

UN CLIMATE
CHANGE
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India

Visions of feasible, desirable and resilient net-zero futures

WELCOME TO INDIA IN A GLOBAL NET-ZERO, **RESILIENT 2050.**

Overview



**Agroforestry across the subcontinent.
Traditional organic soil composting in the Himalayas.
Electric bikes, solar homes and wetland waste management systems.**

India will become the world's most populous nation in the next few years. The country's rapid economic development is transforming millions of lives. But it also creates a complex set of challenges when it comes to building an inclusive, desirable, resilient net-zero future.

India's focus is likely to involve both adapting to a changing climate, and mitigating the climate impact of its ongoing development. What life will look like in 2050 depends on the choices we all make today.

This report presents visions of India in 2050. It brings together:

- > **What is feasible**, based on what is known today through the lens of science and innovation
- > **What is desirable**, based on real conversations with a range of Indian citizens

Those Indian citizens include representatives from government, civil society and business, young people, and other Indian citizens. They were presented with the science, and asked to imagine the futures they hope for based on that science.

This gives leaders and policymakers a new perspective as they shape their country's response to climate change: **what could a desirable future for India look like in a climate resilient, net-zero world?**

WELCOME TO INDIA IN A GLOBAL NET-ZERO, **RESILIENT 2050.**



ABOUT THESE VISIONS

These visions of India in 2050 are composites, bringing together a mix of feasible and desirable solutions from academic experts and citizens. They are not a comprehensive assessment of all options, nor are they a prediction of exactly what will happen. They offer an impression of the changes and possibilities that a net-zero, climate-resilient world could bring to India and beyond.

Pull-out quotes reflect ideas and opinions shared in the workshops, and while some are captured verbatim, others reflect the spirit of the views shared.

ACADEMIC EXPERTS

The in-country academics who shared inputs from India were:

Prof Ambuj Sagar,
IIT, Delhi

Dr Suresh Babu,
Ambedkar University, Delhi

These regional academics were supported by Dr Ramit Debnath from the University of Cambridge.

REGIONAL VISIONS, GLOBAL EFFORT

This report is part of a set of visions for six global regions: the Arabian Peninsula, Brazil, India, Jamaica, Kenya, and the UK. These regions were chosen to reflect the diversity of challenges and opportunities in building a globally net-zero, climate-resilient future.

Each country's role in building this future will be different. While reading these visions, it's important to remember that they represent possible parts of a future that can only be achieved through deep international cooperation.

INDIA IN 2050



India in 2050 will be a very different place to India in 2021. A shift away from coal to renewable energy sources, particularly local solar, may have knock-on effects – for example, new economic opportunities for women. And technology and new green infrastructure will give people greater freedom around where and how they live and work.

INDIA IN 2050

Energy

EVIDENCE AND INSIGHTS

India has made considerable progress in decoupling economic growth and greenhouse gas emissions – the energy intensity of India's GDP decreased by 24% between 2005 and 2016.

2050 VISION

By 2050, India will have shifted decisively away from fossil fuels. Local renewables generation and storage will give rural communities more autonomy, while creating a wave of green jobs.

- > **Green buildings, green homes:** In 2050, India may have doubled its building space. These new buildings will be thermally efficient, and infused with smart technology of all shapes and sizes – from LED lights, which use 75% less energy, to biogas burners that turn household waste into power.
- > **The great coal switch:** A move away from coal will rapidly lower India's emissions, with potential benefits for health and the environment in coal-mining areas. Creating new jobs in renewables and other industries in former coal regions will be a vital part of this transition.
- > **Solar energy with battery storage:** India could become a leader in solar, enabled by emerging technology in long-term battery and hydrogen storage. Incentives that allow communities to invest in rooftop solar could bring major benefits, particularly in rural areas.

"I hope we can expand energy access, enhance production and increase efficiency in a clean and sustainable way."

– WORKSHOP PARTICIPANT



**“BY 2050,
RENEWABLE
ENERGY
SHOULD BE THE
MAINSTREAM
FORM OF
ENERGY”**

- WORKSHOP PARTICIPANT

INDIA IN 2050

Food and Land

"We must reverse land degradation in India, and improve our soil health"

- WORKSHOP PARTICIPANT

EVIDENCE AND INSIGHTS

India's forests and crop lands absorbed approximately 15% of India's CO₂ emissions in 2016 – a 40% increase from 2000. In parallel, the right use of fertiliser, management of water, and adoption of zero-tillage practices could cut emissions from farming.

2050 VISION

By 2050, a new approach to agriculture – combining both technology and traditional practices – could result in improved environmental health, food security, and new economic opportunities in rural areas.

> **Agroforestry:** When carefully managed, India's soil represents a vast carbon sink. Restoring lost forests and practising agroforestry – where crops are grown on forested land – is a far more sustainable model, that may also unlock new economic opportunities, for instance the cultivation of new medicinal plants.

> **Looking after livestock:** Climate change is a major threat to livestock through higher temperatures and increased risk of drought. Indian livestock breeds have good potential to adapt to a changing climate through traditional breeding and genetic modification, protecting farmers' livelihoods and the country's food security.



INDIA IN 2050

Food and Land

> **Nutrient security:** Even a 1°C rise in temperature from 2010 levels will put strain on India's nutrient security. Biofortification – improving the nutrient contents of crops through agricultural practices and technology – would enhance nutrient security in India. A good example is breeding varieties of pearl millet with high levels of iron and zinc.

> **Adopting traditional practices:** Rice-fish culture is an 1,500-year-old Indian farming practice which creates an integrated agro-ecological system. This can help reduce fertilizer needs, which lowers farming costs, reduces emissions, and prevents soil degradation.

Similarly, in Himalayan villages, farmers use traditional organic composting to enhance soil quality and increase carbon sequestration.

"I hope resilient and sustainable food systems, grounded in alternative proteins, decrease our dependence on industrialised animal agriculture and reduce its negative environmental impact"

– WORKSHOP PARTICIPANT



INDIA IN 2050

Water

"We need to make sure drinking water and groundwater is available across Northern India"

- WORKSHOP PARTICIPANT

EVIDENCE AND INSIGHTS

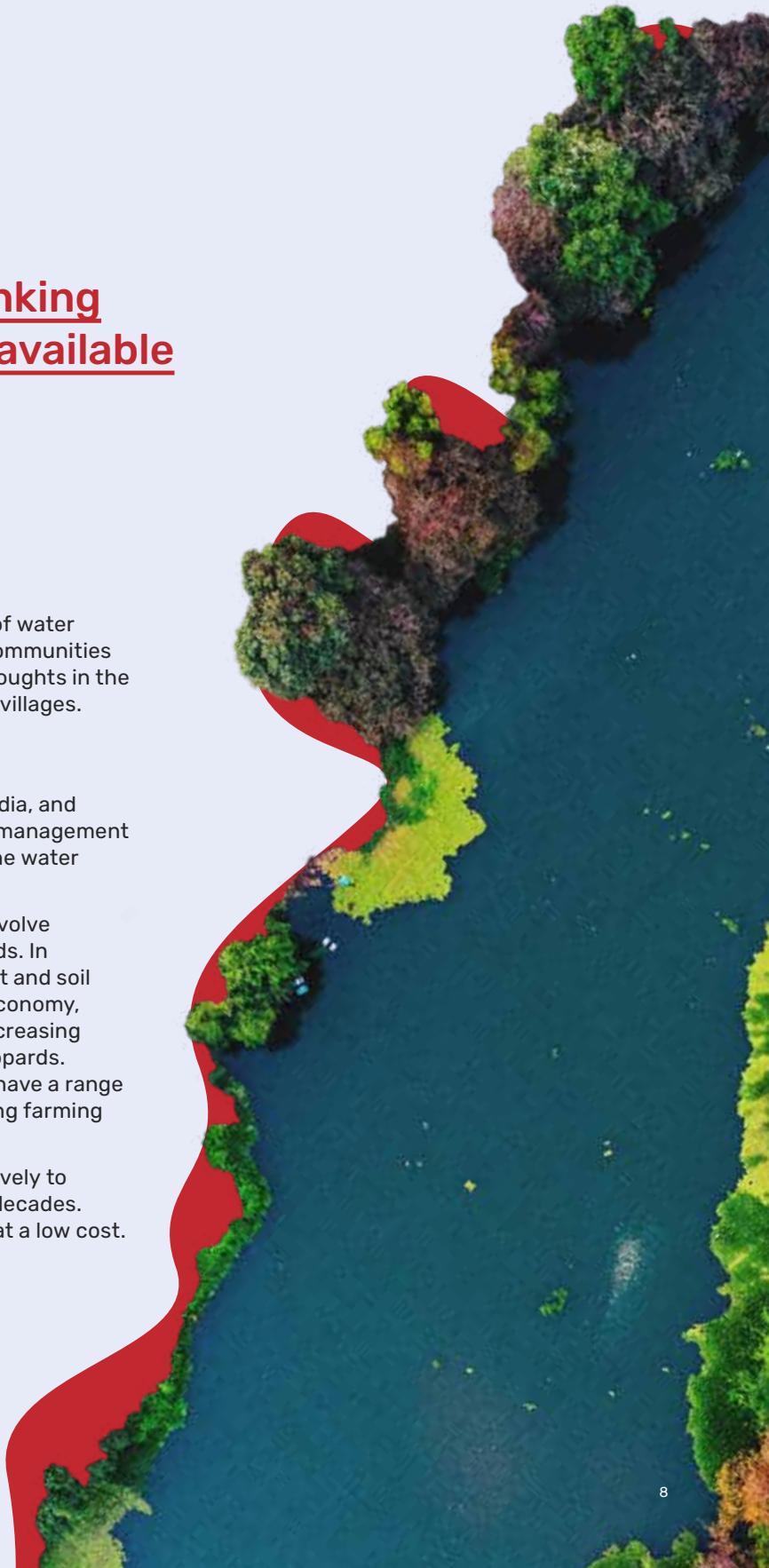
One of the most globally recognised success stories of water conservation is in Rajasthan, where women in local communities revived water bodies to help fight one of the worst droughts in the state. Their actions brought back water to over 1,000 villages.

2050 VISION

Climate change will disrupt rainfall patterns across India, and bring many other water challenges. By 2050, careful management of India's wetlands and watersheds will help ensure the water security of 1 billion people.

> **Nature-based solutions:** Nature-based solutions involve harnessing natural systems to help meet water needs. In Rajasthan, a nature-based approach involving forest and soil regeneration had dramatic effects for people, the economy, and wildlife, with productive farmland in the area increasing from 20% to 80%, and the return of antelope and leopards. Expanding this kind of approach across India could have a range of co-benefits, reducing water stress while improving farming yields and preventing flooding.

> **Eastern wetlands:** Wetlands have been used effectively to clean wastewater in areas such as East Kolkata for decades. Expanding this approach would improve sanitation at a low cost.



“I HOPE THAT GREEN INFRASTRUCTURE IS PART OF CITY PLANNING, TO HELP PURIFY THE AIR AND PROTECT FROM HEAT WAVES AND FLOODING”

- WORKSHOP PARTICIPANT

OTHER HOPES AND IDEAS FROM INDIA

"I want us to have mandatory climate-resilient policies for the construction of buildings"

– WORKSHOP PARTICIPANT

During our workshops, people shared a diverse range of hopes, ideas and possibilities for life in 2050.

Those ideas range from new infrastructure to new kinds of jobs. Together, they paint a picture of the kinds of futures people may want to see.

> **Climate-responsive designs:** With rising temperatures, air conditioners (ACs) are the single most significant source of electricity demand in the Indian building sector. This growth in cooling demand could be mitigated by thermally efficient building designs – for example, wind tunnels that create natural ventilation.

> **Homes for all:** In 2021, more than 150 million Indians live in informal settlements or slums with a lack of basic infrastructure and services.

Future housing initiatives could provide homes built with eco-friendly building materials, rehousing slum dwellers in permanent building structures. The switch to low-carbon technology in India's building sector should centre around a need-driven approach, built on a collaborative and ongoing local assessment process. Climate-resilient housing should be built with a special emphasis on coastal communities. This will also create new livelihoods and economic opportunities.

There is also a huge desire for new housing to be connected by low-carbon, hassle-free transport systems.





**“BY 2050,
I HOPE WE WILL
HAVE HUMAN-
CENTRIC AND
NOT CAR-CENTRIC
DEVELOPMENTS”**

- WORKSHOP PARTICIPANT

OTHER HOPES AND IDEAS FROM INDIA

"By 2050, we need to establish circular models for all consumer products"

- WORKSHOP PARTICIPANT

- > **Urban agriculture:** Small-scale agriculture within cities could help with carbon sequestration, improve air quality and reduce the impacts of heatwaves. It's already been happening in Mumbai, Delhi and Kolkata, enabled by land and spatial planning practices
- > **Green economy:** Building a green economy in India would have a number of interacting benefits, creating new jobs, reducing costs, and improving India's national security. Planning for the loss of 10-15 million coal-dependent jobs is a critical part of this transition.
- > **Low-carbon hub:** Targeted funding and linked incentive schemes could turn India into a low-carbon tech hub, harnessing the competitive advantages of relatively low labour and land costs. In Tamil Nadu, the growth of the electric scooter industry gives a taste of what is possible.
- > **The move to electric:** Transport is one of the main action areas for decarbonisation in India. A successful push toward electric mobility depends on energy storage and other infrastructure investment. But it will bring huge benefits, curbing local air pollution in India's megacities.



"Equitable and fast distribution of supplies of food, water and shelter to people - especially the coastal communities inflicted with extreme climate events"

- WORKSHOP PARTICIPANT

**“BY 2050,
I HOPE INDIA IS
SENSITIVE AND
RESPONSIBLE
ENOUGH
TO BUILD A
CLIMATE-
RESILIENT
SOCIETY”**

- WORKSHOP PARTICIPANT



ACHIEVING THESE VISIONS

These visions give us a taste of what people in India want to see. But what might the path to delivering them look and feel like?

INDIA TODAY AND TOMORROW

India is the world's third-largest energy-consuming country, and the effects of climate change are already visible. By 2050, India could become one of the first places in the world to experience heat waves that cross the survivability limit for a healthy human when resting in the shade.

Key considerations include:

- > **Resilient lands and people:** India is expected to surpass China to become the world's most populated country by 2027, yet its landmass accounts for only 2.4% of the global land. To maximise the efficiency of land, India needs to harness the potential uses of natural landscapes to decrease the vulnerability of small-scale farmers, secure nutrition for future generations, and provide ecosystem services to growing urban populations in India.
- > **People power:** Encouraging energy-conserving behaviours and consumer choices is critical for adopting high-efficiency and low-carbon technologies to achieve low- or net-zero energy performance.



ACHIEVING THESE VISIONS

> Protecting ecosystems: There is a vast range of natural ecosystems in India, from the Himalayas to wetlands, to coastal zones and mangroves. These ecosystems need to be protected and enhanced for their environmental value, their economic value, and their role in managing rising temperatures and absorbing carbon.

> Coal reliance: If India chooses a faster transition towards low-carbon growth in the electricity generation sector, it will affect the revenues of the coal-dependent states. This could risk half a million jobs, and lead to higher fares for Indian rail commuters (which are currently subsidised by coal freight). India's transition toward a sustainable future must recognise such 'stranded workers' and communities, and consider how to protect them socially and financially.

> Pressure on power grids: Mass electrification and a changing energy mix will call for a much more flexible power grid in India. New power lines, new storage technologies and local generation – such as rooftop solar – are likely to play a key part.

> Water security: A key challenge for India is ensuring water security as the effects of climate change unfold. This problem is particularly acute for certain areas and populations – for example, one study in Sikkim demonstrated that women are more likely to be affected by water access issues.

> Growing the circular economy: A shift towards more mindful consumption patterns, waste reduction and recycling is key to building a circular economy.

> The role of government: Policies, subsidies and infrastructure will play a key role in making this transition both achievable and desirable across society.



TRANSITIONS

The hard work of meeting many of these challenges has already begun. It's important that we acknowledge this progress, while also understanding the scale of the task ahead.

CURRENT

The Green India Mission aims to fight climate change by increasing forest cover in India by 5 million hectares

India has set an ambitious target of 30% electric vehicles by 2030

The Indian government launched the India Cooling Action Plan in 2019. One of the first of its kind, this aims to reduce the cooling requirements in residential and commercial buildings, for example through passive cooling building designs and better efficiency standards

FUTURE

India can reach its goal of increasing its forest carbon sinks from 2.5 to 3 billion tonnes of CO₂ by continuously increasing forest cover

Full electrification of India's surface transport by 2050 with an emphasis on shared mobility, and a power grid that can meet this demand

India has the potential to deliver about 30% of CO₂ emission reduction by 2050 through high-efficiency space cooling



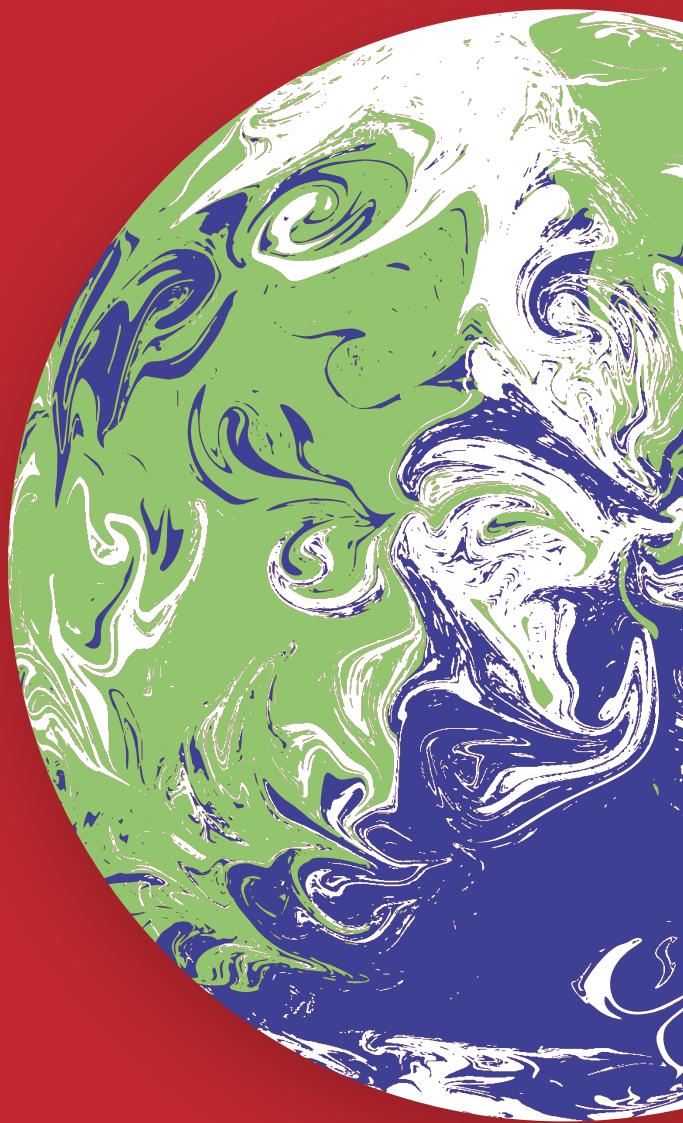
CONVERSATION STARTERS

This report is a thought experiment, offering a window into people's hopes, fears and ideas for a net-zero, climate-resilient future. It's designed to give citizens a voice, and policymakers a more international and more inclusive perspective.

Every country's role in a net-zero, climate resilient future is different. And by profiling some of the solutions and innovations that might work in the context of India, this document aims to inspire action on climate change in other regions too

QUESTIONS TO START THE CONVERSATION INCLUDE:

- > How might vulnerable groups be impacted by or enable a sustainable 2050?
- > What tools or support do farmers and young entrepreneurs need to seize the opportunities to transition to new, sustainable agricultural practices?
- > How could building design and energy performance standards inform how new buildings are resilient and adapted to a changing climate?
- > How might the ageing power system be revitalised through digitalisation, decarbonisation and decentralisation of the grid?



ABOUT THIS PROJECT

This report is part of a set of visions commissioned in 2021 by the UK ahead of their COP26 Presidency. These visions aim to explore what the future could look like in a climate-resilient, net-zero world. They highlight some of the innovations that could make this future a reality, and explore what science can tell us about the wide-ranging benefits of achieving this future.

The visions cover a series of cross-cutting themes and six regions: the Arabian Peninsula (specifically focused on the Kingdom of Saudi Arabia and the United Arab Emirates), Brazil, India, Jamaica, Kenya, and the UK. They were chosen to reflect the diversity of challenges and opportunities in building a sustainable future.

What we did

These visions were created in three stages between April and August 2021:

- > An international collaboration of experts from the six regions, coordinated by the University of Cambridge, gathered existing research from around the world on science & innovation solutions which could support a global transition to a resilient, net-zero future, including information around their impact and wide-ranging benefits.
- > The findings of these experts were shared with groups of citizens, from each of the six regions, who were then asked to share their hopes and ideas for their own region in a resilient, net-zero world. These citizens came from a variety of groups and backgrounds, with representation from industry, youth groups, civil society, government and Indigenous populations.
- > The science from the experts and the ideas and perspectives from the citizens were brought together to create these visions.



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