The Global Green Economy

Capturing the opportunity

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Foreword

David Miller
Managing Director, C40 Centre for City Climate Policy and Economy

This important report by Arup is a critical guide for policymakers, elected officials and the general public about how we make a transition to a green economy. Arup recognises that a green economy isn't just an economy that works in harmony with nature, but one in which shared prosperity ensures that the needs of people are met by design.

Starting from the proposition that the green economy is not a cost, but an opportunity, the Arup team carefully analyses the steps needed to transform national economies and seize the most appropriate opportunities for any particular country. It is timely, optimistic and helpful.

Can it work? We know from the transition underway in many of the world's great cities that it is possible to lower greenhouse gas emissions, respect nature and biodiversity, and create good, well paid jobs at the same time – when governments, public institutions and the private sector put their collective efforts to the goal of an environmentally sustainable economy, in which nobody is left behind.

Foreword

Carol Lemmens
Global Advisory Leader, Arup

No statement is more sobering than the one published by the World Meteorological Organization in September 2022: “we are heading in the wrong direction”.

The gap between aspirations and reality has never been wider, as greenhouse gas concentrations are reaching record highs after a brief lull during the pandemic. A recent report by the United Nations Environment Program (UNEP) shows that the national pledges since COP26 have made only a small difference on predicted 2030 emissions, and that we are far from the goals laid out in the Paris Agreement. With policies currently in place, we are looking at a 2.8°C temperature rise by the end of the century.

We are no longer talking about a hypothetical scenario. The past seven years have been the warmest on record. In 2022 only, the world has had to foot the bill for US$29 billion of weather disasters, from Florida’s Hurricane Ian to the summer heat wave in Europe and the recent floods in Pakistan. Obviously, efforts to cut emissions must be met by equal efforts to deal with the unavoidable impacts of climate change. However, while 84% of parties to the UNFCCC have put in place adaptation plans and strategies, the financing is not following. A UNEP adaptation gap report estimates that “finance flows to developing countries is 5-10 times below estimated needs.” No wonder emerging economies are seeking compensation from the global north for the consequences of carbon emissions at COP27.

Yet, not all is doom and gloom. More than 1,800 companies have set emissions reduction targets, according to the Science Based Targets initiative, and the global consensus around coordinated mitigation and adaptation action is strengthening. The focus of such efforts is, rightly so, on avoiding a catastrophe. But greening our economies also represents a significant opportunity for future prosperity and job creation. The human invention behind the technologies and expertise that will be required to create a carbon free, waste free and environment-friendly economic model is bound to add immense value to global GDP. While risk avoidance or resilience is a strong motivator, we believe that it should be coupled with a real understanding of the upside that a green economy transition would provide.

But how big is this “green economy opportunity”? And how should policymakers, investors and captains of industry position themselves to make the most of it?

These are the questions that our report aims to further illuminate. The urgency of the climate change challenge is already well documented, and a galaxy of new reports is now shedding light on how to adapt to a warmer world. How we contribute to the conversation is by arguing that greening our economies is also a potential driver of immense economic and social prosperity for the second half of the century. As such, embracing it is not only a cost issue. It is a unique occasion.

This report explores this opportunity from various angles. It provides a rethink on how a new green taxonomy could be designed and used. It provides a rigorous quantification of the green economy transition value add, thanks to our partner Oxford Economics. And it lays out a detailed menu for action for policymakers focused on identifying and capturing the right economic opportunities. We hope you will find these analyses and tools helpful, as you pursue your green transition journeys.

The recommendations and numbers you will find in these pages are the product of a powerful combination of experts, spanning climate scientists, policymakers, macro and micro economists and city planners. They emanate from Arup and Oxford Economics, with decades of work and experience, actually making the green transition happen. As such, we do not make these statements lightly. We profoundly believe that the green transition will yield a better, more prosperous world. And there is no better time than now to seize the opportunities it holds.

Foreword

Adrian Cooper
CEO of Oxford Economics

In the past year, extreme weather events including floods in Pakistan, hurricanes in North America and European wildfires have had a devastating impact on the lives and livelihoods of millions of people around the world. These events are likely to leave a larger impression on global GDP this year than any other year in history.

Governments, companies, and investors are aware of the risks of global warming but the 27th Conference of Parties (COP27) climate summit in Sharm El Sheikh served as a reminder of just how complex it is for these stakeholders to agree on a solution, and on their role within it. Agreement on a pathway forward is aided by clear, objective economic analysis about the costs of climate change, and also the opportunities implied by the transition to a "greener" global economy.

This is why Oxford Economics teamed up with Arup to take a fresh look at how a "green economy" should be defined, what the transition to a greener, carbon-neutral economy implies for economic performance, and where opportunities will be created along the way. As economists, we are well placed to assess the future costs implied by climate change. But we have to be honest about the fact that mitigating climate change will also be expensive. Transitioning to a carbon-neutral energy system will demand fundamental changes to the structure of the global economy. Fossil-fuel reliant industries will be disrupted. Carbon-intensive capital will be scrapped. Many enterprises will lose out in the short term, as the world pursues its ultimate long-term prize of limiting global warming.

Furthermore, the transition to a carbon-neutral global economy also presents compelling opportunities. Our objective for this research was to work backwards from a 2050 net zero emissions scenario, to consider what changes are required to make that scenario a reality and analyse the opportunities these changes represent.

As the global economy switches to more sustainable energy systems, a new competitive landscape will emerge. We have identified three pillars of opportunity that will translate across all sectors of the economy—commercial prospects arising from industry disruption, the emergence of new green markets for carbon-neutral goods and services, and productivity gains from climate change mitigation.

Our analysis shows that the market for these new goods and services that facilitate the net zero transition will be worth $10.3 trillion to the global economy by 2050—that's equivalent to around 5% of projected GDP. We have looked in detail at some of the new markets that will emerge to offset the decline of higher-polluting industries. These include renewable electricity generation, clean energy and equipment, renewable fuel production, and green financial services. Opportunities abound along the supply chain of these emergent sectors, too, and in the business ecosystems that will develop around them.

We are aware that there are many large numbers bandied around in the context of the economics of climate change. This study provides an original perspective on the commercial prize on offer for those enterprises and industries that move fastest and most capably to meet the demands of a greener economy. Just as action on global warming is urgent—the commercial proposition for enterprises and economic policymakers to lead the way in the provision of "greener" goods and services is urgent too.

Our hope is that as the world and its political and business leaders look towards another year of progress in advance of next year's COP Summit, this analysis will provide a constructive contribution to their understanding.

Executive summary

As each year passes, the climate emergency facing the planet becomes ever more alarming. But this trajectory is increasingly being met by the rapid emergence of new technologies and expertise that are focused on tackling it. As a result, we can now discern the emergence of a future green economy; one that harnesses human ingenuity to protect the planet's future.

But what is the green economy? How large is it? How will it grow? And how can it be developed in a way that drives prosperity and inclusiveness, as well as environmental sustainability?

These are the questions that a team of climate specialists, industry experts and economists from Arup and Oxford Economics spent the last 12 months addressing. The product of that work is summarised in this report. Our goal is to help governments, investors and communities better understand the opportunities a green economy represents. In this study, we provide a new resource to support the strategic economic decision making required to seize those opportunities, and to place the global economy on an environmentally sustainable track.

A new understanding of the green economy

There are many definitions and interpretations of the green economy, each with carefully constructed taxonomies of the activities that underpin them. But these taxonomies have been developed historically from a financial compliance mindset or otherwise are often overly focused on specific contexts, such as decarbonisation. We identified the need for a green economic definition that is designed more explicitly to aid strategic economic policy making.

We propose a new green taxonomy that encompasses a broader and deeper categorisation of economic activities that create a virtuous relationship between economic growth and environmental and social wellbeing.

Our framework incorporates climate change mitigation and adaptation goals, and spans the whole spectrum of environmental outcomes, including circularity, biodiversity and preservation, as well as positive economic and social outcomes. By focusing on all aspects of sustainability, our framework provides a more holistic tool for policymakers.

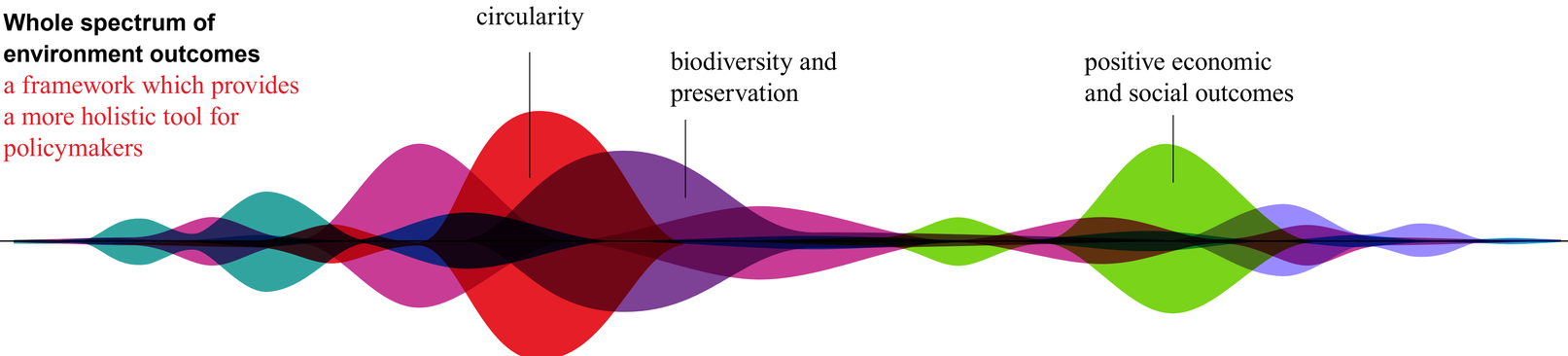
This green taxonomy is different from its peers in different ways. **First, it is significantly more detailed**, providing more than 500 green activities for economies to choose from. Second, it proposes a **flexible way to deal with transitional activities**, such as natural gas. And finally, it explores how green activities should be understood **from a value chain perspective**, rather than purely in isolation.

Doing so, we have created a green economy definition that is not designed for financial compliance, but as a tool to help economies develop meaningful economic policies.

500+
green activities spanning nine sectors, encompassing the full green economy potential

See page 21 for a list of sample activities.

Whole spectrum of environment outcomes
a framework which provides a more holistic tool for policymakers



Executive summary

Sizing the green economy opportunity

The broader vision of a thriving global green economy that our taxonomy enables, implies decoupling economic activity from negative environmental impacts. Achieving this vision will place the global economy on a more sustainable pathway. That means averting the highly damaging impacts of global warming – not just on the environment – but on economic prosperity too.

Mitigating climate change is expensive. It implies, amongst other wrenching changes, a fundamental transition away from fossil fuel-based energy usage. Because of this challenge, policymakers and investors too often conceive of the green transition from a cost perspective. However, the transition to a sustainable environment by 2050 also creates vast opportunities in the global economy.

To quantify the scale of these opportunities, we focused on the goal of a net zero emissions environment by 2050, as articulated by the International Energy Agency.

We have identified three pillars of opportunity that will emerge from the transition to a zero carbon economy. Firstly, the disruption caused by a switch to clean energy will create competitive opportunities across all industries. Those businesses that can steal market share by adapting quickly to changing demands, reducing business risk and hiring the most capable talent, will benefit.

Secondly, we identify five major new green markets for carbon-neutral goods and services that will emerge. We estimate that the transition to a net zero emissions environment by 2050 will create new industries **worth $10.3 trillion to the global economy by that same year**.

This includes the direct contribution to GDP of electric vehicles manufacturing, renewable power generation, clean energy equipment manufacturing, renewable fuels and green finance; plus the activity supported across global supply chains.

Thirdly, placing the planet on this sustainable pathway leads to substantial productivity benefits relative to a world in which climate change has been left unchecked, or poorly tackled. Oxford Economics' climate scenario analysis suggests that by combining carbon pricing with more productivity-oriented policies, including high levels of private and public investment, with an emphasis on R&D in technology and working practices, can place the global economy on a more prosperous, as well as environmentally sustainable footing.

While green taxonomies are multiplying, most are focused on compliance, calling for a green taxonomy designed specifically for strategic economic action.

$10.3Tn
value added to the global economy by 2050

Green transition is not a cost, but a substantial opportunity

3
unique tools
to help economic policymakers identify opportunities and take the right action to capture them

We must address critical challenges, such as developing a specific approach for emerging markets to ensure a just and sustainable transition to a net zero future.

Executive summary

“Fear is a compelling reason to act towards climate change, but we believe human ambition can be another critical driver of environmental action.”

Brice Richard, Arup Global Strategy Skills Leader

Taking the right actions

Transitioning to a green economy is an inevitable end game for all countries, and many have already started their journey. For those who have not, starting the process now is critical. Risk avoidance, compliance, and costs continue to be key drivers of green investments. However, little emphasis has been given to the upside of greening activity – the potential value added to the economy, the high-value jobs created in new green activities, the power of sustainable action to drive innovation, new expertise, and stronger competitiveness.

So, how can countries capitalise on this opportunity and grow their green economies? Our analysis shows that the green economy encompasses hundreds of potential activities, from green aviation and biofuels bunkering, to waste valorisation and water management. While most national economies are able to develop multiple green industries, not all industries will deliver value and jobs to every economy in the same way.

From the wealth of opportunities that exists, national policymakers need to focus their efforts and resources on what works best for their own context, and play to their own strengths.

That requires a clear consideration of their economic structure, their existing natural assets and endowments, and the vulnerabilities and challenges they will face.

To help governments in their decisions, we have developed a green opportunity framework that highlights which green industries should be developed based on different economic characteristics.

So, what should governments do to foster the development of these industries? When it comes to climate change, the governments’ immediate response is to regulate. Yet experience shows that a wider approach typically bears fruit – one that combines setting the right rules, creating the right incentives, nurturing an enabling environment for the transition, and building the right capacities.

In this report, we also lay out a large menu of potential actions that governments can make use of across multiple policy dimensions, including **innovation, standard setting, market creation,** and more.

This report is hence not a mere summary of the context and the opportunity. It is a toolkit for action that we hope will help any reader initiate or pursue their journey towards a green economy.

1

While green taxonomies are multiplying, most are focused on compliance, calling for a green taxonomy designed specifically for strategic economic action

While many see the green transition as a cost, it is actually a substantial opportunity, with the potential of adding $10.3T to the global economy by 2050

2

3

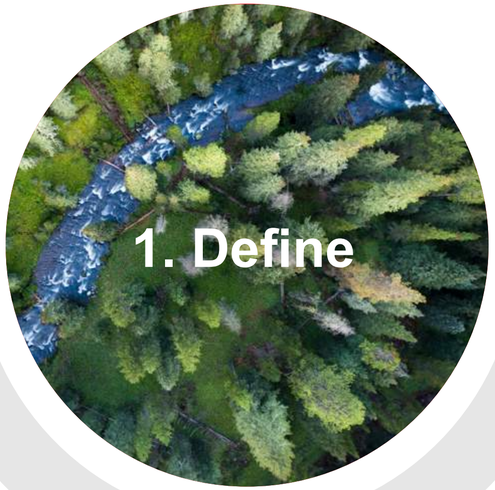
This report includes two unique tools to help economic policy makers identify the right opportunities and take the right action to capture them

Realising the opportunity must address critical challenges, such as developing a specific approach for emerging markets, and ensuring that the transition is just and sustainable

4

1. A new understanding of the green economy

- Why we need a new green economy definition
- Beyond environmental objectives
- Building a strategic green economy taxonomy
- Taxonomy details



2. Sizing the green economic opportunity

- Competitive opportunities in industry disruption
- Creating new green markets
- A boost to productivity and GDP growth
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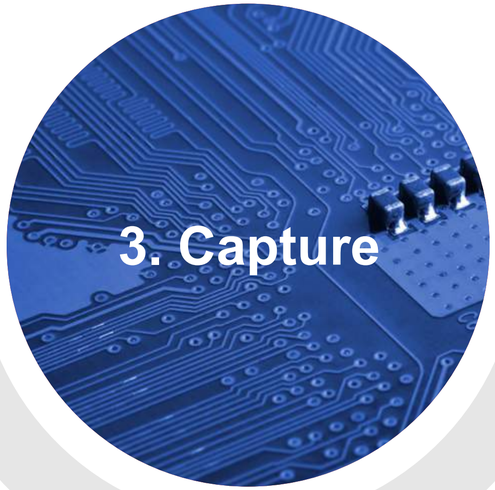
3. Capturing green opportunities

- Why now is the right time
- Playing to one's strengths
- Taking the right actions
- Meeting the challenges ahead



1 A new understanding of the green economy

A new understanding of the green economy

The idea of a green economy is not new. First coined in 1989 in a report to the British government, the term was fully formed in 2008 by the UNEP as a response to global economic downturns, and formally defined by the same UNEP in 2011 as:

"[An economy] that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities. […] In a green economy, growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services".

Many other definitions followed in an effort to drive funding, financing and policy action towards green economies. The rise of green finance and post-Covid green new deals subsequently called for the development of green taxonomies. Multiple such green "classifications" are now underway, spearheaded by the EU, China, South Korea and dozens of other countries.

Many of these taxonomies, however, are being developed purely from a financial compliance mindset. In doing so, they overlook a significant opportunity: that of a Green Taxonomy as a tool for economic policy.

There is a need for a green economic definition that governments can use to identify which green industries to develop in order to foster green prosperity, create green jobs, and position themselves globally as green economy leaders.

Current taxonomies lack the breadth, flexibility and details to do so.

1.1. A new understanding of the green economy

Cutting through the noise

Since the UNEP's first attempt at capturing the essence of the green economy, multiple organisations and governments have followed suit. While each definition has its unique flavour, most agree on reshaping the means of production and consumption towards a more sustainable economy, from environmental, social and economic standpoints. These definitions have been driving donor funding and policy actions towards green prosperity ever since.

More recently, **green taxonomies** – specific classifications of green activities within an economy – have mushroomed across the globe. Such a development is hardly surprising. The rapid growth of sustainable finance as well as green stimulus packages voted by more than 20 countries in the wake of Covid-19, have led to a need for a transparent way to identify industries and projects that meet specific sustainable objectives. Green taxonomies emerged as a way to guide these money flows from an activity rather than a financial instrument perspective.

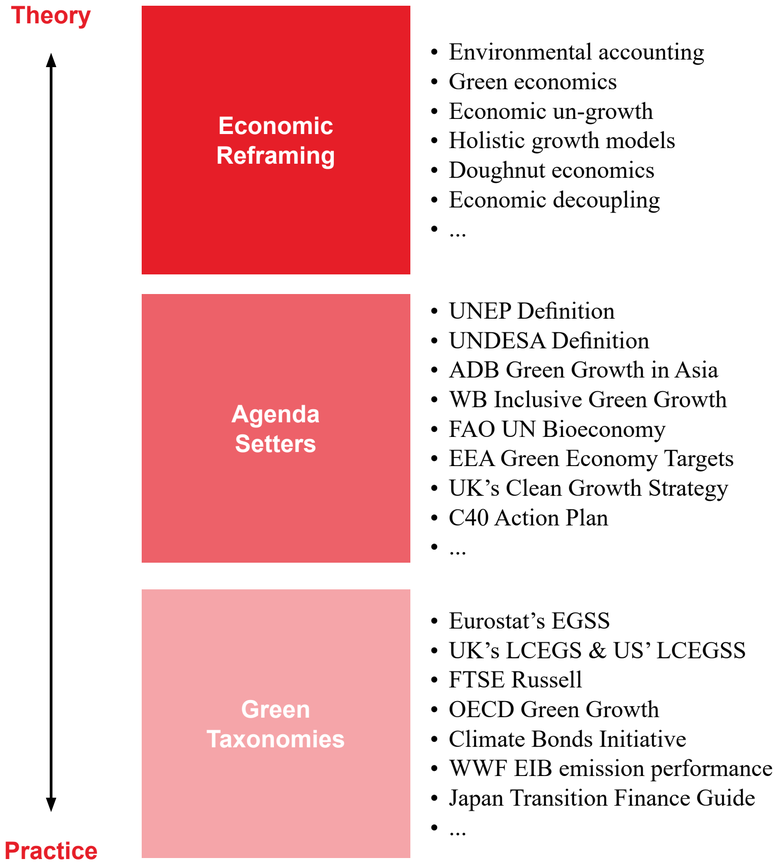
For example, the European Union's Taxonomy for Sustainable Activities, which was introduced to prevent greenwashing, encourages companies to undertake green transitions, mitigate market fragmentation and help shift investments to meet the EU's climate targets for 2030, and European Green Deal (one-third of the 1.8 trillion euro investments from the NextGenerationEU Recovery Plan).

Many countries have pursued similar efforts. South Korea, one of the first to embrace green prosperity as a national strategy, formed its National Strategy for Green Growth in 2009. To achieve this, Korea's Ministry of Environment established a K-Taxonomy which classifies green economic activities into six goals – from emission reduction to biodiversity.

More recently, China has developed a taxonomy that focuses on leveraging financial institutions and corporations to issue green bonds under the "*Green Bond Endorsed Project Catalogue*". In 2019, China contributed $31.3bn to the green market, second only to the United States. Meanwhile, **South Africa, Bangladesh, Chile, Colombia, Indonesia, New Zealand, the United Kingdom, and Vietnam have been building similar green taxonomies that build upon the European Union's.** Other countries, such as India (whose taxonomy combines environmental and social objectives), are developing their own taxonomies with the assistance of multilateral organisations.

Development banks and governments are not the only ones aiming to categorise green activities. Financial service providers have designed similar tools to advise investors with an appetite for green projects, such as FTSE Russell's Green Revenue Classification System, which unites standards of tiering projects for the 16,000 securities in the global market.

Green economy definition types and examples



1.1. A new understanding of the green economy

Harmonising efforts

This cacophony of taxonomies has created much confusion for regulators, investors and companies trying to understand what they should follow. As a result, several efforts are underway to develop a common taxonomy for green activities. The most notable one is being led by the International Platform on Sustainable Finance (IPSF), whose main mission is to develop a common approach to sustainable finance across its 18 members. Others involve the International Finance Reporting Standards and the International Sustainability Standards Board, which aim to create clear and comparable sustainable standards globally. Global taxonomy harmonisation efforts include:

The Common Ground Taxonomy is the outcome of a Working Group on taxonomies initiated by the EU and China to compare and find common grounds between the EU and Chinese taxonomies.

The International Sustainability Standards Board (ISSB) aims to develop a global baseline to enhance the comparability and compatibility of sustainability reporting standards, which might create a more common base for green taxonomy objectives and thresholds.

Why we need another definition

If so many definitions exist, why add another one?

Existing definitions and taxonomies have done most of the work of delineating the contours of the green economy. However, many of these efforts:

- Have been designed with compliance (and not strategic action) in mind;
- Excessively focus on specific contexts, challenges (e.g. mitigation) and sectors;
- Lack the right level of detail to comprehend the full opportunity and drive strategic action;
- Are not structured for flexibility, as many rely on thresholds that cannot be adapted to multiple situations.

As such, **we believe there is a need for a strategic definition of the green economy** that builds upon existing efforts; together with a tool, specifically tailored for economic policy making, designed in a way that can be used flexibly by all. This tool is meant to help any government determine which sections of the green economy to develop in order to foster prosperity, create jobs and strengthen global competitiveness.

This tool is equally useful for countries that already have a green taxonomy, and those who do not.

For countries that do not yet have a green taxonomy, we provide in this report a step-by-step approach to develop one that can be used both from a financial compliance and economic policy perspective.

For countries that already have one, our approach provides several innovative methods to turn existing classifications into a tool for strategic economic decisions.

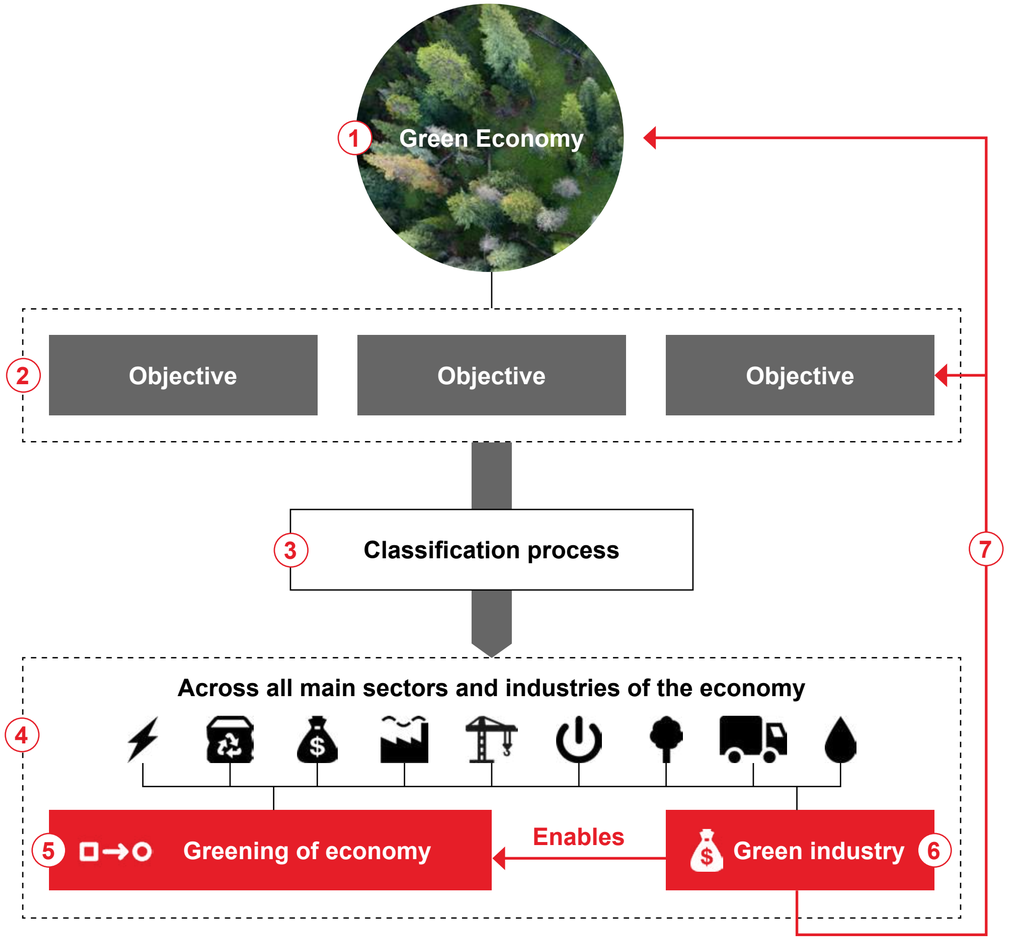
1.2. Why we need another definition

A comprehensive definition of the green economy

Our taxonomy is wrapped into a richer definition of the green economy, and aims to broaden and deepen specific aspects of existing classification systems, from objectives all the way to the tagging of green activities:

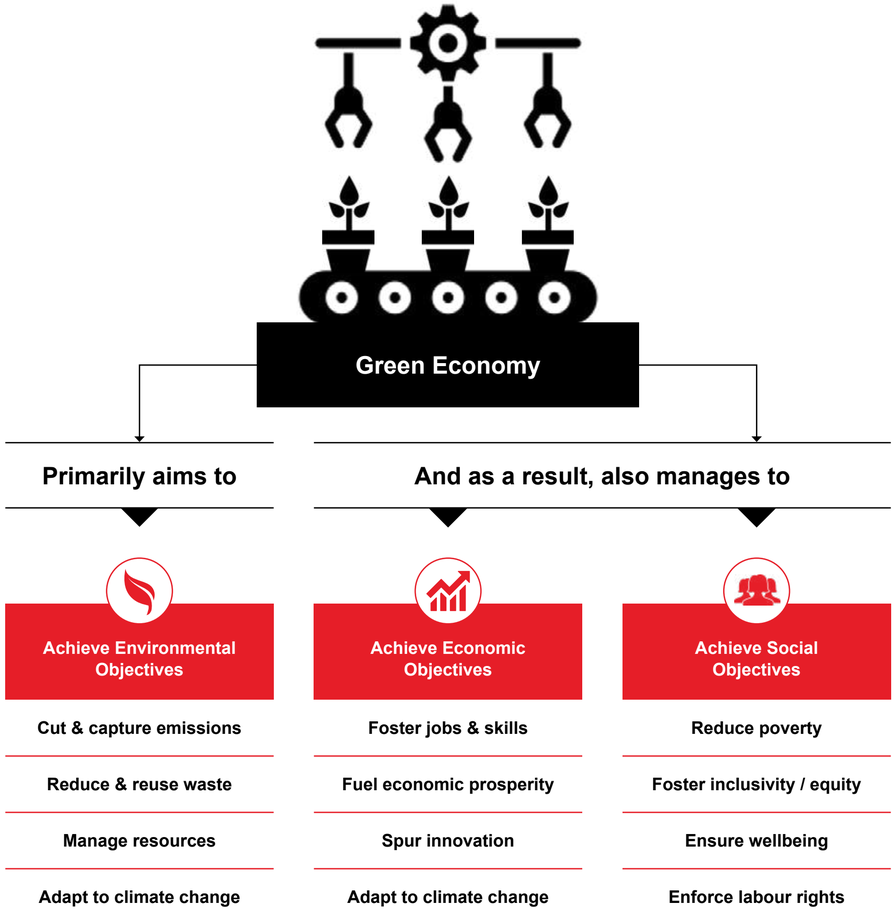
1. The green economy is, most definitions agree, an economic model which creates a virtuous relationship between economic prosperity and environmental and social wellbeing. This leads to growth that is decoupled from environmental externalities, or actually positively connected to the environment.
2. The impact of the green economy is measured by how an economy meets a range of environmental, social and economic objectives. [objective and why they are new]
3. These objectives are used to develop a set of criteria used by a classification methodology to develop a taxonomy of sectors, industries and activities that can be considered "green". [the classification process]
4. The taxonomy delivers a detailed list of green activities across the value chain that provide an exhaustive mapping of potential opportunities, and the foundation to calculate the real size of the green economy, which we do in chapter 2. [the detailed taxonomy] This taxonomy encompasses two different kinds of economic activities:
    5. Activities that green existing sectors of the economy (greening of the economy)
    6. Activities that inherently provide goods and services with an environmental purpose (green industry) [segmentation of types of]
7. Achieving the greening of the economy and a thriving green industry creates the underlying conditions that ultimately realise green prosperity.

In the next sections, we will see how traditional approaches to (2) objectives, (3) classification and (4) taxonomy design by existing taxonomies can be expanded, to create a more robust and flexible tool for economic policy making.



1.2. Why we need another definition

A comprehensive definition of the green economy



A green economy is about more than the environment

All definitions agree that the main purpose of the green economy is to achieve environmental objectives, i.e. to reduce the impact of economic development on the environment. However, many tend to suffer from tunnel vision, by overly focusing on climate change mitigation (CO_2 emission reduction), while forgetting that a green economy should potentially impact all aspects of sustainability, be it environmental (waste reduction, climate adaptation, natural asset preservation), as well as economic and social factors.

As such, a truly comprehensive understanding of green economy objectives should encompass:

Environmental objectives: spanning across climate change mitigation and adaptation, but also circular and sustainable resource management outcomes;

Economic objectives: such as fostering economic prosperity, creating high quality jobs, improving standards of living, fuelling innovation and employment, strengthening global trade competitiveness;

Social objectives: such as poverty reduction and social inclusiveness (the European Union's platform on sustainable finance is currently working for a Social Taxonomy that encompasses an array of social topics, yet to be integrated into their current taxonomy).

However, as a green economy remains driven by the global environmental crisis, **environmental objectives remain the primary objective, while economic and social objectives should be seen as additional ones**. This means that economic activities that achieve economic or social objectives without positively impacting environmental ones should not be included in the "green economy".

How do we measure the impact of the green economy? Most green economy definitions and taxonomies do not directly address this question, explaining instead (like the EU Taxonomy) that an activity is considered green if it "makes a substantial contribution to green outcomes", without explicitly stating how that substantial contribution shall be defined.

Formulating KPIs and metrics able to quantify this contribution is indeed a task that is more often left to governments, given the contextual nature of what a "substantial" impact is. Taxonomy efforts like EGSS rely on "thresholds" to help identify green activities, but many are EU-specific.

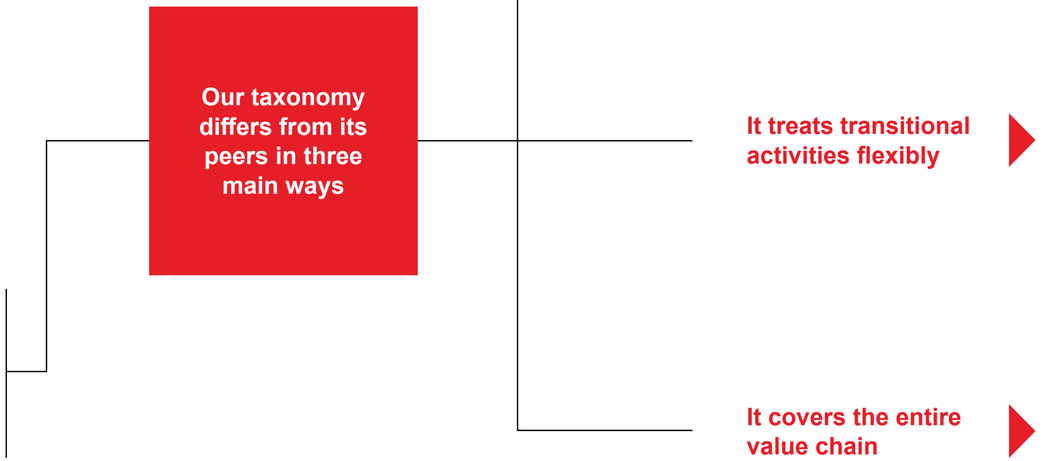
Our definition goes further, by proposing a more detailed breakdown of objectives, as well as a menu of success metrics to help any government assess the impact of green activities on green economy objectives. Contact us if you want to hear more (see page 63).

Building a strategic green economy taxonomy

The number of taxonomies in development is growing fast, spurring multiple attempts to bridge the gaps between definitions and reach a coordinated, commonly accepted classification.

However, most taxonomies are being designed for monitoring and reporting purposes, hence overlooking the role they could play as tools for policy development. In addition, few link the taxonomy to a rigorous quantification of the jobs and economic impact at stake, focusing on the regulatory stick, while missing the substantial carrot of the economic potential the green economy represents (see Chapter 2).

As such, we developed a classification with sufficient details and enough flexibility to inform the formulation of long-term economic strategies.



Our taxonomy pushes the level of detail one step further, by proposing an additional layer to encompass more than 500 potential green sub-activities, thus allowing for more granular strategy formulation. **"Production of Electricity From Renewables"** does not offer much clarity about the related possibilities: should the country focus on tidal power? Offshore solar panel? Bioenergy?

Transitional activities are included in most taxonomies, but are often not categorised. Using global consensus around "transitional" activities, we added this level of clarity including the level of inclusion (partial / total) and the criteria used (standard, threshold or activity). The tagging is flexible, hence making it easy for taxonomy users to update it based on evolving conversation around each activity.

Finally, the taxonomy identifies for each activity the key elements of the value chain that justify being considered "green", based on specific criteria (such as "does this activity require specific skills or equipment?"). This ensures that, for each of the green activities captured on the left side (e.g. low carbon data centres), the full value chain of the activity is potentially taken into account.

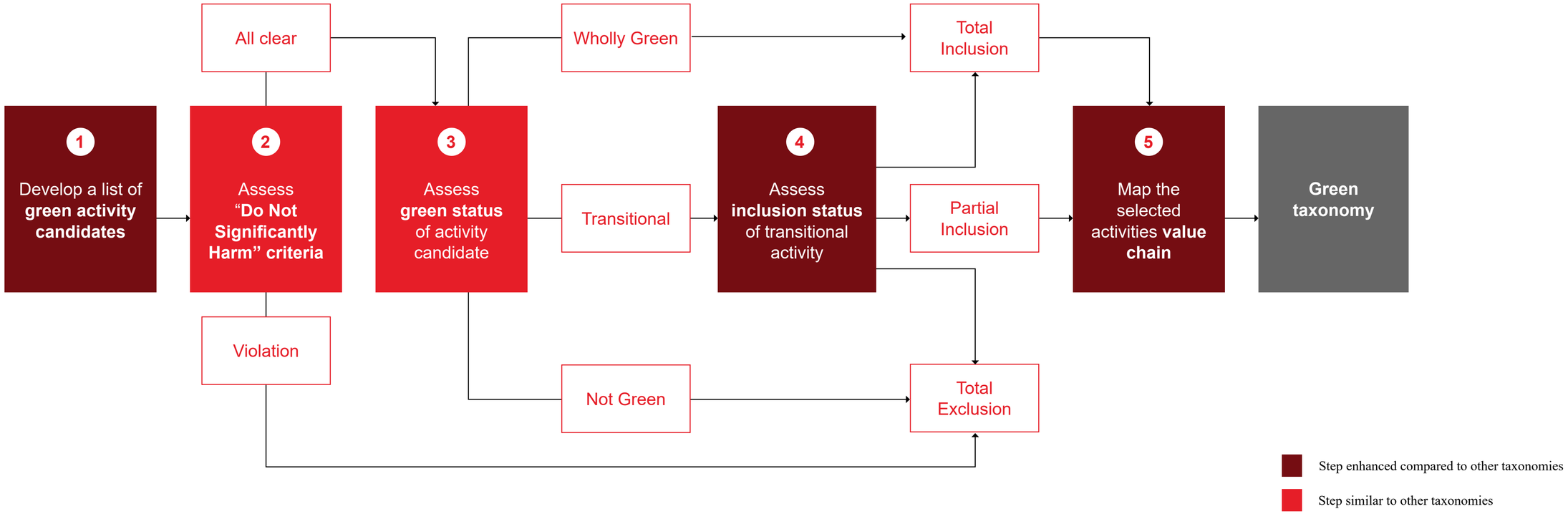
1.3. Building a strategic green economy taxonomy

An adaptable approach

Using specific, defined environmental outcomes, the most detailed – and labour intensive – process of the whole definition involves coming up with a precise classification of the activities to be considered as "green" and ultimately form a comprehensive taxonomy.

Our approach to green classification is quite similar to many already developed. However, existing classifications are quite specific to regional regulations and economic structure. **We will hence focus on what differentiates it from existing taxonomies, to design an adaptable method usable by any government globally**.

Our classification process follows **five main steps** through which economic activities can be defined as "green" or not.



1.3. Building a strategic green economy taxonomy

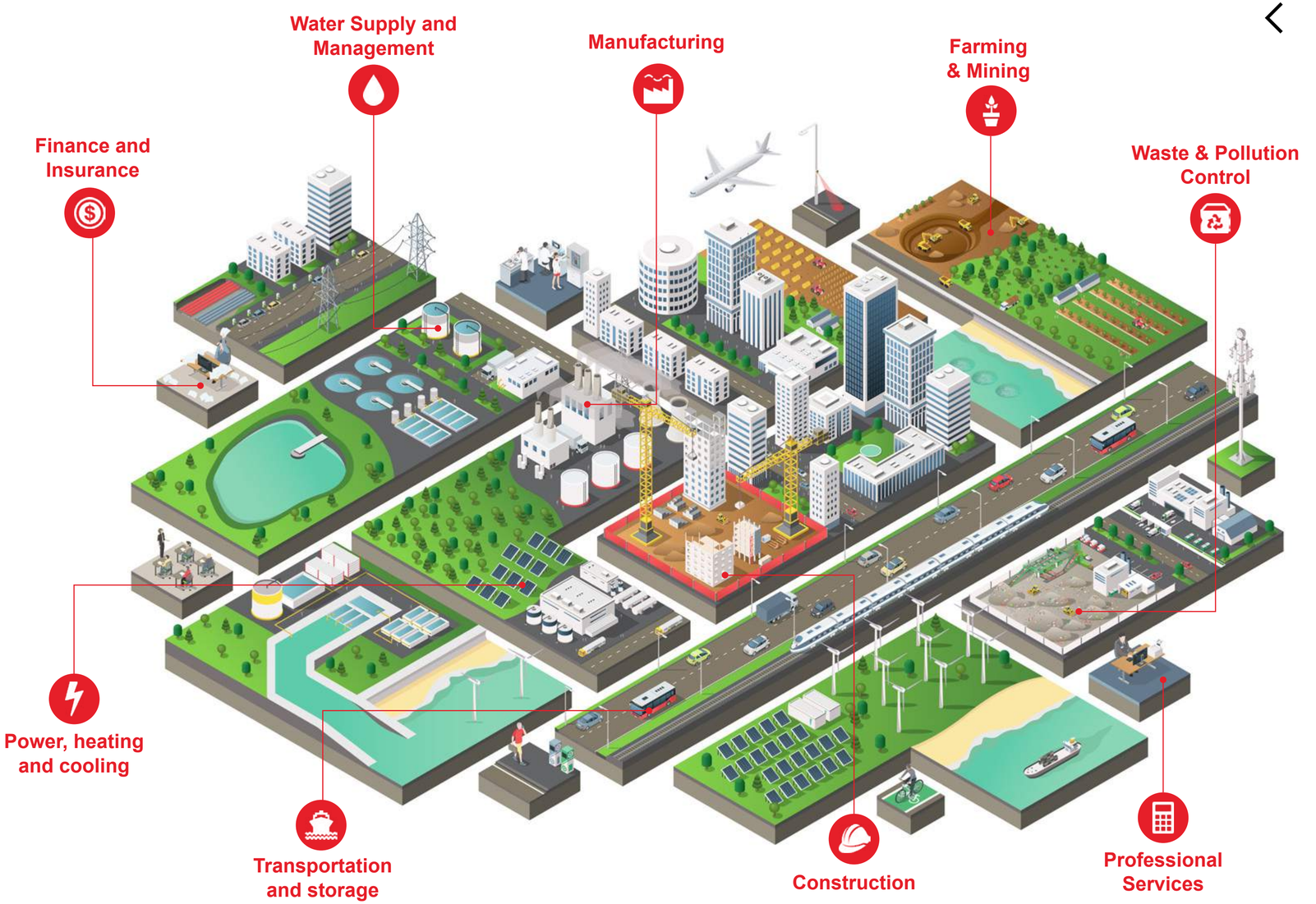
A long list of green activities

1 Develop a list of green economy candidates

As a first step, governments should develop a long list of green economy candidates across sectors. Other taxonomies, such as EGSS, rely on firm reporting to do so, leading to lists that are quite EU specific. Our approach, however, relies on using a combination of existing national and supranational taxonomies, industry codes in place (e.g. NACE, ISIC), and existing industry segmentations. **Our work has led to a comprehensive list of 54 green economy activities and 500+ sub-activity candidates, spanning nine sectors.**

This level of detail exceeds current taxonomies, and provides a more granular map of potential opportunities to choose from. For example, an activity like "*Manufacture of low carbon and environmental technologies*" encompasses sub-activities related to the production of technical products, such as CCU Recycled Carbon Products and Phase Change Material.

These activities and sub-activities are of course not meant to be an exhaustive representation of the green economy potential. For one, new activities are emerging every year, driven by new technologies, instruments, expertise. In addition, our list focuses on a sample of nine ISIC sectors. Nonetheless, we encourage users of this report to use it as a starting point to build from, rather than a finished product. A sample of the taxonomy is provided in the next pages. For the full taxonomy, feel free to contact the authors of this report (see page 64).



1.3. Building a strategic green economy taxonomy

A long list of green activities

1 Green infrastructure projects
- Sustainable land reclamation
- Repurposed roads for cycling
- Active mobility
- Etc...

2 Construction of climate resilient features
- Nature based solutions
- Flood prevention equipment
- Flooding barriers
- Etc...

3 Reforestation & rehabilitation
- Land remediation
- Afforestation
- Naturalisation of waterways
- Etc...

4 Sustainable agriculture processes
- Sustainable food processes
- Vertical farming
- Pathogen monitoring
- Etc...

5 Manufacture of alternative food
- Deep sea farming
- Microbial proteins
- Plant-based proteins
- Etc...

6 Efficient electricity transmission & storage
- Microgrids
- Trading of electrical units
- Solar intermittency mitigation
- Etc...

7 Energy storage activities
- Battery cooling systems
- Hybrid energy storage
- Thermal energy storage
- Etc...

8 Efficient heating & cooling
- Thermal storage system
- Eco-boilers
- Cooling from geothermal
- Etc...

9 Sustainable renovation activities
- EPC chiller plant retrofit
- EPC lighting retrofit
- Efficient interior design
- Etc...

10 Green buildings construction & demolition
- Zero energy buildings
- Low carbon data centers
- Integrated digital delivery
- Etc...

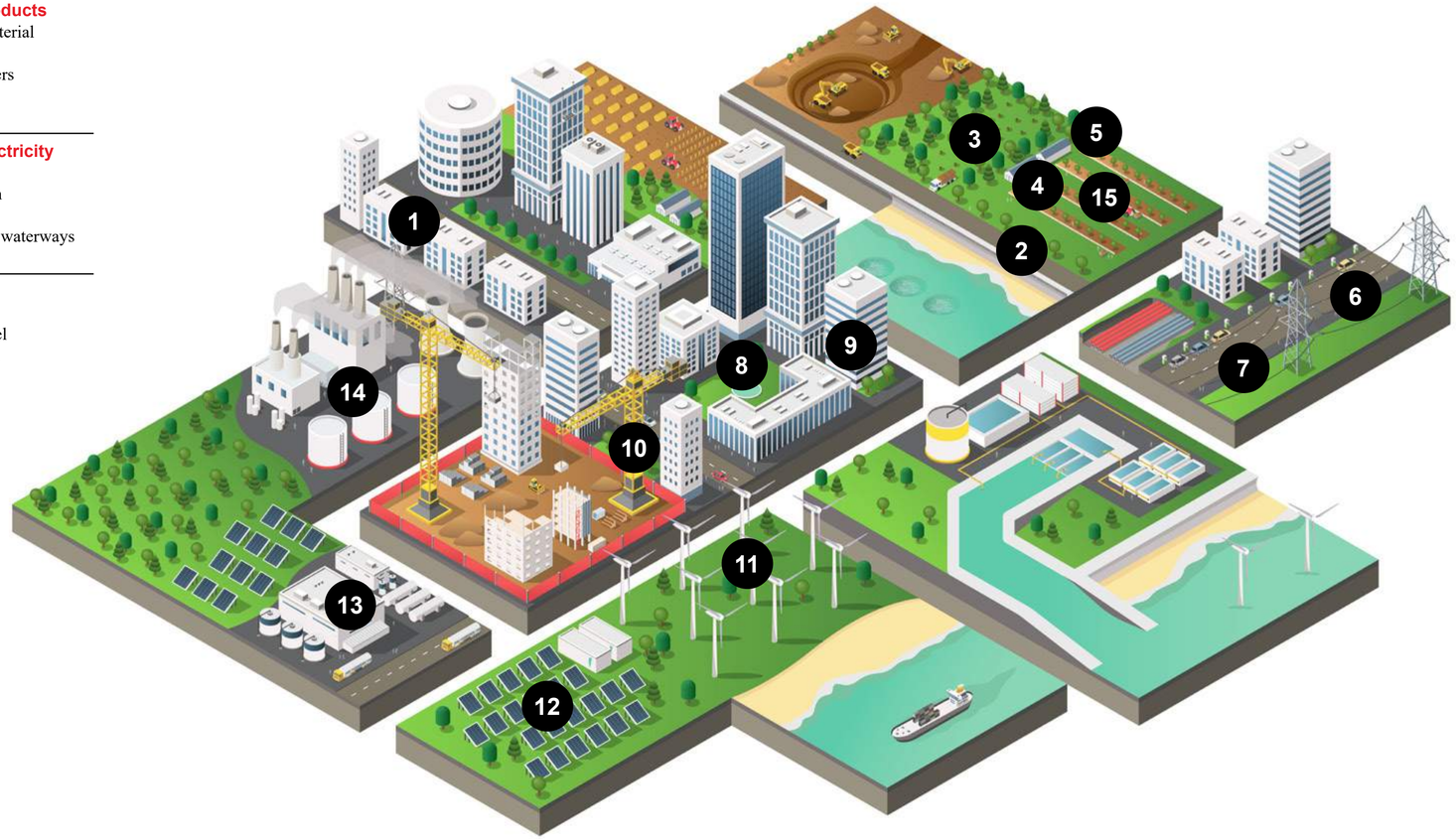
11 Production of electricity from other renewables
- From wind power
- From tidal waves
- From bioenergy
- Etc...

12 Production of electricity from solar PV
- From onshore panels
- From offshore panels
- Solar powered charger
- Etc...

13 Manufacture of low carbon products
- Phase change material
- Photoelectronics
- Smart water meters
- Etc...

14 Production of electricity from natural gas
- Land remediation
- Afforestation
- Naturalisation of waterways
- Etc...

15 Green fuel
- Hydrogen
- Synthethic biofuel
- Low sulphur fuel
- Etc...



1.3. Building a strategic green economy taxonomy

A long list of green activities

16 Pollution detection & reduction
- Pollution emission reduction
- Monitoring of air pollution
- Etc...

17 Waste remanufacturing & refurbishing
- Upcycling of fabric waste
- Metals refurbishing
- Bio-conversion remanufacture
- Etc...

18 Air transport greening activities
- Electric planes
- Electric airside fleets
- H2 powered plans
- Etc...

19 Personal vehicle greening activities
- Autonomous private vehicles
- Hybrid private vehicles
- Ride sharing
- Etc...

20 Management of biological & hazardous waste
- Biological waste composting
- Automated waste collection
- Waste filtering & storage
- Etc...

21 Recovery from non-hazardous waste
- Waste to energy
- Biogas from waste
- Industrial waste exchange
- Etc...

22 Landfill services activities
- Gas capture and utilisation
- Smart landfill management
- Etc...

23 Recycling & related activities
- Bio-conversion
- E-waste management
- Blackwater recycling
- Etc...

24 Public transport greening activities
- Autonomous buses
- H2 powered taxis
- ZDE emission buses
- Etc...

25 Sea transport greening activities
- Energy efficient ships
- Cold ironing
- Etc...

26 Road & rail freight greening activities
- Cleaner energy trucks
- Resource pooling software
- Etc...

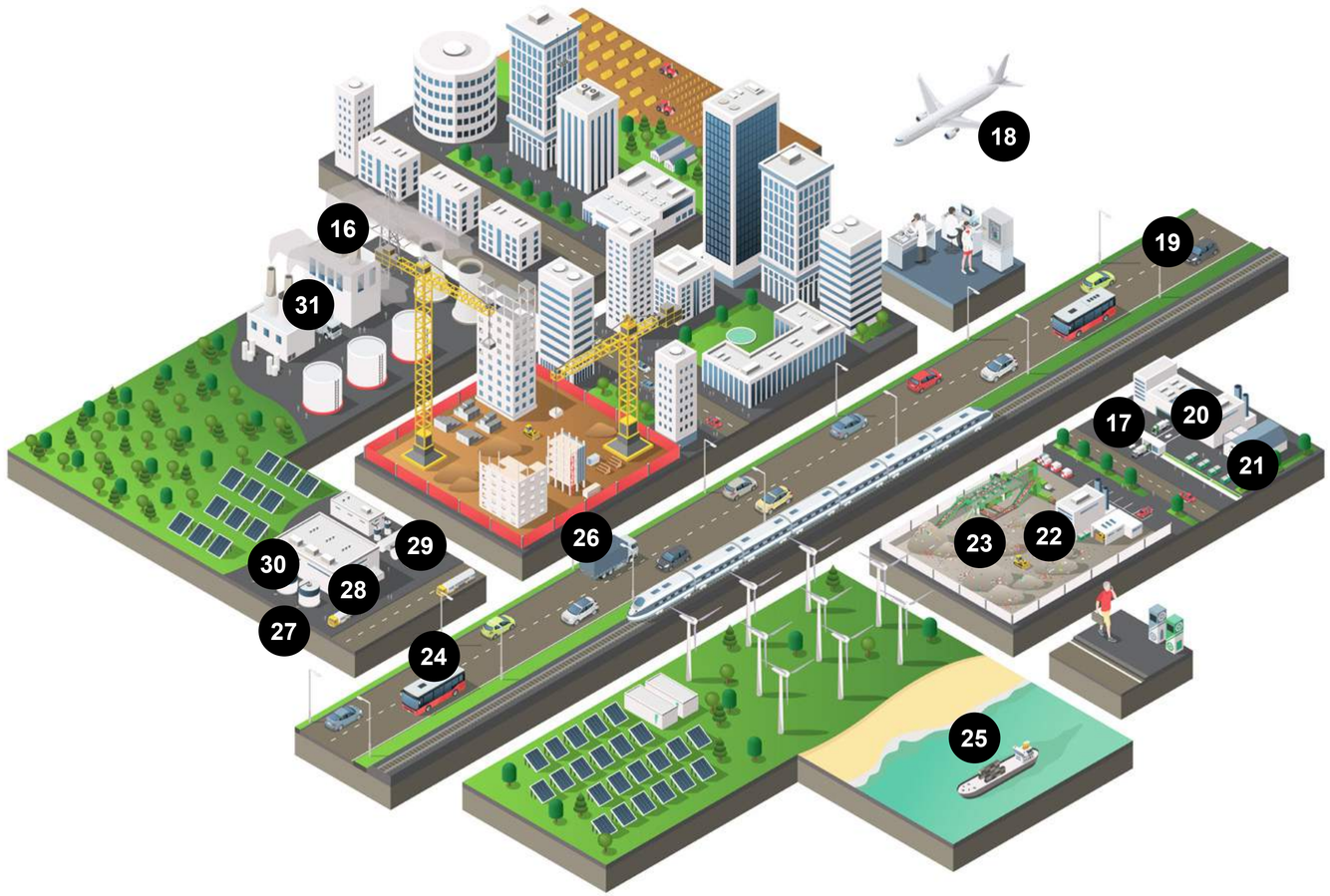
27 Greening plastic & plastic products
- Lignin-based polymers
- Sustainable food packaging
- Etc...

28 Greening of electronics
- Semiconductor wafer fab.
- Greening of engineer process
- Chips for green technology
- Etc...

29 Greening of raw materials & metals
- Eco concrete
- Sustainable apparels
- Green paint
- Etc...

30 Greening of chemicals
- Carbon black
- Disodium carbonate
- Nitrogen compounds
- Etc...

31 Carbon capture, transport & storage
- Oxyfuel combustion
- Coal bed methane recovery
- CO_2 capture modules
- Etc...



1.3. Building a strategic green economy taxonomy

A long list of green activities

32 Environmental monitoring & modelling
- Environmental data analysis
- Enhanced coastal monitoring
- Climate modelling services
- Etc...

33 Water treatment
- Water chemical treatment
- Filtration membranes
- Membrane bioreactors
- Etc...

34 Water storage
- Water tanks
- Rainwater harvesting
- Stormwater management
- Etc...

35 Water monitoring
- Water bodies cleanup
- Meteorological solutions
- Reservoir quality control
- Etc...

36 Water desalination
- Electrochemical desalination
- Wastewater reduction
- Etc...

37 Water infrastructure
- Drainage systems
- Reservoir
- Etc...

38 Sewage services
- Sewer rehabilitation
- Sewage treatment
- Manure and slurry treatment
- Etc...

39 Flood defences
- Surge barrier management
- Pumping station
- Urban flood barriers
- Etc...

40 Environmental consulting services
- Environmental certification
- Energy auditing
- ESG rating / indexing
- Etc...

41 Supporting fresh water & marine ecosystems
- Marine habitat conservation
- No-fishing area patrol
- Freshwater conservation
- Etc...

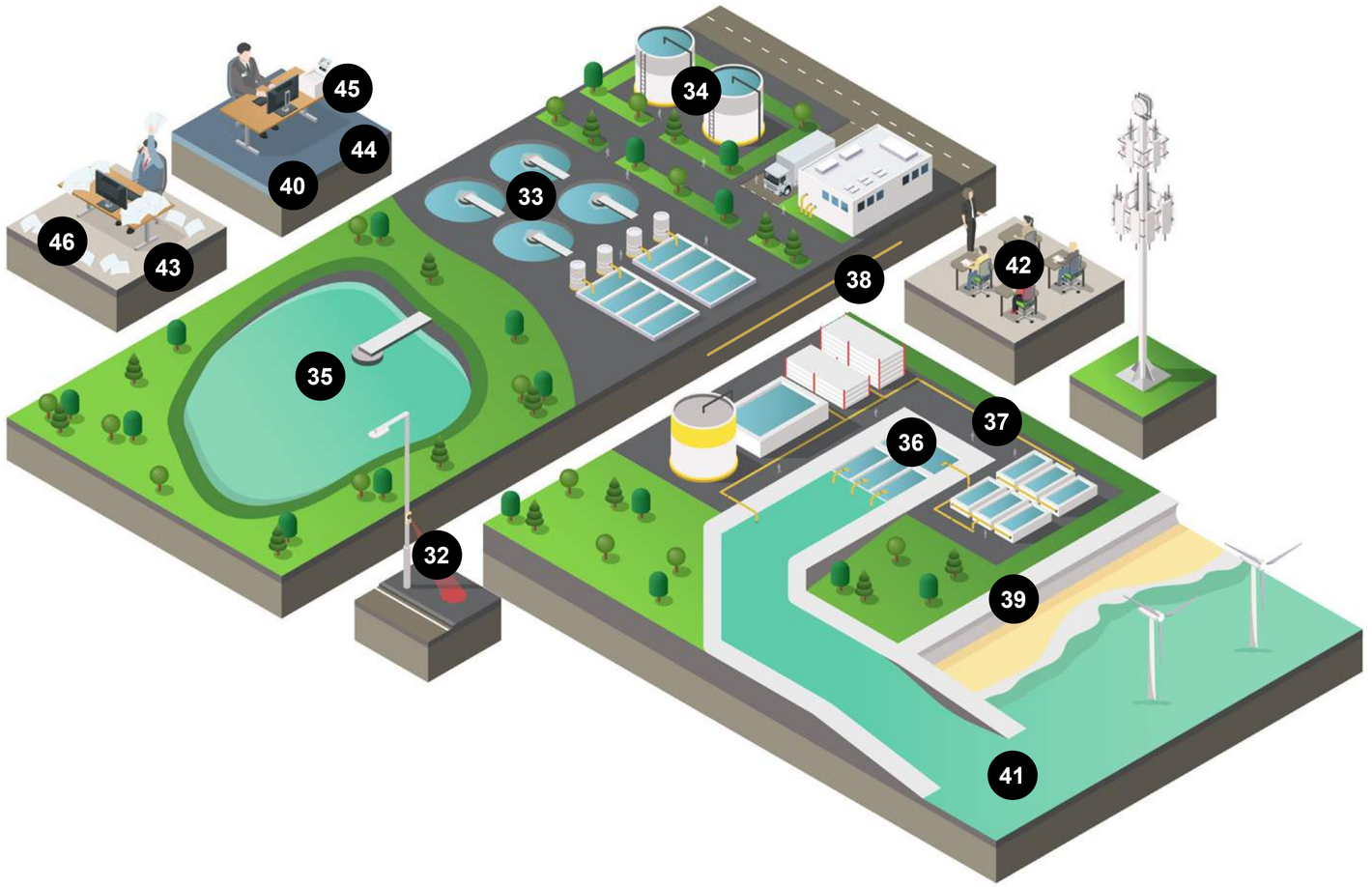
42 Environmental education and training
- Green agri food training
- Green construction training
- ESG reporting training
- Etc...

43 Brokering and trading
- Carbon credits
- Environmental goods
- ESG investments
- Etc...

44 Green finance & insurance
- Impact funds
- Sustainability linked bonds
- Climate change insurance
- Etc...

45 Supporting environmental professional services
- Green marking activities
- Environment media coverage
- Green incubators
- Etc...

46 Cities design & engineering consulting
- Green transport design
- Green waste strategies
- AI traffic flow modelling
- Etc...



1.3. Building a strategic green economy taxonomy

Managing transitional activities

2+3 Assess exclusion criteria and green status

As steps 2 and 3 are aligned with existing taxonomies, we will not go into further details. It is enough to say that "*Do Not Significantly Harm*" and "*Transitional"* criteria should be applied to each green activity candidate to determine whether the activity is fully green (i.e. best practice actively leading to a net zero future) or transitional (i.e. not best practice but potentially representing a helpful step towards a net zero future, like Natural Gas). Transitional activities are then assessed as part of Step 4.

4 Assess the inclusion status of transitional activities

A large proportion of economic activities are "transitional" in nature and are being recognised by global taxonomies as "green". However, to what extent, according to what criteria and for how long should they be included? **Step 4 is providing a systematic approach to resolving these cases.** While it is impossible to reconcile viewpoints on controversial activities (such as natural gas), we aim here to develop tools for taxonomy designers to make systematic and well-informed decisions. There are two important steps in this process.

Step 1 – Assess level of inclusion

A first step for all taxonomy designers would be to determine whether a transitional activity should be fully included, partially included or fully excluded. We see two distinct responses:

- **Align to global consensus:** an extensive review of global taxonomies provides an excellent indication of global consensus on a particular activity, be it full, partial or non-inclusive.
- **Conduct internal arbitration:** in the absence of global consensus, a process of arbitration can be initiated, which might require consultation with relevant government agencies, industry associations and key private sector players.

In cases of full inclusion and full exclusion, the way forward is quite clear. But how should partial inclusion activities be treated?

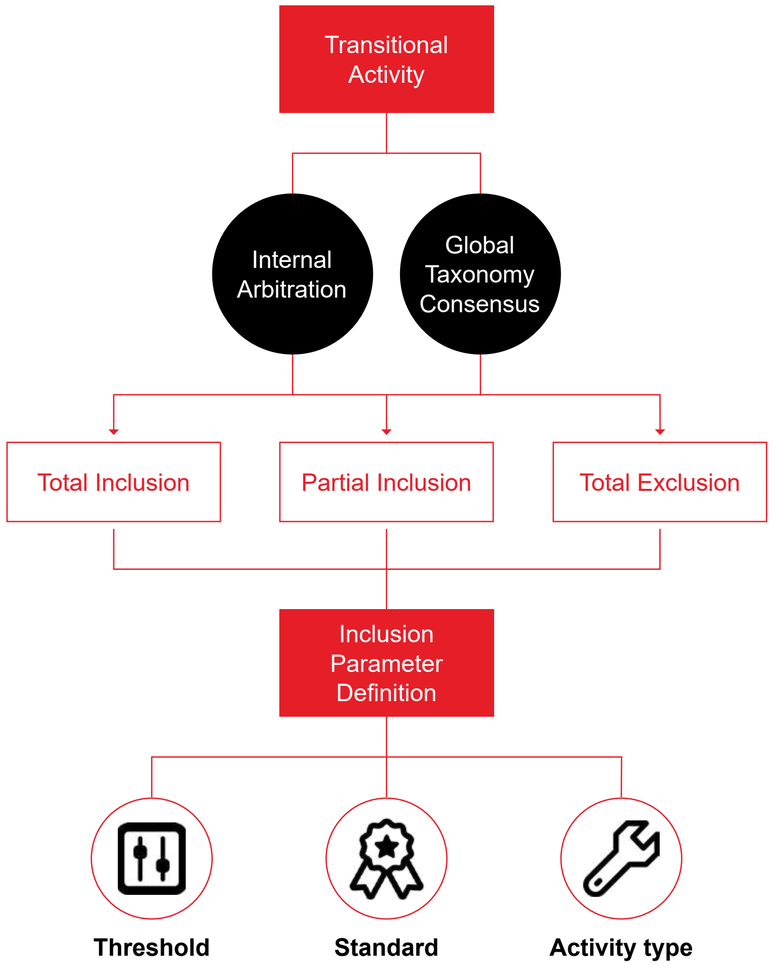
Step 2 – Clarify partial inclusions

For all "partial inclusion" activities, a set of inclusion elements need to be defined and recorded, to establish a clear baseline position which – as the situation evolves – can be modified. Governments can make this decision based on **three criteria** (as opposed to using uniquely thresholds, which is the approach taken by EGSS):

Threshold: A threshold determines which portion of the activity is green based on whether it falls under/above a quantifiable limit.

Standard: A standard, label or any certification that can help discriminate whether a product, an asset or a service can be considered green.

Activity type: When an activity can be broken into several sub-activities, some of which can be considered green and some of which cannot.



1.3. Building a strategic green economy taxonomy

An adaptable approach

5 Map the activities of the value chain

Steps 1 to 4 should yield a comprehensive list of "wholly green" and "transitional" activities, detailing the extent of their inclusion and on what criteria. Most taxonomies stop at that level. Doing so, however, leaves an important question unanswered: **should the value chain of a green activity be considered green as well?**

For example, for "manufacture of low carbon technology" – is it only the manufacture that should be considered green, or should we also consider the R&D activities that allowed for that technology to emerge, the finance that allowed these businesses to flourish, or the transportation of the technology from the manufacturer to the end user?

It would be tempting to say that these activities would be captured in the green activity list of the professional, scientific and technical activities (ISIC 69-75), financial and insurance activities (ISIC 64-66), and transportation and storage (ISIC 49-53).

However, this is not the case. Green activities typically captured under these sectors fail to reflect the full economic value created as part of the value chain of other green activities.

In order to tackle this issue, a taxonomy designer should be able to map out which elements of the value chain of a given green activity could be considered "green" as a result. We provide here a preliminary structure, which applies to the 500+ sub activities we have identified as part of past projects. This structure should be seen as a baseline on which taxonomy designers can build.

Two fundamental questions remain:

1. **What should be mapped?**
   Not all activities within a green activity's value chain should be considered as green (or else the whole economy would immediately qualify). Only value chain activities that require a specific skill, technology or apparatus should be considered. For example, transportation of hydrogen is a specialised part of the process and should be mapped as green. In contrast, the transportation of "eco-concrete" will not be mapped, as transport of such a product is not specialised compared to normal concrete.
2. **Is there a risk of double counting?**
   When mapping the value chain of a green activity, careful consideration should be given to not take into account an activity listed itself as a green activity in another sector.

Value Chain Activities		ISIC Coding
Enablers	R&D	72
	Finance	64-66
	Consulting	69-71, 73-74
Value chain	Raw material	1-3, 5-9
	Planning & Design	71
	Manufacturing	10-11, 13-32
	Construction / Engineering	41-43
	Logistics	52
	Wholesale & Retail	45-47
	Installation / Retrofit	33, 42, 43
	Repair / Maintenance	33, 41, 43, 45, 81, 95
	Demolition / Disposal	38, 43
Operations	Electricity / Gas	35
	Water / Sewage	36, 37
	Waste & Recyling	38, 39
	Transport operations	49-53
	ICT services	58-63
	Growing of crops	1-3
	Rental	68-77
	Other Services	55, 56, 68, 75, 78-99

1.3. Building a strategic green economy taxonomy

Two examples

	1 Develop a list of **green activity candidates**	2 Assess "**Do Not Significantly Harm" criteria**	3 Assess the **green status** of the green activity candidate	4 If identified as a transitional activity, assess **inclusion status**	5 Map the selected green activities along the **value chain**
 **Electricity from solar panels**	The activity **does not significantly harm** any environmental outcomes (or economic / social ones, if one takes a broader definition).	This activity **decreases emissions from electricity generation**, and meets the criteria to be recognised globally as a "wholly green activity".	As this activity is "wholly green", it is **fully included in the taxonomy**, with no criteria attached.	Activities related to R&D, financing and consulting are considered as green, and so is the manufacturing, installation, sale, maintenance and disposal of solar panels, as well as the utility service provided around it.
 **Biofuel blend for air transport**	The activity **does not significantly harm** any environmental outcomes (or economic / social ones, if one takes a broader definition).	This activity **decreases emissions from transportation and reduces air pollution**. Though biofuel for air is linked to lower emissions, it is seen by global taxonomy as **transitional**	**Partially included, using a "product type" criteria**. Any activities related to using biofuel from unsustainable feedstock sources are excluded because they impact food supply, which harm adaptations.	Activities related to R&D, financing and consulting for biofuel blend in air transport are considered as green. Economic value is added from the raw materials and when the biofuel is manufactured and sold in transport operations.

Taxonomy details

Below is a snapshot of our strategic green taxonomy. It has been designed to provide a detailed yet flexible list of green activities, along with their inclusion status and criteria.
The tool can be updated as global consensus (or national positions) on these activities evolve. If you have any questions about the full 500+ activities of the taxonomy, feel free to contact us (see page 64)

Column 1 Sector	Column 2 Green Activity	Column 3 Sub Activity	Column 6 Status	Column 8 Consensus	Column 9 Inclusion	Column 10 Criteria	Column 11 Conditions
Manufacturing	Greening of electronics	Cables	Transitional	Arbitration	Partial	Activity	Must be used to support green outcomes
Manufacturing	Greening of electronics	Inverters	Transitional	Arbitration	Partial	Activity	Must be used to support green outcomes
Manufacturing	Green fuel	Synthetic biofuel	Transitional	Arbitration	Partial	Activity	Feedstock must come from sustainable sources
Manufacturing	Green fuel	Organic biofuel	Transitional	Arbitration	Partial	Activity	Feedstock must come from sustainable sources
Manufacturing	Green fuel	Low sulphur fuels	Transitional	Arbitration	Partial	Activity	Feedstock must come from sustainable sources
Waste collection & treatment	Recycling	Bio-conversion	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Construction waste recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Electronics waste recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	E-waste management	Wholly Green	n.a.	Total	-	-
Waste collection & treatment	Recycling	Glass recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Horticultural waste recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Metals recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Oil and sludge recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Paper recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Plastics recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Rubber recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Scrap tyres recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Wood recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Packaging recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Battery recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Recycling	Blackwater recycling	Transitional	Consensus to Include	Total	-	-
Waste collection & treatment	Landfill services	Landfill gas capture and utilisation	Transitional	Arbitration	Partial	Activity	Landfill must not accept further waste and must capture 75% of gas
Waste collection & treatment	Landfill services	Landfill facilities	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water storage	Water tanks	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water storage	Rainwater harvesting	Wholly Green	n.a.	Total	-	-
Waste supply and sewerage	Water storage	Stormwater management	Wholly Green	n.a.	Total	-	-
Waste supply and sewerage	Water monitoring	Analytical instruments	Wholly Green	n.a.	Total	-	-
Waste supply and sewerage	Water monitoring	Water bodies cleanup	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water monitoring	Meteorological solutions	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water monitoring	Reservoir water quality control	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Water chemical treatment	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Filtration membranes	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Membrane bioreactors	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Oil and grease removal	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Slop oil and sludge removal	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Water and wastewater treatment	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Water ionizer	Transitional	Consensus to Include	Excluded	-	-
Waste supply and sewerage	Water treatment	Water reclamation – water recycling	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Drinking water treatment	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water treatment	Dewatering service	Transitional	Consensus to Include	Excluded	-	-
Waste supply and sewerage	Water distribution	Smart water supply management & op	Wholly Green	n.a.	Total	-	-
Waste supply and sewerage	Water distribution	Plumbing fixtures	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water distribution	Water piping systems	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water distribution	Water supply network	Transitional	Consensus to Include	Total	-	-
Waste supply and sewerage	Water distribution	Water flow systems within buildings	Transitional	Consensus to Include	Total	-	-

1.4. Taxonomy details

The value chain approach

One of the key innovations of the strategic green taxonomy is a value chain mapping tool that aims to identify, for each of the 500+ activities, which portions of the value chain should be considered "green". This approach allows for a more complete understanding of the opportunity.

			Enablers			Product Lifecycle								Operations							
			R&D	Finance & Insurance	Consulting	Raw Material	Planning & Design	Manufacturing	Construction & Engineering	Logistics	Wholesale & Retail	Installation & Retrofitting	Repair & Maintenance	Demolition & Disposal	Electricity, Gas, Heating & Cooling	Water & Sewerage	Waste & Recycling	Transport Operations	ICT Services	Growing of Crops	Rental	Other Services
			72	64-66	69-71 73-74	1-3 5-9	71	10-11 13-32	41-43	52	45-47	33, 42, 43	33, 41, 43, 45, 81, 95	38, 43	35	36, 37	38, 39	49, 53	58-63	01-03	68, 77	55, 56, 68, 75, 78-99
Column 1 Sector	**Column 2 Green Activity**	**Column 3 Sub Activity**	**Column 12 Value Chain Mapping**																		
Manufacturing	Greening of electronics	Cables	X	X	X			X			X	X	X								
Manufacturing	Greening of electronics	Inverters	X	X	X			X			X	X	X								
Manufacturing	Green fuel	Synthetic biofuel	X	X	X			X		X	X							X				
Manufacturing	Green fuel	Organic biofuel	X	X	X	X	-	X	-	X	X	-	-	-	-	-	-	X	-	-	-	-
Manufacturing	Green fuel	Low sulphur fuels	X	X	X	X	-	X	-	X	X	-	-	-	-	-	-	X	-	-	-	-
Waste collection & treatment	Recycling	Bio-conversion	X	X	X	-	X	X	-	X	X	X	-	-	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Construction waste recycling	X	X	X	-	X	X	-	X	X	X	X	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Electronics waste recycling	X	X	X	-	X	X	-	X	X	X	X	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	E-waste management	X	X	X	-	X	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Glass recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Horticultural waste recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Metals recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Oil and sludge recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Paper recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Plastics recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Rubber recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Scrap tyres recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Wood recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Packaging recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Battery recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Recycling	Blackwater recycling	X	X	X	-	X	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-
Waste collection & treatment	Landfill services	Landfill gas capture and utilisation	X	X	X	-	X	X	-	-	X	X	-	-	-	-	-	-	-	-	-	-
Waste collection & treatment	Landfill services	Landfill facilities	X	X	X	-	X	X	X	X	-	-	-	-	-	-	X	-	-	-	-	-
Waste supply and sewerage	Water storage	Water tanks	X	X	X	-	-	X	-	X	X	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water storage	Rainwater harvesting	X	X	X	-	X	X	X	X	X	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water storage	Stormwater management	X	X	X	-	X	X	X	X	-	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water monitoring	Analytical instruments	X	X	X	-	-	X	-	-	X	X	-	-	-	-	-	-	X	-	-	-
Waste supply and sewerage	Water monitoring	Water bodies cleanup	X	X	X	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	X
Waste supply and sewerage	Water monitoring	Meteorological solutions	X	X	X	-	-	X	X	X	-	X	X	-	-	-	-	-	-	-	-	X
Waste supply and sewerage	Water monitoring	Reservoir water quality control	X	X	X	-	-	X	X	-	-	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water treatment	Water chemical treatment	X	X	X	-	X	X	X	-	-	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water treatment	Filtration membranes	X	X	X	-	-	X	-	-	X	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water treatment	Membrane bioreactors	X	X	X	-	-	X	-	-	X	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water treatment	Oil and grease removal	X	X	X	-	-	X	-	-	X	X	X	-	-	X	-	-	-	-	-	-
Waste supply and sewerage	Water treatment	Slop oil and sludge removal	X	X	X	-	-	X	-	-	X	X	X	-	-	X	-	-	-	-	-	-

1.4. Taxonomy details

Not all green activities are created equal

As one classifies the key activities that constitute a country's green economy, some interesting patterns emerge that are worth noting, as they may influence green economy strategies later on.

Traditional vs new green activities

The typology draws a clear line between:

- Activities designed to clean **existing "brown" industries** (such as decarbonising data centres or adopting sustainable farming practices), and
- **Brand new green economic activities that could form the core of a new and emerging "green sector"** (such as green finance or organic biofuel manufacturing).

Why is this distinction important? Firstly, because they play different roles in creating a vibrant green economy.

Traditional green activities play a vital function in cleaning an economy, without making fundamental changes to its composition (e.g. oil and gas, mining, extensive agriculture, etc).

New green activities, on the other hand, provide potential new drivers of prosperity away from traditional sectors. They encompass new technologies and value added services that create new avenues for prosperity and job creation.

The second reason is that new technologies and services, particularly in the area of finance and technology, play a critical role as enablers for the greening of traditional sectors. For example, the financing, R&D and manufacturing of ever more effective and commercially viable carbon capture membranes will drive the technical and financial feasibility (and adoption), of technologies that clean emission intensive industries. In that regard, new green activities are providing some of the most important catalysts on which the expansion of traditional green activities rely.

Walking on two green legs

We might view traditional green activities as a short-term step towards a cleaner economy, and new green activities as a more long-term positioning towards new and fast growing industries. However, this perception is only partially true. If one is looking at green activities' potential to grow the economy both through local markets and exports, we observe that:

1. **Traditional green activities do help many countries develop a set of focused expertise, processes and technologies** that can be exported by said countries to help fellow nations undergo similar greening processes.
2. Similarly, **new green activities can be both developed and implemented at home,** and exported to enable green economies globally.

Our conclusion: **a well-balanced green economy should look equally at both types of activities**, traditional and new, as they both play a critical role in not only the cleaning of local industries, but in developing a country's future global competitive positioning as well.

2 Sizing the green economic opportunity

Understanding the threat, gauging the opportunity

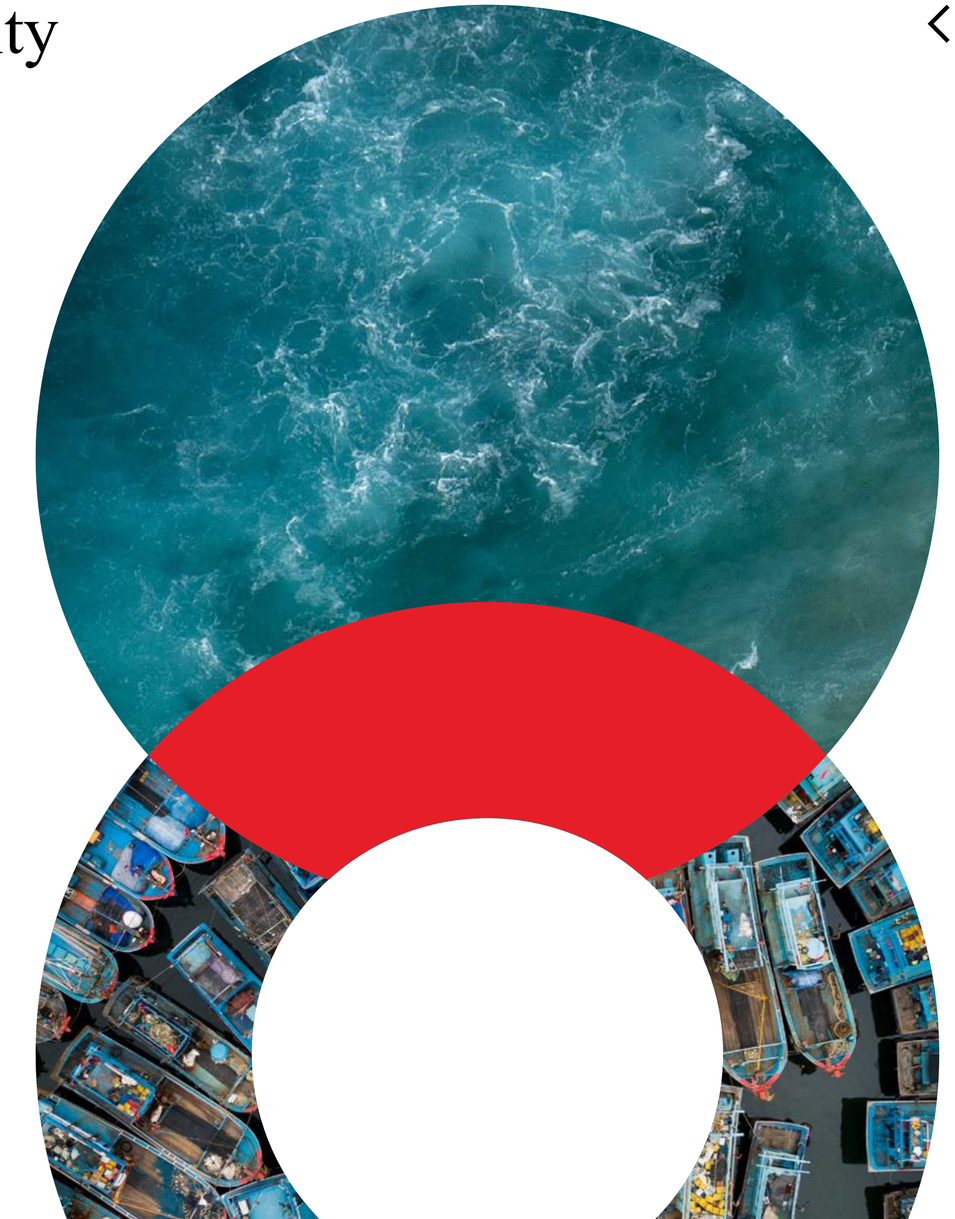
Over time, the green economy will grow to encompass businesses and workers up and down the value chain, with interests in every sector of the economy. Our new framework for classifying green economic activity, described in Chapter 1, is designed to help policymakers consider which aspects of the green economy present them with an opportunity to boost prosperity, generate jobs and strengthen their global competitiveness, in particular in the context of a global transition to a carbon-free energy system.

But while we estimate that opportunities in the green economy run into the trillions of dollars, it is important first to understand the human — and financial — implications of leaving climate change unchecked. Scenario analysis by Oxford Economics suggests that a failure to act on climate change could damage global GDP by around 5% by 2050, compared to a scenario in which the world achieves net zero carbon emissions by 2050. After 2050, the global GDP impacts grow even more severe.

The last seven years have been the seven hottest in the recorded history of the planet. Last year (2021) saw new climate extremes — including the most severe heatwave ever and record high temperatures for 8% of the world's population. Just a few weeks before the start of the COP27 climate change summit, devastating floods in Pakistan affected 33 million of the country's 230 million population. We have seen unprecedented losses of biodiversity and the degradation of ecosystems. Arctic sea ice is disappearing faster than previously thought possible.

Aside from the environmental and societal damage these climate events cause, they are highly costly.

The cost of weather-related interruptions to economic activity reached US$233 billion in 2021. That's 0.24% of world GDP, and the fourth year in five that the world economy has been hit by weather related costs of more than $150 billion.



"There will be fortunes made, crudely, solving these problems. There will be fortunes lost by those who don't understand the context and don't invest wisely or stay too late."

Will Day, Fellow, Cambridge Institute for Sustainability Leadership

Understanding the threat, gauging the opportunity

Climate science demonstrates that severe weather will become more frequent the higher the atmospheric concentration of CO_2 rises, meaning growing human and economic costs. Higher CO_2 concentration will also push average temperatures up across the world, increasing heat stress, undermining productivity, and ultimately sapping economies' potential.

Three pillars of opportunity

The macroeconomics of this clean energy transition are highly uncertain. Economists need to be honest about the fact that solving the problem of climate change will be expensive, it will require fundamental shifts in the structure of the global economy and it carries the risk of a negative supply shock as carbon-intensive capital is scrapped. At the same time, it also presents major opportunities for companies, investors and governments.

As this graphical illustration shows, **we have identified three pillars of opportunity** – commercial prospects arising from industry disruption, new green markets, and productivity gains from climate change mitigation – that will translate across all sectors of the economy.

Transition to carbon-neutral environment creates three pillars of economic opportunity	Competitive opportunities in industry disruption			Creating new green market	Productivity gains from mitigation
	Early movers learn by doing, compete for market share amidst industry disruption.	In many sectors, this requires a fundamental shift to renewable fuels and energy.	In some, new green equipment and technology is needed.	This creates an unprecedented surge in demand for carbon neutral products and services.	Successfully limiting global warming places the world economy on a higher-growth trajectory.
Agriculture, Forestry, Fishing	✓	✓	✓	● Equipment and expertise for sustainable farming and mining.	
Manufacturing	✓	✓	✓	● The production of renewable fuels: hydrogen, biofuels.	
Transportation & Storage	✓	✓	✓	● Electric and zero-emissions vehicle, and green supply chains.	
Construction	✓	✓		● Net zero buildings.	
Electricity, Gas, Heating & Cooling	✓	✓	✓	● Clean energy equipment and green technologies.	
Professional, Business & ICT	✓	✓		●○ Sustainability and green engineering business services.	
Water Supply, Sewage & Waste	✓	✓	✓	● Equipment and expertise for desalination and water mgmt.	
Waste & Pollution Control	✓	✓	✓	● Equipment and expertise for smart waste and landfill, circularity.	
Finance & Insurance	✓	✓		● Green finance and carbon trading services.	

Productivity gains in regions most vulnerable to climate change, relative to global warming scenarios.

+

Productivity gains through knowledge spillovers from largescale R&D investment in green technology.

○ Supply chain spending that flows from the production of green goods and services.

● Direct impact
○ Indirect impact

Competitive opportunities in industry disruption

Decoupling economic prosperity from fossil fuel-based energy usage and environmental degradation requires a fundamental transformation of the global economy. A key part of that is a shift away from energy systems dominated by fossil fuels to systems powered predominantly by clean energy. New investments and innovations are required, as well as skilled personnel and technology applications, new infrastructure and a reconsideration of procurement and operational practices.

The transition will be costly and painful for certain enterprises, industries, and economies. But in a transition to a net zero emissions environment by 2050, under a rapid transition away from carbon-intensive activities, a new competitive landscape will emerge. In many sectors, this requires a fundamental shift to consuming renewable fuels and energy. In others, new green equipment and technology will be needed in production. All sectors will experience short-term costs but the chance of earning large rewards over the medium- and long-term horizons.

Just as the dangers of climate change require urgent action, there is a clear commercial imperative for businesses to move quickly in the net zero transition. **We have identified three areas in which forward-looking enterprises will be able to gain a competitive advantage by pursuing the transition to net zero.**

A Boosting business performance

Forward-looking enterprises make cost savings and hire better talent

As part of IKEA's ambition to be climate positive by 2030, its parent company Ingka Group committed to ensure its business runs on 100% renewable electricity by 2025 and to completely phase out fossil fuel-based heating and cooling by 2030.

B Reducing business risk

Early movers mitigate the risks of volatile and rising fossil fuel prices, and shifting government policies and regulations

There are two prominent types of risks for businesses in the net zero transition. The first is fuel prices. Companies that tackle their carbon intensity up-front will be insulated from unpredictable swings in fossil fuel costs and the introduction of carbon pricing. The second source of risk relates to future changes in global laws and regulations around carbon emissions.

C Adapting to changing demands

B2C producers compete to meet the increasingly 'green' demands of consumers, which catalyse the greening of industries through the drive for greener value chains

Carlsberg Group's Together Towards ZERO programme includes the goal to reduce the value chain carbon footprint by 30%. In 2019, it decided to engage with its suppliers on sustainability parameters, collecting data on the amount and type of energy used and recycled content. This data enables Carlsberg to buy cans and bottles with up to 30% lower emissions within the same region.

Creating new green markets

The challenge for businesses, investors, governments and regulators is to ensure they can seize the full potential of these opportunities.

To quantify the size of the green economic opportunity, we lean on the International Energy Agency (IEA's) 'Net Zero by 2050' scenario to formulate baseline projections. The NZE2050 scenario sets out a detailed roadmap of actions required to limit global warming to 1.5C above pre-industrial levels by 2050. We analysed the changes that need to take place in the global economy to facilitate this shift, and identified five of the largest categories of carbon-neutral goods and services that will emerge.

Each category represents a relatively niche product line today, but will command a major stake in the future global economy, under a net zero scenario. We estimate the direct contribution they make to future GDP, and also the indirect contribution they stimulate through their vast supply chains. We refer to these opportunities as new green markets.

2.2. Creating new green markets

Electric vehicle manufacturing

The driver

In 2020, the transport sector accounted for 7.2Gt of CO_2 emissions, equivalent to more than 20% of the global total. This must be reduced to 0.7Gt under the NZE2050 scenario through a combination of modal shifts, energy efficiency improvements, electrification of vehicles that can be electrified, and biofuel displacement for those that cannot. Electric road vehicles play a critical role in the greening of global transport and the market has grown rapidly in recent years. In one decade, the number of electric vehicles on the road, globally, has risen from close to zero to 10 million, according to the IEA. About 3 million new electric cars were registered in 2020 alone.

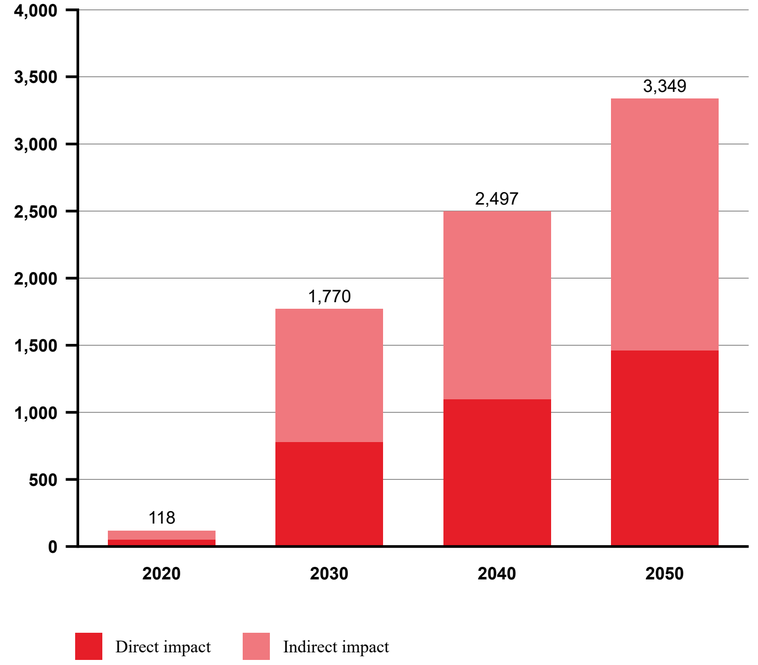
The size

To meet the needs of the IEA net zero scenario, EV production will have to scale rapidly. The electric share of light duty vehicle sales will have to rise from around 4% of total vehicle sales in 2020 to more than 60% in 2030, and close to 100% in 2050. We estimate that the manufacturing of electric motor vehicles (including motorbikes, light and heavy vehicles) and its parts, will directly contribute $777 billion to the global economy by 2030 and $1,471 billion by 2050. We estimate that the EV manufacturing sector will create indirect economic activity in its supply chain worth $993 billion by 2030, rising to $1,878 billion by 2050. **Therefore, we estimate that the total economic activity created by this sector by 2050 will amount to $3.4 trillion.**

Global GVA from EV production, under NZE2050 scenario

USD, billions, 2020 prices

Source: Oxford Economics, Arup, IEA



2.2. Creating new green markets

Renewable electricity generation

The driver

The displacement of fossil fuels by low emissions electricity is one of the most important drivers of emissions reductions in the NZE2050 scenario, accounting for around 20% of total global emissions reductions. The share of renewable energy in total global electricity generation will grow from around 29% in 2020, to 60% by 2030 and nearly 90% by 2050. The majority of this is expected to come from wind and solar power (35% and 33% of total electricity generation respectively in 2050 with hydrogen adding an extra $340 billion).

The size

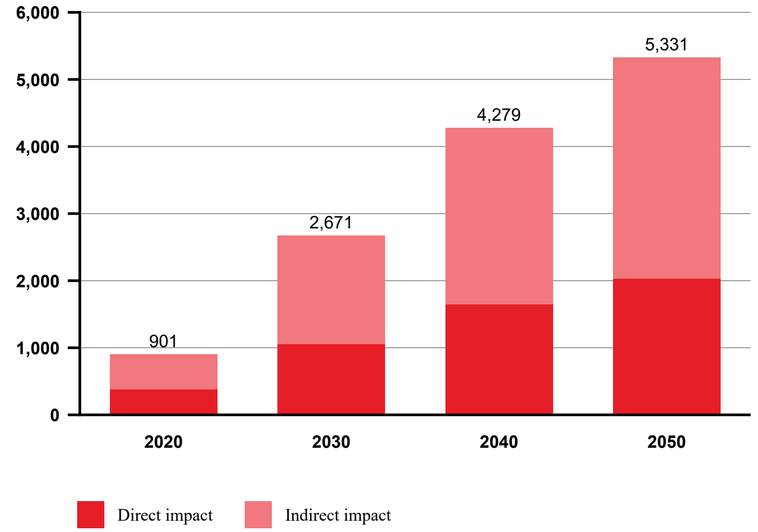
We estimate the green electricity generation and distribution sector will directly contribute $1.06 trillion to global GDP by 2030, rising to $2.03 trillion by 2050. This figure excludes electricity generation from nuclear power plants and carbon capture, utilisation and storage (CCUS)-enabled fossil fuel fired plants but includes the contribution of solar, wind, hydro, bioenergy, geothermal, and marine. In addition, we estimate that this renewable electricity generation will support indirect economic activity in global supply chains worth $1.6 trillion by 2030, rising to $3.3 trillion by 2050.

By 2050 the total economic activity created by this sector will amount to $5.3 trillion.

Global GVA from Renewable Electricity Generation, under NZE2050 scenario

USD, billions, 2020 prices

Source: Oxford Economics



2.2. Creating new green markets

Clean energy equipment

The driver

Achieving the NZE2050's steep reduction in fossil-fuel emissions from electricity production requires a dramatic expansion in the energy supply chain across a wide range of renewable energy sources, including solar, wind, heat pumps, hydro, geothermal, marine and battery power Across this supply chain, it is the expansion in solar and wind power that are most critical. Today, these categories produce less than half the electricity generated by coal, natural gas, and oil-fired power stations. To reach NZE2050, they must be producing more than double that of fossil-based power stations by 2030 and, by 2050, renewable sources must account for 88% of total global electricity generation. Additionally, a wide roll out of heat pumps will enable the world to heat its buildings in a low-carbon way.

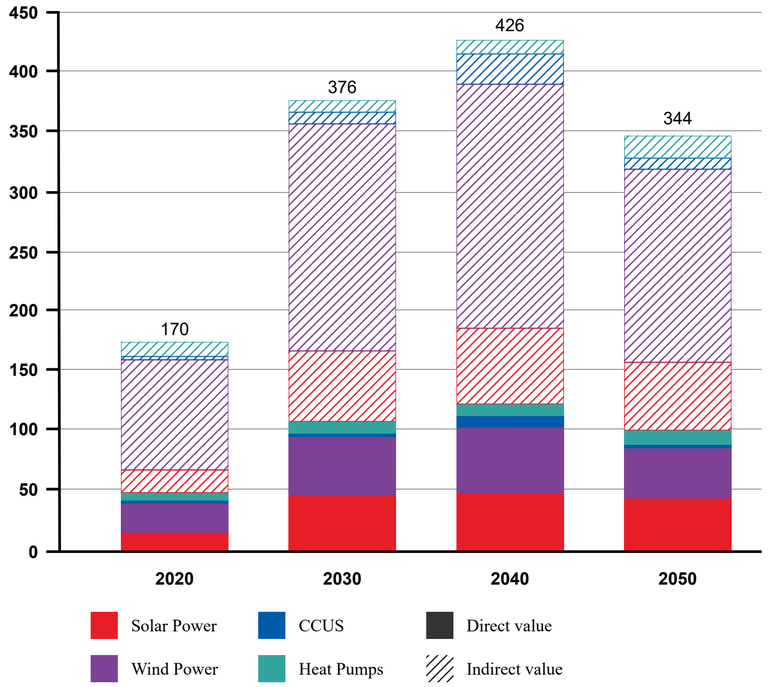
The size

We estimate that clean energy equipment manufacturing activity, as defined above, will directly account for $122 billion of global GDP by 2040, as a result of a rapid escalation in the next eight years. The annual direct GVA contribution to GDP of this sector will then plateau and fall slightly to **$101 billion by 2050** as the need for new capital investment into this infrastructure tails off. This is based on a growth in global production capacity in line with the NZE2050 scenario and Oxford Economics industry forecasts. Solar and wind power generation equipment accounts for around 84% of this total in 2050. But Carbon Capture Utilisation and Storage (CCUS) plays a critical role in the transition during the first half of our forecasting period, reducing the impact of the world's remaining fossil fuel-based power plants. The GVA of this activity peaks in 2034 under our scenario modelling, at $10.4 billion, before falling to $3.5 billion per year by 2050. **We estimate the global clean energy equipment manufacturing sector and its supply chain will be worth a total of $316 billion by 2050.**

Global GVA from clean energy equipment, under NZE2050 scenario

USD, billions, 2020 prices

Source: Oxford Economics



2.2. Creating new green markets

Renewable fuel production

The driver

Part of the solution to reducing carbon emissions in the transport sector and heavy industry comes from a substitution of fossil fuels for sustainable alternatives. Bioenergy plays an evolving role in the net zero transition over the course of the next 30 years. One of its key advantages is that it can be used in existing infrastructure.

Liquid biofuels will play a substantive role in substituting fossil fuels from road transport between now and 2030, before electric vehicles grow dominant. After that, they are increasingly important in the aviation and maritime fuel mix. And as production scales up, new infrastructure will be required to produce, refine and ship sustainable feedstocks.

The size

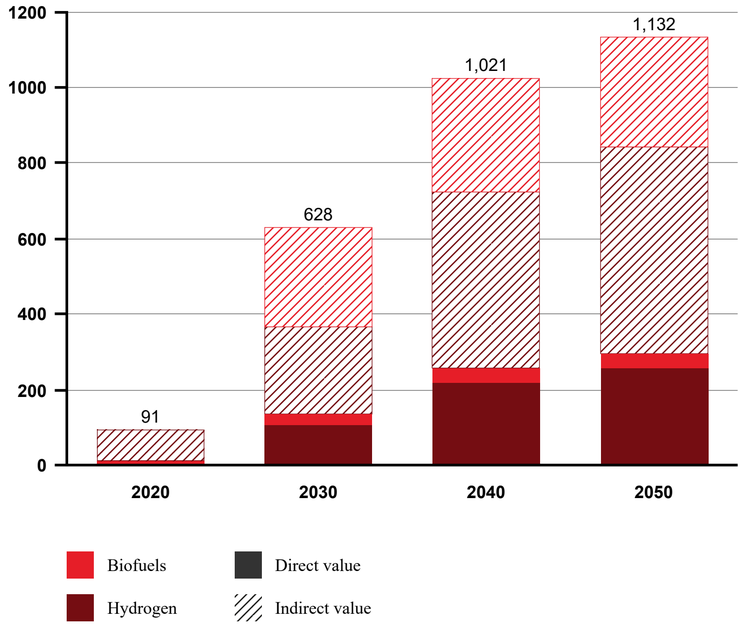
We estimate that renewable fuel production will directly contribute $135 billion to global GDP by 2030, rising to **$295 billion by 2050.** This is based on IEA scenario projections for the use of hydrogen, biogas, ethanol and other liquid biofuels (including biodiesel) and economic data from Oxford Economics industry forecasts.

Our analysis of the supply chain attached to renewable fuel production suggests a considerable indirect economic footprint will also be supported by the growth of this green market. We estimate than an additional $495 billion of economic activity will take place in the supply chain of renewable fuel production by 2030, rising to $837 billion by 2050. **Therefore, we estimate the total economic activity created by this sector by 2050 will be equivalent to $1.1 trillion.**

Global GVA from Renewable Fuel Production, under NZE2050 scenario

USD, billions, 2020 prices

Source:



2.2. Creating new green markets

Green finance

The driver

Capital investment worth 1.5% of global GDP is required to finance the transition to NZE2050, according to the Energy Transitions Commission. A large new capital market must emerge, in which investments to decarbonise the global energy system are driven by the buying and selling of equity and debt instruments.

A new green financial services sector is emerging with the purpose of delivering investable returns and environmentally positive outcomes. Financial tools, such as green bonds and carbon market instruments, incentivise carbon-reducing investments and discourage environmentally damaging ones. They do this by altering risk perceptions and internalising some of the environmental externalities associated with harmful economic activities.

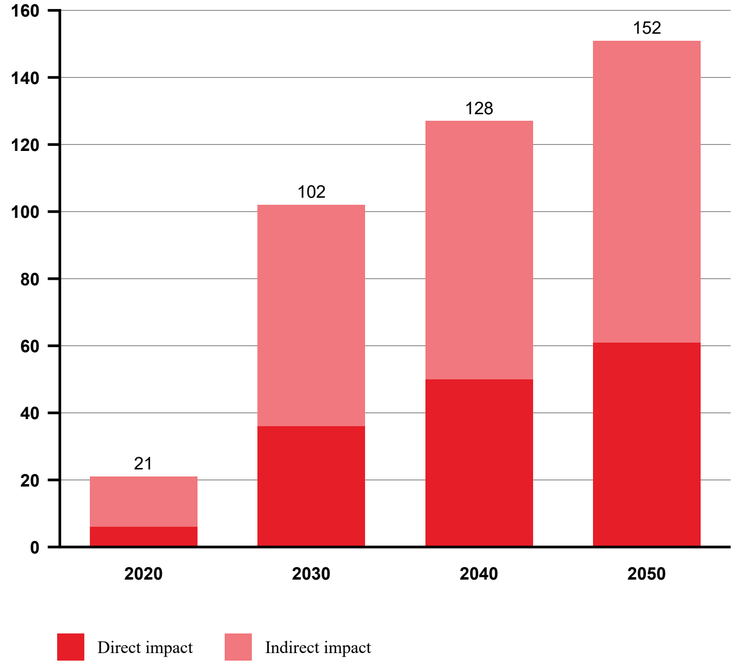
The size

Green finance's impact on the global economy is best judged by the outcomes of the investments it facilitates. In terms of the green opportunity, these outcomes are already represented in the various green markets we describe earlier in this chapter — from clean energy equipment and infrastructure to fossil fuel substitutes. But the green finance sector will also make its own direct contribution to GDP, which from an economic accounting perspective equates to the profits and earnings associated with its issuance of green financial products. We estimate that the green finance industry will make a direct contribution to global GDP of $36 billion in 2030, rising to **$61 billion by 2050**. In addition, a further $66 billion dollars of economic activity will be supported in the sector's supply chain in the 2030 economy, under this scenario, rising to **$90 billion by 2050**.

Global GVA from Green Financial Services, under NZE2050 scenario

USD, billions, 2020 prices

Source:



A boost to productivity and global prosperity

We estimate that the aggregate opportunities presented to industries by the transition to a net zero emissions environment will be worth $10.3 trillion to 2050 global GDP, in 2020 prices. This is equivalent to 5.2% of global GDP that year. Around $4 trillion of this opportunity will be captured directly by those enterprises developing and producing new carbon-neutral goods and services. But a further $6.3 trillion of value is to be added in the wider supply chains of those industries. That means almost two-thirds of the global opportunity is available to a wider array of providers across the world economy.

This transition will also have enormous consequences for global GDP growth - not least by averting the negative impacts of climate change on global productivity. Oxford Economics scenario analysis demonstrates that the macroeconomic impact of the clean energy transition depends on how it is designed. For example, Oxford Economics has designed an upside scenario referred to as the Net Zero Transformation scenario, which assumes significant technological progress and more relaxed fiscal constraints in the climate change mitigation policy mix. Under this scenario, global GDP is boosted by more than 1% by 2050 relative to a scenario based on currently stated policies.

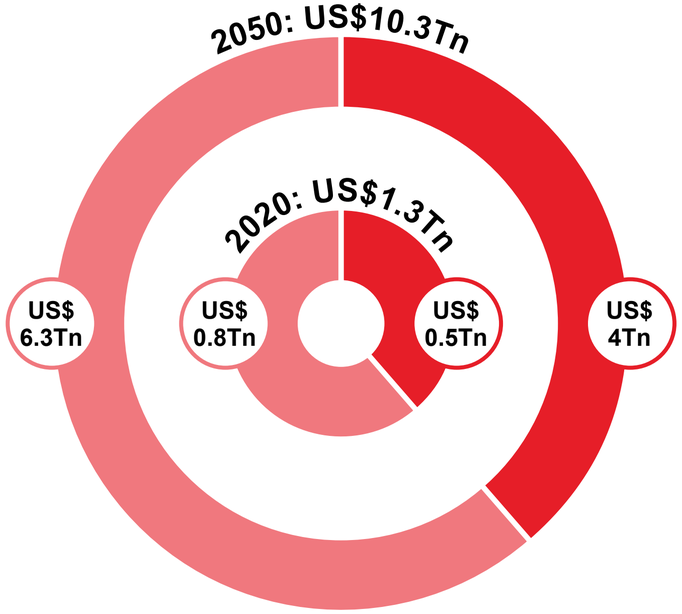
This scenario analysis suggests that if the world economy transitions to net zero over the next three decades, we will need to see an historically large contribution from technological progress and innovation – **roughly equivalent to 0.5% to global GDP by 2050** – to offset the negative supply shock from scrapping carbon-intensive capital and higher energy prices.

In addition to innovation, this Net Zero Transformation scenario assumes that governments introduce policies that encourage private sector investment. Measures such as R&D tax credits, co-financing, and risk guarantees all have the potential to spur faster private sector investment and generate R&D spillovers.

These can be thought of as “carrots” to incentivise private investment, in addition to the “stick” of carbon pricing.

Investments made in low-carbon technology can amplify investment in other sectors too. For example, an expansion in renewable energy capacity requires investment in the manufacturing sectors that supply components, and so on down the supply chain. In fact, the carbon prices needed to facilitate the transition do not play a significant role in this Net Zero Transformation scenario because technological progress results in a lower cost of carbon abatement. This eases the cost of transition to consumers and limits the damage to consumer spending.

Therefore, if delivered effectively, the policy profile described in Oxford Economics’ Net Zero Transformation scenario can result in higher levels of both consumer spending and overall investment, with positive outcomes for GDP growth. In the longer run, the eventual economic dividend will be much greater. Research suggests the most damaging effects of climate change are likely to occur in the second half of this century, so the benefits of averting climate change multiply after 2050.



	2020	2050
Green finance	$21Bn	$152Bn
Biofuels	$88Bn	$326Bn
Hydrogen	$3Bn	$806Bn
Clean energy manufacturing	$170Bn	$340Bn
Renewable power generation	$901Bn	$5,331Bn
Electric vehicles	$118Bn	$3,349Bn

USD, billions, 2020 prices
Source: Oxford Economics, IEA, Arup

Direct impact Indirect impact

The winners and losers from clean energy transition

This transformation to a world of net zero carbon emissions will require the injection of hundreds of billions of dollars of investment a year into clean energy infrastructure. As we have identified, this investment fuels new economic activity via the demand for new green goods and services. But it is also important to consider where that investment will come from.

Carbon taxes are seen as a critical component of the decarbonisation strategy because – as well as influencing consumption choices – they generate government revenues to fund the energy transition. However, carbon prices can generate inflationary pressures, which reduce real disposable incomes and profits. In a scenario of more stringent climate change mitigation measures, this can lead to essentially a zero-sum solution, whereby the boost to investment is effectively financed by consumers.

The economic impact and political success of mitigation policy also depends on its design. For instance, if carbon taxes fall predominantly on poor households (i.e. a regressive tax) then the economic impacts are likely to be greater because poorer households have a higher marginal propensity to consume. A long-term climate change mitigation manifesto becomes more difficult to administer the more it hurts consumers in the short-term.

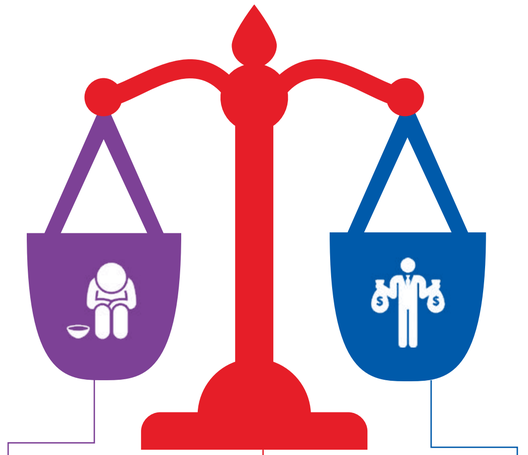
There are of course long-term economic benefits associated with the clean energy transition, which are more equitable. Because countries with hotter climates tend to be amongst the hardest-hit by climate change and natural disasters, and are also more typically lower-income economies, this is where the economic benefits of averting climate change are likely to be greatest.

Oxford Economics' Global Climate Service scenario analysis suggests that if we are to transition to net zero carbon emissions over the next three decades, we will need to see an historically large contribution from technological progress and innovation – roughly equivalent to 0.5% to global GDP by 2050 – to offset the negative supply shock from higher energy prices.

To reiterate, achieving a net zero and carbon neutral world by 2050 is the defining challenge of our age. It relies on many partners working together to shoulder great costs, **and to do so as equitably and efficiently as possible.** It is important for policymakers to be honest about the challenges businesses, investors and consumers will have to face if we are to halt global warming on the sort of timescales scientists are telling us is necessary. Indeed, both governments and economists need to be up-front about the trade-offs involved and design policy accordingly.

Distributional impact of climate policy options

Source: Bruegel, 'Distributional Impacts of Climate Policies' (2018)

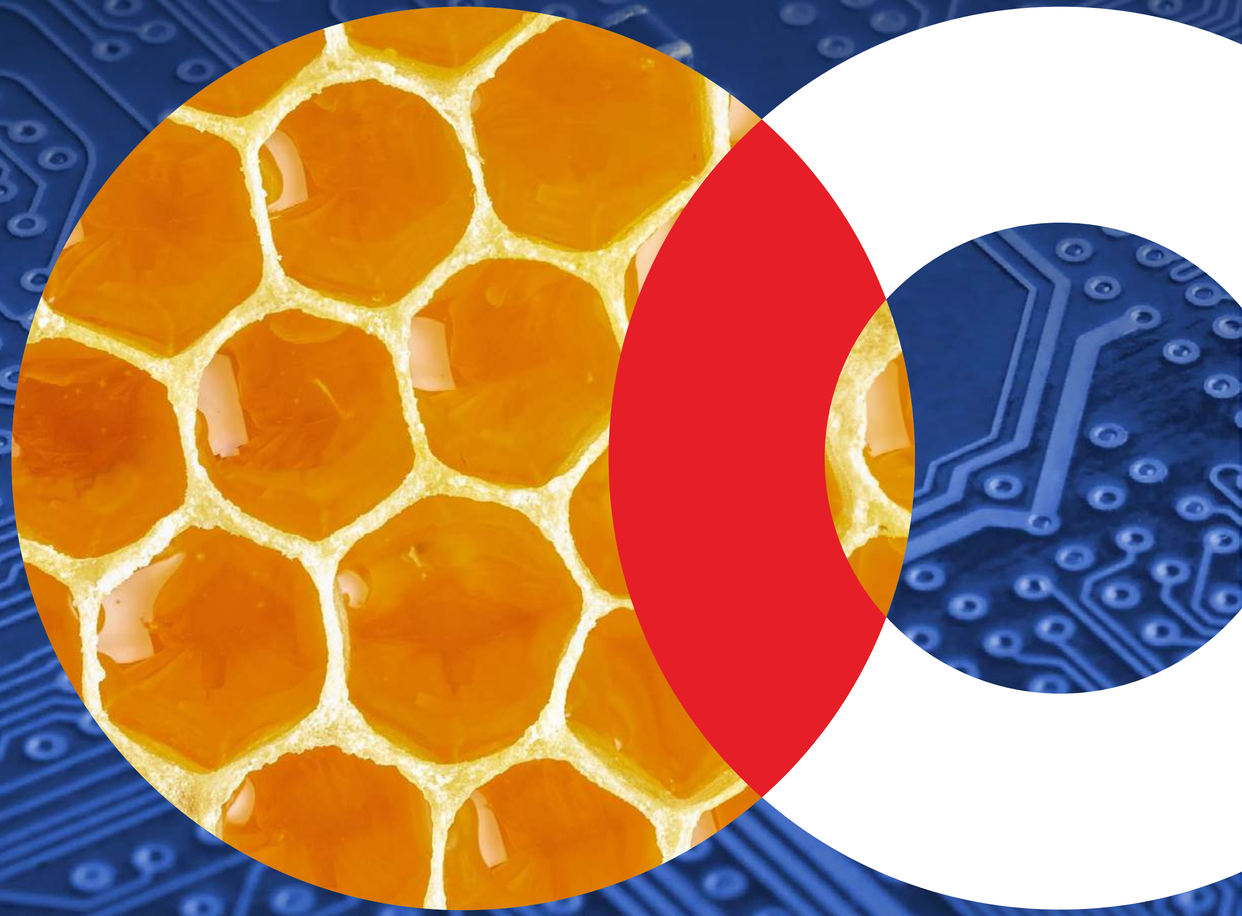


Unclear
Carbon tax on road fuel
Public investment in low carbon technology
Tariffs on high carbon imports

Regressive
Carbon tax on electricity
Carbon tax on heating
Subsidies on low carbon consumer goods
Vehicle standards
Carbon tax on maritime transport

Progressive
Carbon tax on air transport

3 Capturing the green opportunity



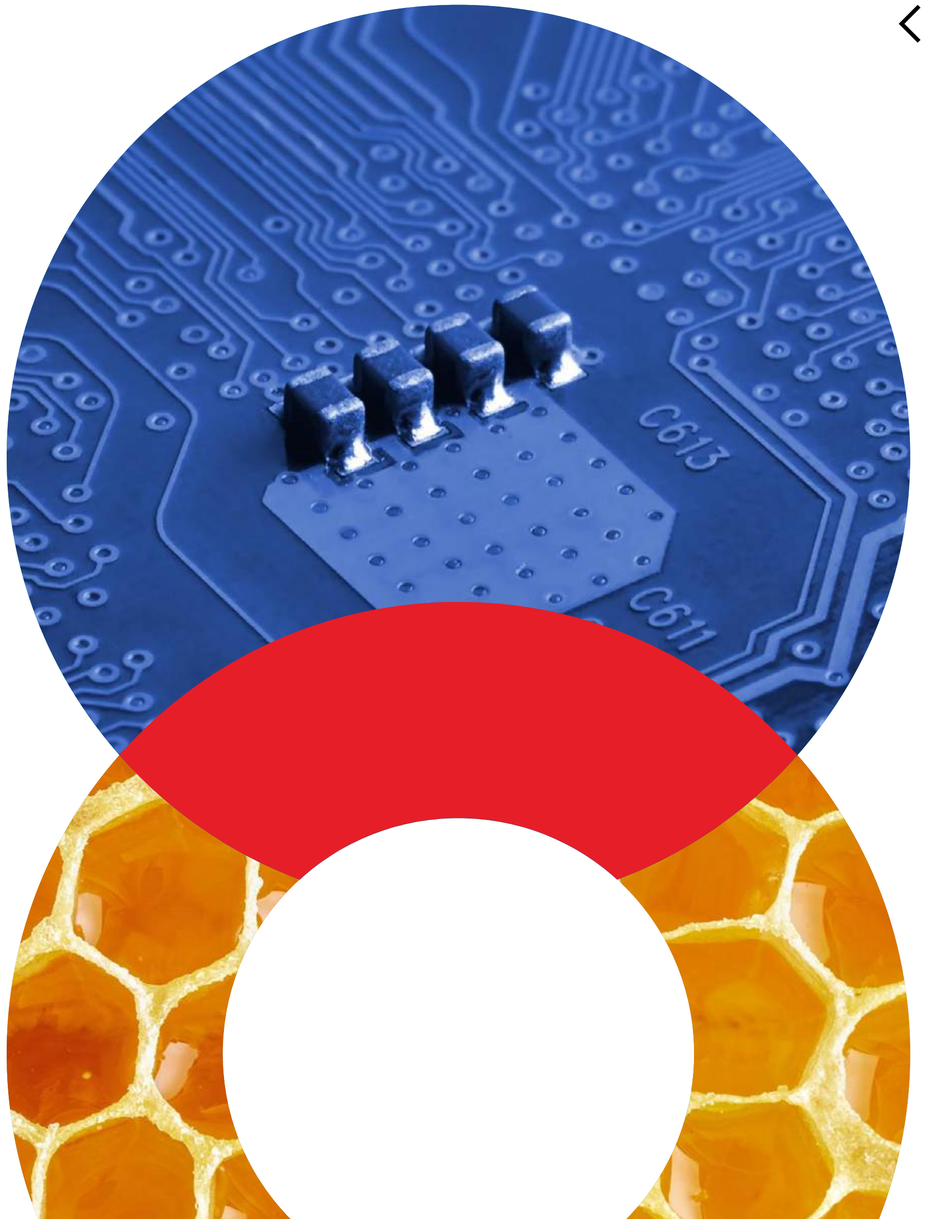
Capturing the green opportunity

We now know the green economy will constitute a significant portion of the global economy in 20 to 30 years' time. So, why is now the right time to take decisive actions that foster green prosperity?

The most obvious answer is that regulatory pressures are building up, creating significant transition risks for governments and industries that fall behind. But just as importantly, investing in green industries early could generate significant first mover advantages for countries daring enough to bet on a green future, especially as the decreasing cost of green technologies is unlocking promises of future returns.

However, not every country can invest in every single green opportunity, nor should they. **So how should governments go about identifying the green activities that make sense for their economy?** Which green industries should they focus on, to develop a real competitive leadership at a global level? Being able to identify the right green opportunities requires a keen understanding of green market development, the global green competitive landscape and most importantly of any given country's own unique characteristics.

With the opportunities now sized and identified, governments can play a critical role in taking the right actions to capture them. When it comes to climate change, the immediate reaction for governments is to regulate. Yet, experience shows that a wider approach typically bears fruit – one that combines setting the right rules, creating the right incentives and building the right capacities. In this chapter, we lay out a large menu of potential actions across multiple areas: innovation, standards, market creation, and many others. These provide a helpful guide for governments to capture green opportunities, by building the right capabilities, and identifying ways to hone their competitiveness in areas that are likely to provide economic returns.



The Global Green Economy

Why it is time to get onboard

Transitioning to a green economy is an inevitable end game for all countries, and many have already started their journey. For those who have not, starting the process now is critical. Risk avoidance, compliance, and costs continue to be key drivers of green investments. However, little emphasis has been given to the upside of greening activity – the potential value added to the economy, the high-value jobs created in new green activities, the power of sustainable action to drive innovation, new expertise, and stronger competitiveness.

The timing has never been better to embrace the green economy. Some reasons are about avoiding significant downsides, such as:

Global agreements are penalising traditional and dirtier industries: An example is the EU's Carbon Border Adjustment Mechanism that aims to stop businesses or countries offshoring their emissions. The shadow debt carried by dirty industries is bound to hurt the competitiveness of high emission industries in the medium term. It is no longer a matter of if, but when investment relocates to greener sectors.

Divestment and stranded assets can significantly hurt economic sectors: New government regulations limiting fossil fuel use, and investors pushing such assets away from their portfolios could significantly expose oil or coal based economic activities. Equally, assets in other sectors exposed to climate-induced physical risk, such as agriculture or real estate, could lose value or insurance coverages. Sector wide asset stranding poses financial stability risks and impacts workers and dependent communities. Managing this risk requires an orderly transition into low-carbon, green economic development.

Consumer demand is changing: Consumers are becoming more aware of the climate impact of their choices and have a greater willingness to pay for sustainable products. Consumers are asking for greater access to information on the carbon footprint of the products they purchase, and also for greater availability of sustainable options. Global companies have in response already committed to climate positive commitments and these then impact upstream supply chains as well, demanding sustainable raw materials and components. This demand shift requires businesses and sectors to adapt quickly to retain market share and sustain economic prosperity.

3.1. Why now is the right time

Upside opportunities

There are also opportunities to seize for countries who move early:

Increasingly cheaper green technologies and supporting financial innovation: the cost curves of existing renewable energies and new emerging technologies, from carbon capture to integrated water management systems, and from hydrogen to smart grids, are shifting the cost equation of large-scale implementation. Lithium-ion battery pack prices for example, have fallen by 89% in real terms from 2010 to 2021. The high cost of technological solutions and infrastructure will no longer remain a strong argument to hold back the process of change. Furthermore, there is immense financial innovation required to enable the adoption of these technologies and transition pathways. Green finance, sustainable investment products, carbon credits, blended finance mechanisms, etc. are scaling up in value and access to facilitate the green economy transition.

A pathway to resilient recovery: While post-Covid recovery has been rapid in several regions, there are many parts of the world that are still reeling under pandemic-related economic shocks. The onset of the war in Ukraine has also produced energy price shocks and supply chain disruptions, revealing just how vulnerable fossil-fuel based economies can be. Facilitating low-carbon, cleaner energy-based economies while aligning with longer term global shifts to greener systems can offer a pathway to greater national resilience as countries rebuild economies and support impacted communities.

An opportunity to grab first mover advantage: While the end goal of limiting the scale of global warming has been defined and agreed in the 2015 Paris Agreement, the path to implementation is still being worked out. This offers an immense breadth of opportunities – how to develop hydrogen infrastructure? How to make cement manufacturing greener? How to electrify global shipping? The to-do list is long but clear. Nations and economies that strive to answer these questions sooner will develop implementation expertise, cost-effectiveness, trained workforces and brand identities that will help them capture shares of valuable future markets and increase their competitiveness.

However, which green opportunities should countries focus on?

Identifying the right opportunities

Policymakers now need to prioritise what to focus on. Some choices may seem obvious, but many seemingly attractive trends may be exaggerated and distracting, whilst other potentially new and disruptive opportunities are less known. Policymakers therefore need to carefully evaluate a wide array of opportunities to understand where to position their economies in a way that optimises value creation and minimises environmental impact for them.

The challenge for policymakers is to define which activities have the greatest potential for their country by ensuring that two criteria are met. The first is the market potential for green economy activities – including the size and longevity of what they represent. The second is the ease of entry into that market – including its feasibility for any given country in the face of global competition and alignment with national strengths.

Looking beyond the obvious

The biggest and fastest growing green markets in the existing economy have been making headlines for so long, they are impossible to ignore: electric vehicles, hydrogen as the new fuel of the economy, carbon capture and utilisation, new forms of agriculture, biofuels, carbon credit market related opportunities, among many others.

While it may be tempting to focus on the biggest ticket items, this is also where the strongest competition is. For example, the current market size for EV vehicles manufacturing is forecasted to have crossed the $1 trillion mark, growing five-fold of what it was in 2020. This is clearly a huge opportunity, but a very competitive one. Tesla is an already established leader, and all automobile manufacturers from BMW to General Motors, Nissan to BYD and many other start-ups, are now operating in this playing field.

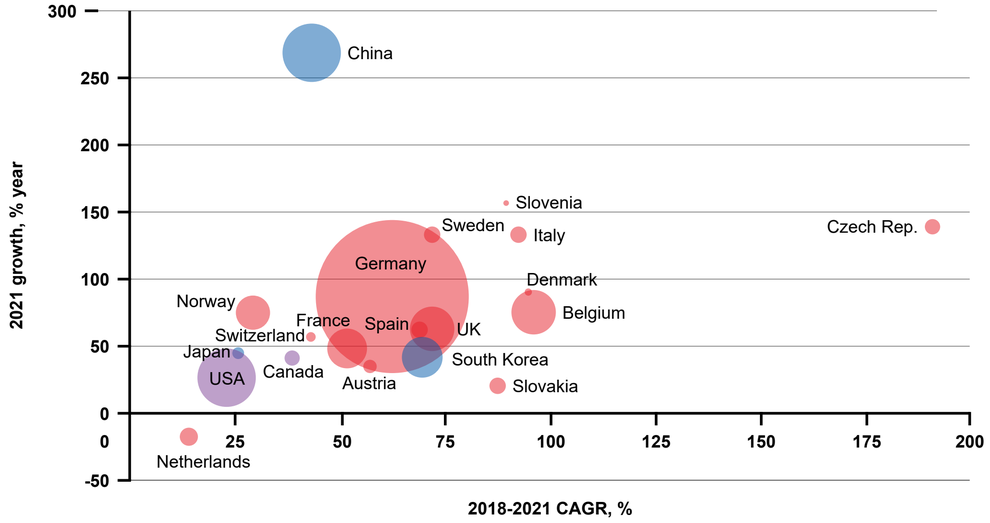
The most viable opportunities for new entrants will be the less obvious ones. There are openings in the EV market for fresh contenders with interesting business models – such as offering battery-as-a-service, new charging infrastructure like wireless charging or ultra-fast charging, new vehicles including e-bikes, and innovations, such as vehicle-to-grid systems.

Indonesia, for example, has been developing an expertise around electric two wheelers and battery swapping technology. Indonesia's largest motorcycle battery swapping network, owned by Swamp Energy, includes more than 400 swapping stations. Battery swapping pilots have been running in Indonesia since 2021 and this has spurred industry partnerships, infrastructure development and investments in the wider EV ecosystem development in the country.

Top 20 electric vehicle exporters by country

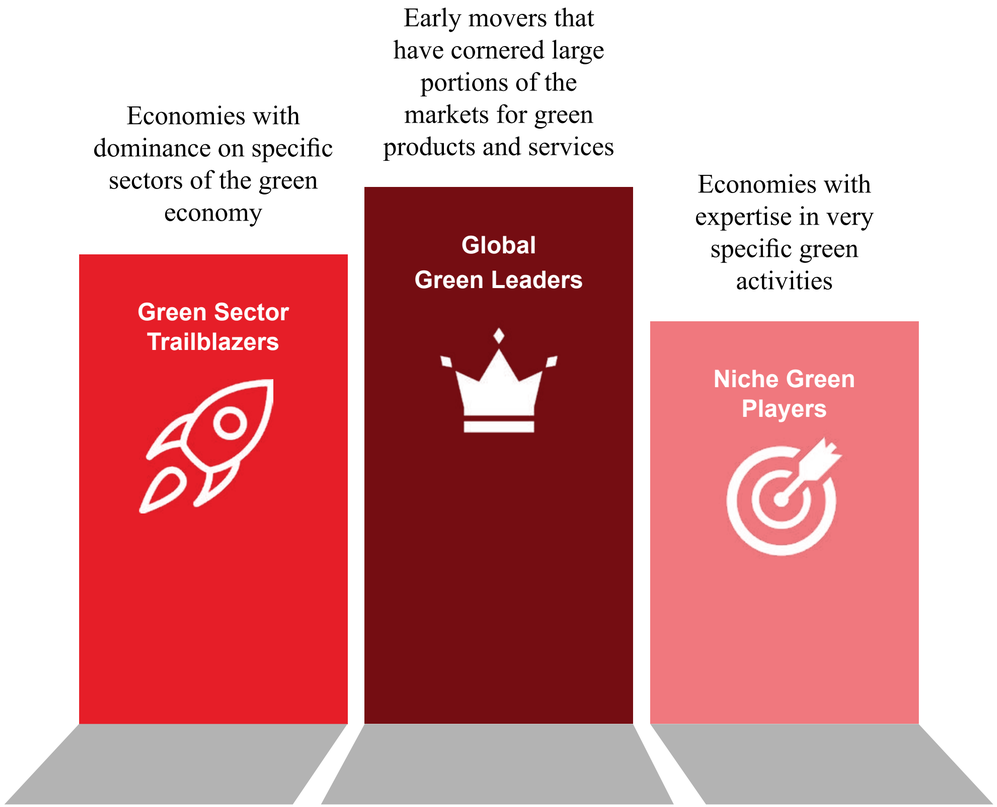
Width represents size of exports (US$)

Source: Comtrade/Oxford Economics



3.2. Identifying the right opportunities

Understanding the competitive landscape



Finding viable new opportunities requires a keen understanding of the green economy's competitive landscape. This will inform the feasibility of any given economy's ability to enter a market, as well as its chances of success in capturing a significant share of it. This landscape can be understood as broadly comprising of three types of players:

The Global Green Leaders: These are economies that took early moves towards decarbonisation or have capitalised on their environmental innovation and actions. These also include fairly established global leaders that are pursuing green opportunities across multiple sectors and value chains. They tend to be large economies such as UK, Japan, South Korea and various EU economies. Germany provides a good example of a country that has made significant strides in growing its renewable energy industry, waste management and recovery, and buildings related energy efficiency industry in recent years, among other green activities. The USA has also established a significant share of the green economy with employment and activities in renewables, environmental remediation, green finance, electric vehicles and energy efficiency.

The Green Sector Trailblazers: There are many other players that generally demonstrate a significant strength in a particular sector and the green economic activities associated with it. This may derive from their established sectoral dominance. The Nordic nations provide an example of countries with long-standing dominance in green shipping that have been exploring and developing ships and vessels using various clean technologies such as renewable energy powered ships, hybrid ships and biofuels for marine vessels. There are also emerging players who are on their way to create a sectoral dominance. Middle Eastern countries such as Saudi Arabia are well-placed to lead the "blue hydrogen" opportunity pivoting from their fossil fuel based infrastructure and market dominance.

The Niche Green Players: Other economies have also discovered their niche opportunities and have not shied away due to their lack of overall scale. Singapore's competitiveness in the sustainable food production space is a noteworthy example. New and alternative, particularly plant-based, foods for example have been dominated by manufacturers in the US and UK, but others are joining with specialist products. Singapore has, however, driven rigorous innovation in alternative food production and has developed a unique expertise in developing synthetic meat. The country recently opened the first commercial cultured-meat production facility in the world, making chicken products through cell culture rather than traditional farming.

Of course, each country must define its own green economy entry point based on its unique context.

3.2. Identifying the right opportunities

Understanding the competitive landscape

Global Green Leaders for example might need to determine where to focus, rather than spreading their resources too thinly across too many sectors. Green Sector Trailblazers might need to understand how to further hone their competitiveness, to build advantages that guarantee their leadership in their area of focus. Niche players, finally, might need to understand how to build very specific expertise that other bigger players will end up depending upon for their own success. Singapore's emphasis on synthetic meat manufacturing is not focused so much on manufacturing huge quantities itself (it lacks the land to reach critical mass manufacturing capacity) but to sell its expertise to bigger economies interested in building an edge in green food production at home.

A competitive landscape assessment thus becomes critical for a new entrant into the green economy, especially to build a clear sense of what areas are still up for grabs, the position where the "new entrant" is starting from, and the leverage it possesses to develop its own competitive advantage. To do so, we must juxtapose a country's strengths against its competitive reality. Let's examine how these strengths lead to a country's positioning strategy.

On this page is provided a sample of the competitive landscape we have conducted for this research. For requests of our full competitive analysis, do feel free to contact us directly (see page 64).

	Energy	Transport	Waste	Construction
Global Green Leaders	In terms of potential for and actual green energy generation, trade, regulations for green energy generation and consumption, availability of resources for newer fuels and energy infrastructure, US, Germany, Australia, China and India are leading the world.	Nordic countries, such as Norway and Sweden have established leadership across all transport modes - green shipping innovation, biofuels including push for sustainable aviation fuel for aviation and leading electric vehicle transition. Japan and South Korea lead in hydrogen use and fuel cell electric vehicles along with overall strong green transport policies.	Several countries lead the curve in waste management and recycling. Countries such as Switzerland are also increasing material recovery percentages from recycling which range from material management strategies to entrepreneurial approaches and new business models for value recovery.	In terms of technology and processes for green construction, retrofitting, standards and certifications, completion and pipeline of green infrastructure projects, countries such as the US, UK, China, Singapore and Netherlands are leading the world.
Green Sector Trailblazers	Oil producing countries such as Qatar and Saudi Arabia are pledging to reduce their own carbon footprint and at the same time emerging to be prominent suppliers of cleaner fuels such as natural gas, which is known to be the cleanest fossil fuel. Countries such as South Korea and Japan have already made a lot of progress in newer fuels such as green hydrogen.	Several countries are gaining ground by pushing green mobility adoption and supply chain development. With EVs, China will likely achieve global market dominance soon on the back of its long-term investments, infrastructure building and years of subsidies. Chile is also driving EV adoption; strong policy targets are spurring opportunities. Green maritime is also a significant focus.	Waste management and material recovery approaches for waste streams are being explored in various regions. Key technologies include anaerobic digestion for food waste, pyrolysis for food waste, plastics, biomass and organic sludge. E-waste recycling and recovery is gaining greater significance and companies across USA, China and EU nations are capturing value creation opportunities.	In emerging areas such as low carbon data centers or zero carbon buildings countries such as Canada are upcoming and emerging as frontrunners. Further, countries in the Middle East such as Qatar are investing heavily in green infrastructure and are making considerable progress in mandating and adopting sustainable and/or green standards for construction.

Playing to one's strengths

After identifying which opportunities are the most attractive (and where new opportunities are emerging), the next move in identifying the right opportunities for any given economy is to make a rigorous assessment of that economy's inherent 'advantages'. What are the areas of its comparative and competitive strength that will naturally enable a country to capture and capitalise on certain kinds of opportunities?

The existing economic structure is key. For example, countries with well-established financial centres are likely better suited to capture opportunities in green finance. Others, for which trade represents a large share of GDP, may be well positioned to capture opportunities in transport, logistics and maritime. In equal measure, the current balance of threats and vulnerabilities also determine a country's focus. The UAE, Saudi Arabia and Qatar – all facing rising electricity consumption, driven by record temperatures – are investing heavily in sustainable cooling technologies. Qatar has established 39 district cooling plants, with 28 more in construction.

With this understanding, we have identified how to derive a country's ability to capture the right green opportunities and created a **green economy framework**. Our method uses a systematic assessment of national characteristics to determine a country's economic 'archetype', which provides a guide as to what types of opportunities any given country can pursue. Those characteristics fall into the following three categories:

Economic structure: This relates to understanding which economic activities contribute most to the economy, and provides an indicator as to a country's strengths and its existing green credentials. It highlights the main established sectors and industries that a country can build upon, not only to green them, but to provide the technologies and services and expertise needed for them to excel. For example, an economy that is heavily reliant on financial services might be well placed to compete in green finance activities.

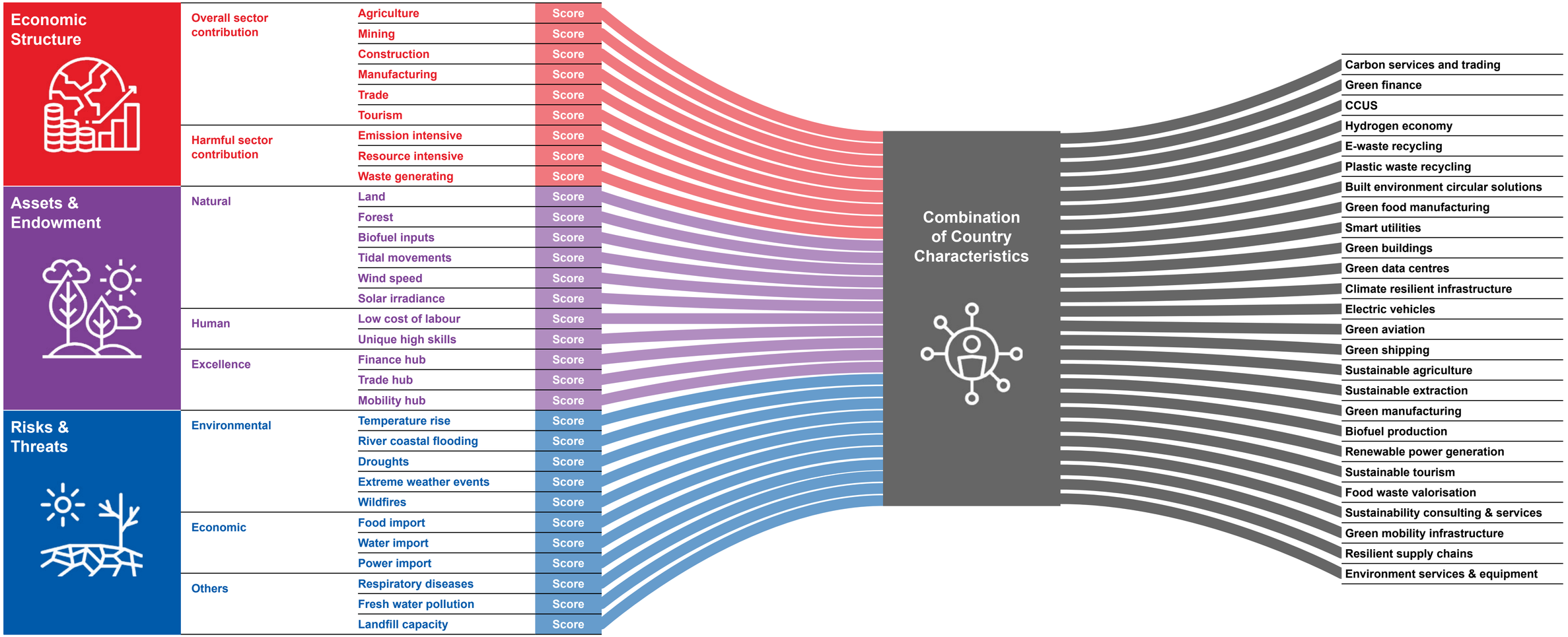
Assets and endowments: Whether a country can rely on unique natural assets, a pool of existing skills or strong commitment to sustainability will determine its ability to capture certain opportunities. For example, countries with large amounts of land and solar radiance might be well placed to develop a vibrant solar power industry.

Vulnerabilities and challenges: Threats and risks, whether they relate to natural disasters or political/economic security, are often important determinants of which opportunities a country may choose to pursue. For example, countries prone to flooding such as the Netherlands, Bangladesh and Vietnam might be incentivised to invest in flood-management expertise.

By assessing the economic structure, key assets and vulnerabilities of a country…

…we can determine what combination of characteristics it can rely on...

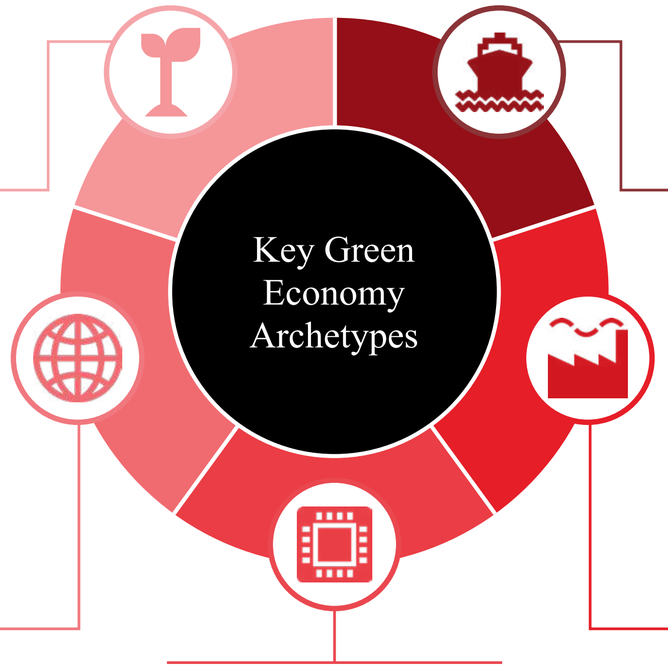
…to capture which green economy opportunity



3.3. Playing to your strengths

Key green economy archetypes

While the tool is designed to be used by any country to determine which opportunities align best with its core characteristics – recognising that each country will have its unique green economy signature – we have already identified five broad archetypes to describe different groups of countries:



The Resource Wells

Economies with vast amounts of natural resources

Examples: India, China, Brazil, Australia, etc.

High GDP share from agriculture and forestry, mining, fossil fuel production/generation, and energy generation. Prone to generating emissions and waste. Rich in natural resources such as land, oil, gas, forest, water, solar exposure, wind.

Potential green opportunities: carbon services and trading, sustainable agriculture, biofuels, renewable energy generation

The Green Traders

High-income and trade-dependent countries

Examples: Singapore, Denmark, Norway, etc.

Low natural resource base but known for having a high knowledge base. Robust financial and capital markets, and centres of excellence. Vulnerable to supply chain disruptions.

Potential green opportunities: green aviation, green shipping, resilient supply chains

The Emerging Economies

Low income economies

Examples: Gabon, Sudan, Papua New Guinea, etc.

Subsistence activities, in most cases agriculture and forestry. Rich in natural resources such as land, forest cover, water, solar exposure, or wind potential but economically unexploited. Exposed to significant environmental and economic threats.

Potential green opportunities: sustainable agriculture, climate resilient infrastructure

The World's Workshop

Low to middle income. large manufacturing base

Examples: Bangladesh, China, Cambodia, etc.

High GDP share from low-cost, labour-intensive and waste intensive manufacturing. Vulnerable to environmental, pollution and specific social vulnerabilities.

Potential green opportunities: green manufacturing, e-waste recycling, plastic recycling, resilient supply chain, environmental equipment

The Industrial Innovators

High income with highly skilled manufacturing base

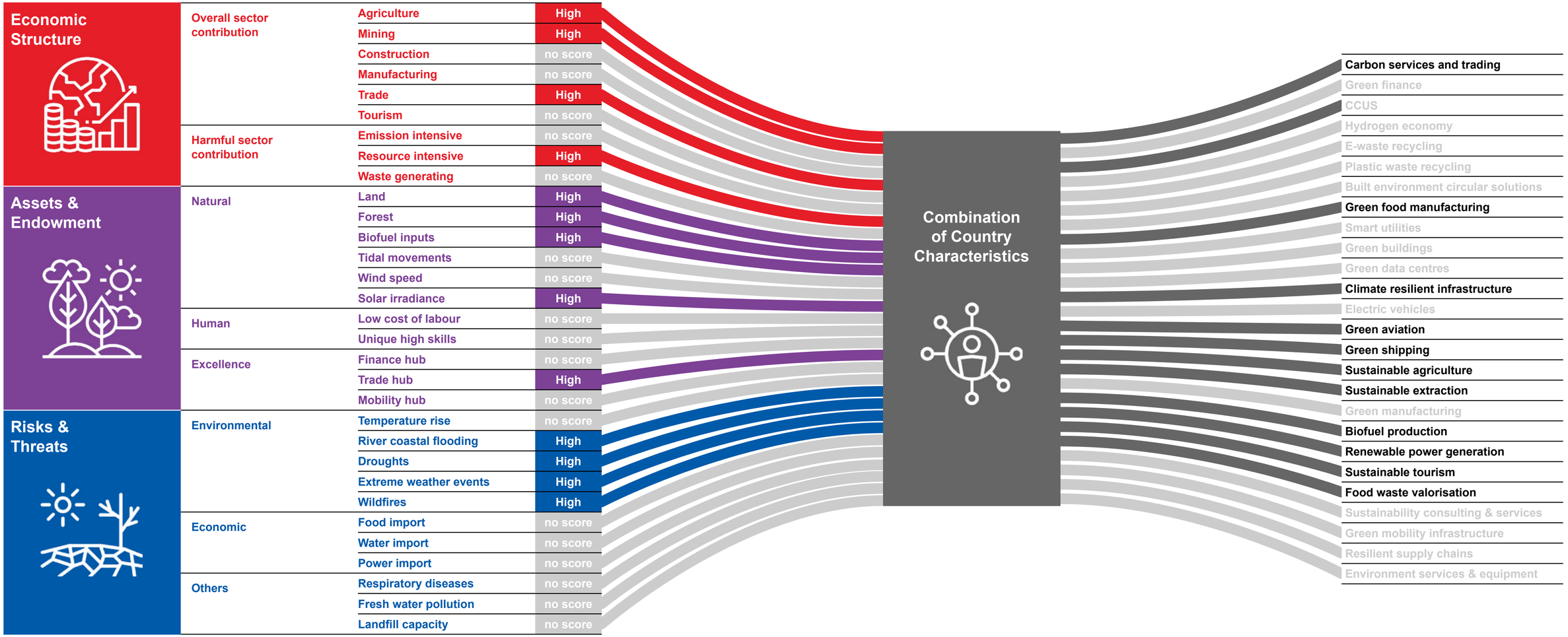
Examples: Germany, South Korea, Japan, etc.

High GDP share from high-value manufacturing industries such as electronics, electrical goods, and automobiles, and their exports. Energy, emission and waste intensive. Highly skilled human capital.

Potential green opportunities: green manufacturing, e-waste recycling, CCUS, environmental consulting and services

3.3. Playing to your strengths

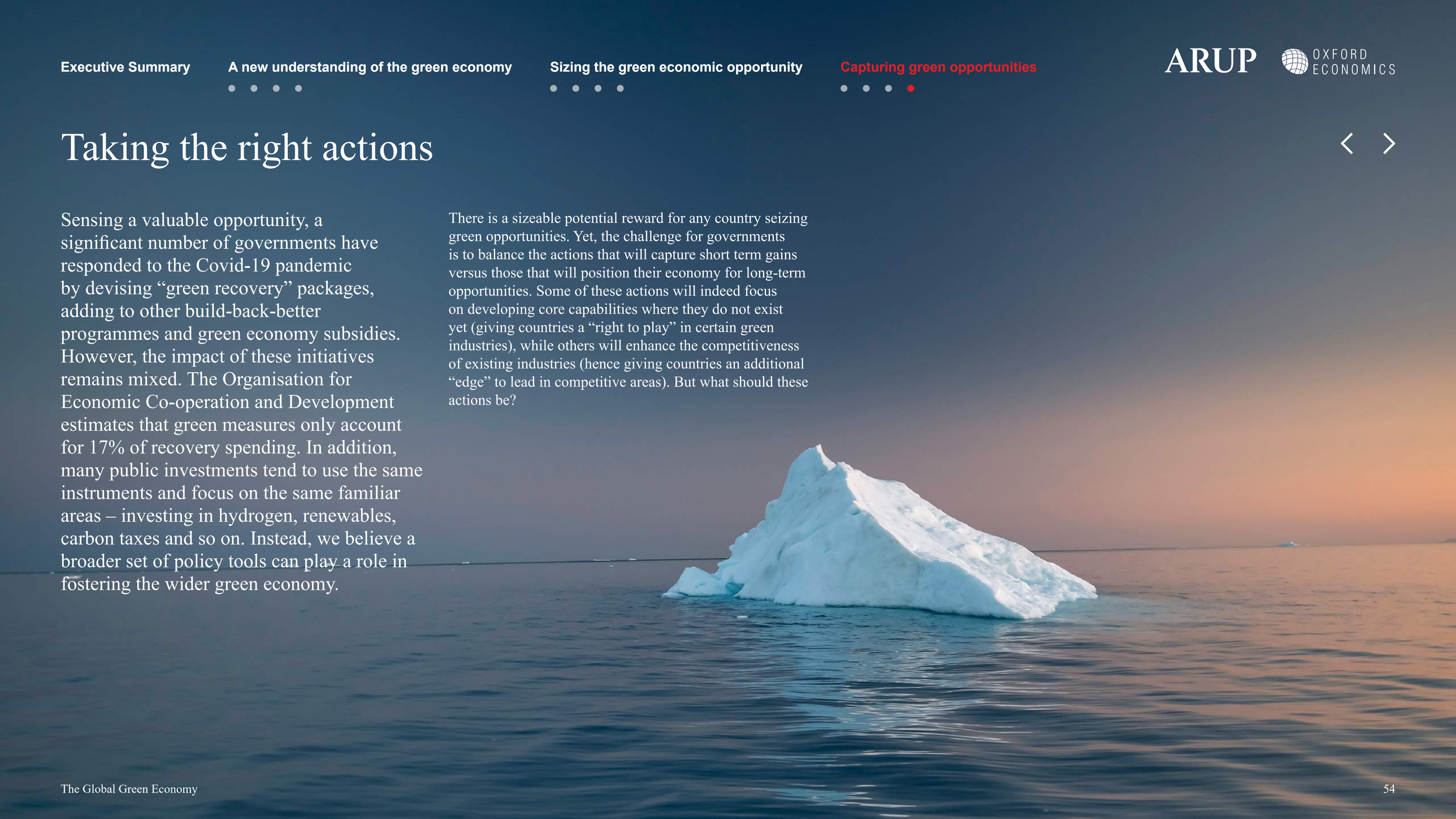
The Resource Wells: characteristics and green opportunities



Taking the right actions

Sensing a valuable opportunity, a significant number of governments have responded to the Covid-19 pandemic by devising “green recovery” packages, adding to other build-back-better programmes and green economy subsidies. However, the impact of these initiatives remains mixed. The Organisation for Economic Co-operation and Development estimates that green measures only account for 17% of recovery spending. In addition, many public investments tend to use the same instruments and focus on the same familiar areas – investing in hydrogen, renewables, carbon taxes and so on. Instead, we believe a broader set of policy tools can play a role in fostering the wider green economy.

There is a sizeable potential reward for any country seizing green opportunities. Yet, the challenge for governments is to balance the actions that will capture short term gains versus those that will position their economy for long-term opportunities. Some of these actions will indeed focus on developing core capabilities where they do not exist yet (giving countries a “right to play” in certain green industries), while others will enhance the competitiveness of existing industries (hence giving countries an additional “edge” to lead in competitive areas). But what should these actions be?



3.4. Taking action

Global green economy actions

Global progress on green economy development is varied and patchy and it's useful to explore what kind of approach different regions are taking.

Looking to other countries for best practice in designing a national green economy plan is often the first step for countries looking to transition their economies. Some are even considered as leaders in their regions due to early action.

Bringing these plans closer to implementation, the development of sectoral green economy plans tends to be another early step for countries.

Incentivising green investments through a green finance plan has also been common action.

3.4. Taking action

The tools: Incentivise. Enable. Mandate

Governments have a variety of policy tools at their disposal to activate their transition to green prosperity from different angles. Incentivising actions leverage people's and business' interests to encourage change (namely through fiscal and pricing policies). Enabling actions create the necessary conditions for green development (by providing training for example), and for the rest mandating actions necessary to shape and enforce change.

It may be tempting for governments to focus solely on one angle, but truly impactful policies use a mix of incentives, enablers and mandates to produce lasting impact.

Mandating
Facing significant barriers to social acceptability, competitiveness issues, vested interests, etc., governments may have no choice but to enforce changes in current practices and behaviours.

Enabling
Where there is a missing link to management or sustained action, government may choose actions to create the enabling conditions necessary for the green economy transition.

Incentivising
Where an incentive structure does not exist, governments may choose from a selection of fiscal and pricing policies, for example, to spur the uptake of green products and services.

Learning from EVs

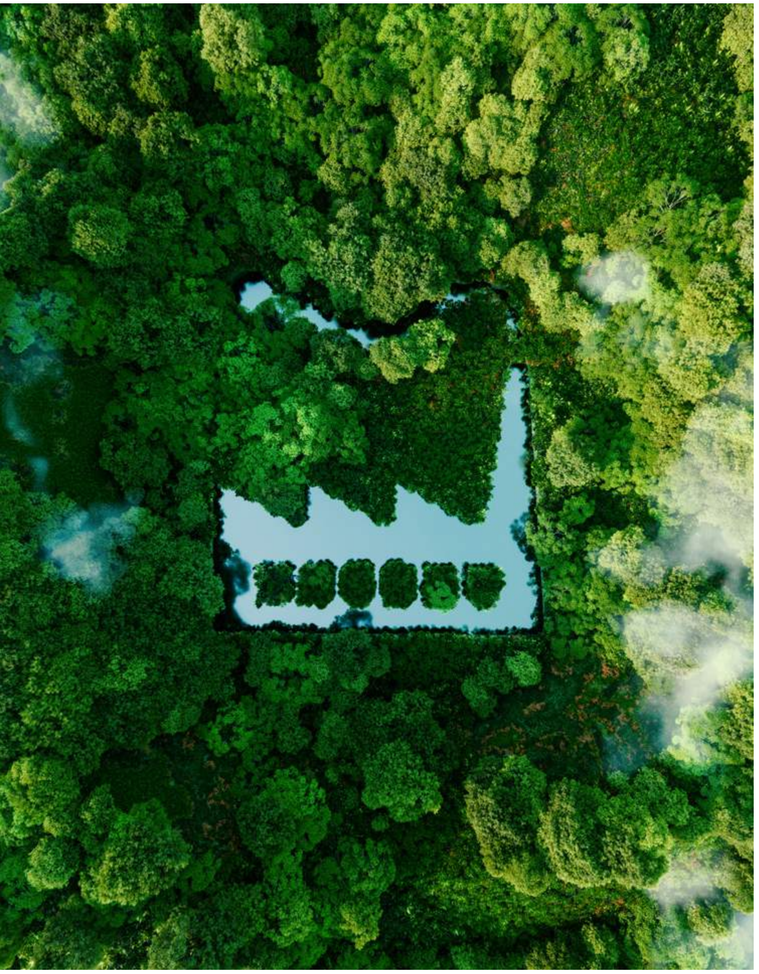
A comparison of approaches can be seen in the different routes that France and Norway have taken to encourage the uptake of electric vehicles. Both countries have developed vehicle taxation systems, though the results have differed greatly.

In Norway, levels of uptake have been a resounding success, where the focus has been on making electric vehicles cheaper through purchase tax exemptions. In addition to this incentive, Norway has encouraged the switch to electric vehicles by funding research and development and through the deployment of a public charging network infrastructure. The country has also created campaigns and tools to further educate the public. It has been a well-coordinated mix of actions.

The opposite approach has been taken in France, which introduced a pollution tax on traditional petrol/diesel vehicles. The country has introduced other measures, though these have mostly been incentivising actions such as a vehicle fee rebate scheme and discounted or preferential electricity rate structures. Partially as a result (as many other factors play a role), the share of electric car sales in France has increased from 1% in 2015 to only 12% in 2020. In the same period Norway saw a jump from 25% to close to 75%.

3.4. Taking action

The tools: Incentivise. Enable. Mandate



What goes into the recipe for effective market stimulating regulation and incentives? We have identified nine areas of activity that governments can deploy to advance green economic development:

An ecosystem-wide effort

Not all actions should be seen as government driven, however. Building competitive green industries is not a matter of top-down industrial plans, but a concerted effort that gets the best out of what each part of a country's economic ecosystem has to offer.

Clearly, governance, regulations and policy are three areas in which the government could lead, as no other actor can provide the long-term vision, build the legal framework and shoulder some of the infrastructure risk. However, innovation, finance and capability building must rely on approaches that combine the expertise, research capabilities and funding/financing firepower of the private sector and academia.

The actions we presented here are of course high level and should be curated to the specific green opportunities that countries define for themselves. Driving the adoption of standards might indeed look very different if applied to e-waste recycling than to maritime green fuels.

Nine areas of green economy action	
Governance	Guide green economy by integrated, collaborative and coherent institutions
Policy	Set strategic direction for the green economy, coherent with existing policies
Standards	Act to enshrine green economy principles across all outputs
Ecosystem	Bring stakeholders across sectors together to drive systemic change
Innovation	Development of new green technologies, processes and business models decoupling growth from negative environmental impacts
Financing	Close the gap between capital providers and green projects
Capabilities	Equip the workforce with the skills needed for new green jobs
Infrastructure	Develop underlying infrastructure and logistics for green activities
Market	Encourage the formation of new markets for a green economy

3.4. Taking action

A menu of options

The menu provides a brief sample of the wide variety of actions governments can take to develop and stimulate their green economy. For a full menu across all nine areas, do feel free to contact us directly (see page 63).

	Mandate	Enable	Incentivise
Governance	Define roles and mandates of institutions	Implement cross-sectoral mechanisms	Align organisational KPIs to green outcomes
Policy	Develop binding carbon budgets	Develop and enable land use and planning policies	Disincentivise unsupportive behaviours
Standards	Audit and enforce standard alignment	Set a national definition for green economy	Promote adoption of voluntary standards
Ecosystem	Require multi-disciplinary procurement	Create collaboration platforms	Reward multi-disciplinary procurement
Innovation	Create green regulatory sandboxes	Nurture innovation ecosystems	Use demand side tools to foster innovation
Financing	Embed carbon cost in non green projects	Harmonise global green finance taxonomies	Disincentivise financing of dirty assets
Capabilities	Establish social protection floor	Establish formal sectoral skills councils	Subsidise green training programs
Infrastructure	Strengthen land tenure / property laws	Develop at-scale green infrastructure	Incentivise financing of green infrastructure
Market	Promote performance-based procurement	Signpost green options to consumers	Introduce tax incentives to green production

Meeting the challenges ahead

Realising the green economy will not be smooth sailing. Multiple pitfalls stand in the way of a just and sustainable transition, one that benefits not only wealthy economies and individuals, but also the most vulnerable among us.

Emerging markets

The green economy transition will play out differently depending on each country's unique context. This is particularly true for emerging markets that face their own set of challenges. Highly vulnerable to climate change, often fossil-fuel dependent and financially constrained, these are just a few of the realities that emerging markets are facing in the transition. As such, it is important to highlight that much of the recommendations in this report are seen from a "developed country" perspective, and that specific approaches should be tailored to the needs of low and middle income economies.

Addressing infrastructure development bottlenecks

Major investments are needed to deliver the green energy transition in emerging markets, which some studies suggest will have to account for 70% of the new green infrastructure required globally for a low-carbon transition. However, the scale and speed of infrastructure development is lagging across the value chain, standing between funds earmarked and actual disbursement. A lack of capability and experience managing big infrastructure projects within government is stifling projects as early as at the planning stage. Then follows chronic issues with project forecasts, cash flow management, social management (relocation, compensation), land disputes and funding issues, to name a few. As a result, investment promises do not necessarily lead to actual disbursement.

Connecting capital providers with green projects

A critical issue for emerging economies is to secure the funding and financing needed for green projects. The challenge partly stems from the issues mentioned above, but also includes the underdevelopment of local capital markets and banking sector, as well lower credit ratings or credit worthiness scores. In a situation where money flows can find easily bankable and safer opportunities in developed economies, there is a need to find better ways to connect capital providers to green projects in emerging markets. Dealing with green project related emerging market risks (as in any other emerging market risk) would benefit from closer collaboration between conventional finance and parties whose mission is to navigate these risks, such as development banks. The focus, hence, should not be on green finance, but on making green projects bankable at large.

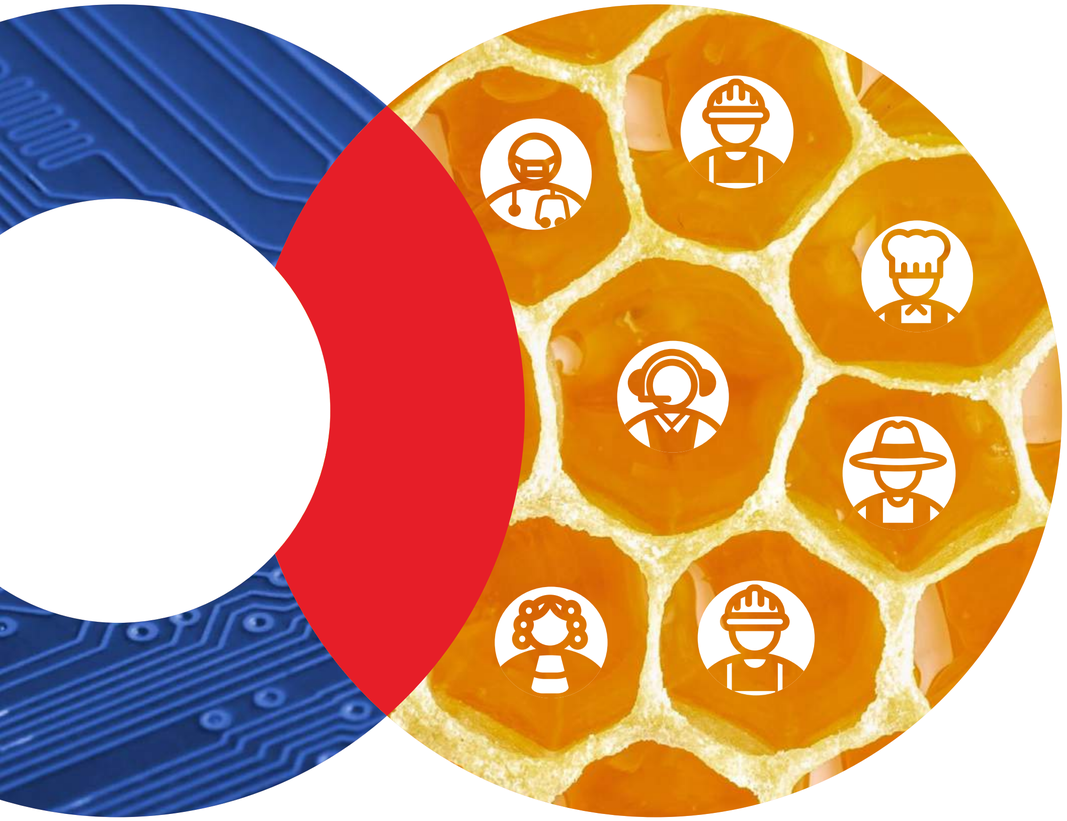
Leveraging COP27's Loss and Damage Fund

At COP27, governments took the ground breaking decision to set up a dedicated fund to assist developing countries respond to loss and damages. This decision, however, asks more questions than it answers. Whose authority should the fund be placed under? How should it align with existing funds for adaptation, primarily disbursed by multilateral organisations? What threshold of development should be used for applicants? How should reparations be measured? Should the funds be used for past adverse events or to prepare for future ones? How can we ensure the fund does not create a moral hazard for governments in developing countries to stop investing in climate resilience? These are some of the questions that need to be answered to ensure the fund delivers impact for its intended beneficiaries.

Finding the right positioning

In the face of competition from advanced economies, that have a seemingly entrenched comparative advantage in key sectors, emerging markets might question whether they have what it takes to be a green economy leader. The findings in this report (and the related tools), however, do highlight that every economy has a unique combination of assets on which it can build to develop sustainable competitive advantages, be it access to low cost workforce, vast amounts of natural resources, or simply exposure to certain types of risks. Much depends on how governments and industry players approach and respond to competition. Brazil, for example, learned from competition to grow its biofuel industry, following in similar footsteps as the US to promote biofuels through collaboration, trade and technology diffusion.

The green job puzzle



A successful transition to a net zero energy system at the global scale will lead to a vast recalibration of the labour market over the coming decades. The demand for workers is derived from the demand for goods and services they produce and the value they can add to the production process. Our analysis points to some fundamental shifts in what the world consumes as global economic activity becomes greener, so we can expect the change in workforce to reflect that.

The demand for workers in carbon-intensive sectors of the economy is likely to shrink, whilst new green markets and their supply chains demand an increase in labour inputs. As with any other major structural economic transition, there will be pain felt by displaced workers and great opportunities for others. The imperative of policymakers is to smooth the transition from today's labour market to the future's.

Unfortunately, dealing with such a large scale transition in jobs and skills is devilishly difficult.

It will require upskilling and reskilling of existing employees to adapt to new demands in old industries; the reskilling and job-matching of displaced workers from one industry to the next; and the recalibration of education and training systems – via both formal training and life-long learning, to make sure the pipeline of talent is bringing future-relevant skills to market.

This task will fall to policymakers on a country-by-country basis, to position their country's human capital in the best way they can to exploit future opportunities and contain future risks. The transition to a net-zero world by 2050 is no doubt a positive trajectory for the global labour market, compared to a pathway of unchecked climate change, in which extreme weather destroys the productivity of many of today's most labour-intensive industries. However, even under a net zero transition, there will be winners and losers in global and local labour markets. To maintain political support for difficult climate mitigation programmes, it's imperative that policymakers are aware of the distributional impacts that labour market churn will have on different households, so they can provide support to those who lose out in the new world order.

To manage the transition to a future labour market, it is important for policymakers to analyse and understand where workers will be displaced and where new, 'green jobs' will be created.

The green job puzzle

What is a green job?

There are many ways to classify ‘green jobs’. In our definition of the green economy, we recognise three categories of significance.

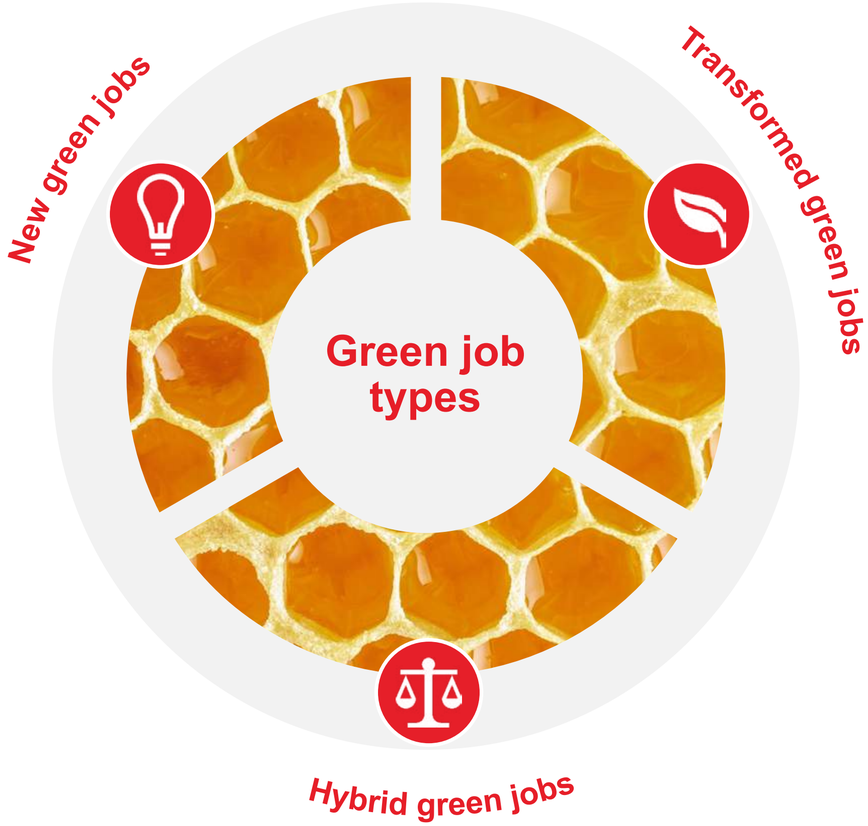
Transformed green jobs: In every industry, new investments in innovations and adaptations to ways of doing business will be required in the transition to a green economy. Many workers will find their jobs re-categorised as green jobs, as the business pivots to ‘green economic activities’, but their day-to-day role might remain the same. For example, construction workers could overnight become “green construction workers”, simply because their industry started working on green buildings, rather than carbon intensive ones.

New green jobs: As green goods and services are demanded in ever-increasing quantities, demand for workers will follow. Highly skilled engineers working on brand new membranes for carbon capture, for example, would be required by a growing corpus of technological firms developing sustainable equipment.

Hybrid green jobs: As the labour market evolves around the demands of a green economy, other categories of hybrid green work will also become more common, and will complicate green jobs classification. For example, should an investment banker selling green financial instruments as 20% of her day job and non-green instruments for the rest be considered as part of the green workforce?

The development and evolution of the green economy will generate millions of new opportunities in low- or zero- emissions industries, and their value chains. The supply of workers to fulfil those roles is critical to the success of the net zero transition and the onus is on policymakers, industries, the education system and workers together, to ensure that future skills demands are met. Some jobs will be filled by workers evolving their current role or skillset within the same company.

Some will be filled by workers transitioning away from shrinking emissions-intensive industries to grow markets in the green sector. And many others will be filled by new generations of workers entering the labour market from formal education or previous spells of non-participation. There is an historic need for dedicated and smart, life-long learning and skills development programmes at the national and local level across all countries that want to stake a claim for their share of a prosperous future green economy.



Managing a just and sustainable transition

So far, our report concerned itself with the difference between the status quo (now) and a more sustainable future. However, the real challenge of making the green economy "real" lies in our ability to transition our current systems to greener ones while inflicting as little pain as possible. Doing so requires time and incrementalism, two qualities that stand at odds with the urgency of climate change. Nonetheless, the move towards a green economy must be made carefully and consider two important trade offs.

Getting worse before getting better

Moving to a greener economy will require the manufacturing and deployment of vast quantities of infrastructure, equipment and vehicles: grids, batteries, interconnectors, carbon capture technologies, efficient irrigation management systems, sea walls and many others.

The production of the green economy's superstructure is bound to make the world dirtier in the short run. More carbon will be released. Rare minerals will be extensively mined. Large amounts of energy will be consumed. Joe Deaux and Filippo Teoldi summarised it well in an article recently published in Bloomberg Businessweek: "*Batteries that power electric vehicles or store solar and wind energy depend on minerals such as lanthanide and silicon. A new generation of cars and electric grids will use millions of tons of copper. Magnets in electric motors are made with so-called rare earths. And the myriad electronic sensors that will keep it all humming will gobble vast supplies of rhodium and palladium*."

As such, the green economy transition is looking at significant environmental trade-offs in the short to medium run. Whether these can be mitigated depends on our ability to prioritise the cleaning of the manufacturing, resource extraction and construction sectors.

It is also important to understand the trade-offs that exist between different green economy outcomes. For example, reducing waste is energy intensive. Circular economy processes impose a heavy energy penalty that may hamper the ability to meet overall energy reduction targets. Climate adaptation requires infrastructure and design redundancies that result in inefficient use of land, energy and water, and are bound to release additional carbon into the atmosphere. The development of low carbon technologies (CCS/U, Hydrogen) currently carry significant resource penalties. These are but a few examples of the tensions that bind environmental outcomes together.

These observations should not stand in the way of ambitious environmental action. Being mindful of the environmental impact of the green transition will need to account for the necessity to act quickly and at scale. But we need to account for the short-term environmental cost of the green transition, lest the cure ends up being worse than the disease.

A just transition

As seen in chapter two, the green economy transition is expected to weigh unevenly on different stakeholders. Fiscal and pricing policies will impact low, middle and upper-income groups differently depending on whether they are regressive or progressive. Similarly, the transition away from fossil fuels will potentially result in significant job losses and revenue impact globally.

As such, ensuring that growing the green economy does not come at the expense of vulnerable segments of the population must be a focus of any future action. Policies must be designed in a way that ensures costs and benefits are equitably distributed, and the pain of transition is eased as much as possible.

Successful actions are those that are designed to focus on distributing equitably the benefits and costs of transition. For example, market-based transition policies tend to be more equitable and efficient than command-and-control policies like personal consumption caps or quotas according to the OECD. The OECD also emphasises the importance of compensation packages, such as supporting the retraining of workers in new green sectors, and stakeholder engagement among workers, employers, governments, communities and civil society for policy decisions.

Implementing fair transition policies will help build consensus around the green economy transition. Without broad-based public support, it is likely that even the best designed initiatives will face significant hurdles.

What's Next?

We hope that this report convinced you of the opportunity the green economy represents. If not, simply look at the number of policymakers, investors and corporations worldwide who are already taking steps to capture it.

However, even the most advanced green economies are still at the beginning of their journey. Many policies and investment initiatives remain incomplete, disorganised and focused on the most visible corners of the market. The purpose of this study is to provide a more complete, systematic and adaptable basis for identifying, capturing and growing the right opportunities for each economy.

So what's next?

Assess your own progress

This report provides you with a benchmark for assessing how clear your own understanding is of your green strategy and action plan. Have you identified all the opportunities that make sense for your economy, your investors, your company? How deeply do you understand the size of the market and the impact of the green economy? How clear are you about your own positioning in a very competitive and fluid landscape? How confident are you of the comprehensiveness of your action plan, that no critical components are missing?

The tools provided here will help you ensure your strategic analysis is sound, and that you are positioned for success in the green economy. Even the most advanced economies and corporations are early pioneers finding their way in the dark. Our ambition here is to provide an additional candle to light the way (for green leaders), and leave a trail of bread crumbs for those who follow.

Our support

We have provided a summary of our analytical findings in this report. However, we have built proprietary tools out of this research which we now combine with our expertise to advise clients worldwide on the green economy. Should you feel you need support to formulate your own green economy strategy, do feel free to contact us.

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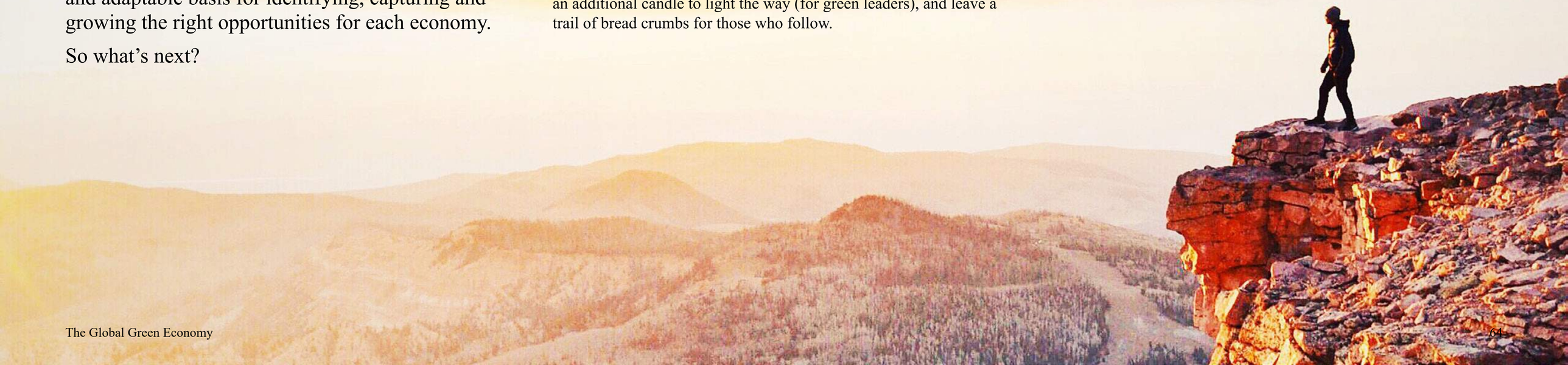

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Brice is an economist and strategy consultant with 16+ years of work experience in public policy and management consulting. As Arup Global Strategy Skills Leader, he advises clients on how to address complex urban and environmental challenges through sustainability, public policy, digital, and business transformation strategies.

Previously the head of Global Strategy for Samsung, Brice designed digital masterplans for large cities across Asia. As an economic and private sector specialist for the World Bank and the IFC, he advised 60+ municipalities on economic development, policy reforms and digital transformation in India, Nigeria, Pakistan and Southern Sudan. Brice is based in Arup's Singapore Office.

James Lambert
Director for Economic Consulting in Asia, Oxford Economics

James works with a wide range of experts across the company's global team to bring data-driven economic and business insights to market, and to deliver tailored solutions to Asia-based clients.

He has been with Oxford Economics for 9 years, and since 2019 has headed up the company's economic consulting portfolio in Asia. He previously worked in the Economic Impact team in London, where he specialised in the impact of technology, particularly on the labour market.

Previously, James worked in the UK Government Economic Service, including roles in the Foreign and Commonwealth Office and the Cabinet Office. James is based in the company's Asia headquarters, in Singapore.

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