NET ZERO NOW

An Analysis of Net Zero Targets and Laws

E3 Analytics

Acknowledgements

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Transport, Environment, Energy, Water in Asia

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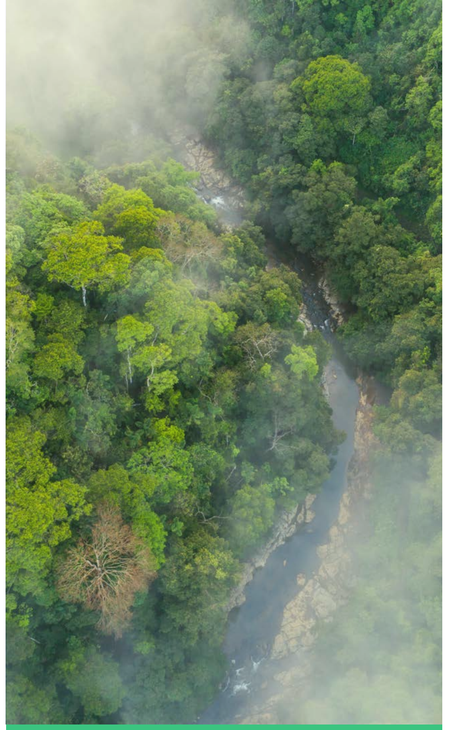
PART 1

Net Zero: Setting the Stage

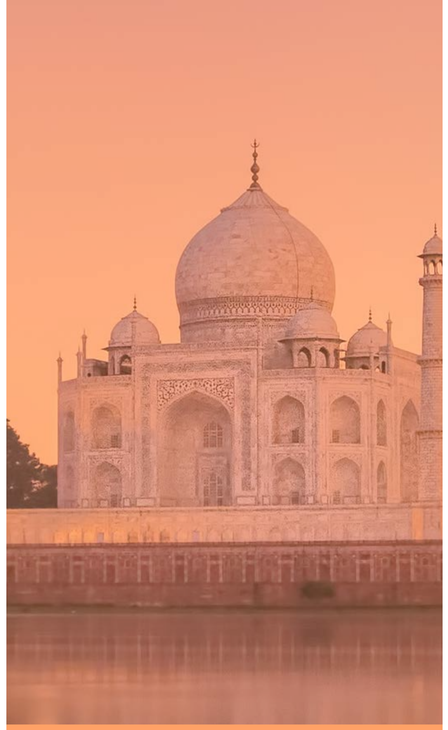
PART 2

Net Zero: Definitions & Design



PART 3

Pathways to Achieve Net Zero



PART 4

India's Pathway to Net Zero

Overview

The overall objective of this report is to provide an overview of Net Zero targets, design considerations, and laws.

As the momentum to adopt Net Zero targets grows, several gaps and issues remain. This report aims to identify some of these gaps and highlight good practices for national and sub-national governments.

This report provides a special focus on India, which is explored in greater depth in Part 4.

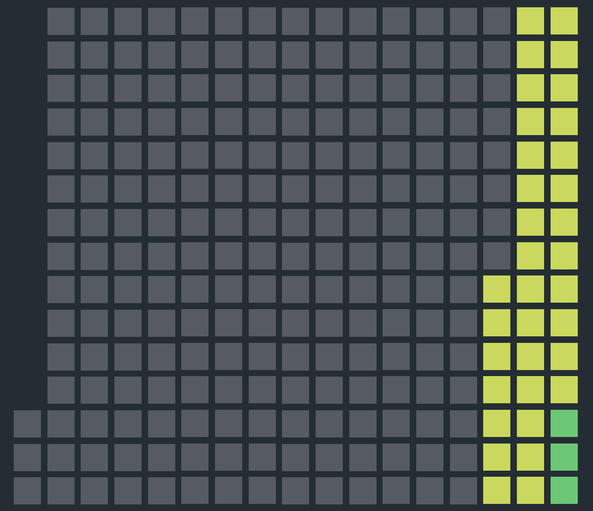
Humanity has a global carbon budget. The aim of Net Zero laws and targets is to keep humanity within that budget.

The Intergovernmental Panel on Climate Change (IPCC) concludes that global temperature rise must be kept to under 1.5°C of warming to avoid the worst effects of climate change. Global average temperature rise has already exceeded 1.0°C.

The **“carbon budget”** refers to the amount of CO_2 emissions (or CO_2 equivalent) humanity can release while keeping the global temperature increase within a given range.

243 Gt CO_2

Global carbon budget under a 1.5° Celsius scenario[2]



36.8 Gt CO_2

Global annual CO_2 emissions in 2022[3]

2.9 Gt CO_2

India's annual emissions in 2022[4]

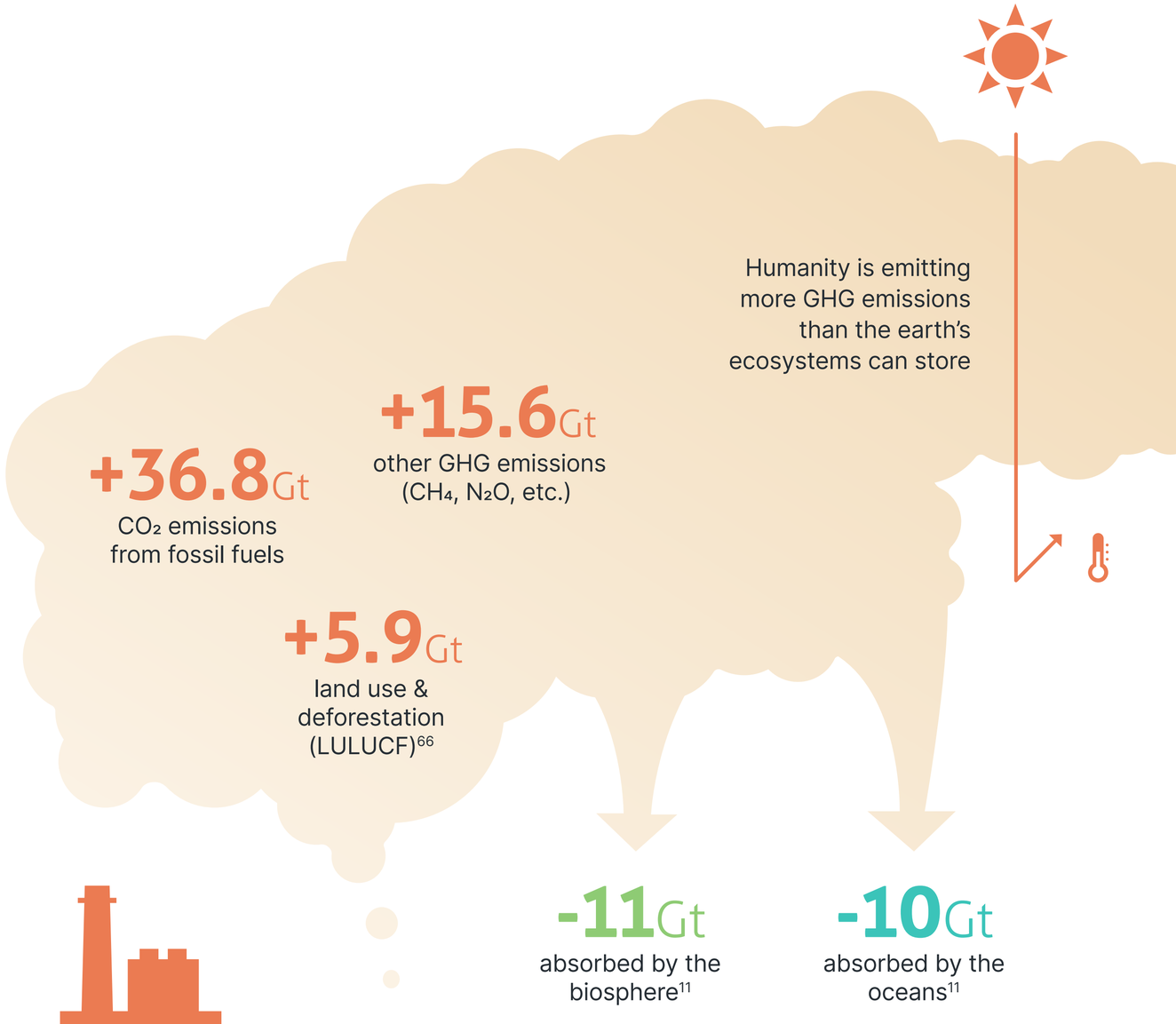
6 years

Time remaining on current trends until global carbon budget for 1.5° Celsius is exhausted[1]

We currently release twice the GHG emissions the Earth can absorb

At the same time, the ability of natural ecosystems and oceans to capture and store carbon is being diminished by human activity (agriculture, deforestation, ocean pollution, etc.)

The result is that between 20–30 gigatons of excess GHG emissions are accumulating each year that cannot be absorbed by natural processes.[11]

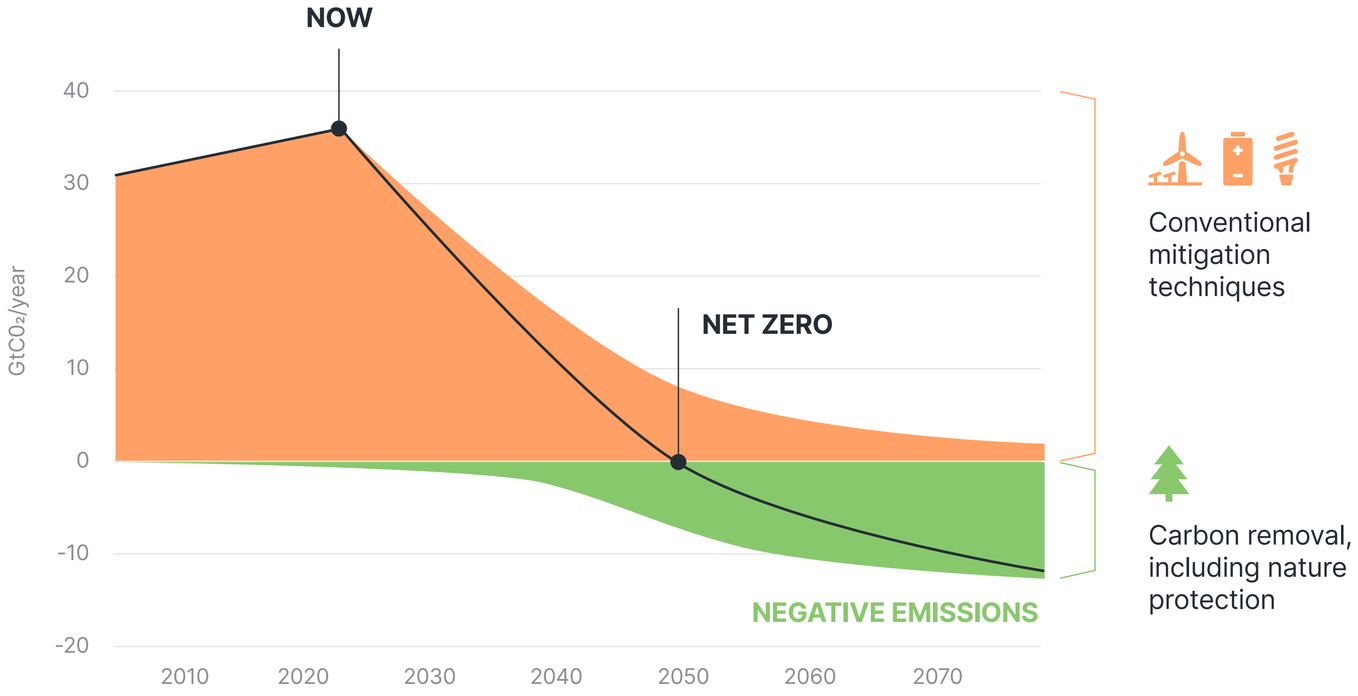


Net Zero Definition: Where Emissions = Removals

The term ‘net zero’ refers to a state in which an actor, such as a country, city, or company, is not contributing to climate change.

Since the reporting period is typically annual, the achievement of Net Zero emissions must be sustained every year in order to remain Net Zero.

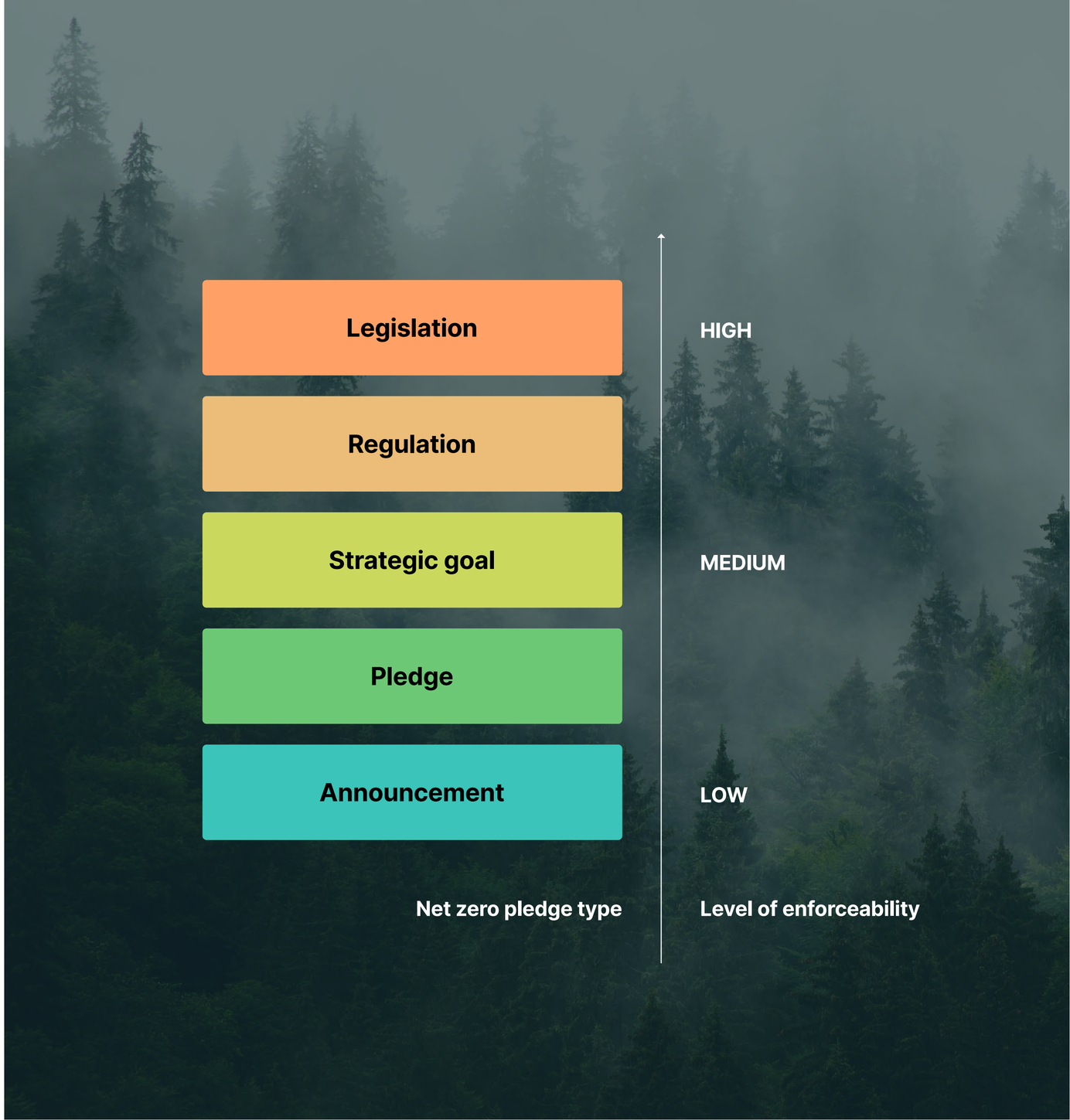
If all countries and companies were Net Zero, the net effect on global warming would be zero; the global carbon cycle would be considered in balance.[5,6,9]



Net zero laws are starting to spread around the world

Net zero goals differ widely in terms of their specificity and in terms of how binding they are. Many Net Zero targets adopted to date are little more than announcements. Some, however, have started to adopt Net Zero targets into law.

26 countries have now passed laws embedding progress towards Net Zero as a legal obligation.[21] Enshrining a Net Zero target in law is considered central to its credibility.



There are several potential pitfalls in the definition of Net Zero

There are often several ambiguities in wording

One challenge of reaching international agreements on Net Zero is that related words and terms often have varying definitions.

There are significant discrepancies in the credibility of Net Zero claims

Studies have demonstrated that Net Zero claims vary widely in complexity, detail and credibility. This creates major challenges regarding the forecasting of the future magnitude and severity of global warming.[12]

There is often a lack of adequate monitoring and reporting

The lack of transparency and consistency in monitoring progress towards Net Zero hinders an accurate assessment of pledges and timelines; furthermore, the absence of consistent reporting standards invites ”creative accounting” and can undermine trust in Net Zero targets.

There are several potential pitfalls in the definition of Net Zero

The time horizon does not match political terms

Currently over 90% of Net Zero targets are set for 2050 or beyond, which lies well beyond the political horizon of the parties and government officials adopting them. This discrepancy increases the risk that decisions and commitments made by governments today will be overturned or watered-down by future governments.

Net Zero is frequently ignored in major national decisions

There are examples of countries with Net Zero targets that, despite having targets, do not actually refer to them when making major decisions, such as permitting coal mines or new oil extraction.

Promoting Net Zero risks supporting continued fossil fuel use

Due to the inclusion of the term ‘net’, the term ‘net zero’ arguably provides implicit license to continue burning fossil fuels, provided that the emissions created can be offset or stored.[10]

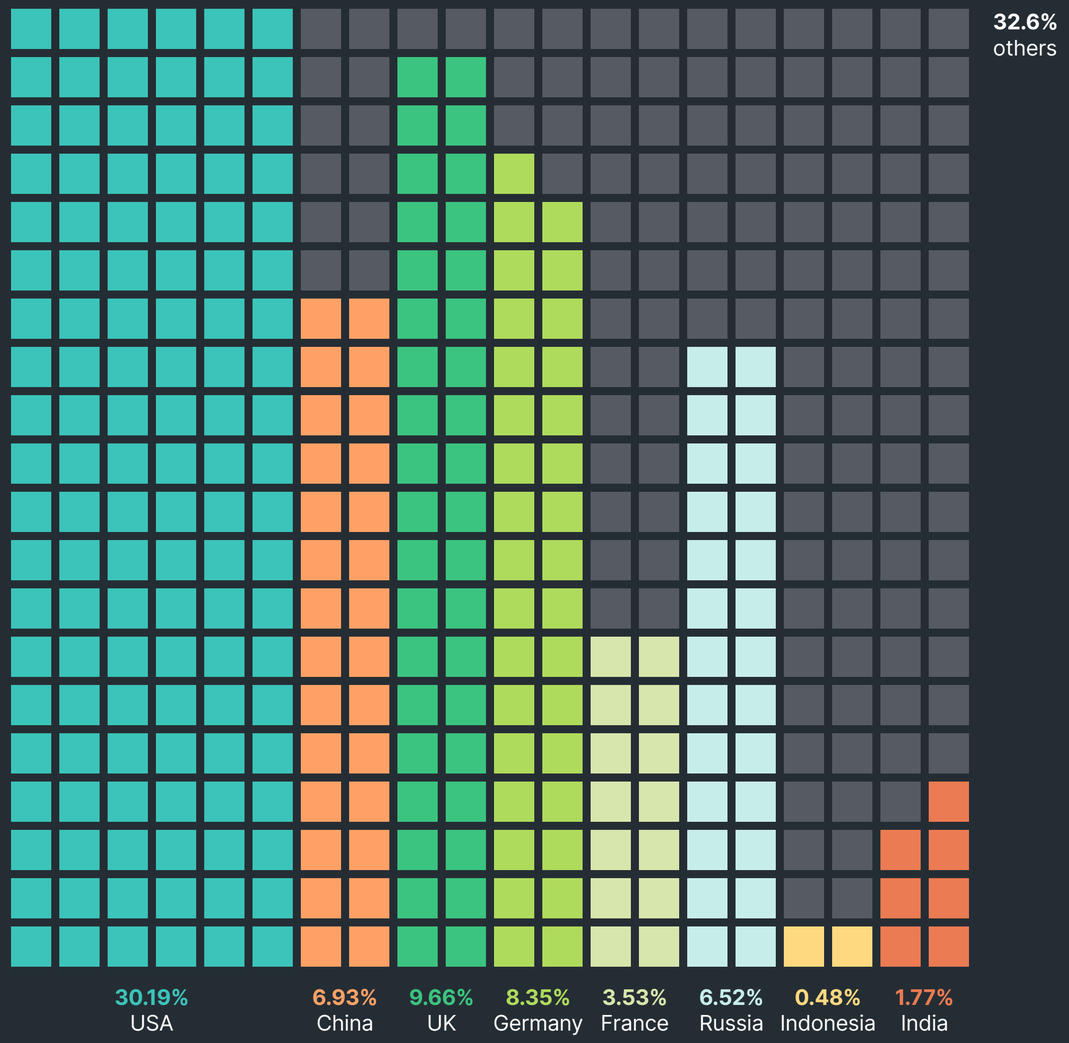
Historical emissions are becoming a contentious topic

‘Historical emissions’ refers to the cumulative emissions an actor (in this case, a country) produced until today since the dawn of industrialization in 1750. Historical emissions makes it possible to compare each country’s overall contribution to global climate change.

For example, the historical emissions of the UK (10% of global historical emissions) are greater than China’s (7%). However, China’s current share of global GHG emissions (25%) far outweighs that of the UK (1%) (see next page).[16,17,18]

To date, only Tuvalu, Burundi, and Paraguay have included historical emissions in their climate pledges.[18]

Historical emissions to end of 2021[18]



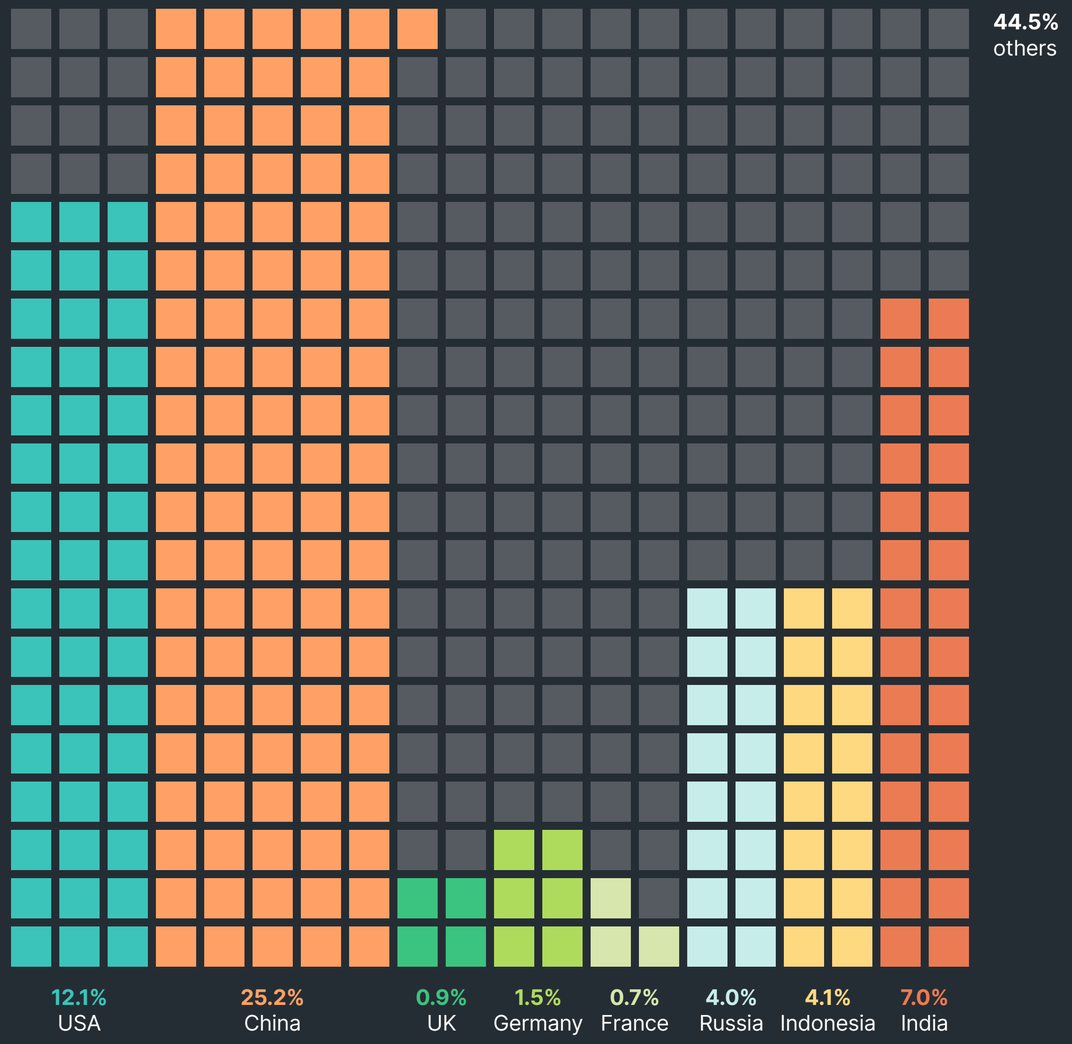
When ranked in terms of annual emissions, countries like China and India rank among the top-5 largest emitters

Annual emissions provide a snapshot in time of countries' contribution to global climate change.

China is now the world's largest emitter (25.2% of global emissions in 2021), followed by the United States (12.1%) and India (7%) in third place.

Note that these emissions data cover emissions from production, and do not capture the emissions associated with consumption.

Annual emissions (2021)[1]



Not all Net Zero targets are created equal

Most Net Zero targets that have been adopted to date are built on shaky foundations and rely on unproven technologies or approaches.[12]

In a global ranking of Net Zero pledges published in the journal Science, 90% of the pledges were found to inspire little confidence in their eventual achievement.[19]

Under 20% of countries have targets that meet the minimum procedural standards of robustness according to the UN's Race to Zero 'starting line'.[20]

Working towards legally binding targets is a central part of Net Zero pledges

Targets are an essential component of planning for a Net Zero future, but pledges must be subjected to scrutiny.

Whether targets are legally binding has a significant impact on the durability and credibility of the policy. Enshrining targets in law helps increase the likelihood of target attainment.

Of national targets currently published globally, **only 26 out of 199 tracked nations have adopted Net Zero targets that are legally binding**.[21]

There are many terms associated with Net Zero[5]

CLIMATE NEUTRAL

The activities of an actor have no net effect on the climate system.

CARBON NEUTRAL

The activities of an actor have no net effect on CO_2 emissions. The actor's residual emissions must be offset by carbon removals, or negative emissions elsewhere.

CARBON NEGATIVE

When carbon removals are greater than carbon emissions. Similar to the phrase 'net negative emissions'.

CLIMATE POSITIVE or NET NEGATIVE

An actor's overall contribution to GHG is 'better than' Net Zero, which means that an actor's GHG removals exceed its emissions over the time period under consideration.

OFFSETTING

When an actor pays a third party to offset, or reduce, greenhouse gas emissions elsewhere, such as by planting trees. Such offsets enable actors for whom it may be difficult to meaningfully reduce emissions in the short-term (such as the aviation sector) to pay (or invest in projects) to reduce emissions elsewhere.

Key components of a Net Zero target

There are several core components of Net Zero targets.

What are carbon removals, and how do they work?

Focusing on immediate and extensive decarbonisation is crucial to limit global warming.

However, many observers and scientists believe that permanent carbon removal will be also be required to meet global emissions reduction targets and keep the global carbon cycle in balance.[22]

Many global Net Zero pledges rely heavily on the concept of **carbon sinks**, or **carbon removals**.

Carbon removal broadly takes three forms

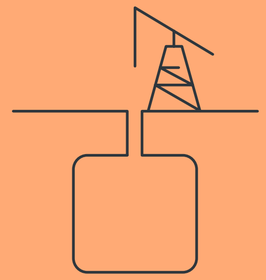
NBS
Nature-Based Solutions

This refers to nature's inherent ability to store carbon. Key elements here include reducing deforestation, planting trees, restoring ecosystems, and re-wilding.[23]

BECCS
Bio-Energy Carbon Capture and Storage

This refers to targeted efforts to store carbon in plant or wood form. This can include increasing the use of wood as a building material, for instance.[24,25]

CCUS
Carbon Capture, Utilisation and Storage



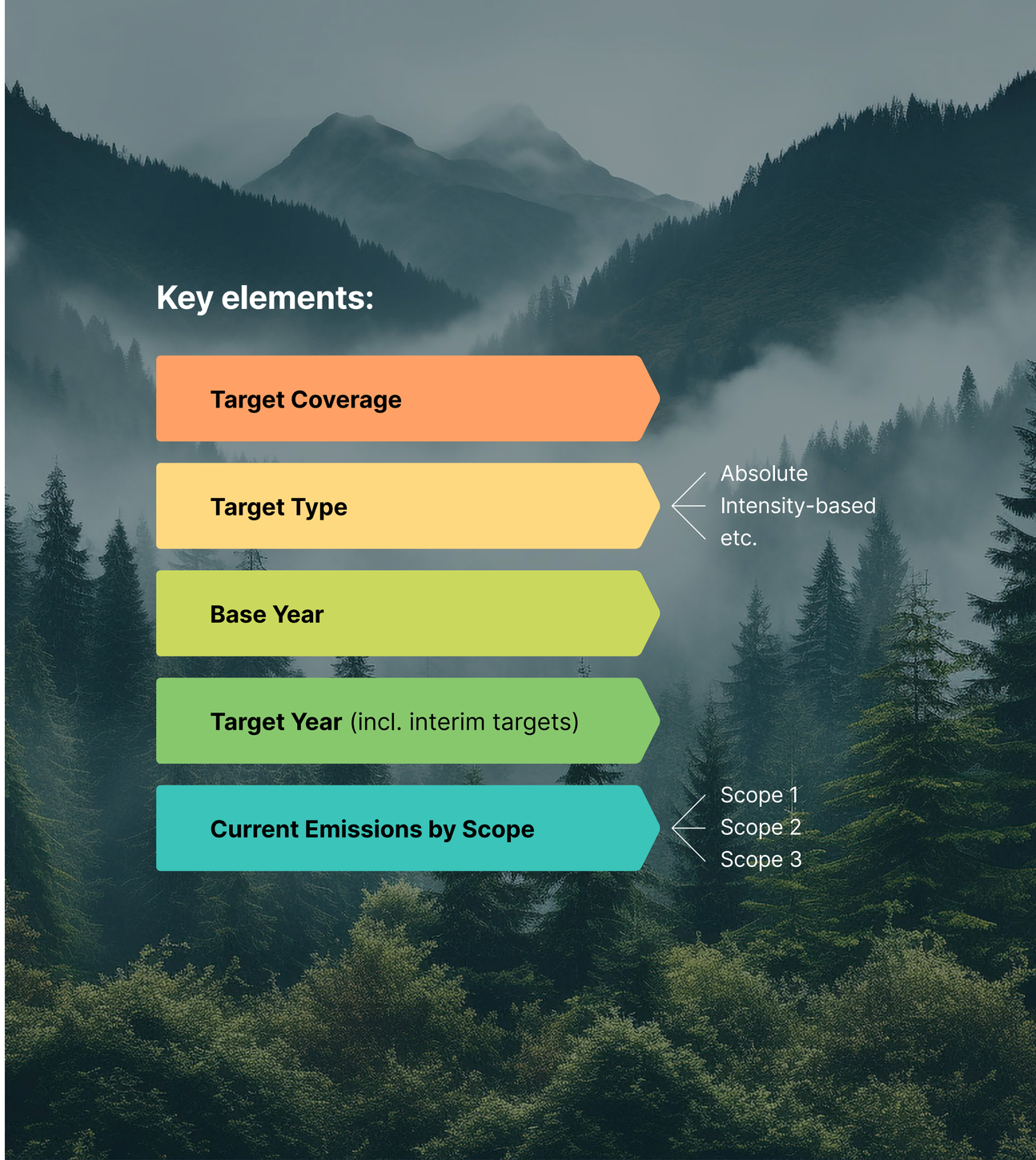
This refers to storing carbon underground, typically in large caverns or in depleted oil and gas well. In most cases, the term 'utilisation' refers to the fact that carbon is used in 'Enhanced Oil Recovery', in which CO_2 is injected into the ground to extract more oil.[26]

There are now tools available to help governments design their own Net Zero targets

The Science-based Targets Initiative has developed a comprehensive tool for setting Net Zero targets:[27]

sciencebasedtargets.org/step-by-step-process#develop-a-target

This tool includes a step-by-step process for designing and laying the foundations of a binding Net Zero target.



Emissions are typically split into ‘scope’ categories

These categories tend to be used to help assess corporate emissions, but they can be used at the national level. For businesses, Net Zero must cover Scope 1, 2 & 3 emissions.[28]

- **Scope 1** refers to the emissions generated directly by an actor’s own operations, such as fuel combustion, vehicle use, fugitive emissions, and manufacturing processes at factories.
- **Scope 2** is related to energy use and represents an actor’s direct emissions resulting from the purchase of electricity, heating, cooling, and other services.
- **Scope 3** encompasses the emissions associated with an actor’s entire value chain, and for manufacturers or suppliers of raw materials, it can be far larger than scope 1 and 2 emissions. Scope 3 includes the products that an actor purchases or sells, waste disposal, travel, as well as investments.

Emissions by Scope

SCOPE 3

emissions generated by upstream and downstream activities of the company

UPSTREAM ACTIVITIES

- employee commuting
- leased assets
- purchased services/goods
- business travel
- waste
- fuel & energy related activities
- transport & distribution
- capital goods

DOWNSTREAM ACTIVITIES

- investments
- leased assets
- transport & distribution
- processing of sold products
- use of sold products
- franchizes
- end of life treatment of sold products

SCOPE 2

emissions generated by the production of electricity and other energy sources purchased by the company

SCOPE 1

emissions directly produced by company facilities and vehicles

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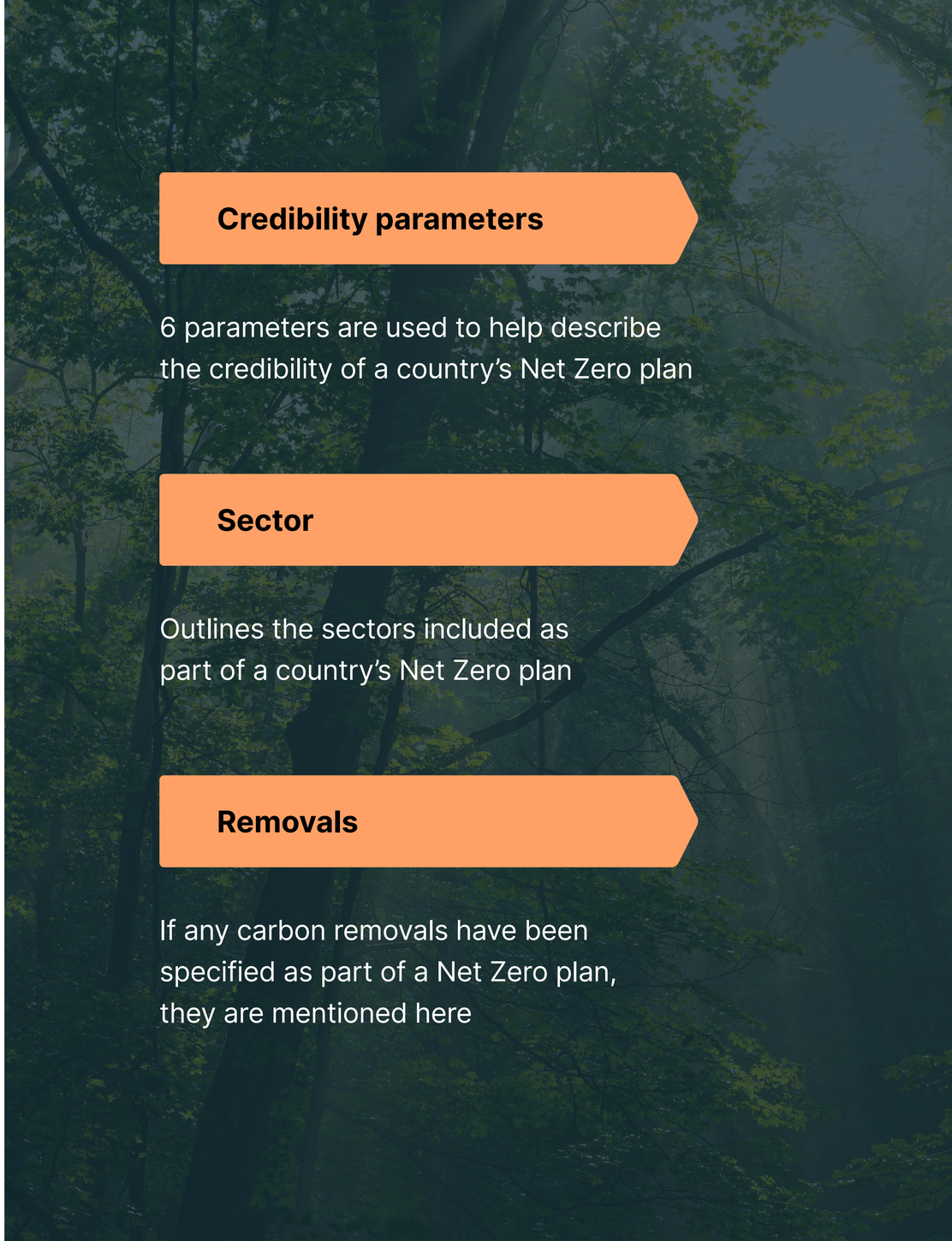
How are countries planning to achieve Net Zero in practice?

A strategy to achieve Net Zero includes many components. While the pathways vary widely from country to country, many commonalities exist.

The framework presented here adopts a **'building block' approach** to highlight the main components of a country's Net Zero target. It presents six key credibility parameters, including whether the Net Zero target is enshrined in law, and whether clear accountability mechanisms are in place. The framework also indicates whether the country explicitly plans to rely on carbon removals to achieve its goals, or not.



Credibility parameters

6 parameters are used to help describe the credibility of a country's Net Zero plan

Sector

Outlines the sectors included as part of a country's Net Zero plan

Removals

If any carbon removals have been specified as part of a Net Zero plan, they are mentioned here

Credibility parameters[34]	
Net Zero target published?	Yes – 2070
Targets set in law?	Declaration / Pledge
Scope 1, 2, and/or 3 specified?	No
Accountability mechanism?	No
Baseline year stated?	Yes – 2005
Annual reporting?	Less than annual

Which sectors have specific sectoral targets?[33]
Power
Industry
Transport
Building
Urban

What carbon removals have been specified?[34]
Not Specified

India

$ $

GDP per capita (2022)[35]
USD **$2,388**

Current annual emissions (2021)[36]
3.9 $GtCO_2e$

Peak emissions (forecast)[37]
2040–2045

Ambitious, best practice or very near best practice

Lags in some important respects

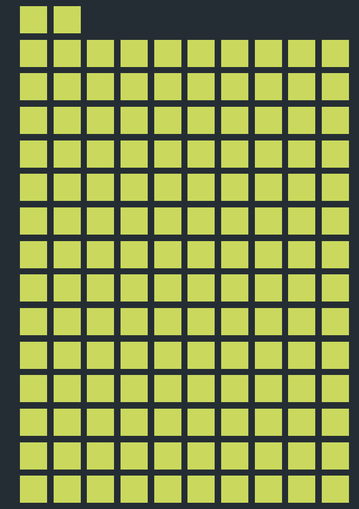
Inadequate or yet to be defined

Credibility parameters[34]	
Net Zero target published?	Yes – 2060
Targets set in law?	In Policy
Scope 1, 2, and/or 3 specified?	No
Accountability mechanism?	No
Baseline year stated?	Yes – 2005
Annual reporting?	No reporting mechanism

Which sectors have specific sectoral targets?[38]
Energy
Agriculture
Waste
Industry

What carbon removals have been specified?[34]
Nature Based
CCS-Based

China



GDP per capita (2022)[39]
USD **$12,720**

Current annual emissions (2021)[38]
14.2 $GtCO_2e$

Peak emissions (forecast)[40]
2025–2030

Ambitious, best practice or very near best practice

Lags in some important respects

Inadequate or yet to be defined

Credibility parameters[34]

Net Zero target published?	Yes – 2050
Targets set in law?	In Policy
Scope 1, 2, and/or 3 specified?	No
Accountability mechanism?	Yes
Baseline year stated?	Yes – 1990
Annual reporting?	Annual reporting

Which sectors have specific sectoral targets?[41]

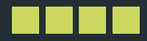
- Transport
- Buildings
- Industry
- Hydrogen
- Land Use (only a commitment, not plan)

What carbon removals have been specified?[1,34]

- Nature Based
- CCS-Based
- International Offsets Allowed

United Kingdom

GDP per capita (2022)[42]
USD **$45,850**



Current annual emissions (2022)[43]
0.417 $GtCO_2e$

Peak emissions (achieved)[44]
1972 (CO_2); **2007** (counting UK imports)

Ambitious, best practice or very near best practice
Lags in some important respects
Inadequate or yet to be defined

Credibility parameters[34]	
Net Zero target published?	Yes – 2050
Targets set in law?	Declaration / Pledge
Scope 1, 2, and/or 3 specified?	No
Accountability mechanism?	No
Baseline year stated?	No (uses 2015 for some sectors)
Annual reporting?	Less than annual

Which sectors have specific sectoral targets?[45]

- Electricity
- Industry
- Transport
- Residential
- Agriculture and Forestry

What carbon removals have been specified?[34]

- Not Specified

South Africa

$$
$$
$$$$$

GDP per capita (2022)[46]
USD **$6,776**

Current annual emissions (2021)[47]
0.553 $GtCO_2e$

Peak emissions (pledged)[48]
2020–2025

Ambitious, best practice or very near best practice
Lags in some important respects
Inadequate or yet to be defined

Credibility parameters[34]	
Net Zero target published?	Yes – 2060
Targets set in law?	Proposed / in discussion
Scope 1, 2, and/or 3 specified?	No
Accountability mechanism?	Not Specified
Baseline year stated?	Yes – 2030
Annual reporting?	Less than annual

Which sectors have specific sectoral targets?[49]

- Land Use & Forestry
- Transport
- **Power** (signed Methane and Coal Exit plans in Glasgow but not included in NDC)
- **Transport** (no plan but there are initiatives)
- Buildings

What carbon removals have been specified?[34]

- Nature Based
- CCS-Based

Indonesia

$ $ $ $ $

GDP per capita (2022)[50]
USD **4,788**

Current annual emissions (2021)[47]
2.03 $GtCO_2e$

Peak emissions (forecast)[51]
2030

Ambitious, best practice or very near best practice
Lags in some important respects
Inadequate or yet to be defined

Credibility parameters[34]	
Net Zero target published?	Yes – 2050
Targets set in law?	In Policy
Scope 1, 2, and/or 3 specified?	No
Accountability mechanism?	No
Baseline year stated?	No
Annual reporting?	Less than annual

Which sectors have specific sectoral targets?[52]
Buildings
Power
Industrial
Agriculture & Land Use
Waste
Transport

What carbon removals have been specified?[34]
Nature Based

Vietnam

$ $ $ $

GDP per capita (2022)[53]
USD **$4,164**

Current annual emissions (2021)[47]
0.57 $GtCO_2e$

Peak emissions (forecast)[54]
2030–2035

Ambitious, best practice or very near best practice
Lags in some important respects
Inadequate or yet to be defined

Credibility parameters[34]	
Net Zero target published?	Yes – 2053
Targets set in law?	In Policy
Scope 1, 2, and/or 3 specified?	No
Accountability mechanism?	Not specified
Baseline year stated?	No
Annual reporting?	Less than annual

Which sectors have specific sectoral targets?[55]
Forestry & Agriculture
Transport
Power / Energy
Industry
Waste
Buildings

What carbon removals have been specified?[34]
Not Specified

Turkey

GDP per capita (2022)[56]
USD **$10,616**

Current annual emissions (2021)[47]
0.598 $GtCO_2e$

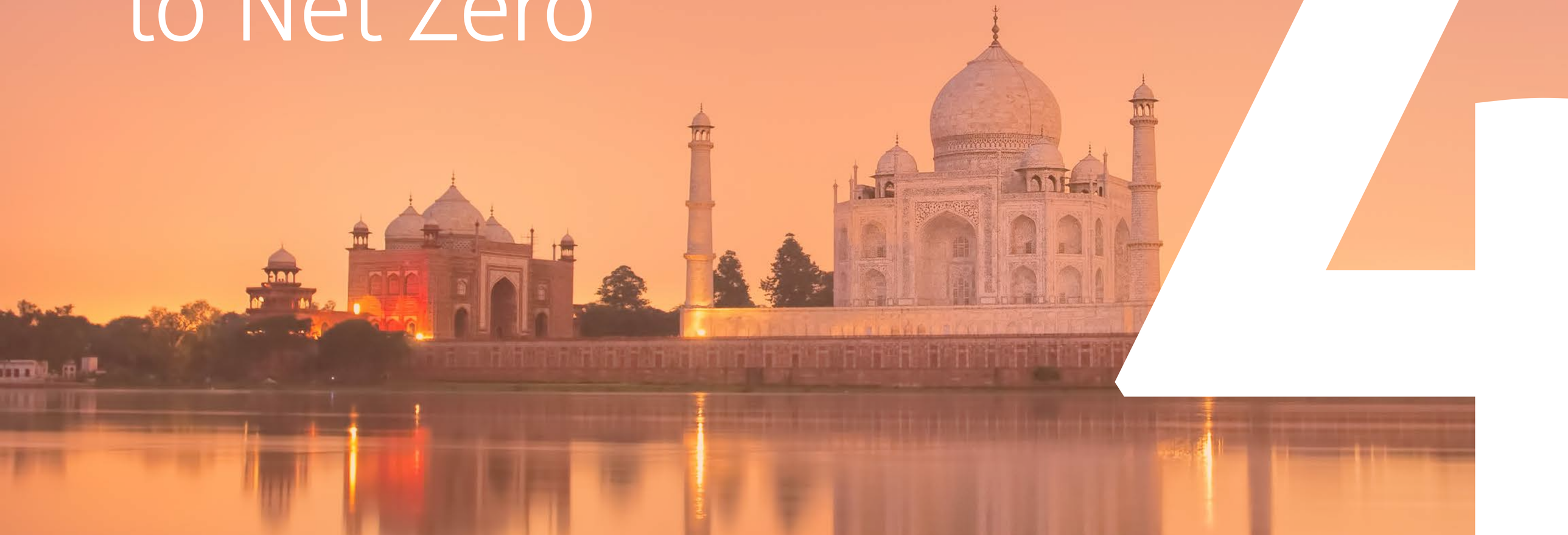
Peak emissions (forecast)[57]
2038

Ambitious, best practice or very near best practice

Lags in some important respects

Inadequate or yet to be defined

India's Pathway to Net Zero



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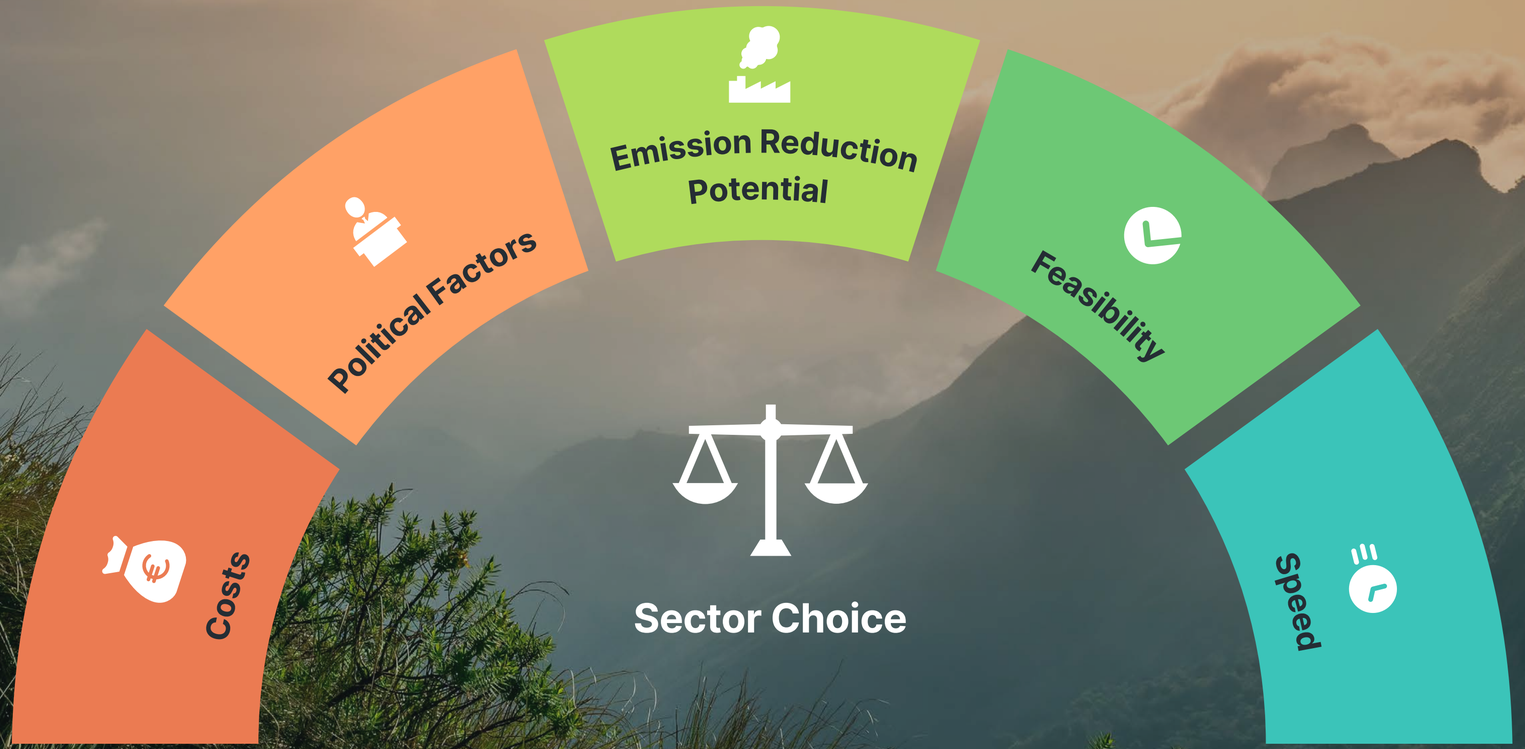
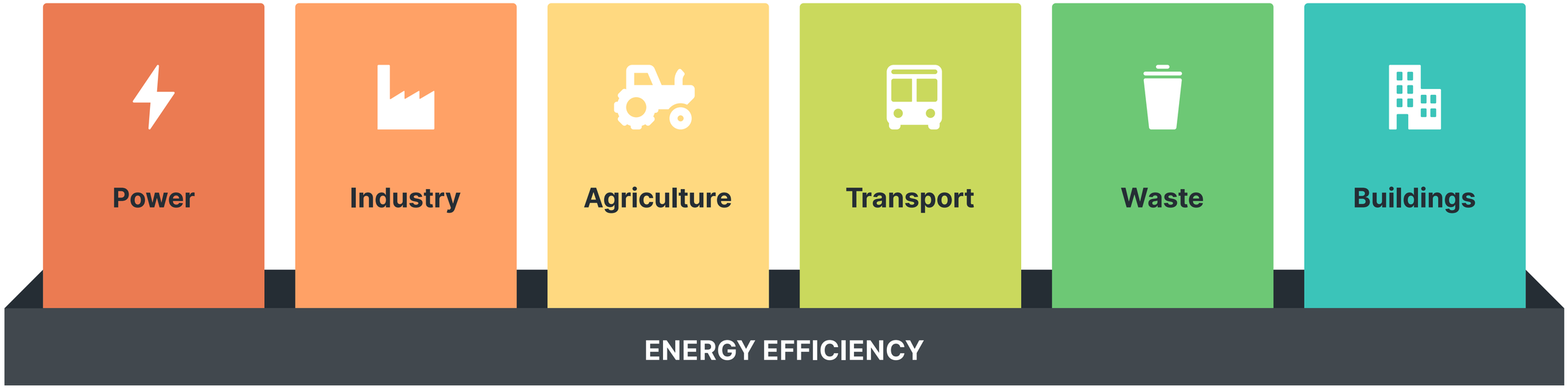
There are several factors to evaluate when designing Net Zero targets



Which sectors should a large, emerging, and rapidly growing country like India target first?



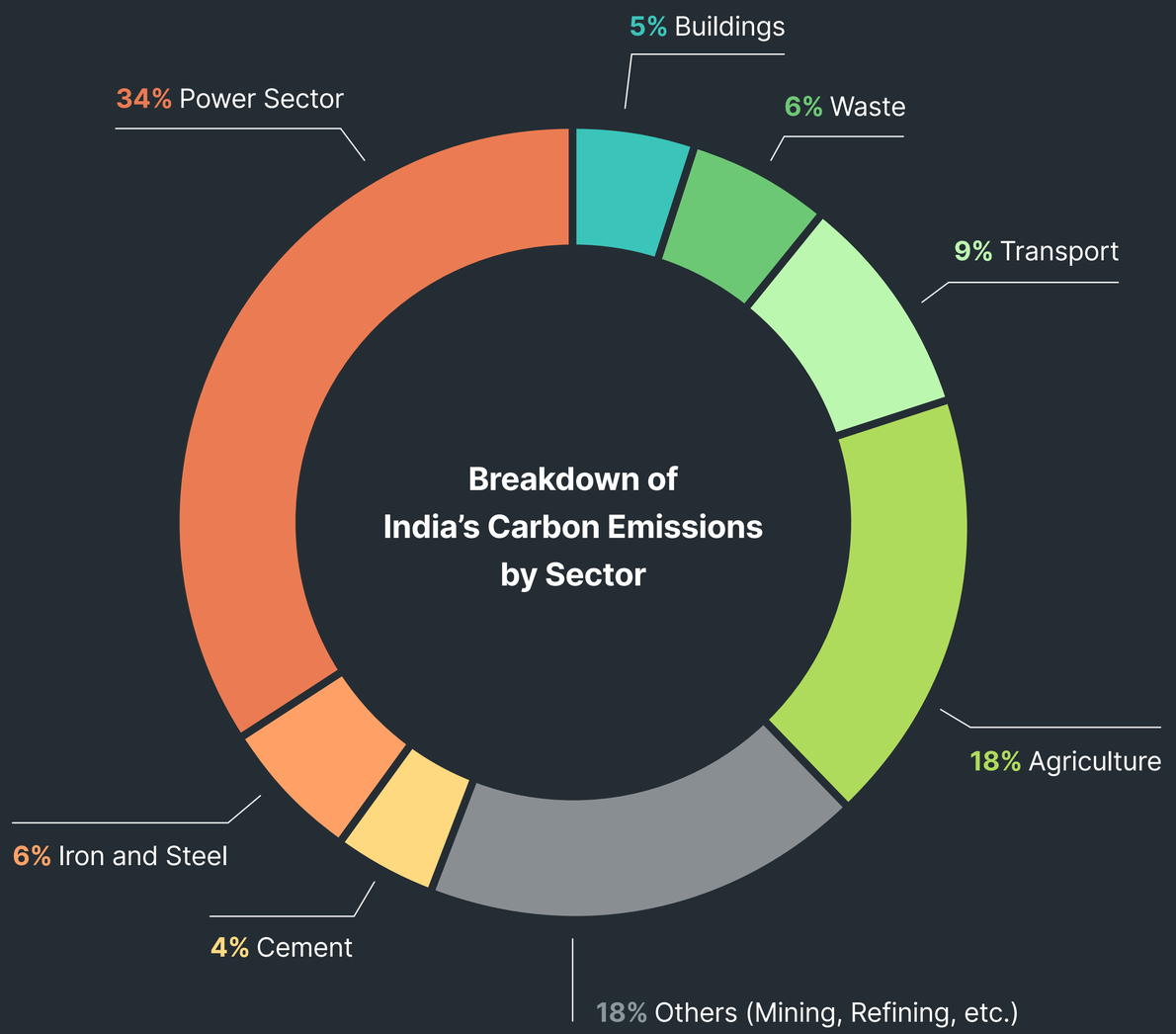
Energy efficiency is cross-cutting and touches all sectors of energy end-use.
Energy efficiency ranks among the most cost-effective of decarbonization options.[58]
As such, energy efficiency should underpin Net Zero plans and strategies.

The power sector needs to lead India's decarbonisation drive

The **power sector** represents over 1/3 of India' emissions, making it central to India' decarbonization.[59]

The second largest player is **agriculture** (18%), followed by **industry**, spread across iron and steel (6%), cement (4%), mining, refining and others (18%).[59]

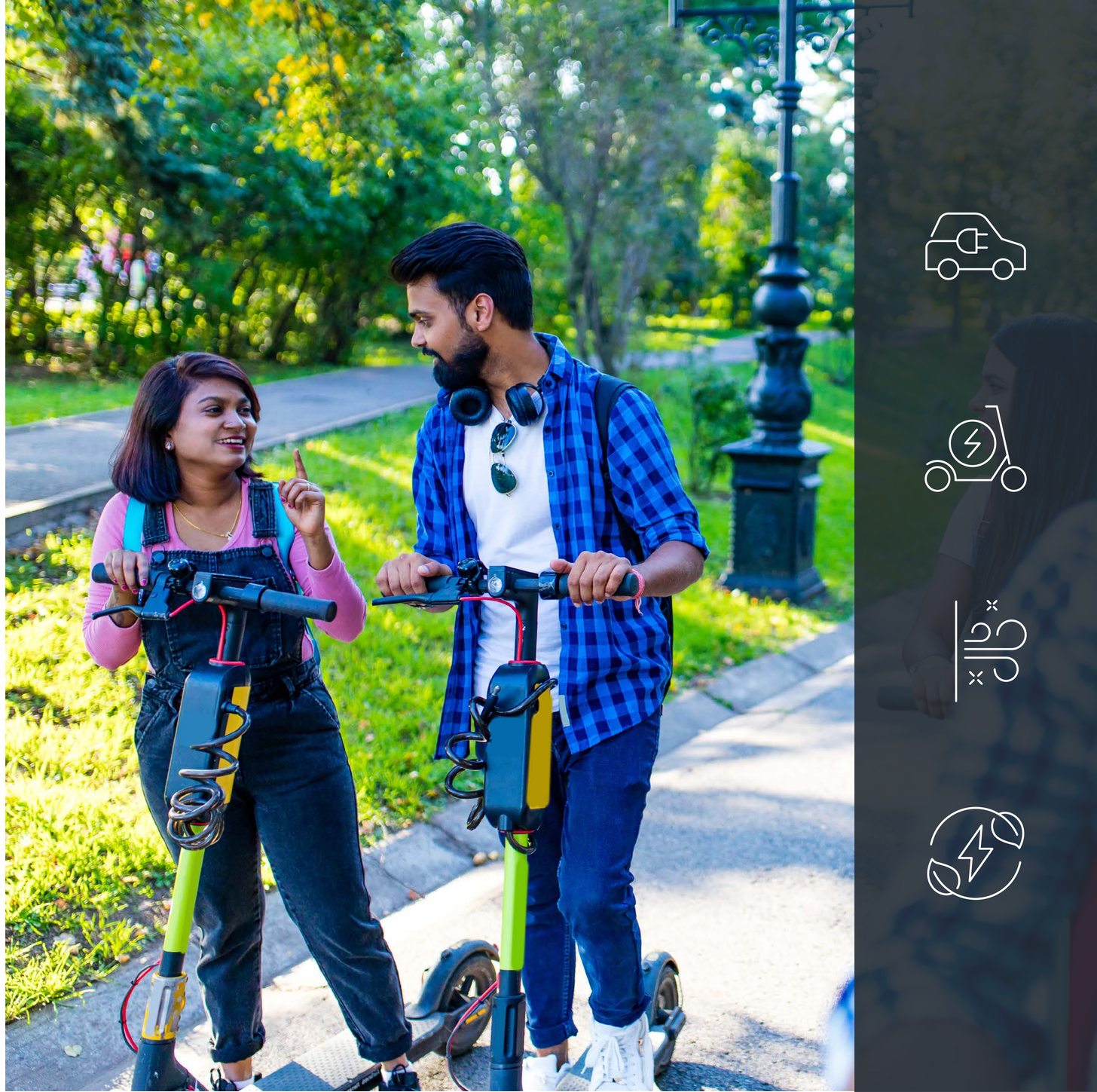
Transport makes up 9%, indicating significant potential for emissions reduction here, particularly considering the anticipated rise in mobility and mobility-related services in India.[59]



Electrification of everything is on the rise

The **power sector** is not only where the largest emissions reduction potential exists: it is also where emissions reductions are available at the lowest cost.

With the increasingly positive economics of **electrification** (heating, cooling, cooking, transport, as well as power-to-X), accelerating progress in the power sector has a positive “knock-on” effect on the decarbonization of other sectors.

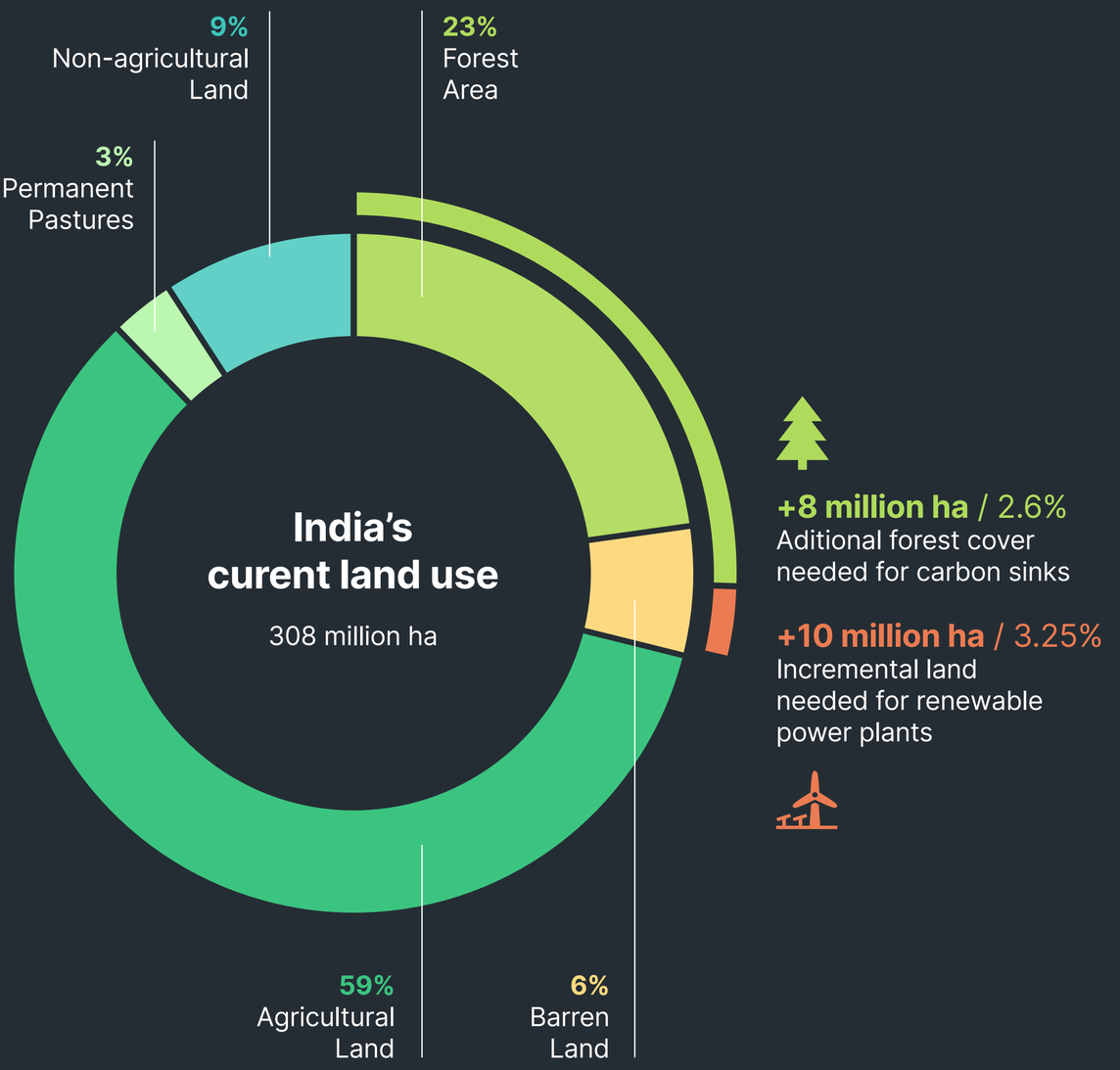


Land-use emerging as a major challenge for India's decarbonization plans

Renewable power deployment alone could take up to 10 million hectares by 2070 (roughly the size of Portugal).[59]

However, co-location and dual-use is possible, both for wind power and for solar power.

- **Agrivoltaics** enable dual-production of both agriculture and solar power.
- **Wind power** can also be easily integrated with farming, as well as grazing and other forms of agriculture.



Key building blocks for achieving Net Zero in India

A **zero-carbon electricity standard** in the power sector could introduce long-term certainty for the sector and help drive emissions down in a scheduled way.

Industry: Reductions of between 15-35% are possible with today's technologies in the industrial sector. Industry needs to be encouraged to lead and supported in its decarbonization efforts.[60]

Agriculture: improvements in agriculture could yield emissions reductions of between 10-25%.[1] More investment is needed, along with more support for farmers to help them transition.

Carbon pricing could help align the price signals and encourage greater efficiency and lower-carbon consumption choices. Carbon pricing can also help shelter industries against the emergence of carbon border adjustment policies like those planned in the EU.

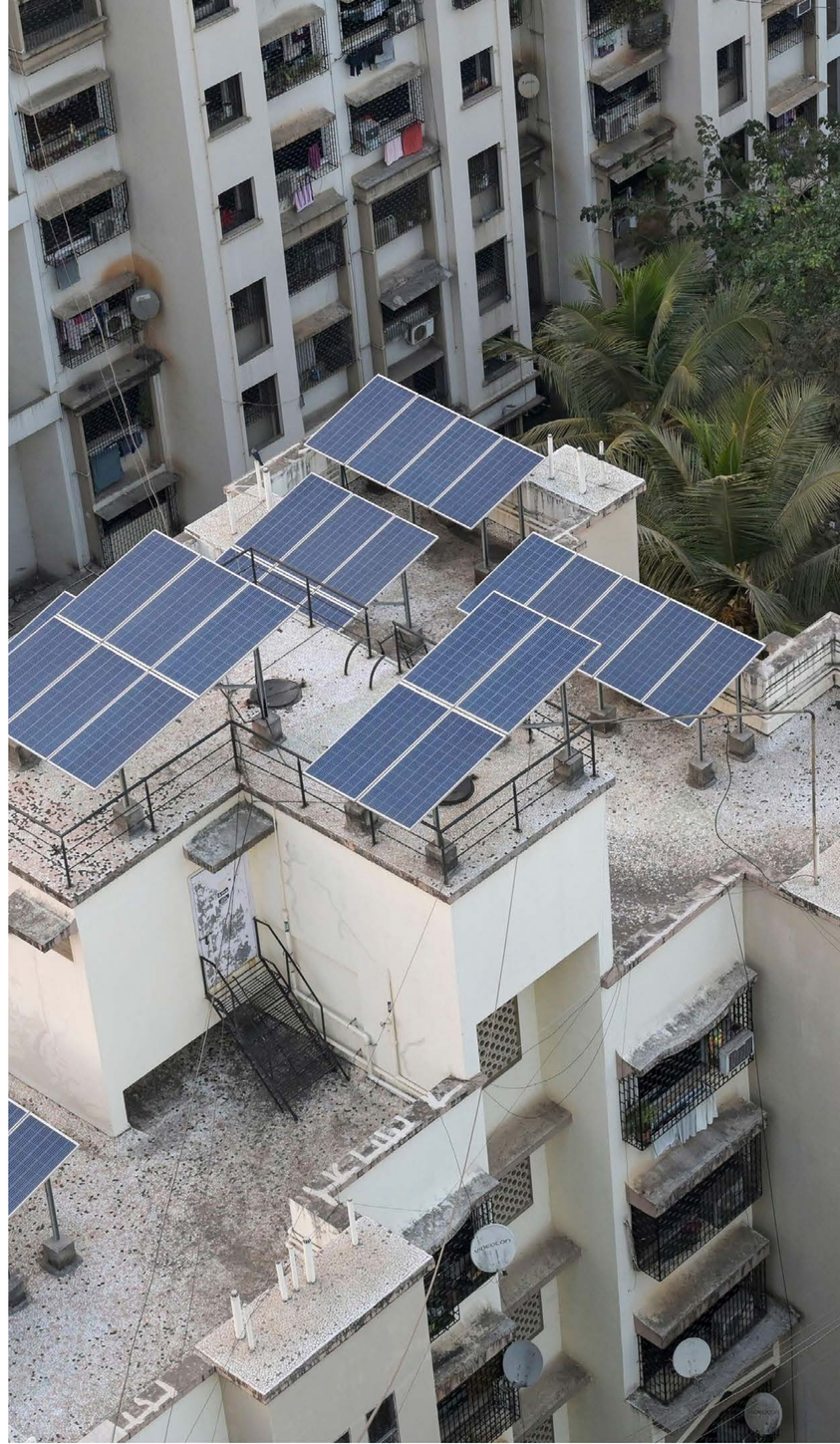
The **electrification of transport**, combined with efforts to reduce the carbon intensity of the power grid, can produce major gains, enabling transport-related emissions to quickly plateau and start declining. Two-wheelers and three-wheelers are already showing rapid growth; more investments in public transit and in charging infrastructure are needed.

Demand for cooling is growing rapidly. Smarter solutions are urgently needed.

According to the International Energy Agency (IEA), cooling is currently the fastest growing source of end-use energy demand worldwide.[61] Cooling demand is projected to grow 33-fold by 2100.[62] In addition, India currently has the largest population that is at risk of extreme heat worldwide (323 million).[62]

On hot days, air conditioning represents fully 50% of China's peak electricity demand. In the Middle East, this figure is even higher, exceeding 70% in countries like Qatar and Saudi Arabia. While the figure in India remains small (at under 10%), it is projected to grow rapidly as living standards rise.

Meanwhile, **rapidly rising cooling-related electricity demand is one of the leading causes of power outages worldwide**. Ensuring that growing cooling loads are primarily supplied by onsite solar PV and/or with onsite thermal storage represents a simple and cost-effective way to protect the stability of the grid.



Efforts to increase carbon sinks, including forest protection and re-wilding, need to be expanded

Nature-based solutions hold tremendous potential to stabilize global temperatures. It is estimated that nature-based solutions like nature protection can meet fully 1/3 of the global emissions reductions needed under the Paris Agreement.[63]

In addition, improved forest protection can provide billions of dollars in savings in terms of **flood protection**.

Also, trees and vegetation have positive effects on **cooling** (and reducing the need for air conditioning), particularly in cities.

India should establish a **registry** of its current carbon sinks (forests and nature protected reserves) and **expand nature protection** as part of its decarbonization plans.

Protecting and expanding existing forests is far easier, cheaper, and more effective than investing in plantations, which are prone to disease, and at greater risk of wildfires.[64]


In your view, what are the next steps?
Discussion and Questions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