroom climate in some countries, including Denmark, Indonesia and Italy, than in others, including Malta and the Republic of Korea. ICCS 2016 will continue to ask questions about classroom interaction.

Sources: Schulz et al. (2010); UNESCO (2014d).

development in preparing teachers to respond to various groups of students, potentially through a range of teaching strategies (OECD, 2016a).

ACTIVITIES OUTSIDE THE CLASSROOM

While classrooms may be effective places to introduce students to sustainability and global citizenship issues, they are not the only ones, or necessarily the most potent. Extracurricular activities can strengthen and complement classroom interventions and textbook contents. Such activities outside the classroom that complement core academic content include academic clubs and competitions, student government associations, sports activities and teams, debate clubs, theatre productions, music groups and volunteer work.

An analysis for this Report has reviewed the impact of various extracurricular activities around the world. It finds that well-designed, inclusive activities that are accessible to all population groups improve conflict resolution and relationships for social cohesion, increase awareness of legal frameworks and concepts related to human rights as well as the personal capacity to claim and advocate for them, and promote a sense of global citizenship that transcends national boundaries and allows for greater communication and collaboration with people from other countries (Akar, 2016).

Such activities can empower young people to be confident and active agents of positive change to advance various elements of target 4.7, including equality and inclusion, peace, human rights and improved health, particularly as related to HIV prevention.

Some surveys monitor access to extracurricular activities, mostly organized by schools. The 2006 PISA, for instance, asked principals what kinds of extracurricular science activities their schools offered. On average, across OECD countries, 89% of students attended schools whose principals reported commonly offering science-related field trips. Other extracurricular science activities were less prevalent: 56% of students were in schools holding science competitions, 48% in schools encouraging extracurricular science projects, 42% in schools organizing science fairs and 41% in schools with science clubs (OECD, 2012b).

The 2009 ICCS asked teachers if they and their students participated in school-organized activities in the local community, including activities related to environment, human rights, underprivileged people or groups, local multicultural/intercultural events, and awareness-raising campaigns such as World AIDS Day. Principals were asked how many students had the opportunity to take part in such activities. Across the countries surveyed, participation in environment-related awareness-raising campaigns and activities appeared to be widespread. Support of underprivileged people or groups was less common, except in Indonesia and Thailand, where around 70% of teachers said they had participated in such activities (Schulz et al., 2010).

Less information is available about extracurricular activities not organized by schools. Providers of such activities may not give information to or participate in any monitoring and reporting systems. It is hard to imagine global-scale monitoring of this area.

Some opinion surveys have collected data on involvement in extracurricular and similar activities. In 2014, Flash Eurobarometer telephone interviews, collected data on participation in society, in particular involvement in voluntary and cultural activities, from people aged 15 to 30 in the 28 European Union (EU) countries. Around 30% of respondents reported being active in a sports club in the past 12 months, while 16% were involved in a youth club, leisure-time club or other youth organization. On average, 5% participated in an organization promoting human rights or global development, and 3% in one involved in climate change and other environmental issues (European Commission, 2015).

In some countries, national surveys can help track progress. In England (United Kingdom), the National Foundation for Education Research carried out a nine-year evaluation of citizenship education. The Citizenship Education Longitudinal Study began in 2001 and tracked a cohort of young people from age 11 to age 18; the group entered secondary school in 2002. The eighth and final report found a clear, steady decline in the share taking part in extracurricular activities (sports, arts, drama and hobbies), from 80% in grade 7 to 66% in grade 13 (Keating et al., 2010).

In the United States, the 2008 panel of the nationally representative Survey of Income and Programme Participation included a topical module on child well-being in the 10th wave of interviews conducted in 2011. The survey collected information on a variety of

child well-being indicators to illustrate children's daily experiences, including participation in extracurricular activities. Data were limited to children aged 6 to 17 and based on parents' responses about children's involvement in three extracurricular activities: sports, clubs and lessons. It was found that 35% of children participated in sport and 29% in clubs or lessons including music, dance and language (Laughlin, 2014).

A major shortcoming of all these data collection tools is a lack of attention to the quality of experiences or development processes within extracurricular activities. And the absence of common or shared standards for publicly reporting information on extracurricular activities limits the chance of obtaining consistent and reliable data.

OUTCOMES

Monitoring the core aspiration of target 4.7 – acquisition of knowledge and skills needed for sustainable development – is not easy. Challenges include the scarcity of relevant student assessments or specially developed opinion or values surveys, the difficulty of developing test items that are context-relevant but not culturally biased, the broad scope of the target's topics and the relative lack of research on adult learning. One

“ It is hard to test knowledge and skills for sustainable development in a way that is context-relevant but not culturally biased ”

strategy would be to develop a pool of materials from which countries could select components that were both culturally and age appropriate and could be linked to a comparative or international scale.

ASSESSING GLOBAL KNOWLEDGE AND UNDERSTANDING

Knowledge and understanding of global themes and issues (e.g. peace and conflict, poverty, migration, globalization, climate change), events and institutions are essential to an ability to contribute to sustainable development (Davies, 2006). A basic, interdependent understanding of world history, geography, international institutions and global processes could serve as a starting point to monitor knowledge regarding the concepts in target 4.7. Yet, few cognitive assessments exist in this area.

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Very few cognitive assessments exist for the understanding of world history, geography, international institutions and global processes
 ”

One example of student cognitive assessments comes from the 2009 ICCS, which drew on the 1999 Civic Education Study. With the aim of reporting on students’ conceptual knowledge and understanding in civic and citizenship education, it used a 79 item test administered to grade 8 students in 38 countries of Europe, Asia and Latin America (Schulz et al., 2010).

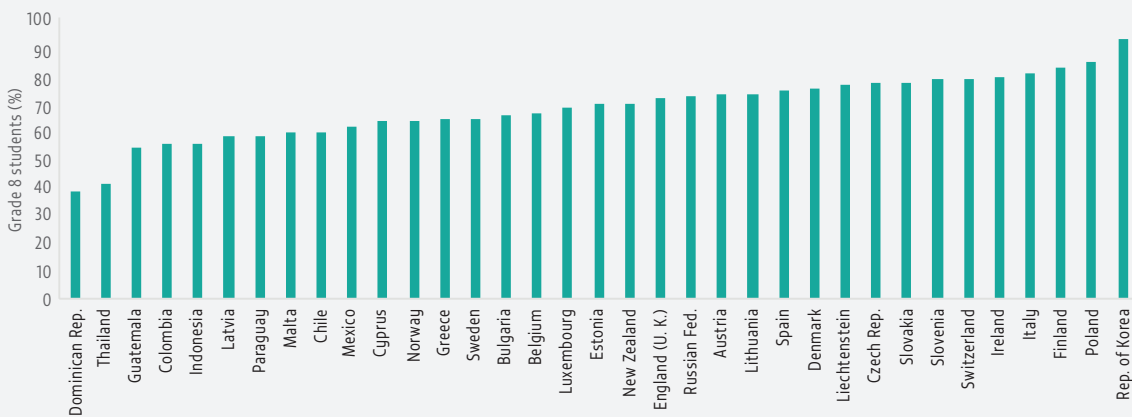
The 2009 assessment included an item on knowledge of the Universal Declaration of Human Rights, which can provide a set of universal values as a basis for judgements about global issues (Osler and Starkey, 2000).³ An average of 68% of students responded correctly to this item. In Finland, Poland and the Republic of Korea, over 80% recognized that the declaration was intended to apply to all people; around 40% did so in the Dominican Republic and Thailand (**Figure 3.6**).

Regional modules for Asia, Europe and Latin America were added to the 2009 ICCS. In Europe, students were asked about basic facts on the EU and its policies, institutions, practices and processes to gauge their knowledge of supra-national political governance structures (UNESCO, 2015f). Only 57% knew how many countries were EU member states; national averages ranged from 35% in England (United Kingdom) to 75% in Slovakia (Kerr et al., 2010).

National assessments with a civics component can also gauge knowledge relating to global issues. In the United States, the 2014 National Assessment of Educational Progress assessed grade 8 students’ knowledge of the benefits of international interactions such as trade, treaties and humanitarian aid. While 62% of students described benefits of two or three types of interactions, 11% could not describe a benefit of any type of interaction (Institute of Education Sciences, 2016).

Preparing learners for a future of climatic and environmental instability begins by helping them understand issues such as why and how climate change takes place, and its likely effects on habitats

FIGURE 3.6:
In many countries, no more than two-thirds are familiar with the Universal Declaration of Human Rights
 Percentage of grade 8 students responding correctly to the item ‘Which of the following is the main purpose of the Universal Declaration of Human Rights?’, 2009 ICCS



Source: Schulz et al. (2010).

and ecosystems (Mansilla and Jackson, 2011). The 2006 PISA included questions designed to assess knowledge, skill and dispositions on environmental and geoscience among more than 400,000 15-year-olds from 57 countries. The study provided the first internationally comparable data on students' knowledge of the environment and related problems, the sources of this knowledge, their attitudes on environmental issues and the relationship between their results in environmental science and their environmental attitudes (OECD, 2009a).

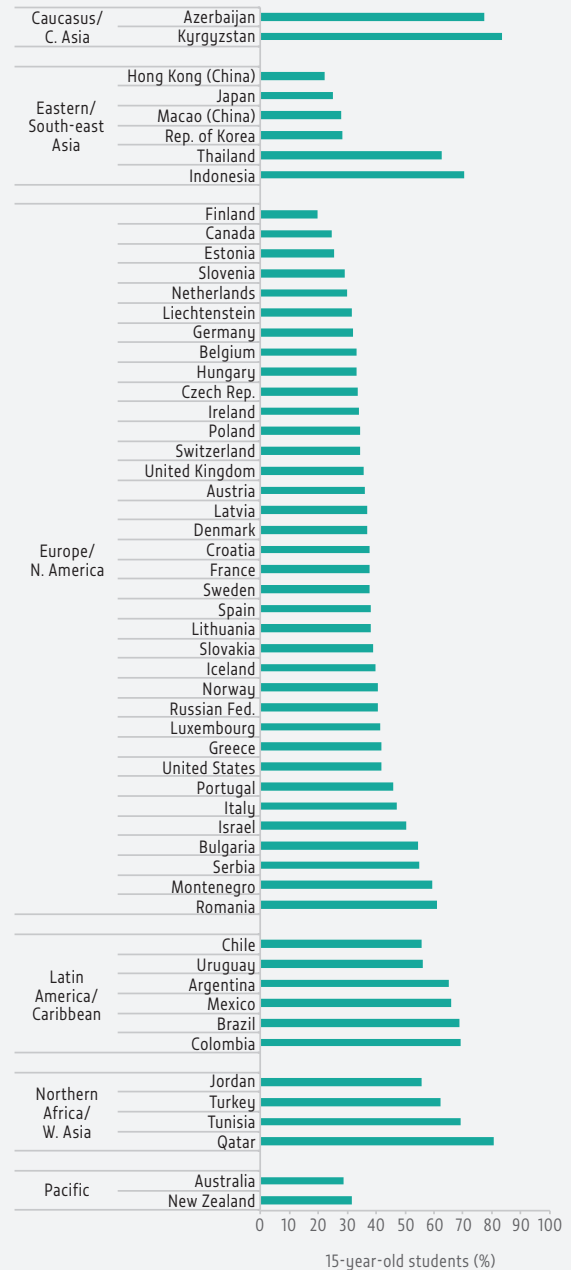
Of the 108 questions in the PISA 2006 science assessment, 24 were related to environmental science; of these, 14 focused on geoscience. Each subset was the basis for a performance index. At the lower end of the index distribution, students were unable to interpret a graph or figure when given appropriate cues, or show basic knowledge of common environmental processes (OECD, 2009a). The environmental science performance index highlighted wide differences between countries. In Azerbaijan, Indonesia, Kyrgyzstan and Qatar, more than 70% of students were at level D or below, compared with around 25% in Canada, Estonia, Finland and Japan (Figure 3.7). These results from PISA 2006 could be taken as a baseline for the level of environmental science knowledge among 15-year olds.

Since 2000, some national cognitive assessments have measured understanding of environmental issues and the ability to use critical thinking in decisions about individual and collective action strategies.

A national assessment of grade 6 and 12 students conducted in Israel over 2004–2006 included nearly 20 questions on general environmental principles and national and global issues. Some 80% of sixth graders correctly answered questions about bottle-deposit laws and recycling, but only 25% were successful on questions about global warming and bird migration. Older students had higher scores: only 25% of sixth graders knew about waste management and the most polluting mode of transport, compared with 55% of 12th graders (Negev et al., 2008).

In Turkey, as part of a nationally representative survey of 2,412 grade 5 students, cognitive skills on environmental protection were assessed in terms of identifying, evaluating and solving problems. About 5% could correctly order the scientific processes given to solve water pollution. About 50% knew that identifying and assessing a problem starts with searching for relevant

FIGURE 3.7:
Environmental knowledge varies widely between countries
Percentage of 15-year-olds at level D or below on environmental science performance index, PISA 2006



Note: At the lower end (level D or below) of the index distribution, students cannot interpret a graph or figure when given appropriate cues, or show basic knowledge of common environmental processes.

Source: OECD (2009a).

information from various sources, but only 27% knew that the last step was reporting and presenting the data collected (Erdogan and Ok, 2011).

Improving on current assessments

Recent initiatives seek to improve monitoring mechanisms for target 4.7 regarding adolescents, mainly in secondary education. In 2016, UNESCO and the International Association for the Evaluation of Educational Achievement (IEA) officially began collaborating on measuring global citizenship and sustainable development knowledge. The IEA's 2016 ICCS will ask students to rate the seriousness of threats including poverty; declines in living standards, economic well-being and environmental health; and attacks on human dignity. The ratings will indicate student awareness of global issues (Schulz et al., 2016). ICCS 2019 will build on the main cycle of ICCS 2016, extending country and thematic coverage. Critically, it will include indicators of knowledge, understanding, skills, beliefs, attitudes and behaviours relating to GCED and ESD.

A major limitation of ICCS is the country coverage. More are needed for this instrument to be used effectively to provide global estimates. Another limitation is the age of those assessed. Ages 13 and 14 could be considered appropriate in countries where compulsory education ends at 14, but marked differences between young people on political engagement start to appear at age 15 to 16. These differences need to be recognized (Hoskins, 2016).

A challenge for measuring outcomes related to target 4.7 has to do with tension between national values and the commitment to a global agenda. Hence, there

“ There is a need to develop comparative student assessments that are more attuned to local conditions ”

is a need to develop comparative student assessments that are more attuned to local conditions. One promising example is the Southeast Asia Primary Learning Metrics, focusing on literacy, numeracy and global citizenship in

grade 5. In 2016–2017, at least six countries in the region will pilot the assessment tools. By 2020, all countries of the Southeast Asian Ministers of Education Organization and the Association of Southeast Asian Nations are expected to join (SEAMEO and UNICEF, 2015).

Another recent development is the OECD decision to include global competence as a field for testing in PISA 2018 (see **Box 3.3**).

Data sources on adult global knowledge and understanding are even more limited

Existing data on knowledge and skills related to global citizenship and sustainable development tend to be limited to children and adolescents. Yet, it is equally important to evaluate similar knowledge and skills in the adult population. There have been very few cognitive assessments, however.

One example was an early survey of global understanding in the United States that included measures of cognitive dimensions of global awareness and was not limited to knowledge of a particular culture or area. This nationally

BOX 3.3

Assessment of global competence in the 2018 PISA assessment

Countries participating in PISA are collaborating to develop an assessment of global competence to be conducted in 2018. It will involve testing 15-year-olds, who also take separate tests in reading, mathematics and science.

Global competence is a multidimensional learning domain encompassing three dimensions needed to engage in productive and respectful relationships with people from different cultures: knowledge and understanding, skills, and attitudes. It is defined as the capacity to analyse global and intercultural issues critically and from multiple perspectives; to understand how differences affect perceptions, judgements and ideas of self and others; and to engage in open, appropriate and effective interactions with others from different backgrounds on the basis of a shared respect for human dignity.

The cognitive assessment in the 2018 PISA currently proposed by the OECD aims to build a single scale to test knowledge, understanding, and analytical and critical thinking in a problem-solving context concerning a global or intercultural issue. It would include tasks that draw on numerous types of knowledge and thinking processes and would be designed to be appropriate to the context and learning of 15-year-olds.

The questionnaire would also include self-reported components on the dimension of knowledge and understanding – for instance, how familiar students are with global issues such as climate change and global warming, global health and population growth – and on linguistic, communication and behavioural skills required to interact respectfully, appropriately and effectively with others. Students’ flexibility, empathy, openness to and respect for cultural otherness, global mindedness and responsibility will also be assessed.

Sources: OECD (2015e); OECD (2016a); Reimers (2010).

representative survey of some 3,000 undergraduates featured 101 items testing knowledge in 13 areas, including environment, international monetary and trade arrangements, human rights, and race and ethnicity. Only 31% of students identified crop cultivation as the human activity that has contributed most directly to environmental alteration of the greatest area of earth's surface (Barrows et al., 1981).

A more recent assessment of sustainability knowledge is the UN Sustainability Literacy Test (SULITEST). It is administered by higher education institutions to assess and verify sustainability literacy upon graduation. This online multiple-choice test measures the level of knowledge on social, environmental and economic issues and a basic understanding of the earth system. Of the 50 questions, two-thirds are related to international issues such as global warming, the rest being on national and regional issues such as legislation and culture. Between January and October 2014, almost 20,000 students in higher education took the SULITEST; the average score was 54% (Sustainability Literacy Test, 2014).⁴

Building on the idea that broad, integrated geographic knowledge is critical to becoming a global citizen, the National Geographic–Roper 2002 Global Geographic Literacy Survey assessed the geographic knowledge of 3,250 people aged 18 to 24 in nine countries.⁵ The survey contained multiple-choice questions on country identification from maps and on factual knowledge of world issues and current events, including population, natural resources, religion, politics and nuclear weapons. Results showed young adults were uninformed about global population issues, which affect, among other things, food and energy consumption. Only 40% or less of young adults in all surveyed countries except Sweden (61%) correctly named China and India as the countries with more than 1 billion people (RoperASW, 2002).

The follow-up National Geographic–Roper Public Affairs 2006 Geographic Literacy Study was conducted in the United States. As in 2002, factual questions were addressed to a representative sample of young adults. Only 35% correctly chose Pakistan from four possible choices as the country hit by a catastrophic earthquake in October 2005. Seven in ten young Americans could find China on a map but less than two in ten knew that Mandarin Chinese was the world's most widely spoken native language (GfK Roper Public Affairs, 2006).

International opinion surveys, such as the regional barometer surveys (Afro, Arab, Asian, Eurasia and Latino) and the World Values Survey (WVS), include questions on self-reported knowledge and understanding of global and intercultural issues. The 2005–2009 WVS asked about awareness of the Millennium Development Goals (MDGs); only 5% of people surveyed in the United States and 11% in Japan had heard about them, compared with 27% in Germany and 31% in Sweden. Sub-Saharan African countries registered the highest awareness of the MDGs, with 66% in Ethiopia, 47% in Mali and 44% in Zambia. This result indicated that people in countries that received aid were more likely to be aware of the MDGs than people in donor countries (Freschi, 2010). The potential of using international opinion surveys to measure adult global knowledge and understanding needs to be further explored.

SKILLS AND ATTITUDES

Critical skills for promoting sustainable development include communicating appropriately and effectively with people from other cultures or countries; comprehending other people's thoughts, beliefs and feelings and seeing the world from their perspective; adjusting one's thoughts, feelings or behaviours to fit new contexts and situations; and analysing and thinking critically in order to scrutinize and appraise information and meanings.

PISA 2018 will be an important step to assess such skills on a broader scale (OECD, 2016a). The cognitive assessment will be designed to test knowledge, understanding, and analytical and critical thinking in an authentic problem-solving context. Self-reported items will be incorporated to measure skills such as communication, flexibility and empathy (Box 16.3).

A number of cross-national assessments examine attitudes, including openness towards people from other cultures or countries, respect for cultural otherness and responsibility for one's own actions.

ICCS 2009 contained scales for monitoring supportive attitudes, e.g. on gender equality and towards migrants. Supportive attitudes on gender equality were captured by how students responded to positive and negative statements on ideas such as equal opportunity to take part in government and equal pay for the same jobs. Large majorities agreed with positive and disagreed with negative statements about gender equality, with girls

expressing more support for gender equality than boys (Schulz et al., 2010).

Regional ICCS modules reflect local, national and regional differences. The 2009 Latin American questionnaire included items measuring acceptance and respect of social minority groups as neighbours. While most students in the participating countries (Chile, Colombia, the Dominican Republic, Guatemala, Mexico and Paraguay) were tolerant of people of a different nationality, from other regions of the country or with a different skin colour, fewer approved of people with a different sexual orientation or with HIV (Schulz et al., 2011).

In the 2010 Australian National Assessment, student attitudes on indigenous cultures were measured in grades 6 and 10. In both grades, 9 out of 10 students agreed that Australia should support cultural traditions and languages of Indigenous Australians. A similar proportion agreed on the importance of recognizing traditional land ownership and giving everyone the chance to learn about promoting reconciliation between Indigenous and non-Indigenous Australians (Australian Curriculum Assessment and Reporting Authority, 2011).

The annual International Social Survey Programme (ISSP) is a cross-national collaborative project on attitudes concerning social issues, conducted in multiyear modules.⁶ Its third module on environment, in 2010, mainly dealt with attitudes on issues such as environmental protection, and respondents' behaviour and preferences regarding government measures on environmental protection.

An ISSP summary index on environmental attitudes shows Canada, Denmark and Switzerland leading the ranks in environmental concern, with Bulgaria, the Philippines and South Africa at the lower end.

“ The International Social Survey Programme shows that environmental concern is decreasing in almost all countries over the past two decades

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Longitudinal analysis of successive ISSP waves shows environmental concern decreasing in almost all countries over the past two decades. In the United States, for instance, about 46% of the population was very willing or fairly willing to pay much higher prices to

protect the environment in 2000 and 2010, down by six percentage points from 1993 (Franzen and Vogl, 2013).

The European Social Survey, conducted every two years, consists of a core questionnaire and rotating questions. In 2014, the rotating questions were related to immigration. An active willingness to seek out and take up opportunities to engage with people from other cultures can be measured by, for instance, having close friends of another cultural group. In France, Sweden and Switzerland, 35% of respondents reported not having close friends of a different race or ethnic group (ESS, 2014).

In 2015, the Pew Research Centre conducted a survey in 40 countries to measure perceptions of global challenges. The survey of representative samples of adults over age 18 showed that climate change was cited as the biggest challenge in 19 countries, making it the most widespread concern. In Latin America and sub-Saharan Africa, 50% of adults reported high concern about climate change. Global economic instability was the biggest concern in several countries and the second biggest in half the countries surveyed (Pew Research Centre, 2015).

Cross-national opinion surveys have their limits, however. Attempts to measure and analyse self-reported data on attitudes often confront the social desirability problem: adults are rarely willing to admit prejudices in relation to gender, race and religion in opinion surveys but may be more likely to give a socially acceptable or desirable response.

Overall, target 4.7 makes explicit the need for 'all learners [to] acquire the knowledge and skills to promote sustainable development'. Currently proposed indicators refer only to school-age children and adolescents. An appropriate monitoring framework would find ways to better capture the target's intent. Future data collection efforts should strengthen the knowledge base on out-of-school youth and all adults.

Furthermore, coordinated efforts are needed in developing a shared monitoring framework and conducting assessments of learners' knowledge and skills. Establishing common understandings at the regional level, such as the Southeast Asia Primary Learning Metrics, is likely to prove more feasible in coming years.

MONITORING CHALLENGES AND OPPORTUNITIES

Target 4.7: In response to explicit reference in the target to knowledge and skills related to sustainable development and global citizenship, the international community has prioritized progress assessments based on the content of education. This is positive, as it will encourage countries to reflect on what is taught in classrooms. However, it has not been clarified how such information is to be collected and communicated at the global level.

UNESCO member states' reports on implementation of the 1974 Recommendation concerning Education for International Understanding, Co-operation and Peace and Education relating to Human Rights and Fundamental Freedoms are proposed as the mechanism to monitor progress towards the target. But low response rates and submission quality mean the process is weak and needs to be complemented by a more systematic and rigorous approach.

The GEM Report has proposed an approach that would require a systematic listing of national curriculum frameworks and a coding protocol to analyse curricular materials. Such a mechanism would also require close collaboration between education ministries and regional or international organizations to ensure that the quality of the information is good and that the process is country-led. The mechanism could also cover other aspects of national policies, including teacher education programmes, learning assessments and textbooks.

ENDNOTES

1. The third phase, 2015–2019, focuses on strengthening the work of the first two phases and promoting human rights training for media professionals (OHCHR, 2014).
2. 18 countries in Latin America and the Caribbean, 16 in Europe and Northern America, 15 in sub-Saharan Africa, 11 in the Pacific, 7 in Eastern and South-eastern Asia, 6 in Southern Asia, 3 in Northern Africa and Western Asia, and 2 in the Caucasus and Central Asia.
3. Understanding the importance of human rights helps understand the rights and responsibilities of individuals and groups, examine the multiple ways in which intolerance violates human rights, and recognize human rights violations such as racism, sexism and xenophobia (Reimers, 2010).
4. The SULITEST will also be available for companies and organizations in 2016.
5. Canada, France, Germany, Italy, Japan, Mexico, Sweden, the United Kingdom and the United States.
6. Module topics have included environment; the role of government; social inequality; social support; family and gender issues; work orientation; the impact of religious background, behaviour, and beliefs on social and political preferences; and national identity.



Girls wash their hands outside their classroom in the government-run United Methodist School in Freetown, Sierra Leone. Schools throughout Sierra Leone, including this one, were closed for eight months at the height of the Ebola crisis.

CREDIT: Kate Holt/GEM Report



CHAPTER

4

Education and sustainable development: conclusions and policy recommendations



KEY MESSAGES

For education to be transformative in support of the new sustainable development agenda, 'education as usual' will not suffice.

Collaborate across sectors: Include ministries, civil society, the private sector, at the local and national level.

Use education as a capacity-building tool in all sectors. Invest in integrated interventions that will have multiplier effects for several development outcomes.

Education cannot fight inequality on its own. Labour markets and governments must not excessively penalize lower income individuals. Cross sectoral cooperation can reduce barriers to gender equality.

Education funding needs to be both adequate and predictable to ensure the provision of good quality education, especially to marginalized groups.

PLANET: A whole-school approach is needed to build green skills and awareness. Campaigns, companies, as well as community and religious leaders must advocate for sustainability practices. Non-formal education and research and development should also help solve global environmental challenges.

PROSPERITY: Invest in teaching green and transferable skills in school and the workplace. Incentivize universities and agricultural extension to focus on green economic growth and sustainable agricultural production. Promote cooperation across all sectors to encourage full economic participation by women or minority groups.

PEOPLE: Ensure universal access to basic services. , Support the integration of marginalized groups by investing in early childhood care and education, social protection programmes and awareness campaigns. Fund integrated delivery of basic services in schools.

PEACE: Expand education on global citizenship, peace, inclusion and resilience to conflict. Emphasize participatory teaching and learning especially in civic education. Invest in qualified teachers for refugees and displaced people, and teach children in their mother language. Incorporate education into the peacebuilding agenda.

PLACE: Distribute public resources equitably in urban areas, involving the community in education planning. Include education in all discussions on urban development. Improve and fund urban planning programmes and curricula to include cross-sector engagement and develop locally-relevant solutions.

PARTNERSHIPS: Develop equitable funding mechanisms. Use progressive public finance policies to fund lower levels of education; combine grants and loans to finance upper levels of education. Increase multilateral aid mechanisms and engagement with the private sector. Mobilize domestic resources by improving knowledge about tax systems, halting tax evasion, and eliminating fossil fuel subsidies.

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The 2030 Agenda for Sustainable Development grew out of intensifying concerns over the health of the planet and the prosperity of all its inhabitants. Clearly, education matters for people and planet. It transforms the lives of children, youth and adults. The fact that education is a positive force for social, economic and environmental change – that it can significantly influence how we think, perceive and act – is neither new nor revolutionary. And yet important questions remain: How does education function to create societal change? In what contexts does it matter more or less? Which types of education have lasting impact on sustainability issues? Answers to these questions are critical as concrete proposals for improving economic, social and environmental sustainability are being considered.

“ There are concerns that evolving global conditions may weaken the impact of education

They are particularly salient in places where widespread access to schooling is a recent achievement or remains an ambition.

This publication contains three of the chapters (Planet, Prosperity and SDG 4 target 4.7) from the 2016 GEM Report, *Education*

for people and planet: Creating sustainable futures for all. All the chapters in the full report – Planet, Prosperity, People, Place and Peace – showcase evidence about

the many and varied effects of education. The benefits of completing primary and secondary education are substantial, not only for the individuals involved but also for their families, communities and workplaces. Adult men and women who have completed some secondary education tend to be more environmentally aware, more resilient to the impact of climate change, more productive and able to generate income, and more likely to live healthier lives, be politically engaged and exercise greater control over their lives. The effects of broadening access to girls and women, in particular, are numerous and intergenerational.

The *Projections* chapter goes one step further and underscores the stakes involved in universalizing primary and secondary education by 2030. Enabling every child in the world to complete 12 years of schooling would not only catalyse education progress more broadly (e.g. in many targets of the education goal, Sustainable Development Goal 4), but would also help save millions of lives among children who might not otherwise reach age 5 and among those residing in disaster-prone areas. It would also improve overall worker productivity and economic growth.

Concern exists, however, that evolving global conditions – social, economic, political and environmental – may weaken the impact of education. Over the past two centuries, the world economy has been massively transformed through industrialization, mechanization, computerization, innovation and globalization, the latest

iteration resulting in today's 'knowledge economies'. These transformations have created enormous wealth for some and, in many instances, helped expand sizeable middle classes. At the same time, huge populations throughout the world have been left behind, their lives and livelihoods remaining vulnerable to economic dislocation or persistent poverty or both. The vicissitudes of economic cycles, which often exacerbate political insecurity and violent conflict, have forced millions of families and even whole communities to relocate under difficult circumstances.

Despite challenges, the worldwide movement to universalize a long cycle of education and improve learning levels gathers steam. These aspirations are deeply embedded in the aims, policies and plans of almost all countries, regardless of population, location and degree of development. Education, which historically served elite interests, has been made more accessible, expanded into national systems that seek to provide all students, even those in hard-to-reach locations and marginalized groups, with the opportunity to become educated and skilled. The aim of good quality education for all has become the norm, driving national commitments and the activities of international agencies and external donors, bolstered by human rights conventions.

If it were to be achieved, the new global education goal would mean that each and every child, regardless of birth circumstances, would have a chance to acquire valuable knowledge, skills and attitudes that could improve the quality of their lives from personal, civic, social and employment-related perspectives. But the scale of the challenge is pronounced: 263 million children and adolescents are currently excluded from primary and secondary education and unable to acquire relevant skills and competencies for life and work. Education's many benefits now go disproportionately to some individuals at the expense of others. The ones who are far less likely to reap them include people who face discrimination, are unhealthy, lack access to basic services and live in remote or sparsely populated areas.

The *Global Education Monitoring Report* (GEM Report) emphasizes the inequity and unsustainability of global and national economies, and the various roles education plays in this respect. Modern economic systems have increased the value of and demand for educated labour, especially as a source of innovation-led economic growth. Economic benefits and social status accrue to those with credentialed knowledge and skills, leaving behind huge numbers of people who may never have had access

to school or to lifelong learning opportunities and who therefore face persistent obstacles in obtaining decent work or escaping from working poverty.

From a sustainability perspective, the world's wealthy, with their high levels of education and standards of living, leave large ecological footprints and make the planet less sustainable. Educated people may have considerable knowledge about environmental and other progressive issues, but do not always act on it. Education and qualifications do not necessarily translate into desirable outcomes, such as greater tolerance for diversity, respect for women and men, less risky health behaviour, waste prevention, more balanced diets and a commitment to social justice. At the same time, the least educated and most vulnerable contribute little to the planet's burdens. And yet they are most exposed to the impact of climate change and increasingly frequent and severe natural disasters. Inequality in opportunity and living conditions, including in access to education of good quality, are especially visible in our growing cities and urban areas, which has often led to civil unrest and discontent.

Education cannot serve as a cure-all for society's problems. Global social and economic challenges are interdependent, involving sectors beyond education, and education is provided within the context of entrenched social and political institutions that are resistant to change. Radical transformation of how and what we consume and produce, and of the basis for sharing economic rewards, requires commitments that must cross economic sectors and political boundaries. At the same time, education reforms are no quick fix if not reinforced by changes in the home, workplace and community that result in altering, for example, stereotypical gender roles or attitudes towards people who face discrimination on any grounds, from ethnicity to disability.

Politics, economics, health, water, sanitation, energy, migration, conflict and climate have direct effects on education systems. Poor air quality or extreme weather can destroy schools, force them to close or make learning nearly impossible. Groups such as people displaced by climate change or conflict, economic migrants and poor slum dwellers can place enormous pressure on education systems. Education is much affected by the context in which it operates.

Yet formal, non-formal and informal education can lay the groundwork for transforming institutions and norms to address today's pressing challenges in tangible ways. Schools can deliver knowledge on sustainability issues

and promote good environmental, health and sanitation practices. When designed smartly, and conveyed by well-prepared teachers, school-based programmes can inculcate values of tolerance and equality.

Evidence gathered for this report suggests that education systems do not change quickly, despite well-articulated intentions, since content and pedagogy often reflect deeply set social, economic and environmental norms. And in many instances, schools lack adequate financing for transformation, even if school leaders are committed to this aim.

Several of the GEM Report chapters document a wide range of non-formal and informal learning initiatives, especially targeting girls and women, that fill gaps in useful knowledge – such as how to demand local services or fight for justice – and equip learners for stronger economic and political participation. The report also highlights learning-focused actions by national and local governments, civil society organizations and private companies, recognizing the ways in which education and lifelong learning matter for reducing inequality, encouraging sustainable transport and waste prevention, and both preventing conflict and natural disasters and recuperating from them.

The GEM Report also pays special attention to the importance of developing integrated approaches to solve complex, collective problems. Such strategies align well with key points made in the 2030 Agenda for Sustainable Development. However, the Partnerships chapter finds that the notion of integrated planning, though part of the post-2015 development discourse, still exists mostly on paper and there is limited evidence of its benefits, partly because there is little appetite for difficult collaborative arrangements. Few countries have genuinely pushed for integrated actions to provide, for instance, early childhood development or joint basic services. Without strong political incentives and adequate financial backing, planning and implementation in most contexts will remain in silos. We know the many ways education matters for shaping knowledge, values and attitudes; education and lifelong learning policies targeting all learners of all ages must be given their rightful priority and embedded in integrated national and local planning efforts.

For education to truly be transformative, ‘education as usual’ will not suffice. Schools need to become exemplary places that breathe sustainability, finding ways to be

more inclusive, participatory and healthy, as well as carbon-neutral and producing no waste and pollution. Formal and non-formal learning needs to foster thinking that is more relational, integrative, empathic, anticipatory and systemic.

POLICY RECOMMENDATIONS

Keeping all of the above discussion in mind, the GEM Report presents general and specific policy recommendations for how education systems can more effectively contribute to sustainable development:

- Support collaborations and synergies across all sectors and partners. Since systemic problems require multiple actors and diverse perspectives, stronger efforts are needed to involve all partners at the local and national level and across sectors. Finance and planning ministries need to engage in more systemic planning. Education ministries should be better linked with ministries of health, gender, environment and labour. Education experts need to learn from and work with civil society and communities, which already carry out an impressive array of education and training. Stronger focus is required on cross-sector collaboration and integrated perspectives in the activities of civil society and the private sector, as well as in urban planning and research and development strategies. The private sector, civil society, multiple sectors of government activity and international actors should work together to fund various facets of education, since education matters for all aspects of sustainable development.
- Integrate formal and non-formal education and training into government efforts to tackle complex problems. Education can be an important tool for capacity-building in all public sectors. Many of the Sustainable Development Goal targets will require the specialized skills and expertise education can provide, for instance in water management or addressing global health and climate risks. The case for education interventions should focus on both immediate and longer-term cross-sector benefits that

“ For education to truly be transformative, ‘education as usual’ will not suffice ”

education solutions can provide, so that funds additional to those traditionally targeted for education can be used. Governments and other stakeholders also need to better investigate and invest in combinations of integrated interventions that are likely to have multiplier effects for several development outcomes, including education. Investment is particularly needed in low income countries so they can build their own expertise by improving higher education and vocational institutions, as well as informal adult learning initiatives.

- Education can be an important means of reducing inequality but cannot be seen as the sole solution. Making primary and secondary education of good quality widely accessible can enable large numbers of individuals and their families to raise their incomes above the poverty line. Expanding educational opportunities to marginalized groups and further reducing gender inequality in the school system are crucial to reduce disparity in labour market outcomes, much of which is accounted for by lower levels of attainment. Policy-makers must ensure that changes in labour market institutions, such as technological progress and easing of labour market restrictions, do not excessively penalize lower income individuals, who are disproportionately employed in lower paying and less secure jobs, often in the informal sector. At the same time, cooperation across all sectors of society and the economy is needed to reduce prejudice and any policy-related obstacles to full economic participation by women and minority groups.
- Increase the level and predictability of education system financing. Education funding needs to be both adequate and predictable to ensure the

“ Education can be an important means of reducing inequality but cannot be seen as the sole solution

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provision of good quality primary and secondary education, especially to marginalized groups. This would entail ensuring appropriate inputs and teachers, and transforming school systems to better inculcate values of social and environmental sustainability in addition to a specific set of cognitive

skills. Improved financing is also critical to support non-formal and informal learning initiatives instead of waiting for the longer-term effects of formal systems. Such initiatives are often innovative, localized, targeted to adults and capable of helping address pressing issues such as disaster risk resilience and conflict prevention.

More specifically, stakeholders working to promote the sustainable development agenda should consider the following actions to expand education's focus and create more equitable opportunities for all:

PLANET

In order to lessen environmental degradation and the impact of climate change:

- Develop whole-school approaches that promote environmental teaching, learning, planning and operations by drawing attention to the ties between the environment, economy and culture.
- Provide disaster risk-resilience training in schools and equip learners with the means to support communities in times of disasters.
- Fund efforts to ensure that education infrastructure is resilient to climate change.
- Engage community elders in curricular development and school governance, produce appropriate learning materials and prepare teachers to teach in mother languages.
- Promote the value of indigenous livelihoods, traditional knowledge and community-managed or -owned land through actions such as land conservation and locally relevant research.
- Initiate large-scale awareness campaigns that 'nudge' people to engage in sustainability practices and behaviour.
- Work with community and religious leaders to spread ideas about environmental stewardship, and incentivize companies that incorporate sustainability into workplace practices.

- Scale up non-formal education initiatives promoting family planning and maternal well-being.
- Increase funding of research and development that promote technological innovations in energy, agriculture and food systems.

PROSPERITY

In order to reduce poverty and stimulate green and inclusive economies:

- Invest in teaching green skills in formal and non-formal programmes. Coordinate green-focused curricula through cooperation between education and training systems, policy-makers and industry.
- Train and support teachers and instructors at all education levels and in the workplace to enable learners to acquire green skills.
- Ensure universal access to good quality education that emphasizes skills and competencies for entry into economically productive, environmentally sustainable industries.
- Develop short-term strategies focused on workforce retraining and upskilling, together with longer-term strategies to improve or revise curricula in secondary education, initial higher education and vocational training.
- Incentivize universities to produce graduates and researchers who address large-scale systemic challenges through creative thinking and problem-solving.
- Promote cooperation across all sectors to reduce policy-related obstacles to full economic participation by women or minority groups, as well as discrimination and prejudice that also act as barriers.

PEOPLE

In order to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment:

- Target marginalized groups consistently left behind by adequately redistributing existing resources and

ramping up funds to improve access to good quality education.

- Support strong investment in early childhood care and education, especially for infants and toddlers, who gain lifelong benefits from participation in integrated interventions combining stimulation with health care and nutrition supplementation.
- Promote partnerships between education ministries and ministries responsible for health, water and sanitation, and gender issues, to help simultaneously improve multiple, linked and connected outcomes.
- Fund integrated delivery of basic services in schools. Ensure that all schools provide meals, access to water and sanitation, adequate gender-specific toilets and child-friendly spaces, and can deliver curricular interventions focused on behavioural change, such as hygiene education, sexual and reproductive health education, and obesity prevention education.
- Provide awareness campaigns and training to boost innovation in service delivery, such as e-government and participatory budgeting.
- Fund community-oriented education and training programmes in relation to health and sanitation.
- Ensure all girls complete primary and secondary education to promote their autonomy and decision-making abilities.
- Invest in programmes that address gender stereotypes and roles by engaging men and women in group education sessions, youth-led campaigns and multipronged empowerment approaches.
- Support media-based awareness campaigns, the development of positive role models and other initiatives to change gender norms inside and outside the education system.

“ All schools should provide meals, access to water and sanitation, adequate gender-specific toilets and child-friendly spaces ”

- Support efforts to improve participation of girls and women in science, technology, arts and design, and mathematics so as to improve employment prospects.
- Support social protection programmes, health policies and child-care support that improve maternal education and facilitate men's and women's employment-related decision-making.

PEACE

In order to foster peaceful, just and inclusive societies that are free from fear and violence:

- Expand the emphasis on global citizenship and peace education in curricula.
- Invest in civic education programmes that contribute to a functioning justice system, including participation and access for marginalized communities.
- Promote learning emphasizing the values of tolerance and peace education to help build less violent and more constructive societies.
- Teach in children's mother languages. Countries with high proportions of minorities should consider training teachers in methods for teaching second-language learners, in both initial teacher training and professional development.
- For refugees and internally displaced persons, implement policies that expand the pool of qualified teachers proficient in their languages, and address the issue of official validation and certification of learning by refugees. Refugees who were teachers in their home countries could be an important resource.
- Incorporate education into official foreign policy, transitional justice efforts and the peacebuilding agenda when trying to prevent and recover from conflict situations.
- Ensure curricula and learning materials are not biased or prejudiced against ethnic and minority groups. Engender resilience in students and communities in post-conflict societies through curricula, teacher training, transitional justice programmes and supporting integrated schools.
- Fund civil society organizations and other institutions that provide legal and political education in communities.

PLACE

In order to foster sustainable, inclusive and prosperous cities and other human settlements:

- Ensure urban areas distribute public resources equitably, including amenities and good quality teachers, so as to promote social inclusion and reduce inequality resulting from education disparity.
- Take steps to halt segregation stemming from increased opportunities to choose between public and private schools.
- Work to reduce school-based violence, including gender violence, and discriminatory attitudes among teachers.
- Develop local autonomy and localized system-wide education planning, especially in populous African and Asian cities, considering education as a local as well as national issue.
- Better incorporate education into local, national and global agendas focused on improving cities and other human settlements.
- Educate and engage with those who are disenfranchised, include them in planning, and collaborate with civil society actors who work with them.
- Fund schools and training programmes for slum dwellers and other disadvantaged groups who live in absolute poverty, so that assistance for them is not limited to basic services such as housing and water and sanitation.
- Fund urban planning education to increase the numbers of planners, and promote integration of education as well as multidisciplinary approaches.
- Improve urban planning curricula to include cross-sector engagement, community engagement, learning by doing and the development of locally relevant solutions.
- Involve communities in any processes to consolidate and improve schools in rural and

“ We should educate and engage with those who are disenfranchised, and include them in urban planning

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other areas affected by population declines due to migration.

- Monitor and address any unintended consequences of the growth of knowledge economies, such as gentrification and middle class flight, with strong economic and housing policies to limit social segregation and societal discontent.

PARTNERSHIPS

In order to ensure adequate financing, policy coherence and multisector capacity:

- Make links with tax authorities and others to improve tax-related knowledge through formal education.
- Develop equitable funding mechanisms to address in-country disparities in education funding.
- Use progressive public finance policies to ensure adequate funding of lower levels of education, and combine public allocations and a well-designed system of student grants and loans to finance upper levels of technical, vocational and tertiary education.
- Increase multilateral aid mechanisms and engagement with the private sector, learning from health sector efforts to increase and diversify funding.
- Mobilize domestic resources, stop corporate tax evasion and eliminate fossil fuel subsidies to generate government revenue for fundamental needs such as education and health.
- Provide political and financial support for planning and implementation of education and other activities to be carried out with an integrated approach to policy and development at the national and local levels. Develop knowledge exchange programmes to learn from successful integrated policies involving education.
- Support multistakeholder governance for the sustainable management of natural resources and of public and semi-public rural, urban and peri-urban spaces.

Planet: Education for environmental sustainability and green growth

Living sustainably requires a huge shift in mindset for individuals, communities, governments and the private sector. Business as usual is insufficient to address the significant environmental challenges we face, and education has to be a central part of the change needed to secure sustainable futures for all.

PLANET: Education for environmental sustainability and green growth, a publication taken from the full 2016 Global Education Monitoring Report, explores the knowledge and skills needed for sustainable and inclusive economic growth that does not damage our planet.

This publication demonstrates how education can help people understand and respond to environmental issues and climate change. Environmental education can increase green knowledge and build sustainability practices. The publication warns that while education contributes to economic growth, education systems must be careful not to encourage unsustainable lifestyles and all learners must acquire the knowledge and skills needed to promote sustainable development.

It also argues that we must continue to learn throughout our lives in order to make production and consumption sustainable, and to provide green skills for green industries. Creating green industries relies on high-skill workers with specific training, yet by 2020 there could be 40 million too few workers with tertiary education relative to demand. Higher education and research should also be oriented towards green innovation and growth; innovation depends on cooperation in higher education and investment in research and development to transform production in vast swaths of the economy.

It also recognises that education must change in order to keep up with the changing face of work. Green and transferable skills should be taught in both school and the workplace. The greening of industries requires not only the production of more high-skill workers, but the continued training and education for low and medium skill workers, often on the job.

"To ensure the Sustainable Development Goals are implemented, everyone involved needs to think, to work, to organise, to communicate and to report in ways that are completely different from what has been done up till now. Education truly is key to a wide appreciation not just of the SDGs but the new ways of thinking and working that are going to be necessary to fulfil them. So the challenge to all of us is to re-learn, and that does not just apply to educators, but it applies to all of us."

– David Nabarro, Special Adviser on 2030 Agenda for Sustainable Development

