

In collaboration with
Boston Consulting Group



Accelerating an Equitable Transition A Framework for Economic Equity

INSIGHT REPORT

JANUARY 2024



Contents

| | |
|---|-----------|
| Foreword | 3 |
| 1 Introduction: The climate-inequality nexus | 4 |
| 1.1 Emissions and inequality: Parallel trends | 4 |
| 1.2 Understanding the socioeconomic impacts of the green transition | 4 |
| 2 What is an equitable transition? | 7 |
| 3 A Framework for Evaluating Economic Equity of the Green Transition | 8 |
| 3.1 Dimensions of the economic equity-green transition matrix | 9 |
| 4 Green transition-economic equity intersections | 13 |
| 5 Conclusion: Creating a path to an equitable transition | 22 |
| Acknowledgements | 23 |
| Endnotes | 24 |

Disclaimer

This document is published by the World Economic Forum as a contribution to a project, insight area or interaction. The findings, interpretations and conclusions expressed herein are as a result of a collaborative process facilitated and endorsed by the World Economic Forum but whose results do not necessarily represent the views of the World Economic Forum, nor the entirety of its members, Partners or other stakeholders.

© 2024 World Economic Forum. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, including photocopying and recording, or by any information storage and retrieval system.

Foreword



Saadia Zahidi
Managing Director,
World Economic Forum



Rich Lesser
Global Chair,
Boston Consulting Group



Achim Steiner
Administrator, United National
Development Programme
& Co-Chair, Global Future
Council on Economics of
Equitable Transition

The green transition, driven by a rising urgency of accelerated climate action, is a transformative economic shift that impacts the production, distribution and consumption of goods and services with far-reaching and complex implications on equity, fairness and justice. Achieving net zero will encompass a wide range of changes: a clean energy system; the greening of agriculture, mobility and heavy industry; sustainable cities and infrastructure; and the scaleup of circularity models.

Carefully managing the economics of an equitable transition – putting at the centre the fair allocation of costs and benefits and the impact on people – will ultimately determine the success of this unprecedented transformation. The green transition is already impacting labour markets, shifting relative and absolute prices, changing the landscape of basic goods and services, and drawing new divides in the access to capital, knowledge and technology.

The risk of the green transition widening inequalities is not a peripheral concern. It is set against a backdrop of widening inequality within countries and stalling global economic convergence, as well as a cost-of-living crisis currently felt by many people around the world. In no region of the world do the bottom 50% of the population own more than 5% of wealth,¹ nor contribute to more than a quarter of their region's emissions. Yet climate policies such as carbon taxes and efficient equipment mandates can have a disproportionate impact on low- and middle-income groups, including in advanced economies. The social and political support that the transition requires cannot be developed and sustained unless fairness is a foundational principle. Climate action that exacerbates inequalities can give rise to geopolitical and social fragmentation, which might impact the cost and speed of the green transition.

The perspectives offered in this paper take a step towards this ambition, offering a framework for economic equity that categorizes the costs and benefits of a shift to a low-carbon economy for workers, consumers and entrepreneurs. By focusing on economic equity, we aim to surface the distributive impacts of climate mitigation on people and mobilize businesses and governments to maximize opportunities and minimize risks. Retooling economic and business strategies to place equity at the centre of the green transition can have far-reaching impacts in a world of integrated supply chains and increasing public-private investment and collaboration.

This framework will be used as a starting point for the World Economic Forum's **Equitable Transition Initiative**, which attempts to create a platform to connect stakeholders, develop insights and build consensus on the necessity, vision and organizing principles for an equitable green transition. The initiative's ambition is to ensure that the shift toward a low-carbon future places people – together with the planet – at the centre. While economic equity is only one aspect of fairness, it is deeply relevant to the daily experiences of large populations and an area of focus where a global coalition of government and business leaders is well-positioned to accelerate progress.

We are deeply grateful to the partners and constituents of the Centre for the New Economy and Society for their leadership on the socioeconomic agenda, and particularly to the Laudes Foundation for their collaboration and support to this initiative, to the Global Future Council on the Future of Economics of the Equitable Transition for intellectual leadership, and to the Boston Consulting Group team for their dedication to this topic.

1

Introduction: The climate-inequality nexus

The interplay between climate vulnerability, income and wealth manifests between and within countries, intensifying existing inequalities and risking the emergence of new divides. Over 780 million people globally are currently exposed to the combined risk of poverty and serious flooding.² Within low- and middle-income countries, the income losses from climate hazards of the bottom 40% are estimated to be 70% larger than the average.³ The serious consequences of climate change and its uneven impacts heighten the imperative to limit global temperature to 1.5°C.

However, the costs and responsibilities of the socioeconomic transformation that a carbon-neutral future requires fall unevenly too – and the ramifications are increasingly evident in the political and social polarization surrounding climate discourse and action. This creates a strong risk that existing inequalities may be amplified, if not addressed actively.

1.1 Emissions and inequality: Parallel trends

Over the past four decades, the richest 1% of individuals captured more than twice the world's income growth compared to the poorest 50%.⁴ This divergence parallels inequity in carbon emissions: Since 1990, the top 1% of emitters have been responsible for 23% of global growth in carbon emissions, while the bottom 50% have been responsible for only 16%.⁵ Those between the 75th and the 95th percentile of the emissions distribution have seen their per-capita emission levels drop over the past 30 years by rates of up to 15%. This group overlaps largely with the low-income and middle classes in rich countries, who have seen their income shares stagnate or even decrease in the past 30 years (Figure 1).

Today, within-country income inequalities explain a significantly larger part of global income inequalities

than 40 years ago,⁶ and a similar trend is reflected in inequality of per-capita emissions, showing the urgency to realize an equitable transition as much within countries, as it is between countries. Figure 2 shows that 64% of global inequality in per-capita emission today is due to within-country gaps. The inverse was true in 1990, when between-country divides accounted for 62% of global carbon inequality.⁷

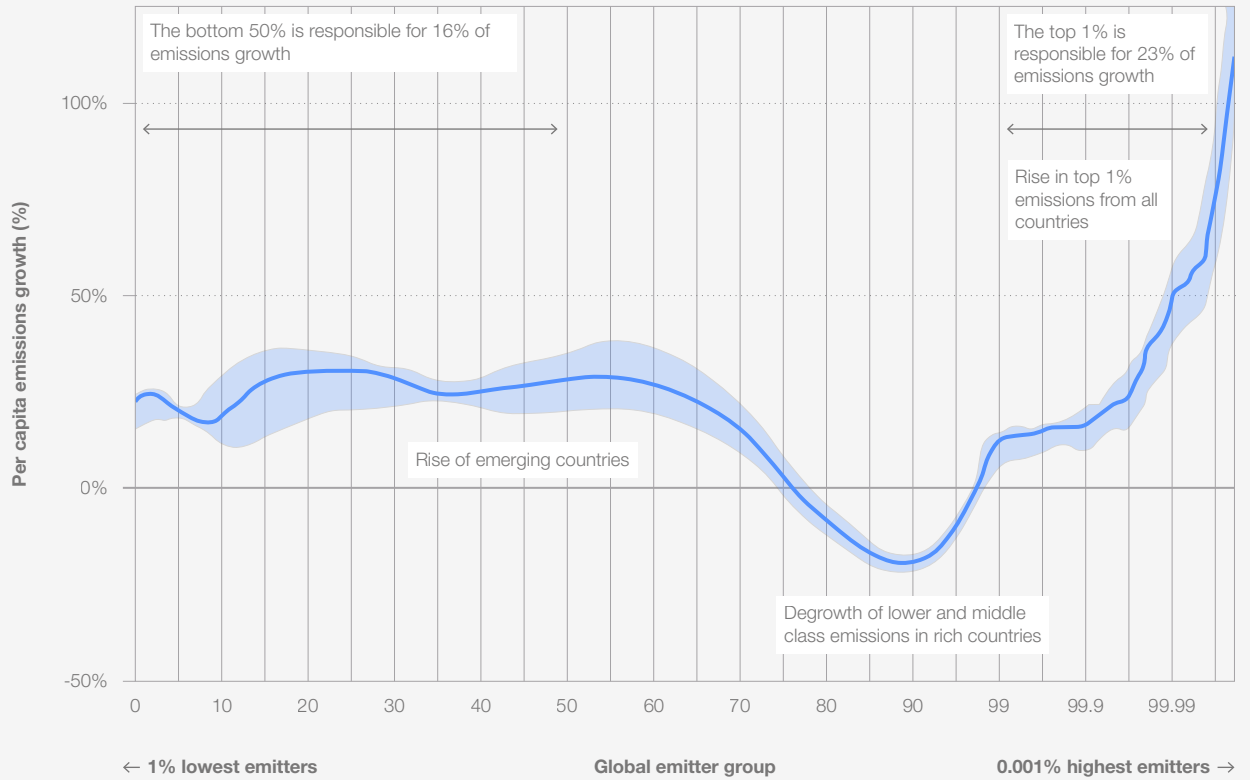
To build the social and political capital required to progress on the green transition, a focus on fairness in the distribution of costs and benefits arising from the transition is a necessity. As countries embark on the green transition at the speed and scale required, it is only viable if inequality is curtailed, and more ambitiously, reduced through it.

1.2 Understanding the socioeconomic impacts of the green transition

Throughout modern history, no country has achieved economic growth without increasing its energy consumption. Energy is the lifeblood of the modern economy, an enabler of modern life, and has powered technological progress over the past two centuries. As the environmental consequences of this energy-fuelled growth become apparent, the

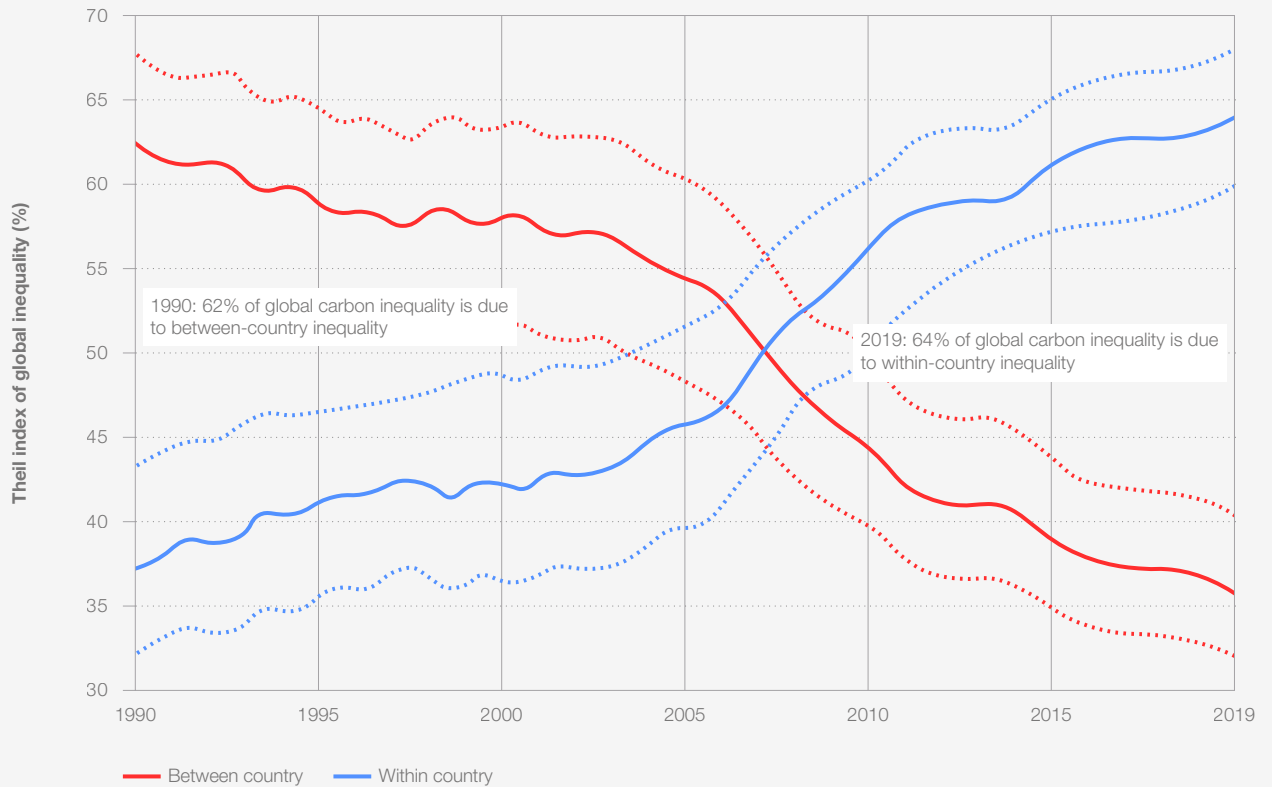
green transition entails harnessing cleaner forms of energy and decoupling economic growth from energy consumption and emissions. However, given the complex linkages between the energy system and the economy, the green transition is not confined solely to the boundaries of the energy system. Rather, it encompasses the means of

FIGURE 1 | Emissions growth by percentiles, 1990-2019



Source
Chancel, 2022.

FIGURE 2 | Global Emissions Inequality: between vs. within country, 1990-2019



Source
Chancel, 2022.

industrial production, modes of transportation, urbanization, consumption habits and the rethinking of the future of low-carbon growth.

As the urgency of an accelerated green transition rises, it's imperative to understand and address the inherent economic costs and benefits that will asymmetrically impact different segments of society. Consider the impact on workers. Over 50% of senior executives globally believe that the climate and green transitions will be key drivers of job creation in the next five years.⁸ Available estimates quantify the net-positive impact of the green economy on the labour market to be approximately 25 million additional jobs globally. While that breaks down to 103 million new jobs created, it means 78 million workers will lose their jobs by 2030.⁹ The impact on green jobs unfolds against a backdrop of broader labour-market transformations, driven by changes in technology and a volatile economic outlook. The combined effects of these disruptions lead to an estimated one in four jobs being affected globally, both through growth and decline, and 44% of workers' core skills expected to change in the next five years.

In addition to labour-market dislocations, price volatilities or cost of living implications of the transition can limit the access to energy and affordability of basic goods and services in the

near term, even as renewable energy holds the promise of cheaper localized energy in the long term. The impacts herein are felt by individuals, businesses and policy-makers alike. Despite strong progress on universal access to electricity, recent trends indicate that the critical milestone of universal access by 2030, as endorsed by the UN Sustainable Development Goals (SDGs), will be missed.¹⁰ This is largely due to disruptions following the COVID-19 pandemic and subsequent macroeconomic volatility. Between 2019 and 2022, for example, many African utilities bore the cost of keeping energy affordable for users, contributing to high debt levels and constraining the financial resources available to expand access to energy.¹¹ The constrained fiscal space in many low- and middle-income countries elevates the emphasis on financing while, in parallel, evidences the benefits to be derived from strengthening local capacity through an effective diffusion of technology and know-how.

If principles of equity are embedded into global decarbonization plans and implementation, global leaders can create opportunities for workers, consumers and entrepreneurs, and ensure a fairer distribution of the costs linked to the green transition, ultimately building broader support for climate action around the world.

↓ Image credit:
Markus Spiske,
Unsplash



2

What is an equitable transition?

Equity, inclusivity and justice in the climate transition have a long political history, shaped since the 1970s by the efforts of labour unions to achieve justice for workers while responding to environmental concerns.¹² Since then, there has been a broader emphasis on dialogue and engagement with key stakeholder groups beyond workers and decent jobs. For example, there has been an increasing focus on communities (e.g. loss of land, cultural capital), on human rights (e.g. use of child labour in cobalt mining) and broader stakeholder engagement (e.g. representation and inclusivity in decision-making).

The following principles are common across ambitions for a just and equitable transition:

- **A low-carbon economy that thrives within planetary boundaries.** It is imperative to recognize the urgency of aligning to targets to reduce greenhouse gas (GHG) emissions to net zero by 2050 while ensuring that economies in all parts of the world can grow and prosper.
- **An inclusive path.** All stakeholder groups must have a voice and role throughout the transition process; the process is as important as the outcome.

- **Leave no one behind and drive shared prosperity.** There must be equitable outcomes across all stakeholder groups in both the access to and distribution of benefits and costs, taking into account that current socioeconomic systems benefit some groups over others.

Despite multiple efforts to define a “just” and “equitable” transition, there is not yet a unifying definition of what this means or a shared understanding of how to achieve it in practice.

This paper contributes to this discussion, developing a framework for “economic equity.” Economic equity considers the fairness in distributing the costs and benefits of the mitigation actions arising from the shift to a low-carbon economy. It is one dimension among other aspects of fairness and can be broken down into five key areas, including: employment and job transitions, affordability of products and services, accessibility of products and services, access to financing and investments, and access to capacity. Within these dimensions, this paper will highlight the impacts of climate mitigation actions on people, in particular, the following key stakeholder groups: workers, entrepreneurs and consumers.

↓ Image credit:
Spencer Scott Pugh,
Unsplash



3

A Framework for Evaluating Economic Equity of the Green Transition

To put people, together with planet, at the centre of the transition requires a comprehensive understanding of where the mitigation actions of the green transition might result in inequity on the lives of people, whether as workers, entrepreneurs or consumers. To reveal where and how inequalities can manifest across lenses, the green transition

dimensions can be considered in relation to the economic dimensions of equity.

The following section outlines the proposed green transition and economic equity dimensions, highlighting those areas with the broadest applicability across geographies.

FIGURE 3 Defining the Green Transition Dimensions

Green Transition Dimensions

| | |
|--|---|
| Transitioning away from fossil fuels | Reductions in coal, oil, gas (including extraction, pipeline, refineries, power) |
| Scaling up low-carbon energy sources | Increase in solar, wind, hydropower, green hydrogen, nuclear power and associated impacts on supply chain (including green metals and batteries) |
| Greening transportation and mobility | Transforming of shipping, aviation, other vehicles including SAF, EVs and changes in the mix of transport and mobility services (e.g., increased use of public transport and soft mobility) |
| Greening agriculture and food production | Increase in sustainable and regenerative farming practices, development of food technologies and changes in consumers preferences |
| Greening heavy industry | Increase in sustainable production practices of hard to abate sectors (e.g., steel, cement, chemicals) |
| Greening infrastructure and built environment | Increase in sustainable buildings practices, including retrofitting, new building materials and changes in consumers' behaviours |
| Moving to a circular economy | Increase in adoption of sustainable production practices aiming to reduce, reuse and recycle necessary materials |

Note

SAF = Sustainable Aviation Fuel; EV = electric vehicle; circular economy refers to circularity principles embedded across all green transition dimension categories, e.g. transportation, steel, chemicals.

3.1 Dimensions of the economic equity-green transition matrix

The green-transition dimensions are seven high-emitting and major segments of the economy that require transformation to achieve carbon neutrality.

- **Transitioning away from fossil fuels.** Reflects the reduction in fossil-fuel extraction activities, including the mining of coal and drilling for oil and gas. It also encompasses the scaling down of infrastructure such as pipelines, which transport oil and gas over long distances, and refineries, where crude oil is processed into usable fuels. The scope further extends to include the shifting impacts in the power sector, notably a reduction in the dependence on fossil fuels for electricity production.
- **Scaling up low-carbon energy sources.** Encompasses the increased use of renewable and low-carbon energy sources including solar, wind, hydropower, green hydrogen and nuclear power. It also includes the associated impacts on supply chains, particularly in the mining and production of raw materials such as cobalt, copper and rare earth elements used in the manufacture of low-carbon technologies and batteries for renewable energy storage.
- **Greening transportation and mobility.** Captures the transformative shift across various modes of transport. This includes the adoption of cleaner fuels such as in shipping and aviation (for example, Sustainable Aviation Fuel [SAF]), the widespread adoption of electric vehicles, the broad electrification of transportation systems, the greening of transport companies (such as logistics and delivery companies) and the shift to more sustainable mobility models, for example, supporting the expansion of public transport.
- **Greening of Agriculture and Food Production.** Considers the shift towards sustainable and regenerative farming practices that prioritize factors such as soil health, water conservation and crop rotation to ensure long-term sustainability of the land. The scope also includes the development and growing consumption of plant-based meat alternatives, organic offerings and more sustainably produced foods, but also the reduction in livestock farming.
- **Greening of Heavy Industry (Steel, Cement, Chemicals).** Reflects the shift toward sustainable production practices within traditionally hard-to-abate industries through the adoption of innovative technologies and processes.
- **Greening of infrastructure and built environment.** Encompasses the movement

toward sustainable practices for both new building construction and the retrofitting of existing structures. The former includes the use of energy-efficient materials, green architecture and technologies like solar panels, heat-pumps and green roofs to reduce energy consumption and lessen environmental impact. The latter, meanwhile, involves upgrades such as improved insulation and energy-efficient windows. This dimension also encompasses changing consumption patterns, for example reduced reliance on heating and cooling systems.

- **Moving to a circular economy.** Comprises the increased adoption of sustainable production practices aiming to reduce, reuse and recycle necessary materials. In textile manufacturing, for example, this can include the use of eco-friendly materials, the reduction of waste and a shift away from single-use and non-recyclable items (especially plastics).

Economic equity considers the fairness in distributing the costs and benefits of the mitigation actions arising from the shift to a low-carbon economy. This framework includes five economic equity dimensions and considers the impacts on key stakeholder groups including workers, entrepreneurs and consumers.

- **Employment and job transition.** Places emphasis on workers in declining industries and value chains that need to move to new sectors. This dimension is both concerned with support for job transitions via social protection and reskilling, as well as job quality in growing occupations.

Even in countries with advanced social protection and active labour-market systems, transition from brown to green industries remains difficult. Using data from the EU Labour Force Surveys, it has been estimated that, across the most advanced countries in Europe, only one worker out of four who had lost a job in a brown sector found a new occupation in a green industry one year later. In addition, while 35% of them were still unemployed one year later, approximately 20% moved into in non-green industries, 15% went into retirement and only 5% were in training.¹³ This highlights the need for social protection and accelerated investments in skills development for effective job transitions. Moreover, relative to jobs in the fossil-fuel industry, jobs in the renewable energy sector can offer shorter contract durations,¹⁴ in part reflecting the sector's need for more workers at the infrastructure-heavy onset and fewer for maintenance. The wage differential between sectors can further inhibit transfers,

Economic Equity Dimensions

| | |
|--|---|
| Employment and job transition | Ability to navigate job loss with adequate social protection, support for reskilling, and to have access to good work in new and existing value chains. |
| Affordability of goods and services | Ability to purchase relevant products and services (e.g., impact of short-term price hikes) and green alternatives. |
| Accessibility of goods and services | Availability and ability to use relevant products and services as well as green alternatives. |
| Access to financing and investments | Ability to access finance and investments to transition into and out of industries/sectors. |
| Access to capacity | Ability to access knowledge, technology and other resources to create and use relevant products and services. |

Note

Circular economy refers to circularity principles embedded across all green transition dimension categories, e.g. transportation, steel, chemicals.

again evidencing the emphasis on job quality as a key enabler for job transitions. In developing economies, jobs in renewable energy are in some cases primarily in the informal economy.¹⁵ This, therefore, reiterates the necessity for new green jobs to unlock a leap forward in equity, expanding the global share of workers with access to good work where security and fair wages are a given.

- **Affordability of goods and services.** Recognizes that the economic transformation required for the green transition can impose long-term shifts in costs, near-term price hikes and market volatility. Affordability is, firstly, a priority with respect to basic goods and services impacted by the wider macroeconomic context and then extends to include products more directly linked with greening (e.g. retrofits in residential homes). This dimension therefore also considers the policy instruments that can impact affordability (e.g. carbon taxes, direct cash transfers).

Increases in the cost of goods (e.g. as a result of carbon taxes), including sustainable alternatives, can significantly impact poorer countries and households. For example, food expenditure can take, on average, up to 44% of the consumption basket in low-income countries compared to 28% in emerging market

economies and 16% in advanced economies.¹⁶ The disparity holds within countries: in the United States, 27% of household spending in the poorest income quintile goes to food, compared with 7% among the richest income quintile. This can impact consumer choices – in a recent study on consumer behaviour, 52-65% cited pricing as a key barrier to sustainable purchases, particularly across groceries, electricity and cars.¹⁷

- **Accessibility of goods and services.** Linked to and reinforced by affordability, relates to the availability of relevant goods and services across various geographies and communities, and the reach of complementary services and infrastructure necessary to operate them.

While worldwide access to electricity has steadily increased over the past decades, from 75% of the global population in 1999 to 91% in 2021, approximately half of the population in Sub-Saharan Africa remained unconnected to the electricity grid in the same year.¹⁸ In the European Union, only 40% of the population is connected to the gas grid.¹⁹ Current energy consumption trends mirror the existing economic inequalities, with the top 10% of global energy consumers using 30 times more energy than the bottom 10%.²⁰ Lack of infrastructure is not the only constraint

to access to goods and services. Only half of the urban population around the world has access to some form of public transport services, and about 11% has convenient access to high-capacity transport systems.²¹ These divides often compound each other and lead to increased costs and exclusion as countries move their energy and transport systems towards low-carbon models.

– **Access to financing and investments.**

Recognizes the sizeable increase in financial capital required to facilitate the green transition and focuses on its distribution, within and between countries. This dimension is also concerned with the policy instruments that affect financing, including the use of taxes and subsidies.

The Climate Policy Initiative (CPI) estimates that the average annual need for climate finance in 2030 will be \$9 trillion, while current flows are at \$1.3 trillion. In addition, there is a significant disparity in how existing flows are distributed. For example, for clean energy the International Energy Agency (IEA) projects that the annual capital spending on clean energy in emerging markets and developing economies (EMDEs) must increase from under \$150 billion in 2020 to over \$1 trillion by 2030. Despite accounting for two-thirds of the global population, EMDEs hold only 10% of global financial wealth and have accounted for only 10% of global sustainable debt issuance. This disparity is also reflected within countries. For example, many entrepreneurs that own micro or small-to-medium enterprises cite a lack of funding as a key barrier to climate action.²² This can be a similar concern for consumers from lower-income households in accessing green finance (e.g. green mortgages). These two groups tend to be disproportionately exposed to the physical risks of climate change and thus financial institutions may offer these groups services at higher rates, or not at all. This can lead to the

financial exclusion of vulnerable segments of the economy.²³

- **Access to capacity:** Includes access to knowledge, technology and natural resources, and considers each of these components in combination (e.g. the nexus of knowledge and technology as expressed through capacity for innovation and intellectual property development).

Five countries – Japan, United States, Republic of Korea, Germany and China – accounted for 85% of all green patents held by industrial firms in 2022.²⁴ Innovation in this regard opens markets and opportunities but, in the absence of opposing policy measures, favours the proprietors. The effects of inequity in capacity are evident in prior transitions – notably, the differential impact of the Industrial Revolution on agricultural labour productivity in Africa versus the rest of the world. Another example is that of female farmers, who account for roughly 43% of global agricultural workers²⁵ and lag male counterparts in terms of productivity, owing to less access to knowledge and resources.²⁶ In addition to technology and know-how, access to shared intellectual property and access to raw materials influence overall capacity. An electric car, for example, requires nearly double the amount of copper than a car powered through combustion engines. Against this backdrop, the share of global exports of critical raw materials subject to restrictions surged from 5% in 2019 to around 30% in 2022. This sharp uptick imposes vulnerability into supply chains with not only the risk of cost passthrough to entrepreneurs and consumers, but also in reinforcing inequity in who has the capacity to innovate for the green transition.²⁷ Inequity in transparency of information for consumers can also hinder adoption of sustainable alternatives, for example in solar photovoltaic (PV) adoptions.²⁸

↓ Image credit:
Tim Mossholder,
Unsplash



4

Green transition- economic equity intersections

↓ **Image credit:**
American Public Power
Association, Unsplash

At the intersection of each green transition and economic equity consideration, there are both costs and benefits whose allocation will ultimately determine the equity of the transition to net zero (Figure 5). Tables 1-7 outline examples of the

distributional impacts of each green transition dimension across the five economic equity dimensions identified in the framework.



FIGURE 5

Exploring the green transition-economic equity intersections

| Economic Equity Dimensions | |
|---|---|
| Green Transition Dimensions | |
| Transitioning away from fossil fuels | |
| Scaling up low-carbon energy sources | |
| Greening transportation and mobility | |
| Greening agriculture and food production | |
| Greening heavy industry | |
| Greening infrastructure and built environment | |
| Moving to a circular economy | |
| Employment and job transition | What are the economic equity implications for workers of each green transition dimension, in terms of job losses, new employment opportunities, changes in livelihoods and working conditions and capacity to transition into new roles? |
| Affordability of goods and services | What are the economic equity implications for consumers and entrepreneurs of each green transition dimension, in terms of price changes for goods and services currently in use or green alternatives? |
| Accessibility of goods and services | What are the economic equity implications for consumers and entrepreneurs of each green transition dimension, in terms of changes in the availability and ability to use goods and services in current use or green alternatives? |
| Access to financing and investments | What are the economic equity implications for consumers and entrepreneurs of each green transition dimension, in terms of their capacity to invest in new, low-carbon business opportunities and divest from legacy business models? |
| Access to capacity | What are the economic equity implications for consumers and entrepreneurs of each green transition dimension, in terms of their access to knowledge, technology and critical resources necessary to produce and use new, low-carbon goods and services? |

Note

Circularity principles embedded across all green transition dimension categories e.g. transportation, steel, chemicals.

TABLE 1 | Transitioning away from fossil fuels

| | |
|---|---|
| <p>Employment and job transition</p> | <p>Approximately 13 million energy-related jobs²⁹ are likely to be lost globally as a result of the phase-out of fossil fuels within the energy system. Most of these job losses will be concentrated in communities built around the fossil-fuel value chain, where alternative employment opportunities are less likely to be available. As a result, further investment in schemes that support reskilling and reemployment in alternative workplaces is required, pointing to the continued need for development of active labour-market policies. When job transition is not possible, early retirement, rehabilitation or additional redundancy payments are often used to compensate those adversely affected. However, on their own, such policies are insufficient to meet the needs of those displaced. Environmental Transition Contracts (as developed in France in 2018) point to a possible way forward.³⁰</p> |
| <p>Affordability of goods and services</p> | <p>As governments progressively remove fuel subsidies and increase carbon taxes and other forms of carbon pricing, this is expected to have cost-of-living implications for low-income households. For example, a study by the Congressional Budget Office (CBO) of the United States found that a carbon tax of \$28 per metric tonne on CO₂ emissions disproportionately affected lower-income households by 2.5 times the effect on households in the highest income quintile.³¹ Such households should be compensated through targeted measures and supported to move away from the use of fossil fuels. Recent protests across many countries in the wake of a period of energy price volatility underscore the political sensitivity that surround fuel prices.³²</p> <p>Moreover, as the relative share of fossil fuels in the energy mix declines, a disorderly transition may trigger further energy market volatility and create energy insecurity.³³ Fuel price shocks – which indirectly lead to price changes in food, transportation and other essential goods and services – tend to impact developing countries and vulnerable populations more severely than developed and wealthy groups. This was evident in the recent period of macroeconomic volatility.³⁴ In addition, the implications will be particularly severe for countries and communities reliant on fossil-fuel extraction and processing as a major driver of economic growth.³⁵</p> |
| <p>Accessibility of goods and services</p> | <p>Many products derived from oil and gas serve as feedstock to a wide range of goods which lack scalable and affordable substitutes (e.g. plastic). This can restrict the accessibility of these goods until supply chains of sustainable alternatives mature.</p> |
| <p>Access to financing and investments</p> | <p>As competitive low-carbon energy sources account for an increasing share of the energy mix, major assets, primarily in fossil-fuel extraction and coal-power generation, may become stranded. Stranded asset write-offs are estimated to hit \$1-4 trillion,³⁶ concentrated largely in developing economies. The impact that these stranded assets and impaired investments have will disproportionately affect small-to-medium enterprises that have heavily invested in equipment and manufacturing processes and across the supply chain.</p> |
| <p>Access to capacity</p> | <p>The geographic mismatch between fossil-fuel and renewable energy sites combined with the implications to public finance (e.g. lost tax revenue) illustrates that transitioning away from fossil fuels can exacerbate capacity gaps if the equity dimensions pertaining to skills and access to technology associated with scaling-up renewables are not adequately addressed, as detailed in the subsequent sections.</p> |

TABLE 2 | Scaling up low-carbon energy sources

| | |
|---|---|
| <p>Employment and job transition</p> | <p>As new manufacturing operations, supply chains and power-generation facilities take shape, they can be avenues to rehabilitate and reskill workers displaced by the phase out of fossil fuels, or to diversify economies of countries and communities reliant on fossil fuels as source of growth. The rapidly growing renewable energy sector faces a skills gap; some estimates suggest that 36% of the workforce requires specialist know-how in this field (versus 27% in the broader economy).³⁷ Addressing this shortage with the gradually displaced fossil-fuel workforce can support the twin objectives of meeting the labour demand to accelerate renewable energy and mitigating socioeconomic fallout from transitioning away from fossil fuels.</p> |
| <p>Affordability of goods and services</p> | <p>Renewable energy is the cheapest power source globally.³⁸ However, given the intermittent and geographical attributes of renewable energy, additional system costs related to maintaining system resilience, adequacy and building transmission infrastructure are incurred. As the share of renewable energy in the power system expands further, steps should be taken to ensure these broader system costs do not fall unfairly on already energy burdened low-income households.</p> <p>Beyond system-level planning, scaling up low-carbon energy also requires households and consumers to install decentralized power for self-generation, and to replace end-consumption appliances with energy efficient alternatives. Despite a positive payback in the long term, high up-front capital costs for these low-carbon solutions act as affordability barriers.³⁹ Mechanisms to incentivize adoption of clean energy, such as tax credits for residential solar applications, have largely accrued to high-income households.⁴⁰</p> |
| <p>Accessibility of goods and services</p> | <p>Innovations in clean energy can increase access to electricity in remote and rural areas. For example, distributed energy systems, such as rooftop solar panels and energy storage systems, can enhance access to energy and reduce reliance on a centralized power grid. Maximizing the potential of clean-energy sources will require designing policies and technologies to make them equitably accessible and affordable, especially for low-income consumers, rural households and small businesses.</p> |
| <p>Access to financing and investments</p> | <p>The annual financial flows to low-carbon energy technologies have grown consistently, reaching more than \$500 billion in 2022. Yet, current financing levels fulfil only 17% of the \$3 trillion⁴¹ in annual financing needed for a timely transition to net zero. Certainly, a significant share of that gap is reflected in disparities – in terms of meaningful climate finance shortfalls – between advanced countries and emerging and developing countries. At the same time, however, there is also inequitable access within countries; for example, with low-income households facing limited access to finance to meet high upfront capital requirements for localized clean energy generation.</p> |
| <p>Access to capacity</p> | <p>Knowledge and technology are key enablers to support the scaling up of low-carbon energy sources and energy-efficient solutions. Countries lacking the necessary knowledge and resources have been slow to adopt clean energy. Advanced knowledge and information infrastructure have enabled developed countries to take advantage of global trade in clean energy technologies. Between 2018-2021, while the total exports of green technologies from developed countries increased from \$60 billion to \$156 billion, exports from developing nations only increased from \$57 billion to \$75 billion.⁴² Mechanisms that enable developing countries to build localized skills and resources can help them pursue green growth with greater participation in higher value-added sectors.</p> <p>Digitally enabled smart energy management is a critical component of net-zero transformation, which allows consumers to optimize their energy demand through greater transparency. Adoption of smart technologies is limited by existing inequalities in access to digital services.⁴³ The expansion of renewable energy operation is expected to drive increased global demand for metals and minerals such as lithium, graphite, nickel, copper and cobalt. Security in access to critical minerals has a direct impact on supply chains and the consequent price and risk passthrough to businesses and consumers.</p> |

TABLE 3 | Greening transportation and mobility

| | |
|---|--|
| <p>Employment and job transition</p> | <p>The Automotive and Transport industries are significant employers, both directly through manufacturing jobs and indirectly through their supply chains and services.⁴⁴ In the EU, the Automotive sector generates 13 million direct and indirect jobs, accounting for 7% of total EU employment.⁴⁵ Ensuring timely and effective rehabilitation and reskilling of affected workers is at the centre of the electric vehicle (EV) transition. This was evident in the recent negotiations between car manufacturers and autoworkers unions in the United States.⁴⁶</p> |
| <p>Affordability of goods and services</p> | <p>Fuel taxation and environmental levies are primarily market-based instruments to incentivize efficient consumption and investment in low-carbon transport options, from public transport to cleaner private vehicles. However, these policies, together with mandates to phase out internal combustion engines (ICEs), adversely affect those unable to afford cleaner modes of transport. In the absence of supportive policy incentives, low-carbon alternatives – from EVs to SAFs – come at a price premium as compared to traditional options, raising affordability challenges for low-income consumers.</p> <p>Significant investment is required to green public transport, with a risk that this is passed onto consumers as an additional cost burden. Furthermore, consumption taxes on road transport are a significant source of fiscal revenue (e.g. 5.3% on average for OECD countries in 2016).⁴⁷ The shift to EVs could cut into those revenues for some economies. Progressive taxation of consumption and reforming the tax system for a low-carbon future could support an equitable transition.</p> |
| <p>Accessibility of goods and services</p> | <p>Considering the essential nature of transport services for normal economic activities, and the direct impact increased fuel taxes have on household budgets, the availability of public transport systems is a key component of an equitable transition to a greener transport and mobility model. Similarly, complementary infrastructure (e.g. bike lanes, EV charging stations) plays a significant role in ensuring equitable access in new mobility models. Finally, technology design parameters need to consider the needs and means of wider sections of the populations. The electrification of transport in Asia and Africa is a good example, where more affordable two- and three-wheeler vehicles enjoy the fastest rate of electrification and consumer adoption.⁴⁸</p> |
| <p>Access to financing and investments</p> | <p>Decarbonization of mobility, from light-passenger transport to hard-to-abate transport sectors such as Aviation, Marine and Road Freight Transport, will require major capital investments and large-scale infrastructure development. While these investments and developments are likely to yield significant socioeconomic dividends, they also come with uncertain financial returns and poor economics in the early years of operation. These challenges continue to hold back investments at the scale required.⁴⁹ Blending grants with flexible debt could offer one avenue to scale, including for the charging infrastructure required to power low-carbon vehicles. Within the Transport sector, SMEs and start-ups in the growth phase find it particularly difficult to access finance. In Europe, the financing gap for this group is estimated at between €5.5bn to €13bn annually.⁵⁰</p> |
| <p>Access to capacity</p> | <p>Low-emission transport technology solutions are in early stages of development, concentrated in advanced economies, and less accessible to emerging countries due to intellectual property and competitiveness concerns. Given the globally interconnected nature of these sectors, ensuring access to low-emission transport options within emerging economies will help drive the decarbonization at scale and speed.</p> |

Employment and job transition

The sector employs a quarter of the world’s working population, more than 850 million people.⁵¹ The ILO estimates that 5% of jobs in the industry will be lost by 2030,⁵² driven by less labour-intensive practices. This could impact many workers, including rural workers, and tenant and smallholder farmers.⁵³ Greening of Agriculture and Food Production might disrupt employment and production in some segments of the industry, for example livestock farming.

Meanwhile regenerative agriculture and other green practices, which will require the upskilling of farmers and agri-workers, are generally expected to have positive net effects on employment and livelihoods. For example, regenerative agriculture – which includes practices such as topsoil regeneration, focus on biodiversity, and water cycle improvement – has been estimated to create up to 5 million new jobs by 2040 in Africa.⁵⁴ Regenerative farming practices can improve farmers’ incomes, with estimates suggesting 15-25% return on investment.⁵⁵ For smallholder farmers, who account for roughly 85% of farms worldwide⁵⁶ and rely on agriculture and food production for their livelihoods, this will represent a significant transformation.

Affordability of goods and services

Organic farming practices are environmentally positive but may reduce yields compared to conventional agriculture.⁵⁷ The effects of organic and regenerative farming can contribute to food-price inflation.⁵⁸ Higher prices may make it difficult for vulnerable population and developing countries to achieve food security.

Accessibility of goods and services

In addition to food supply-side measures, demand-side measures are necessary to nudge consumer behaviour. Alternative proteins, which include plant-based alternatives, lab-grown meat and insect-based alternatives, can support mitigation of methane emissions from livestock farming. The accessibility of these alternatives tends to be restricted to high-income consumer groups, given the price premium to conventional protein.⁵⁹ Over time, as consumer acceptance improves, and alternative proteins become mainstream, it can have effect on livelihoods in the livestock value chain.

Access to financing and investments

Accelerated greening of agriculture relies on access to finance and innovative technologies. The current distribution of finance and technologies is concentrated in developed countries or in large, industrialized farms.⁶⁰ Ensuring access to financing opportunities and technologies to other stakeholder groups – including smallholders, family farms and women – is necessary for the equitable transition of agriculture.

Access to capacity

With increased investments in agricultural and food technologies, there has been a surge in patenting, with over 330,000 green food and agri-tech related patents filed over the last five years.⁶¹ Ensuring equitable access to the technology landscape can help to accelerate agricultural and food innovation across businesses and countries.

→ Image credit:
Aboodi Vesakaran,
Unsplash



TABLE 5 | Greening heavy industry

| | |
|---|--|
| <p>Employment and job transition</p> | <p>The transformation of heavy industries is expected to cause job losses, particularly for unskilled workers involved in the low-carbon processes who will need support in transitioning to new employment opportunities. For the remaining workforce, significant upskilling will be required to manage new materials and processes. The scaling up of new technological models might also lead to a geographical relocation of production around new clusters that provide better access to key production inputs. Such geographic shifts could potentially create challenges and opportunities, just as the shift of industrial manufacturing to emerging economies did over the past few decades.</p> |
| <p>Affordability of goods and services</p> | <p>Heavy industries will continue to be impacted by the progressive increase of carbon costs and the expansion of carbon-pricing schemes. Prices are likely to increase across the sector and in the downstream value chains that source intermediate goods from heavy industries. Moreover, as carbon prices rise, international trade is likely to be reshaped. For example, applying carbon prices specified for 2030 in the IEA's scenario for reaching net-zero global emissions by 2050, some estimates put the cost of carbon in the Republic of Korea at 12.85% of the current selling price of steel.⁶²</p> |
| <p>Accessibility of goods and services</p> | <p>Accessibility of relevant goods and services is not expected to be a significant economic equity dimension in the context of the decarbonization of heavy industries.</p> |
| <p>Access to financing and investments</p> | <p>Currently, financial allocation to industrial decarbonization is just 1% of what is required,⁶³ owing to the risk profile of low-emission technologies and low profit margins of these industries. Pilot green industrial projects are typically driven by large enterprises with strong balance sheets and the capability to raise external capital. Small and medium enterprises account for a significant proportion of industrial manufacturing. For example, SMEs constitute 33-35% of India's crude steel capacity.⁶⁴ However, these smaller players may lack the capital required to undertake green projects. Targeted measures to improve access to finance to SMEs are necessary to ensure their participation in the green transformation.</p> |
| <p>Access to capacity</p> | <p>Innovations in low-emission production technologies are largely concentrated in select high-income countries. Today much of the knowledge related to decarbonizing heavy industries is concentrated among a limited number of companies. For example, most patents and R&D investments related to the production of low-carbon steel are held by American, Japanese and German companies.^{65,66} Lack of access to advanced solutions can affect the manufacturing operations currently based in developing countries, with implications for economic growth and employment.</p> |

→ Image credit:
Andrey Metelev,
Unsplash



Employment and job transition

The construction industry provides employment for an estimated 220 million people (or 7% of total global employment in 2022).⁶⁷ Building retrofits are labour-intensive and can boost local labour markets by creating large numbers of construction jobs. In addition, the greening of infrastructure and the built environment is likely to transform and shift employment within industries producing relevant products, from heating systems to windows and insulating systems. Labour conditions and job security in the construction sector vary widely around the world, and the application of international labour standards are therefore key to ensure a equitable transition for construction workers.⁶⁸

Affordability of goods and services

Electrification and retrofitting of existing buildings can optimize energy demand, leading to reduced operational and maintenance costs for households. Despite the long-term cost savings, the high upfront investments required for building renovations restrict access for households with limited savings or inability to obtain credit.⁶⁹ Policy measures to incentivize investments in building renovations and retrofits do not evenly accrue to areas with lower economic resources or a higher share of rented dwellings.⁷⁰ Renovated buildings often result in higher rental values, which are not completely offset by the reduction in energy costs.⁷¹ In the current macroeconomic climate, with housing affordability at an all-time low, this can further deepen the cost-of-living crisis and have a disproportionate impact on low-income households.

Accessibility of goods and services

Measures such as the creation of public parks or bike lanes, planting of trees, or better storm water drainage can dramatically improve the urban quality of life. However, these measures have also led to increased gentrification as green urban re-development often leads to higher property values, which restricts access to green spaces among low-income urban residents.⁷² As more and more urban spaces open up for greening, households and businesses in low-income urban neighbourhoods face the prospect of displacement.

Access to financing and investments

The decarbonization and increasing climate resilience of urban infrastructure require high volumes of capital, estimated to be \$4.5-\$5.4 trillion per year.⁷³ The ability for countries to mobilize capital varies dependent on the sources of municipal income and ability to access capital markets.

Access to capacity

The quality, delivery and accessibility to urban services can be significantly enhanced with the application of digitalization and smart technologies. Building capacity in cities with low levels of readiness for technology adoption is crucial for inclusive, equitable and sustainable urban development.

→ Image credit:
Chuttersnap, Unsplash



TABLE 7 | Moving to a circular economy

| | |
|---|--|
| <p>Employment and job transition</p> | <p>According to the International Labour Organisation (ILO), the shift to a circular economy is expected to create (net) 6 million jobs,⁷⁴ though this will also affect employment in the current waste-management value chain primarily in Asia-Pacific and Africa. Older, mature industries with linear processes may not be able to shift completely to circular economy models. New circular employment will need to offset the job losses in linear industries, but must also carry the opportunity of better quality of work, decent wages and improved records on child labour and human rights.</p> |
| <p>Affordability of goods and services</p> | <p>Recycled materials continue to have a sizeable green premium over traditional ones, due largely to undersupply, low elasticity of demand and costs differentials. In the case of plastic materials, the green premium is estimated to be as much as 60%, with downstream consequences in terms of affordability of related consumer products.⁷⁵ However, in the long term, closing product-to-waste loops and increasing recycling and reuse of materials can reduce demand for raw materials and help mitigate demand-driven price volatility in commodity markets, lower production costs, and improved affordability.</p> |
| <p>Accessibility of goods and services</p> | <p>Building a circular economy requires access to an efficient network of services to collect, recycle and redistribute materials. Supply of recycled materials is currently limited in most geographies; recycled material accounted for only 11.7% of material used globally in 2021, an increase of less than one percentage point since 2010.⁷⁶ As a result, many businesses are not able to increase the recycled content of their products and end consumers' demand remains unmet.</p> |
| <p>Access to financing and investments</p> | <p>Moving to a circular business requires significant investments in terms of product design, recycling facilities and process management and design. As some of these activities might have low and uncertain returns, businesses with solid financial fundamentals are likely to be first movers and reap most of the economic benefits stemming from the transition to a circular economy.</p> |
| <p>Access to capacity</p> | <p>Advances in new materials lie at the heart of the transition to a circular economy, enabling breakthroughs in terms of product design and recycling technologies. Organizations and countries with existing advantages, greater know-how and a more established recycling ecosystem are advancing faster to circular manufacturing.</p> |

→ Image credit:
Lacey Williams,
Unsplash



Conclusion: Creating a path to an equitable transition

The proposed framework to consider economic equity across various green-transition dimensions aims to uncover where inequity can be created or exacerbated in the lives of people – whether as workers, entrepreneurs or consumers – as well as to identify opportunities for human development and improving living standards. Recognizing that inequity heightens the prospect of social fractures and resistance to the transition itself, the challenges and opportunities identified at the intersections of green and equity present a scope of focus – an initial articulation – of what a vision for an equitable transition must encompass. The scale and nature of these intersections reflects the complex stakeholder landscape of the globalized modern economy, necessitating the need for collective action to forge a consensus on a vision and pathways for an equitable transition.

The Framework for Economic Equity in the Green Transition is the foundation of the World Economic Forum's Equitable Transition Initiative. The initiative aims to develop and build consensus on a vision and organizing principles for an equitable green transition, distilling thought leadership into actionable frameworks and tools at sectoral, national and local levels. The initiative additionally offers a platform to connect stakeholder groups across sectors and geographies for knowledge-exchange and partnerships, recognizing the centrality of public-private collaboration in responding to equity gaps both globally and locally.

The framework will be further used as a basis to analyse risks and opportunities of each green-transition dimension and provide an actionable toolkit for businesses and governments, based on industry and country heatmaps grounded in a set of common metrics. The framework will also guide the identification of sectoral and national best practices to inspire change among key stakeholders, as well as the development of a playbook of guidelines and examples.

While efforts to accelerate an equitable transition must be concerned with addressing the negative impacts caused by the transition, the opportunities of the green transition to accelerate social progress and drive economic development compel a bolder vision. A shared language on what equity entails is critical for accelerating action on an equitable transition.

As we push toward a more sustainable future, we must strike a delicate balance – harmonizing the critical drive to decarbonize the global economy with the equally vital imperative to address human needs. Absent that equilibrium, we risk leaving many behind and dampening the momentum required to keep net zero within reach. But if we put fairness and equity at the heart of climate efforts, we can accelerate progress for people and for the planet.

Acknowledgements

The World Economic Forum acknowledges and thanks Laudes Foundation for their support to the initiative, Global Future Council on Future of Economics of Equitable Transition for their expert inputs, and Boston Consulting Group for their collaboration. Expert advice is purely consultative in nature, and does not imply any association with the takeaways or conclusions presented within this report.

We would further like to thank our colleagues in the Centre of New Economy and Society for their helpful suggestions, in particular Ida Jeng Christensen, Filippo Crotta, and Ricky Li.

We also thank all those involved in the design and production of of this report and related assets: Mike Fisher for editing, and Accurat Studio for design.

Contributors

Boston Consulting Group

Douglas Beal

Partner and Director, Global Head Social Impact and Just Transition in Financial Institutions

Dave Sivaprasad

Managing Director & Partner,
Just Transition Lead, Social Impact Practice

Nadia Shamsad

Project Leader

Rachana Kanakagiri

Knowledge Analyst

World Economic Forum

Attilio Di Battista

Head of Impact Design and Coordination

Tarini Fernando

Acting Lead, Equitable Transition Initiative

Harsh Vijay Singh

Acting Head, Equitable Transition Initiative

Saadia Zahidi

Managing Director

Endnotes

1. World Inequality Lab, *World Inequality Report 2022*, 2022, https://wir2022.wid.world/www-site/uploads/2021/12/WorldInequalityReport2022_Full_Report.pdf.
2. Chancel, Lucas, Philipp Bothe and Tancrède Voituriez, *Climate Inequality Report 2023*, World Inequality Lab, 2023, <https://wid.world/wp-content/uploads/2023/01/CBV2023-CiimatelInequalityReport-3.pdf>.
3. Ibid.
4. Alvarado, F., L. Chancel, T. Piketty, E. Saez, and G. Zucman, *World Inequality Report 2018*, <https://wir2018.wid.world/files/download/wir2018-full-report-english.pdf>.
5. Chancel, L., "Global carbon inequality over 1990–2019". *Nature Sustainability*, vol. 5, 2022, pp. 931-938, <https://www.nature.com/articles/s41893-022-00955-z>.
6. Chancel, Lucas and Thomas Piketty, "Global Income Inequality, 1820-2020: The Persistence and Mutation of Extreme Inequality", *Journal of the European Economic Association*, vol. 19, no. 6, 2021, pp. 3025-3062, <http://www.piketty.pse.ens.fr/files/ChancelPiketty2021JEEA.pdf>.
7. Chancel, et al., 2023.
8. World Economic Forum, *Future of Jobs Report 2023*, 2023, <https://www.weforum.org/publications/the-future-of-jobs-report-2023/>.
9. International Labour Organisation (ILO), *Just Transition Policy Brief*, 2022, https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_860617.pdf.
10. International Renewable Energy Agency, *Tracking SDG 7: The Energy Progress Report 2023*, 2023, https://trackingsdg7.esmap.org/data/files/download-documents/sdg7-report2023-ch1_access_to_electricity.pdf.
11. International Energy Agency (IEA), *World Energy Outlook 2023*, 2023, <https://www.iea.org/reports/world-energy-outlook-2023/overview-and-key-findings>.
12. Abram, Simone, Ed Atkins, Alix Dietzel, Kirsten Jenkins, Lorna Kiamba, Joshua Kirshner, Julie Kreienkamp, Karen Parkhill, Tom Pegram and Lara M. Santos Ayllón, "Just Transition: A Whole-systems approach to decarbonisation", *Climate Policy*, vol. 22, no. 8, 2022, pp. 1033-1049, <https://www.tandfonline.com/doi/full/10.1080/14693062.2022.2108365>.
13. European Bank for Reconstruction and Development (EBRD), *Transition Report 2023-2024*, 2023, <https://www.ebrd.com/news/publications/transition-report/transition-report-202324.html>.
14. Alfaro-Pelico, Raul, Charlie Bloch, Nick Pesta and Madeline Tyson, *Realizing the Green Jobs Promise: The Benefits of a Regenerative Approach*, Rocky Mountain Institute, 2023, <https://www.esi-africa.com/wp-content/uploads/2023/02/Realizing-the-Green-Jobs-Promise.pdf>.
15. Ibid.
16. Amaglobeli, David, Emine Hanedar, Gee Hee Hong and Celine Thevenot, *Fiscal Policy for Mitigating the Social Impact of High Energy and Food Prices*, International Monetary Fund (IMF), 2022, <https://www.imf.org/en/Publications/IMF-Notes/Issues/2022/06/07/Fiscal-Policy-for-Mitigating-the-Social-Impact-of-High-Energy-and-Food-Prices-519013>.
17. Turquier, Lea, Kanika Sanghi, Sarah Lichtblau, Julia Dhar, Fadi Makki and Lauren Taylor, "Overcoming the Eight Barriers to Making Green Mainstream", *BCG*, 9 June 2023, [https://www.bcg.com/publications/2023/nudging-customer-behavior-toward-sustainable-choices#:~:text=In%20previous%20research%2C%20BCG%20measured,\(their%20actual%20buying%20behavior](https://www.bcg.com/publications/2023/nudging-customer-behavior-toward-sustainable-choices#:~:text=In%20previous%20research%2C%20BCG%20measured,(their%20actual%20buying%20behavior).
18. The World Bank, *Access to electricity (% of population)* [Graph], <https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS>, accessed January 2024.
19. European Union Agency for the Cooperation of Energy Regulators, *Gas Factsheet*, 2023, <https://www.acer.europa.eu/gas-factsheet>.
20. Millward-Hopkins, Joel and Yannick Oswald, "Global inequality must fall to maintain a safe climate and achieve a decent standard of living for all – it's a huge challenge", *The Conversation*, 2023, <https://theconversation.com/global-inequality-must-fall-to-maintain-a-safe-climate-and-achieve-a-decent-standard-of-living-for-all-its-a-huge-challenge-199529>.
21. United Nations Statistics Division, *SDG Report 2020, Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable*, 2020, <https://unstats.un.org/sdgs/report/2020/goal-11/>.
22. Organisation for Economic Co-operation and Development (OECD), *Financing SMEs for sustainability – Financial institution strategies and approaches*, 2023, <https://www.oecd.org/cfe/smes/Financing%20SMEs%20for%20sustainability%20%E2%80%93%20Financial%20institution%20strategies%20and%20approaches.%20%20Survey%20report.pdf>.
23. "Inclusive green finance – what a new agenda could look like for central banks and financial supervisors", *London School of Economics (LSE)*, 3 July 2023, <https://www.lse.ac.uk/granthaminstitute/news/inclusive-green-finance-what-a-new-agenda-could-look-like-for-central-banks-and-financial-supervisors/>.
24. United Nations Industrial Development Organization (UNIDO), *Who is at the forefront of the green technology frontier? Again, it's the manufacturing sector*, 2023, <https://www.unido.org/sites/default/files/unido-publications/2023-10/IIID%20Policy%20Brief%206.pdf>.

25. Food and Agriculture Organization of the United Nations (FAO), *Reduce Rural Poverty: Women in Agriculture*, 2021, <https://www.fao.org/reduce-rural-poverty/our-work/women-in-agriculture/en/>, accessed January 2024.
26. Food and Agricultural Organization (FAO), *The Status of Women in Agrifood Systems*, Rome: FAO, 2023, <https://www.fao.org/3/cc5343en/online/cc5343en.html>.
27. European Bank for Reconstruction and Development (EBRD), *Transition Report 2023-2024*, 2023, <https://www.ebrd.com/news/publications/transition-report/transition-report-202324.html>.
28. Sunter, Deborah, Sergio Castellanos and Daniel Kammen, "Disparities in rooftop photovoltaics deployment in the United States by race and ethnicity", *Nature Sustainability*, vol. 2, 2019, pp. 71-76, <https://www.nature.com/articles/s41893-018-0204-z>.
29. International Energy Agency (IEA), *World Energy Employment 2023*, 2023, <https://www.iea.org/news/clean-technologies-are-driving-job-growth-in-the-energy-sector-but-skills-shortages-are-an-increasing-concern>.
30. Galgóczi, Béla, *Towards a just transition: coal, cars and the world of work*, European Trade Union Institute, 2019, <https://www.zbw.eu/econis-archiv/bitstream/11159/4871/1/1738768651.pdf>.
31. Dinan, Terry, *Offsetting a Carbon Tax's Costs on Low-Income Households*, Working Paper 2012-16, Congressional Budget Office (CBO), 2012, https://www.cbo.gov/sites/default/files/112th-congress-2011-2012/workingpaper/11-13LowIncomeOptions_0.pdf.
32. Savage, Susannah, "Protests over food and fuel surged in 2022 – the biggest were in Europe", *Politico*, 17 January 2023, <https://www.politico.eu/article/energy-crisis-food-and-fuel-protests-surged-in-2022-the-biggest-were-in-europe/>.
33. Zurich Insurance for the Financial Times, "*The risks of net-zero transition – and why we should embrace them*", <https://bigpicture.ft.com/global-risks/article/the-risks-net-zero-transition-and-why-we-should-embrace-them>.
34. Kpodar, Kangni R. and Boya Liu, *The Distributional Implications of the Impact of Fuel Price Increases on Inflation*, International Monetary Fund (IMF), 2021, <https://www.imf.org/en/Publications/WP/Issues/2021/11/12/The-Distributional-Implications-of-the-Impact-of-Fuel-Price-Increases-on-Inflation-506822>.
35. Bems, Rudolf, Lukas Boehnert and Andrea Pescatori, "Reducing fossil fuel extraction may imply persistent negative effects for fossil fuel-producing economies", *VoxEU*, 11 July 2023, <https://cepr.org/voxeu/columns/reducing-fossil-fuel-extraction-may-imply-persistent-negative-effects-fossil-fuel>.
36. Muñoz Cabré, Miguel and José Vega-Araújo, *Considerations for a Just and Equitable Transition*, Stockholm Environment Institute and Council on Energy, Environment and Water, 2022, <https://www.sei.org/wp-content/uploads/2022/05/energy-transitions-stockholm50backgroundpaper.pdf>.
37. IEA, *World Energy Employment 2023*.
38. Masterson, Victoria, "Renewables were the world's cheapest source of energy in 2020, new report shows", *World Economic Forum*, 5 July 2021, <https://www.weforum.org/agenda/2021/07/renewables-cheapest-energy-source/>.
39. The World Bank, *Breaking Down Barriers to Clean Energy Transition*, 16 May 2023, <https://www.worldbank.org/en/news/feature/2023/05/16/breaking-down-barriers-to-clean-energy-transition>.
40. Shea, Ryan and Russell Mendell, "Congress Cannot Ignore Residential Solar Tax Credit Inequities" *Rocky Mountain Institute*, 14 October 2021, <https://rmi.org/congress-cannot-ignore-residential-solar-tax-credit-inequities/>.
41. Buchner, Barbara, Baysa Naran, Rajashree Padmanabhi, Sean Stout, Costanza Strinati, Dharshan Wignarajah, Gaoyi Miao, Jake Connolly and Nikita Marini, *Global Landscape of Climate Finance 2023*, Climate Policy Initiative, 2023, <https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2023/>.
42. United Nations Conference on Trade and Development (UNCTAD), *Green Technologies: Coherent Policy Action Needed for Developing Countries to Reap the Benefits*, 2023, <https://unctad.org/news/green-technologies-coherent-policy-action-needed-developing-countries-reap-benefits>.
43. Chambers, Joseph, Caitlin Robinson and Matthew Scott, "Digitalisation without detriment: A research agenda for digital inclusion in the future energy system", *People, Place and Policy*, vol. 16, no. 2, 2022, pp. 177-192, <https://extra.shu.ac.uk/ppp-online/wp-content/uploads/2022/10/digitalisation-detriment-inclusion-energy-system.pdf>.
44. ILO, 2022.
45. European Automobile Manufacturers Association, *Employment Trends in the EU Automotive Sector*, 2023, <https://www.acea.auto/figure/employment-trends-in-eu-automotive-sector/>.
46. Naughton, Keith, "Detroit's Electric reckoning Has Arrived", *Bloomberg*, 12 October 2023, <https://www.bloomberg.com/news/articles/2023-10-12/united-auto-workers-strike-spotlights-us-electric-vehicle-transition>.
47. Elgouacem, Assia, Håvard Halland, Enrico Botta and Gurtegh Singh, "The Fiscal Implications of the Low-Carbon Transition", *2019 GGSD Forum*, Organisation for Economic Cooperation and Development (OECD), Paris, 26 and 27 November, 2019, https://www.oecd.org/greengrowth/GGSD_Forum%20Paper_Fiscal%20Implications.pdf.
48. Sengupta, Somini, Abdi Latif Dahir, Alex Travelli and Clifford Krauss, "Tiny Electric Vehicles Pack a Bigger Climate Punch Than Cars", *The New York Times*, 9 December 2023, <https://www.nytimes.com/2023/12/09/business/energy-environment/two-three-wheel-electric-vehicles.html>.
49. European Investment Bank, *Financing Innovation in Clean and Sustainable Mobility: Study on Access to Finance for the Innovative Road Transport Sector*, 2018, <https://op.europa.eu/en/publication-detail/-/publication/26ea3d99-4832-11e8-be1d-01aa75ed71a1/language-en>.

50. Ibid.
51. Food and Agriculture Organization of the United Nations (FAO), *Almost Half the World's Population Lives in Households Linked to Agrifood Systems*, 2 April 2023, <https://www.fao.org/newsroom/detail/almost-half-the-world-s-population-lives-in-households-linked-to-agrifood-systems/en>.
52. International Labour Organization (ILO), *World Employment and Social Outlook, 2018*, Chapter 2, https://www.ilo.org/weso-greening/documents/WESO_Greening_EN_chap2_web.pdf.
53. Ross, Annabel, Brendan Curran, Nick Robins and Mark Nicholls, Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, *Sowing Seeds: How Finance Can Support a Just Transition in UK Agriculture*, 2023, <https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2023/07/Sowing-Seeds-How-finance-can-support-a-just-transition-in-UK-agriculture.pdf>.
54. Africa Regenerative Agriculture Study Group, *Regenerative Agriculture: An Opportunity for Businesses and Society to Restore Degraded Land in Africa*, 2021, https://www.iucn.org/sites/default/files/2022-06/regenerative_agriculture_in_africa_report_2021_compressed.pdf.
55. World Business Council for Sustainable Development, *Farmers Stand to See Increase Crop Yields and Profits with 15-25% Return on Investments by Transitioning to Regenerative Farming Practices*, 24 May 2023, <https://www.wbcsd.org/Projects/OP2B/News/Farmers-stand-to-see-increase-crop-yields-and-profits-with-15-25-return-on-investment-by-transitioning-to-regenerative-farming-practices>.
56. International Fund for Agricultural Development, *Stronger Together: The Power of Farmers' Organizations*, 6 February 2020, <https://www.ifad.org/en/web/latest/-/story/stronger-together-the-power-of-farmers-organizations>.
57. Smith Olivia, Abigail L. Cohen, Cassandra J. Rieser, Alexandra G. Davis, Joseph M. Taylor, Adekunle W. Adesanya, Matthew S. Jones, Amanda R. Meier, John P. Reganold, Robert J. Orpet, Tobin D. Northfield and David W. Crowder, "Organic Farming Provides Reliable Environmental Benefits but Increase Variability in Crop Yields: A Global Meta-Analysis", *Frontiers in Sustainable Food Systems*, vol. 3, 2019, <https://www.frontiersin.org/articles/10.3389/fsufs.2019.00082/full>.
58. Lee, Anne Marie, "Organic food prices are surging as inflation continues to bite shoppers", *CBS News*, 1 March 2023, <https://www.cbsnews.com/news/organic-food-prices-rising-faster-than-conventional-foods-inflation-2023/>.
59. Good Food Institute, *Reducing the Price of Alternative Proteins*, <https://gfi.org/reducing-the-price-of-alternative-proteins/>, accessed January 2024.
60. Mehrabi, Z., M.J. McDowell, V. Ricciardi, et al., "The Global Divide in Data-driven Farming", *Nature Sustainability*, vol. 4, 2021, pp. 154–160, <https://www.nature.com/articles/s41893-020-00631-0#citeas>.
61. Global Data, *Patents Filed across Top 10 Environmental Themes over the Last Five Years* [Chart], <https://www.globaldata.com/esg/environment/patents/signals/>, accessed January 2024.
62. Ma, Qiang, Peter Merrill, Verena Quitta and Cameron Stonestreet, *The Hidden Cost of Carbon*, PwC, 2023, <https://www.pwc.com/gx/en/issues/esg/the-hidden-cost-of-carbon.html>.
63. Buchner, et al., 2023.
64. "MSMEs in steel sector get an India build-out lift: CRISIL SME Tracker", *Business Standard*, 28 August 2023, https://www.business-standard.com/industry/news/msmes-in-steel-sector-get-an-india-build-out-lift-crisil-sme-tracker-123082801242_1.html.
65. Gerres, Timo, Johanna Lehne, Gökce Mete, Suzanne Schenk and Caitlin Swalec, "Green steel production: How G7 countries can help change the global landscape", *Leadership Group for Industry Transition*, 10 June 2021, <https://www.industrytransition.org/insights/g7-green-steel-production/>.
66. Organisation for Economic Cooperation and Development (OECD), *Greening Steel: Innovation for Climate Change Mitigation in the Steel Sector*, 2015, <https://www.oecd.org/sti/ind/Environmental-patents-steel.pdf>.
67. ILO, 2022.
68. Ibid.
69. Wedeen, Sophia, "Home Repairs and Updates Pose Considerable Burdens for Lower-Income Homeowners", *Joint Center for Housing Studies of Harvard University*, 16 June 2022, <https://jchs.harvard.edu/blog/home-repairs-and-updates-pose-considerable-burdens-lower-income-homeowners>.
70. Willand, Nicola, Trivess Moore, Ralph Horne, Sarah Roberston, "Retrofit Poverty: Socioeconomic Spatial Disparities in Retrofit Subsidies Uptake", *Buildings and Cities*, vol. 1, no. 1, 2019, pp. 14-35, <https://journal-buildingscities.org/articles/10.5334/bc.13>.
71. "Retrofit Reset: Prioritize Low-Income Households", *Affordability Action Council*, 2 November 2023, <https://irpp.org/research-studies/prioritize-low-income-households/>.
72. Rigolon, Alessandro and Jeremy Németh, "When do new parks drive gentrification?", *Housing Matters*, 18 December 2019, <https://housingmatters.urban.org/research-summary/when-do-new-parks-drive-gentrification>.
73. Ulpiani, Giulia, Enrique Rebolledo, Nadja Veters, Pietro Florio and Paolo Bertoldi, "Funding and financing the zero emissions journey: urban visions from the 100 Climate-Neutral and Smart Cities Mission", *Humanities and Social Sciences Communications*, vol. 10, no. 647, 2023, <https://www.nature.com/articles/s41599-023-02055-5>.
74. Circle Economy, International Labour Organisation (ILO) and Solutions for Youth Employment, *Decent Work in the Circular Economy: An Overview of the Existing Evidence Base*, 2023, https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---

- sector/documents/publication/wcms_881337.pdf.
75. Azevedo, Marcelo, Anna Moore, Caroline Van den Heuvel and Michel Van Hoey, *Capturing the Green-Premium Value from Sustainable Materials*, McKinsey & Company, 2022, <https://www.mckinsey.com/industries/metals-and-mining/our-insights/capturing-the-green-premium-value-from-sustainable-materials>.
 76. European Environment Agency, *Resource Use and Materials*, 2023, <https://www.eea.europa.eu/en/topics/in-depth/resource-use-and-materials?activeTab=fa515f0c-9ab0-493c-b4cd-58a32dfaae0a>.



COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation.

The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.

World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744
contact@weforum.org
www.weforum.org