

## 1. India

### 1.1 Green Agriculture

#### 1.1.1 India should learn from Sri Lanka's egregious mistakes as it transitions to sustainable farming

Dec 19, 2022

The production-centric intensive agriculture brought about by India's Green Revolution in the 1960s, using high-yielding seeds, fertilisers and high levels of groundwater utilisation, helped India achieve food self-sufficiency by the 1970s, but has created a crisis of depletion of soil health, groundwater, and other natural resources, said PS Vijayshankar, an expert on sustainable farming and water resource management. What India needs now is an ecosystem-centric approach to agriculture, which understands that agricultural production draws resources from the ecosystem, and that there are limits to these resources, Vijayshankar told us in an interview about the impacts of industrial agriculture, sustainable agriculture policy and the imperative of sustainable natural resource management.



While the Union government has announced policies and schemes to promote a transition to non-chemical farming, its decision in October to grant approval for herbicide-tolerant, genetically-modified mustard for commercial use reveals confusion in the government's approach to agriculture, said Vijayshankar. As India attempts to bring about a paradigm shift to chemical-free and sustainable agricultural practices, lessons

should be drawn from the coherent approach of the Green Revolution, by ensuring adequate research, administrative and financial support for natural farming, said Vijayshankar. India's transition should also be well calibrated, learning from the recent crisis in Sri Lanka, as the abrupt withdrawal of chemical fertilisers can adversely impact yield, and thus farmer's income, he said.

<https://scroll.in/article/1039930/india-should-learn-from-sri-lankas-egregious-mistakes-as-it-transitions-to-sustainable-farming>

### 1.1.2 India may issue 'green bonds' to partly fund National Mission on Natural Farming

December 07, 2022

Cabinet likely to take a call soon on the ₹2,481-cr scheme



The Cabinet will soon take a call on the Agriculture Ministry's ₹2,481-crore proposal to launch National Mission on Natural Farming (NMNF), to be implemented from the current fiscal until 2025-26. The NMNF will target to bring into its fold 7.5 lakh farmers to practice non-chemical natural farming on 7.5 lakh hectares. Under the scheme, farmers will get a maximum funding of ₹15,000/hectare (until 2025-26) depending on loss in income, if any, after switching over to natural farming.

The initial focus will be to roll it out in the 5 kilometre-wide corridor along river Ganga and subsequently it will be extended to other areas.

<https://www.thehindubusinessline.com/economy/agri-business/india-may-issue-green-bonds-to-partly-fund-national-mission-on-natural-farming/article66234590.ece>

## 1.2 Smart home

### 1.2.1 How Gen Z lifestyle is boosting the smart home automation industry

October 3, 2022

From cassettes to CDs, DVDs and now live music streaming. From Floppy discs to CDs, USB and now cloud drives. From landlines to cordless, mobile phones and now smartphones. If the first three lines made you nostalgic, congratulations! You, like me, have witnessed this technological revolution first hand and have beautiful memories associated with all of these products. At the same time, we also appreciate the current technology better since our definition of fast and convenient has evolved over time, be it internet speed (the dial up connection from telephone lines, remember?), or grocery shopping (10 minutes! I mean it's incredible) or internet availability (cyber cafes were a thing once).

The Gen Z, unlike my generation (I already feel older now), grew up during the best phase of this technological revolution, and with a different definition of fast and convenient. So the challenge is for technological advancements to keep up with them, to keep them excited and amazed. Since “quick and convenient” is very important for this new generation, they prefer online shopping, online food delivery, online cab booking, online grocery delivery, online dating, etc. Basically, they love to save time and effort in rudimentary transactional tasks and enhance their quality of life by spending time on things they love doing or just chill rather.

<https://timesofindia.indiatimes.com/blogs/voices/how-gen-z-lifestyle-is-boosting-the-smart-home-automation-industry/>

## 1.2.2 Home Automation Market in India: USD 3.58 Bn incremental growth expected between 2021 and 2026

Oct 02, 2022, 22:45 ET

The "Home Automation Market in India by Product and Geography - Forecast and Geography 2022-2026" report has been added to Technavio's offering. With ISO 9001:2015 certification, Technavio is proudly partnering with more than 100 Fortune 500 companies for over 16 years.



Technavio has announced its latest market research report titled Home Automation Market in India 2022-2026

The potential growth difference for the home automation market in India between 2021 and 2026 is USD 3.58 billion. To estimate the size of the market, Technavio has tracked the recent trends and developments in the information technology industry. Some of the factors considered in estimating the market size include server and storage device shipments, mobile device shipments, revenue generated by vendors operating in India, internet and mobile penetration rates, and others.

<https://www.prnewswire.com/news-releases/home-automation-market-in-india-usd-3-58-bn-incremental-growth-expected-between-2021-and-2026--301636676.html>

## 1.3 Green Building

### 1.3.1 Green Buildings: The Future Of Sustainable India

Updated: Nov 10, 2022

Green buildings are a growing trend in India. It is expected to become more popular as the country moves towards a sustainable future. To promote green buildings, the government has set up various schemes. The National Buildings Code of India (NBCI) and Energy Conservation Building Code (ECBC) are few of them. All of these aim to promote high-performance and energy-efficient buildings.



Environment friendly green buildings covered with plants

#### Government of Punjab:

- Department of Local Government (Town Planning Wing) offers an additional 5% Floor Area Ratio (FAR) free of charge for projects which are rated Gold or above by IGBC.

- Department of Housing and Urban Development, Government of Punjab offers an incentive of additional 5%, 7.5% and 10% FAR free of charge with 100% exemption of building scrutiny fee for projects which are rated silver, gold and platinum, respectively by IGBC.

### **Government of Rajasthan:**

- Urban Development Department offers additional 0.075, 0.10 and 0.15 BAR free of charge for projects which are rated silver, gold, and platinum respectively by IGBC.
- Rajasthan Investment Promotion Scheme – 2019 offers enterprises of MSME sector a subsidy in the form of reimbursement of 50% of amount paid to the suppliers for the plant, excluding civil work, for adopting Green Building Measures.

<https://www.magicbricks.com/blog/green-buildings-the-future-of-sustainable-india/99984.html>

### **1.3.2 Green building challenges and latest trends in India**

October 17, 2022



## Challenges to promoting green building in the country

A popular view against green buildings involves higher operation and maintenance costs in comparison to conventional buildings. Rather, the truth is by optimizing key systems such as lighting, air-conditioning, electrical and vertical transportation, green buildings can over a longer-term help reduce energy consumption and operation cost thanks to their higher operational efficiency

Locally, popularity of green building is still hindered somewhat by funds and budget constraints of owners and developers, limited awareness on operation and maintenance requirements, and most importantly the environmental and financial benefits green buildings can offer in the longer term.

### Next generation green elevator solutions

Elevators allow cities to expand upwards instead of outwards, allowing us to effectively reduce urban sprawl and associated negative impacts of traffic congestion, pollution and other key issues that are concerns for many countries in Asia Pacific.

### Digital and sustainable mobility solutions “The major game changer”:

Mobility solutions play a pivotal role in building a sustainable tomorrow. And TKE’s solution for the future is MULTI, which allows the operation of multiple cabins in both horizontal and vertical directions and frees tall building design from the constraints imposed by traditional elevators. As the world’s first rope-free elevator system, MULTI gives architects the power to completely reshape our cities and has the potential not just to connect floors but also buildings and cities as an eco-friendlier transportation means. The focus of our innovation is also on using the latest technologies to drive energy efficiency and minimise the overall energy consumption of the building.

<https://timestech.in/green-building-challenges-and-latest-trends-in-india/>

## 1.4 Vertical farming

### 1.4.1 3rd Global Vertical Farming Show to Hit the Floor this 29th & 30th November!

17 November, 2022

GVF2022 now in its 3rd edition- is a game-changing event that brings together the entire vertical farming, controlled environment, and urban agriculture value chain to discover business opportunities, meet new people, gain new projects, and form long-term collaborations.



The 3rd Global Vertical Farming Show India is a highly anticipated and revolutionary event, with the previous two editions being a global success and also taking into account the recent developments in the horticulture industry of India. Following the conclusion of the previous one in Dubai, this time it will be held on the 29th & 30th of November 2022 in New Delhi at Welcomhotel By ITC, Dwarka.

The show organizer TAB group is excited to onboard some of the top international companies like Qualiplast, Vertaag, Inhydro, Accenture, Kokosflora, Nutrifresh Farms, Jain Irrigation Systems, UrbanPonics, Urbinati S.r.l., Emesh Farms Technik, Bioled Eco Light Systems, Agam Photovoltaic Solution, Multivac, Ideal Agri-Business Services, Flora Consult, Grow Rich, K.D.S. Coir Farm, Lumen Electronics, Brio Hydroponics, Simply Fresh, FutrAgTech, Hindustan Agri-Business, AS Agri & Aqua, Go coir, Netafirm, Isaayu Farms, Fraser Techno Circuits, Sangam India, Sinolanka, Payir Corp, Kelltech Energies, etc. and many others. They will be showcasing their top-notch products and high-end solutions to the market.

With support from the Ministry of Agriculture and Farmers' Welfare - GOI, Indian Chamber of Food and Agriculture (ICFA), Invest India, National Horticulture Board (NHB), Indian Council of Agriculture Research (ICAR), Indian Agriculture Research Institute (IARI), National Institute of Urban Affairs (NIUA),

Climate Centre for Cities, Grant Thornton, Association of Vertical Farming-India and many others, GVF India aims to revitalize the entire landscape of how agriculture is being practised in the world and specifically the Asian Market by highlighting the developments of Urban Agriculture, Hydroponics, CEA and Vertical Farming.

<https://krishijagran.com/news/3rd-global-vertical-farming-show-to-hit-the-floor-this-29th-30th-november/>

## 1.5 Organic agriculture

### 1.5.1 Urban farms offer a fresh perspective on managing kitchen waste and nurturing a community

14 November 2022

- Urban farms in Mumbai, Navi Mumbai, Pune and Bengaluru show how urban spaces like homes and institutions can be used for growing organic vegetables as well as for building a community around them.
- Erratic weather and finding a reliable workforce are a challenge for these small urban farms. Some initiatives are working with citizen volunteers as well as migrant workers to nurture these farms.
- Urban farms can potentially reduce kitchen waste but require awareness and efforts at a larger scale to become mainstream.

As Indian cities expand, concerns about their rising food demand and the accompanying pressure on the agriculture sector cannot be ignored. Indian agriculture is already under scrutiny for being one of the largest contributors to India's total greenhouse gas emissions. At the same time, it is also vulnerable to the impact of climate change. Efforts are on among the government, research institutions and civil society to find a sustainable solution to safeguard India's food production.

A transition towards an Alternative Food system (AFS) offers a fresh perspective for authorities and citizens to produce locally grown food with sustainable practices. According to a study published last year, by WU Vienna University of Economics and Business and the University of Bayreuth, AFS focuses on food production at a local level using organic methods. The difference between AFS and the conventional food system is that the latter heavily depends on economic value, while the former focuses on democratic value chains, explains the study.



Located inside the campus of Tata Memorial Centre Advanced Centre for Treatment, Research and Education in Cancer, Kharghar, Navi Mumbai, is a 25,000 sq. ft, volunteer-run urban farm. The Earthen Routes initiative, started by Manasvini Tyagi, is an example of an alternate food system (AFS).

Started almost a decade ago by Tyagi and a few members, the farm operates solely on the funds raised by Tyagi, the occasional funding from brands as a part of their Corporate Social Responsibility budgets, and the fees from workshops and employee engagement programmes organised at the farm.

<https://india.mongabay.com/2022/11/urban-farms-offer-a-fresh-perspective-on-managing-kitchen-waste-and-nurturing-a-community/>

## 1.6 Pension

### 1.6.1 Bring back old pension scheme, Central government employees write to Cabinet Secretary

November 06, 2022

The National Pension System is a disaster for retiring employees, says an apex body of various government unions; pension under existing scheme just 15% of that under earlier one.



A federation of Central government employees' unions has written to the Cabinet Secretary to restore the Old Pension Scheme (OPS), stating that the National Pension System (NPS) is a disaster for retiring employees in their old age.

The federation said a Defence establishment official who recently retired after more than 13 years of service received only 15% of the assured pension he would have otherwise availed under the OPS.

<https://www.thehindu.com/news/national/central-government-employees-federation-intensifies-demand-for-old-pension-scheme/article66104422.ece>

## 1.6.2 India's \$182 Billion Pension Fund Resumes Buying Private Debt

15 Dec 2022

India's biggest pension fund, with more than 15 trillion rupees (\$182 billion) in assets, has resumed investing in rupee bonds issued by top-rated private firms as surging inflows pushes it to look for newer avenues to deploy cash, a top official said.

<https://www.bloomberg.com/news/articles/2022-12-15/india-s-182-billion-pension-fund-resumes-buying-private-debt?leadSource=verify%20wall>

## 1.6.3 India's Pension System Improves Marginally From 2021 In Global Pension Index; Iceland Tops List

18 OCT 2022

The 44 global pension systems included in the joint survey of the CFA Institute, the Monash Centre for Financial Studies (MCFS), and Mercer, accounted for 65 per cent of the world's population.



India's retirement system has improved slightly from 2021, ranking 41 out of the 44 countries examined, revealed the 2022 Mercer CFA Institute Global Pension Index survey (MCGPI) released Tuesday.

Iceland topped the list, followed by the Netherlands, while Thailand ranked last, according to the survey. Portugal was the new addition to the study this year.

The study showed India's overall index value rose from 43.3 in 2021 to 44.4, boosted by an increase in net replacement rates.

In a press release, Preeti Chandrashekhar, India Business Leader at Mercer – Health and Wealth, said: “The results from this year's Mercer CFA Institute Global Pension Index show that India's pension system is getting stronger, but also highlights how much work still need to be done.”

She stressed that India needs inclusive programs for all workers, including those in the gig economy while noting that subscribers under the National Pension System (NPS) have been increasing.

<https://www.outlookindia.com/business/india-s-pension-system-improves-marginally-from-2021-in-global-pension-index-iceland-tops-list-news-230809>

#### **1.6.4 Is reversing reforms to grab power the way forward for India?**

Nov 07, 2022

The move to shift from a defined benefit pension scheme or Old Pension System to defined contribution pension scheme or New Pension Scheme was in order to contain the rising and unsustainable pension bill with around 4 per cent of Union Budget already going towards pensionary benefits.



The Congress Party on Saturday released its manifesto in Himachal Pradesh offering largesse -- 300 units of free electricity, restoration of the old pension scheme (OPS) and so on. Freebies are part of recent political culture when a party is desperate to grab power and the ruling party is perceived to be facing anti-incumbency. Freebies more than often at the peril of public exchequer. They ultimately cost the people who shoulder the entire financial burden and diversion of funds would thus mean, less resources available for transformational reforms and poverty alleviation. Political parties, mainly the Opposition, are using the lollipop of restoring OPS by scrapping the New Pension Scheme (NPS) to woo voters, particularly in a state like Himachal Pradesh where government employees and retirees wield tremendous power to sway votes. But this political short-sightedness could be detrimental for the state's economy as it would put severe fiscal burden on the exchequer.

<https://www.hindustantimes.com/analysis/is-reversing-reforms-to-grab-power-the-way-forward-for-india-101667784468737.html>

### **1.6.5 Old pension scheme should be implemented across India: Rajasthan CM**

Nov 08, 2022. India News.

Addressing a press conference in Shimla ahead of the November 12 Himachal Pradesh Assembly polls, Gehlot said the Congress government in Rajasthan has implemented the old pension scheme (OPS) and those saying only an announcement has been made are trying to mislead people.



Rajasthan chief minister Ashok Gehlot on Tuesday said the old pension scheme should be implemented across the country and those saying it will put a burden on the exchequer are not right as it is all about financial management.

Addressing a press conference in Shimla ahead of the November 12 Himachal Pradesh Assembly polls, Gehlot said the Congress government in Rajasthan has implemented the old pension scheme (OPS) and those saying only an announcement has been made are trying to mislead people.

"We have implemented it in our state," he said.

Gehlot said the BJP government in Himachal Pradesh has formed a committee on the issue of OPS, which is only a tactic to divert people's attention before the polls as the government employees in the hill state have been staging protests demanding its implementation.

<https://www.hindustantimes.com/india-news/old-pension-scheme-should-be-implemented-across-india-rajasthan-cm-101667920520315.html>

## 1.7 Cultural tourism

### 1.7.1 Cultural Tourism Market by Type, Service, and Geography - Forecast and Analysis 2023-2027

The cultural tourism market is estimated to grow at a CAGR of 20.77% between 2022 and 2027. The size of the market is forecast to increase by USD 6600.71 million. The growth of the market depends on several factors, including growing affordability, increased preference for cultural tourism to break mundane lifestyles, and growing contribution toward GDP and employment.

This report extensively covers market segmentation by type (domestic cultural tourism and international cultural tourism), service (cultural eco-tourism, indigenous cultural tourism, and socio-cultural tourism), and geography (Europe, APAC, North America, Middle East and Africa, and South America). It also includes an in-depth analysis of drivers, trends, and challenges. Furthermore, the report includes historic market data from 2017 to 2021.

What will be the size of the Cultural Tourism Market During the Forecast Period?



### Cultural Tourism Market: Key Drivers, Trends, Challenges, and Customer Landscape

The growing affordability is notably driving the cultural tourism market growth, although factors such as the high impact of terrorism may impede the market growth. Our researchers analyzed the data with 2022 as the base year, along with the key drivers, trends, and challenges. A holistic analysis of drivers will help companies refine their marketing strategies to gain a competitive advantage.

### **Key Cultural Tourism Market Driver**

The growing affordability is notably driving the cultural tourism market growth. The per capita disposable income has low volatility in developed countries, which is attributed to the rise in the number of double-income households. This has a direct influence on an individual spending capability. Because of improved spending capability, the affordability of high-end products has increased in developing countries. Therefore, higher disposable incomes in Pacific Rim countries, such as Malaysia, Indonesia, and Vietnam, are expected to drive market growth even further.

Additionally, the number of working women has increased considerably worldwide. For instance, according to The World Bank Group, the number of working women populations in the total labor force increased from 41.45% in 2011 to 46.58% in 2019 in Italy. This is creating a financial boost in the overall income of people, enabling consumers to spend lavishly on cultural tourism and related activities. Earlier, due to lower affordability, limited awareness, and higher security risks, the preference for cultural tourism was limited. However, with the rise in income and investments by the market vendors, the market is likely to post significant growth during the forecast period.

### **Significant Cultural Tourism Market Trend**

Growing instances of stress-related cases is the primary trend in the market. Many factors influence stress in individual life and affect the health of a person directly. Stress levels vary from one individual to another. Some of the major factors influencing stress levels are money, family, work, and personal health.

In many cases, untreated stress could lead to anxiety, irritability, anger, lack of motivation or focus, restlessness, sadness, or depression. Stress weakens the immune system and exhausts the entire body physically and mentally. Untreated stress can also end up in behavioral changes like angry outbursts, drug or alcohol abuse, over- or under-eating, social withdrawal, and tobacco use. In many instances, health professionals recommend individuals travel or visit a place where a person can experience peace of mind,

which helps to treat stress and anxiety. A change of atmosphere and a break from everyday lifestyle heal a person at a faster rate. This leads to higher opportunities for cultural tourism providers to target travelers who come for wellness purposes. Such factors are expected to drive the growth of the market during the forecast period.

### **Major Cultural Tourism Challenge**

Threat from natural disasters is the major challenge impeding market growth. A natural disaster could pose a challenge to the revenue of the tourism industry. Rebuilding and maintaining infrastructure could be a highly time-consuming process, depending on the severity of the natural calamity. For instance, Japan took almost two years to recover from the earthquake and tsunami that took place in 2011; Haiti took 22 months to recover from the earthquake that hit the country in 2010, whereas Thailand took 14 months to recover from the 2004 tsunami. Thus, the long recovery from natural disasters takes an enormous amount of time, which affects the revenue growth of the market.

Some of the other threats faced by the tourism industry include environmental disasters and political unrest. Environmental disasters have a direct effect on agriculture, biodiversity, human health, and the tourism industry, which involves a recovery period of 20-24 months, whereas any political unrest takes about 27 months to recover. These factors impact the revenue growth of cultural tourism for longer durations when compared to terrorism, which is another challenge for the market during the forecast period.

### **Key Cultural Tourism Market Customer Landscape**

The report includes the adoption lifecycle of the market, covering from the innovator's stage to the laggard's stage. It focuses on adoption rates in different regions based on penetration. Furthermore, the report also includes key purchase criteria and drivers of price sensitivity to help companies evaluate and develop their growth strategies.



<https://www.technavio.com/report/cultural-tourism-market-industry-analysis>

**1.7.2 The Global Cultural Tourism Market is expected to grow by \$6600.71 mn during 2023-2027, accelerating at a CAGR of 20.77% during the forecast period**

21 December 2022

The analyst has been monitoring the cultural tourism market and it is poised to grow by \$6600.71 mn during 2023-2027, accelerating at a CAGR of 20.77% during the forecast period. Our report on the cultural tourism

market provides a holistic analysis, market size and forecast, trends, growth drivers, and challenges, as well as vendor analysis covering around 25 vendors.

<https://au.finance.yahoo.com/news/global-cultural-tourism-market-expected-160000916.html>

## **1.8 Healthcare**

### **1.8.1 An overview of Indian healthcare**

The Indian healthcare industry is one of the largest and rapidly growing markets in the Asia-Pacific region. Healthcare comprises primarily of pharmaceutical, biotech, hospitals and medical equipment. While the government was always focused on healthcare, the sector has received a greater focus post COVID-19.

#### **Pharmaceuticals**

India is the largest provider of generic medicines globally, occupying a 20% share in global supply by volume. It also meets 50% of global demand for vaccines". India ranks third in the world for production of pharmaceuticals by volume and 14th by value, thereby accounting for around 10% of world's production by volume and 1.5% by value.

#### **Biotechnology**

India is among the top 12 destinations for biotechnology in the world, with approximately 3% share in the global biotechnology industry. India is also the leader in the global supply of DPT, BCG and measles vaccines. By 2025, the Indian biotechnology industry is expected to reach US \$150 billion. Presently there are around 5,075 Biotech startups which are expected to reach 10,000 by 2025.

#### **Medical devices**

The Indian medical devices industry consists of large multinationals, with extensive service networks, as well as small and medium enterprises (SMEs). The current market size of the medical devices industry in India is estimated to be US\$11 billion and is expected to reach US\$50 billion by 2025.

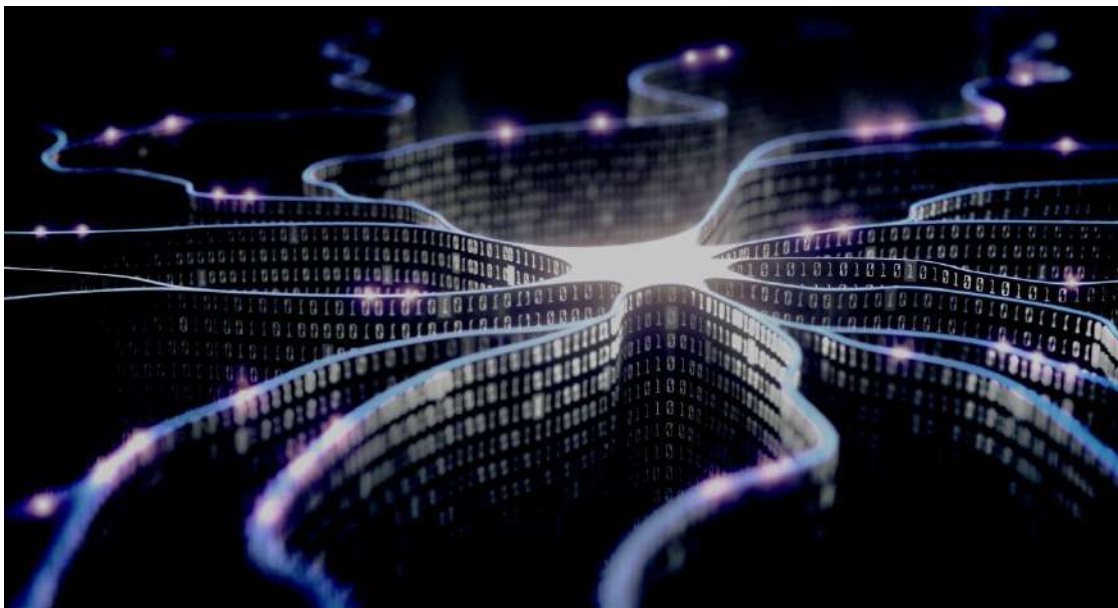
#### **Hospitals**

The hospital industry in India accounts for 80% of the total healthcare market. It is witnessing a huge investor demand from both global as well as domestic investors. The hospital industry is expected to reach US\$132 billion by 2023 from US\$61.8 billion in 2017; growing at a CAGR of 16%-17%.

Source: PDF “ey-doing-business-in-india”

## 1.8.2 AI in healthcare: India's trillion-dollar opportunity

Oct 18, 2022



- AI expenditure in India is expected to reach \$11.78 billion by 2025 and is expected to add \$1 trillion to India's economy by 2035.
- AI is already being integrated into diagnostic algorithms for screening for diseases ranging from cancer, diabetic retinopathy, to cardiovascular disease.
- A measured approach that scales up AI in healthcare, while ensuring meaningful human control and informed consent is critical to long-term success.

The 2030 Sustainable Development Goals focus on the central promise of “leaving no one behind” — but in emerging markets and the Global South, which face major health inequities, this remains a tall challenge.

Limited-resource settings in places like India mean a shortage of qualified healthcare professionals and inequitable access to healthcare.

India has just 64 doctors available per 100,000 people compared to a global average of approximately 150 per 100,000. Primary health centres and sub-centres at the rural peripheries are often woefully understaffed and lack critical infrastructure to meet patient needs. This often translates to a lack of high-quality diagnostic services, especially in rural India, home to more than 70% of the population.

Leveraging predictive analytics by using Artificial Intelligence (AI) for early detection can be a powerful tool for targeted public health interventions, especially in the context of limited healthcare capacity and delayed disease detection capabilities outside of urban centres. AI-enabled tools offer opportunities to bridge these inequities and reach AI maturity in the healthcare market in India, which is expected to reach \$372 billion this year.

<https://www.weforum.org/agenda/2022/10/ai-in-healthcare-india-trillion-dollar/>

### 1.8.3 India's Digital Health Ecosystem Is An Unparalleled Opportunity

Oct 26, 2022

The Indian healthcare system is a remarkable phenomenon in many ways. Boasting one of the largest social health programs in the world, in addition to incredible research and development facilities, the country has certainly become a powerhouse in its relatively short tenure as an independent nation. However, congruently, India certainly hosts a unique barrage of problems with regards to healthcare as well, just like other countries: staffing discrepancies, high expenditures, a shortage of physicians and skilled workers—these are just a few of the many problems the country faces. Nevertheless, the Indian spirit marches forward, attempting to serve its vast population across a variety of demographic categories and amidst a complex payor and provider landscape.

One major variable that is entirely unique to the Indian subcontinent is the sheer population that must be served. Recent reports indicate that there is a nearly 1:854 doctor to population ratio in India; that is, there is approximately 1 doctor for every 854 people in the country. This has caused a renewed interest in expanding access to medical education: the government has acted swiftly to not only create more seats for students that

desire medical training, but has also aggressively opened new state-of-the-art medical colleges and institutions across the country.

Additionally, the government is actively pursuing digital health ventures, as a means to increase access to quality care. In partnership with established technology giants such as the Tata Group and Reliance Industries, in addition to prominent healthcare organizations such as Apollo Hospitals, technology enthusiasts are working hard to make this dream a reality.

One significant and key enabler is how incredibly ripe India is for digital health disruption. The country has some of the most advanced internet infrastructure in place, providing a steadfast baseline for lightning speed connectivity and high information fidelity. Furthermore, in the last 10 years, the transition to a digital economy has completely revamped India's societal mindset: digital payments and electronic currency is now commonplace for everyone, from small-time rural vegetable vendors, to large scale construction builders. The country has undoubtedly already embraced a digital mindset—it is just a matter of time before the right tools are in place.



In fact, Sundar Pichai, CEO and leader of global technology giant Alphabet (Google), is extremely positive about India's swift transition into the digital ecosystem: "The country has made huge progress in getting a billion Indians online. Low-cost smartphones combined with affordable data, and a world-class telecom

infrastructure, have paved the way for new opportunities [...] But India's own digital journey is far from complete. There's still more work to do in order to make the internet affordable and useful for a billion Indians...from improving voice input and computing for all of India's languages, to inspiring and supporting a whole new generation of entrepreneurs.”

<https://www.forbes.com/sites/saibala/2022/10/26/the-digital-health-ecosystem-in-india-is-an-unparalleled-opportunity/?sh=47795b572df0>

#### 1.8.4 A virtual bridge to Universal Healthcare in India

Virtual care could be instrumental in helping India achieve Universal Healthcare. COVID-19 has catalysed virtual-care adoption by practitioners and end-users alike. Recent inclusive policy measures, a favourably-evolving technological landscape, and infrastructural development empower India to technology-leapfrog existing Western healthcare systems.

India went into COVID-19 lockdown on 23 March 2020, resulting in widespread disruption of routine healthcare. This led to significant task-shifting in hospitals, changing inpatient to outpatient care, and outpatient to telemedicine-driven home care. Consequently, in-person appointments went down by 32%, and online consultations went up by 300%. Within six months of launch, one of India's largest private-sector healthcare providers, Apollo Hospital group's digital consultation platform (Apollo 24/7), enrolled four million people with about 30,000 downloads per day. Fifty million citizens accessed healthcare online from March–May 2020, 80% of whom were first-time users.

As another example, on 29 March 2020, within a week of the first COVID-19 lockdown, one of the study co-authors (BGD) helped launch a voluntary pan-India telecare initiative to offer free teleconsultations to anyone unable to access in-person care. Thirty specialist physicians across eight cities treated over 500 patients. The majority had minor ailments which were resolved online; in-person consultations were arranged to treat four patients; and one gentleman was referred to a medical college where he underwent life-saving surgery. These physicians were telecare novices operating out of a hastily-formed Facebook page for outreach. But this experience led to individual and collective reflection upon the potential of virtual care in India, scaled up and supported by the right tools.

<https://www.nature.com/articles/s43856-022-00211-7>

## 1.8.5 India a cost-effective healthcare destination: Jitendra Singh



New Delhi: India has become one of the world's most cost-effective healthcare destination with the latest technology tools deployed across care delivery, said Union minister of state for Science and Technology Jitendra Singh on Thursday.

Addressing the Healthcare Leaders' Summit 2022, the minister said that more than 10 lakh medical visas were issued between 2019 and 2022. "The number is quite significant as there was almost complete ban on international travel during the pandemic. The country is fast emerging as the medical tourism hub of the world. India has almost 600 globally and nationally accredited hospitals that provide world-class treatment in cost-effective manner."

Singh added that healthcare sector in India is expected to grow to reach a size of \$50 billion by 2025, while the global medical tourism market is estimated to be worth about \$72 billion. "India's share in medical tourism is expected to be around 10 billion dollars by 2023. The country is also world's largest supplier of generic drugs."

He said that the intention and policies of the government are in perfect alignment for creating affordable healthcare for all. "The Modi government is hand-holding in harnessing the enthusiasm of scientific brilliance and addressing the most pressing healthcare challenges of the current generation and being future-ready."

The minister said that massive efforts are on to build a robust life sciences ecosystem through science and research. "It will in turn reduce health inequalities and build a clear road map on the continuing successes of vaccines, therapeutics and diagnostics. The action plan laid out by the government to support healthcare stakeholders to create a vibrant healthcare ecosystem in the country is happening through funding, incentives, government and industry-academia partnership and incubation."

<https://www.livemint.com/news/india/india-a-cost-effective-healthcare-destination-jitendra-singh-11668675682227.html>

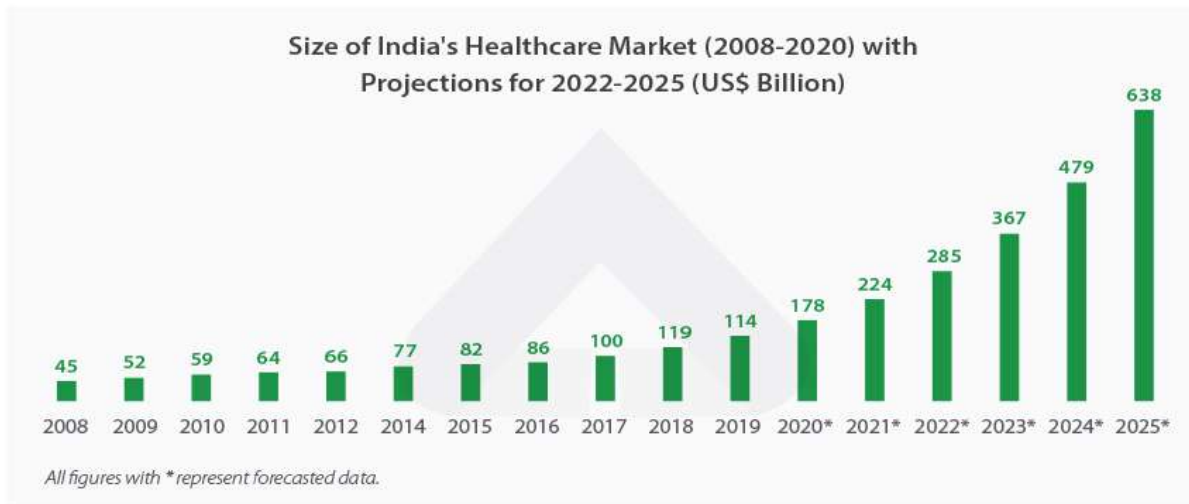
### 1.8.6 An Overview of India's Healthcare Ecosystem

October 20, 2022

India's healthcare ecosystem is among the fastest growing sectors having benefited from government policies to make the country a global hub for health and wellness. There is huge scope for foreign investment in this area due to a liberalized FDI regime in various sub-sectors like hospitals, medical devices, health insurance, etc.

Driven by factors like population demographics, a growing middle class, rising incomes, better health awareness, and increasing lifestyle diseases, India's healthcare market has been expanding at a compound annual growth rate (CAGR) of 22 percent. The Indian healthcare market, which was valued at US\$86 billion in 2016 is now projected to reach US\$367 billion by 2023 and US\$638 billion by 2025 as per INC42. Data by Statista pegs this estimate at US\$372 billion by 2022, up from US\$160 billion in 2016.

The fast-moving growth in the sector is supported by improvements in healthcare coverage, services, and increasing expenditure by public as well as private players. In fact, post the Covid-19 pandemic, there is an increased call for self-reliance in the Indian healthcare system with focus shifting to innovation and research, drug and equipment manufacturing, digital transformation in health services, fair access to healthcare solutions, mental health, and wellness.



Graphic © Asia Briefing Ltd.

The healthcare sector in India is among major contributors to the Indian economy, in terms of both revenue and employment. The sector has grown rapidly in the last five years on account of digitization, innovation, and newer hybrid business models with the integration of traditionalists and technology enterprises.

Further, the Covid-19 pandemic catalyzed long-term behavioral transformation towards personal health and hygiene, health insurance, fitness and nutrition, as well as health monitoring and medical check-ups. The pandemic also augmented the adoption of digital technologies, including telemedicine.

Moreover, the rising proportion of lifestyle diseases caused by high cholesterol, high blood pressure, obesity, poor diet, and growing alcohol consumption in urban areas is boosting demand for specialized care services.

### Trends in the Indian Healthcare Sector


-  Shift from communicable to lifestyle diseases caused by high cholesterol, high blood pressure, obesity, alcohol consumption, etc.
-  Expansion to Tier II and Tier III cities like Nashik, Mohali, Dehradun, etc.
-  Emergence of telemedicine
-  Rising adoption of artificial intelligence (AI)
-  Increasing penetration of health insurance
-  Focus on universal immunization programs (UIP)

Graphic©Asia Briefing Ltd.

### Key segments of the Indian healthcare sector

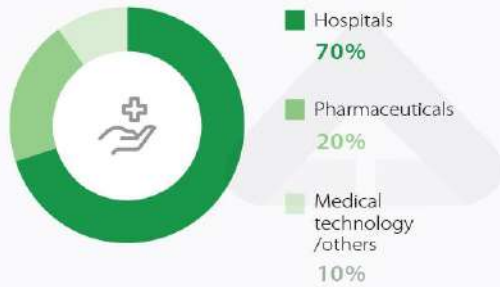
India's healthcare sector comprises hospital infrastructure, medical devices and equipment, health insurance, clinical trials, telemedicine, and medical tourism. These market segments are expected to diversify as an ageing population with a growing middle class increasingly favors preventative healthcare.

### Major Segments in India's Healthcare Sector

-  **Hospitals**  
Government (healthcare centers, district hospitals, general hospitals)  
Private (nursing homes, mid-tier & top-tier private hospitals)
-  **Pharmaceutical**  
Includes manufacturing, extraction, processing, purification & packaging of chemical materials for use as medications for humans or animals
-  **Diagnostics**  
Comprises businesses & laboratories that offer analytical or diagnostic services, including body fluid analysis
-  **Medical equipment and supplies**  
Includes establishments primarily manufacturing medical equipment & supplies, e.g. surgical, dental, orthopedic, ophthalmologic, laboratory instruments, etc.
-  **Medical insurance**  
Includes health insurance & medical reimbursement facility, covering an individual's hospitalization expenses incurred due to sickness
-  **Telemedicine**  
Has enormous potential in meeting the challenges of healthcare delivery to rural & remote areas besides several other applications in education, training & management in the health sector

Graphic©Asia Briefing Ltd.

### Share of Market Segments of the Healthcare Sector in India in FY 2021



Data accessed from Statista, as on July 28, 2022

Graphic©Asia Briefing Ltd.

### Healthcare Market Distribution India 2019-2030\*, by Provider Type (in %)



Data accessed from Statista, as on July 28, 2022

Graphic©Asia Briefing Ltd.

<https://www.india-briefing.com/news/indias-healthcare-ecosystem-key-segments-market-growth-prospects-26225.html/>

### 1.8.7 Indian healthcare comes of age

20 December 2022

Our healthcare is evolving with improved accessibility to modern technology

Digital influence and technological intervention are breaking barriers in the Indian healthcare industry, leading to a dynamic transformation. While the telemedicine sector witnessed a 30 per cent spike during the pandemic, the online consultation market is projected to grow at 72 per cent CAGR to reach over 800 million dollars by FY2024, as per the report by Praxis Global Alliance.

Artificial intelligence is geared up to dominate the Indian healthcare industry by increasing the market value from \$1.1 billion to \$5 billion at a 39 per cent CAGR. Tech trends like nanomedicine, virtual and augmented reality and robot-assisted surgery are also acquiring large space in the Indian healthcare industry.

While adopting disruptive technologies, the Indian healthcare industry is evolving from improved accessibility and affordability to quality of life in the rural areas, as well, through technological advancements. In India, the doctor-patient ratio is 1:1456 compared to the standard ratio of 1:1000 as per the WHO. Since the doctor-patient ratio in India lacks the standard WHO ratio, digital healthcare becomes more imperative in remote rural areas where doctors can reach via technology.

Artificial intelligence is the game changer in the global healthcare industry. Currently, the global market of AI stands at \$15 billion and is estimated to expand at a CAGR of 37 per cent by 2030. The high-focus areas of AI in Indian healthcare are triaging, detection and diagnostics. AI plays a vital role in identifying the underlying causes of diseases and managing their treatment plans. The government of India is also proactively boosting several initiatives, policies and schemes like National eHealth Authority (2015), the Biotechnology Ignition Grant Scheme (2012), Health Data Privacy & Security Act (2016).

A few decades back, consulting doctors via video conference must have looked like a far-off dream. Virtual healthcare has become the potential tech health segment in India and is targeting to reach \$5.4 billion at a CAGR of 31 per cent.

<https://www.dailypioneer.com/2022/columnists/indian-healthcare-comes-of-age.html>

### 1.8.8 Cyberattacks on hospitals thwart India's push to digitize health care

December 17, 2022



In late November, as a thick layer of smog settled on the All India Institute of Medical Sciences in New Delhi, patients began to experience extended wait times. Long lines snaked along the vast building and backed up for several yards.

Computers at the hospital had stopped working, so medical reports could not be generated. Though patients were still being treated, paper bills were being handed out. After a few days, people who feared that traveling back home would be too expensive began to sleep under a nearby overpass to wait it out.

A massive cyberattack had compromised the health data of millions of patients, from those who live in extreme poverty to high-profile politicians, bureaucrats and judges.

The Delhi Police had a bigger problem at hand. They were in possession of an email that read, "What happened? Your files are encrypted? What is the price to repair? The price depends on how fast you can pay to us," reported news sources.

The Delhi police initially denied reports of a ransom demand. But they later confirmed that the servers at AIIMS were attacked and data was being held for ransom. Police sources were quoted as saying the attack originated from China and Hong Kong.

<https://www.npr.org/sections/goatsandsoda/2022/12/17/1143396605/cyberattacks-on-hospitals-thwart-indias-push-to-digitize-health-care>

## 1.8.9 India seizes opportunities in African healthcare

2 December 2022



Like many African doctors, Peter Mativo had to travel overseas to complete his training.

In 2007 he left Kenya for Bangalore to pursue his goal of becoming a neurologist. After 18 months in India, he returned to Kenya and now works at the Aga Khan University Hospital in Nairobi.

"Most of us train in India, as Africa is not a developed continent. We have a very poor economy with no medical infrastructure in place nor specialised training," he says.

"I would have never been able to get a specialised degree if I would have not opted for India," Mr Mativo says.

India is keen to strengthen such ties with Africa. It has identified the healthcare sector as one area where trade between the continents can flourish.

So young African doctors are encouraged to finish their training in India, meanwhile Indian healthcare firms are expanding all over Africa.

<https://www.bbc.com/news/business-63476025>

### 1.8.10 India will lead the healthcare market of emerging countries

Oct 25, 2022

The analysis stated that the 'AI expenditure in India increased by over 109% in 2018, totaling \$665 million and is expected to reach \$11.78 billion by 2025, adding \$1 trillion to India's economy by 2035'.

Leaving no one behind (LNOB) is the transformative promise of the 2030 Agenda and its SDGs. But in the emerging markets of the Global South, this is a major challenge.

In countries like India, there is a lack of qualified healthcare and inequitable access to healthcare. According to the World Economic Forum statistics, India has just 64 doctors available per 100,000 people compared to a global average of approximately 150 per 100,000. In addition, primary health centers and sub-centers in rural areas are often woefully understaffed and lack the critical infrastructure to meet patient needs.

However, the intervention of AI has made significant progress in developing rural healthcare in India. With the rapid development of computers, the internet, advanced statistics, ML, and neural network technology, and the increase in handheld and wearable networked devices such as smartphones and watches, AI technology is bringing revolutionary changes in healthcare.

Solutions like the XraySetu are now considered a vital tool in the arsenal of solutions needed to beat COVID-19 and aid doctors and healthcare workers in India's towns and villages. Another notable one is NIRMAI which uses thermal analytics for early-stage breast cancer detection. NIRMAI, deep-tech from Bangalore, was founded in July 2016 and has so far raised a total of \$7M from institutional investors from India, Japan and Singapore.

AI also plays a crucial role in Chatbots and voice assistants. They are significant for the collection and management of medical data, as well as for maintaining electronic health records.

<https://indiaai.gov.in/article/india-will-lead-the-healthcare-market-of-emerging-countries>

### 1.8.11 Climate change's impact on healthcare in India

18 October 2022



It's 20:30 in Delhi. Thirty-six-year-old Janki has just returned home from her housekeeping work at a local house. She lights up an egg tray to repel mosquitoes.

"Burning an egg tray or dried cow dung is the best method to repel dengue mosquitoes. I can't afford mosquito repellent creams and it seems that the dengue mosquitoes are increasing year by year," she says.

In another part of India, Paras is trying to remove flood water from his house.

"Mumbai gets more rainfall than other states, but it did not result in floods every year. Now it does. We are boiling water three times a day because water-borne diseases are on the rise."

Dr Kritika Sharma from the All India Institute of Medicine Sciences (AIIMS) has been monitoring situations like these across the country. "In both of the above settings, we are observing the negative impact of climate change on the environment and its subsequent effects on human health," she says.

"Owing to pollution, land use changes, and climatic factors, Delhi is experiencing a hotter climate year on year, resulting in higher temperatures and untimely rainfall. These factors promote the breeding of mosquitoes and the increased transmission of dengue. Mumbai, on the other hand, is at risk of coastal flooding and other anthropogenic climate change factors.

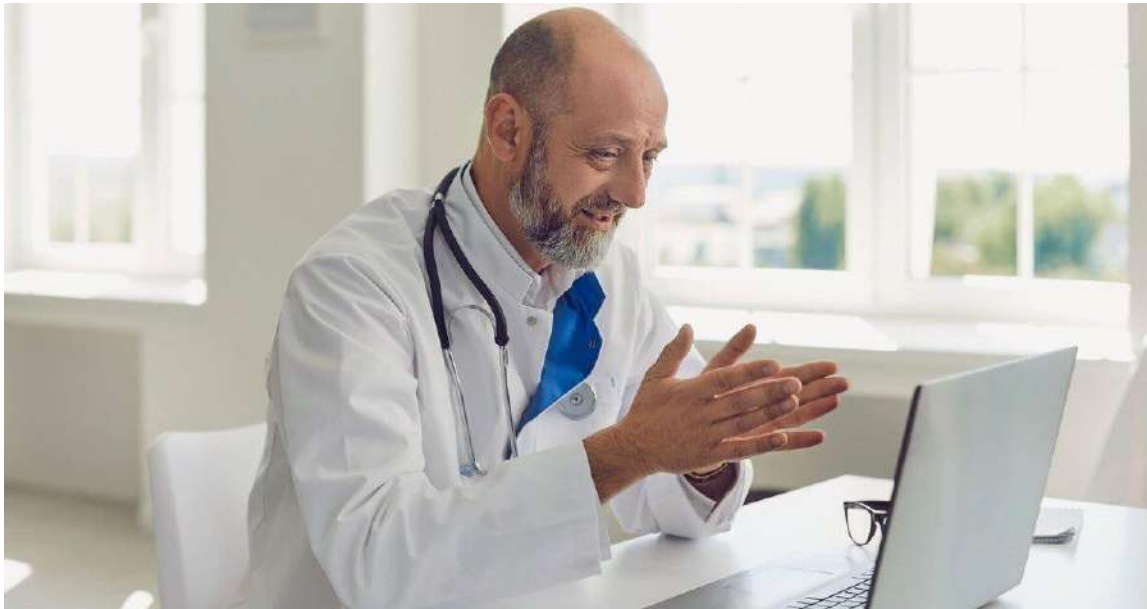
"Climate change creates a conducive environment for the creation and transmission of several communicable diseases like malaria, dengue, diarrhoea, etc.," she continues. "For example, when flood water gets contaminated with human or animal waste, water-borne diseases like diarrhoea and cholera start spreading faster. Similarly, we have seen increased respiratory diseases owing to polluted air in Delhi."

<https://www.gavi.org/vaccineswork/climate-changes-impact-health-care-india>

### **1.8.12 India rolls out nationwide tele-mental health service**

October 11, 2022

Presently, five regional coordination centres have been set up, along with 51 state or union territory-level cells



The Union Ministry of Health & Family Welfare of India has formally launched this week its national tele-mental health programme.

#### WHAT IT'S ABOUT

Called Tele Mental Health Assistance and Networking Across States (Tele-MANAS), it will provide free, round-the-clock teleconsultation service for mental health concerns. It runs a network of 23 tele-mental health centres of excellence with the National Institute of Mental Health and Neurosciences (NIMHANS) at its core and the International Institute of Information Technology-Bangalore providing technology support.

The Indian Institute of Technology-Bengaluru and the National Health Systems Resource Centre are also providing technical support for the programme.

It will be organised in a two-tier system: Tier 1 comprises state-level cells with trained counsellors and mental health specialists and Tier 2 comprises the e-Sanjeevani, India's national telemedicine service, which provides audio-visual consultation, and specialists from the District Mental Health Programme and partner medical colleges who are providing in-person consultations.

In a press statement, the union government said it aims to open at least one Tele-MANAS cell in each state or union territory across the country. Presently, five regional coordination centres have been set up, along with 51 state or union territory-level Tele-MANAS cells.

Additionally, about 900 counsellors have been trained by NIMHANS for the programme.

This initial rollout, the government said, will provide basic support and counselling through a centralized Interactive Voice Response system that is being customised for use across states and union territories.

Tele-MANAS is planned to be linked with other services such as e-Sanjeevani and Ayushman Bharat Digital Mission, as well as with mental health professionals and emergency psychiatric facilities.

"Eventually, this will include the entire spectrum of mental wellness and illness, and integrate all systems that provide mental health care," the government added.

<https://www.healthcareitnews.com/news/asia/india-rolls-out-nationwide-tele-mental-health-service>

### 1.8.13 India's G20 Presidency giving fillip to innovation in healthcare, will remain key factor in 2023; here's why

Dec 19, 2022



In view of India's G20 Presidency, digital health innovation, achieving universal health coverage, improving healthcare infrastructure and delivery will continue to be the key driving factors in 2023, health experts have said.

This vision rests on the premise of precision and preventive care, especially as India looks at innovation to lead the sector's growth.

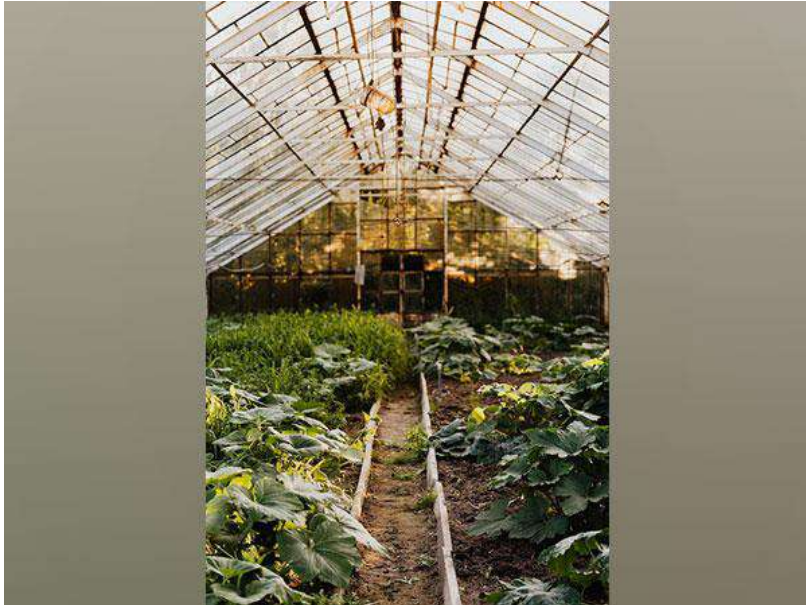
“Moreover, the sector growth map of 2023 rests on our abilities to achieve the digital transformation in healthcare, accelerate investments in new technologies and R&D, address the NCDs burden, create favourable policies that can help reduce import dependence, and stronger partnerships between the government, industry and academia,” said Dr. Shravan Subramanyam, President, NATHEALTH and Managing Director, Wipro GE Healthcare.

The recovery of the healthcare sector in 2022 was underlined by the industry's commitment to innovation and tech advancements, steered by putting patient at the centre of care. As India inches closer to become the global manufacturing hub, and key exporter of medical devices worldwide, today, the industry has the much-needed impetus across the value chain, Subramanyam points out.

<https://www.businesstoday.in/latest/economy/story/indias-g20-presidency-giving-fillip-to-innovation-in-healthcare-will-remain-key-factor-in-2023-heres-why-356959-2022-12-19>

## 1.9 Greenhouse

### 1.9.1 As Kashmir awaits winters, govt with 'greenhouse sheds' scheme gears up to help farmers



As Kashmir awaits winters, the central government with the help of the horticulture department is taking several initiatives to overcome the shortage of vegetables and fruits during the season.

The horticulture department has improved the distribution, installation of-greenhouse shed schemes and distribution of vegetable saplings among the growers, reported media outlet Good Morning Kashmir.

<https://www.aninews.in/news/national/general-news/as-kashmir-awaits-winters-govt-with-greenhouse-sheds-scheme-gears-up-to-help-farmers20221028232739/>

## 1.10 Vegetable

### 1.10.1 The Indian Fruits and Vegetables Industry

India is the second largest producer of the fruits and vegetables in the world after China. The country has diverse topography and climate, which ensures availability of fruits and vegetables in every season. During 2021-22, India produced 204.61 million metric tonnes of vegetables and 107.10 million metric tonnes of fruits. The area under cultivation of fruits stood at 7.09 million hectares in 2021-22, while vegetables were

cultivated at 11.28 million hectares. In addition, India leads the world in the production of ginger and okra, along with banana, papaya, mango and guava.



Production and export of Indian fruits and vegetables have increased in recent years. During 2021-22, India exported fresh fruits and vegetables worth US\$ 1.527.60 million, which comprised fruits worth US\$ 750.7 million and vegetables worth US\$ 767.01 million. India mostly exports to its neighbours, namely the UAE, Bangladesh, Pakistan, Saudi Arabia, Sri Lanka and Nepal. India's global market share is still only about 1%, but its horticulture products are becoming increasingly popular due to advancements in cold chain infrastructure, research, contemporary post-harvest technologies, supportive governmental policies and quality control procedures.

<https://www.ibef.org/blogs/india-s-fruits-and-vegetables-industry>

### **1.10.2 Data | Vegetable prices in India are on a rollercoaster ride**

December 22, 2022

As there is an alternating pattern of inflation peaks and deflation troughs, vegetable prices are highly volatile.



On Monday, a member of the Prime Minister’s Economic Advisory Council, Poonam Gupta, expressed her disappointment in the manner in which “monetary policy is held hostage by vegetable prices”. She termed monetary policy as a “blunt instrument” to address vegetable inflation. “Surely, our economy, which is more than \$3 trillion, can manage its vegetable prices better than it has. These shocks, which hold the policymakers’ attention unduly, I would say... can be addressed better,” she said at a discussion hosted by the Ananta Centre on the upcoming Union Budget. The “shocks” that Ms. Gupta was referring to are the highly volatile retail and wholesale prices of food products, especially vegetables. These shocks jolt the Indian economy every year. During some years, vegetable prices skyrocket and burn a hole in the pockets of consumers. During others, they crash, leading farmers to dump their produce owing to negative returns.

<https://www.thehindu.com/data/data-vegetable-prices-in-india-are-on-a-rollercoaster-ride/article66290251.ece>

### **1.10.3 Fruit & Vegetable Bowl of India: How Himachal Pradesh manages to keep up economic growth**

Himachal Pradesh is one of the largest producers of off-season vegetables like capsicum, tomato, peas, cabbage, and cucumber, and exotic fruits like persimmon and kiwi.



Himachal Pradesh, with its abundance of scenic areas, attracts thousands of international and domestic tourists every year. And while tourism is a major industry, what really turns the wheels of the state's economy is its drug manufacturing capacity and its ability to grow fruits and vegetables.

Himachal Pradesh is Asia's largest hub for manufacturing drugs and houses more than 600 pharmaceutical formulation manufacturing units and over 300 pharmaceutical companies. In fact, 40 per cent of India's total manufacturing of drug formulations happens in Himachal Pradesh alone, government data shows.

<https://www.indiatoday.in/diu/story/himachal-pradesh-manages-to-keep-up-economic-growth-fruit-vegetable-bowl-of-india-2296117-2022-11-11>

## 1.11 Seeds

### 1.11.1 India 'deeply engaged' in developing GM seeds for 13 crops



MUMBAI (Reuters) - Indian institutions are "deeply engaged" in the development of genetically modified seeds for 13 crops, including rice, wheat and sugarcane to improve their yield and quality, the government said on Friday.

The environment ministry in October granted clearance for indigenously developed GM mustard seeds, potentially paving the way for a commercial release of the country's first food crop in about two years.

Cotton is the only GM crop currently allowed for cultivation in India.

Research is also being done by the state-run Indian Council of Agricultural Research (ICAR) and other organisations to develop GM seeds for potato, pigeon pea lentils, chickpeas and banana, the agricultural ministry said in a statement.

"ICAR institutions and universities are deeply engaged in the development of GM crops for different traits such as biotic and abiotic stress tolerance, yield and quality improvement in 13 crops," it said.

India is keen to adopt farming technologies like GM crops to ensure food security and cut a reliance on imports, as it tries to boost the output of items like edible oils for its nearly 1.4 billion people, the most in the world after China.

India spent a record \$19 billion importing vegetable oils last fiscal year that ended on March 31. Russia's invasion of Ukraine also disrupted imports and raised prices, before supplies improved.

[https://www.business-standard.com/article/economy-policy/india-deeply-engaged-in-developing-gm-seeds-for-13-crops-122122300889\\_1.html](https://www.business-standard.com/article/economy-policy/india-deeply-engaged-in-developing-gm-seeds-for-13-crops-122122300889_1.html)

## 1.12 Artificial intelligence

### 1.12.1 India's artificial intelligence revolution



Technological advancements have revolutionised the industry and businesses in the past few years, thus influencing the production process and supply chain. Industry 4.0 has integrated new technologies, for instance, cloud computing, AI, analytics and machine learning, into operations and production processes, unveiling a new generation of smart techniques. Digital technologies used in manufacturing processes facilitate self-optimisation and automation, leading to operational proficiency across the entire value chain. Artificial intelligence in India is no longer a marginal technology, as enterprises and manufacturers will gain considerably from the superior deployment of machine learning technologies and AI. Companies in India are increasingly adopting AI to drive business outcomes. However, there is substantial hype around what constitutes AI.

AI offers numerous opportunities to the world to supplement and complement human intelligence and enhance the work and lives of people. With a wide array of applications, machine learning and AI have created an impeccable impact on different sectors and have revolutionised the method in which businesses operate. According to the Principal Scientific Advisor (PSA) to the Government of India, AI expenditure in India surged by 109.6% or US\$ 665 million in 2018. In addition, AI expenditure is estimated to surge at a compounded annual growth rate (CAGR) of 39% between 2019-25 to reach US\$ 11,781 million by 2025.

<https://www.ibef.org/research/case-study/india-s-artificial-intelligence-revolution>

### 1.12.2 India assumes chair of the global partnership on artificial intelligence



India assumed the Chair of the Global Partnership on Artificial Intelligence (GPAI) on Monday, said the Ministry of Electronics and Information Technology.

The Minister of State for Electronics and IT, Rajeev Chandrasekhar represented India virtually at the GPAI meeting held in Tokyo for the takeover from France, which is the outgoing Council Chair.

Addressing the occasion, the minister said that India will work in close cooperation with member states to put a framework in place. "Around the framework, the power of artificial intelligence (AI) can be exploited for the good of the citizens and consumers across the globe and ensure that there are adequate guardrails to prevent misuse and user harm."

Chandrasekhar added that AI is a kinetic enabler to take forward current investments in technology and innovation. “India is building an ecosystem of modern cyber laws and framework that is driven by three boundary conditions of openness, safety and trust and accountability.”

<https://www.livemint.com/technology/tech-news/india-assumes-chair-of-the-global-partnership-on-artificial-intelligence-11669043467856.html>

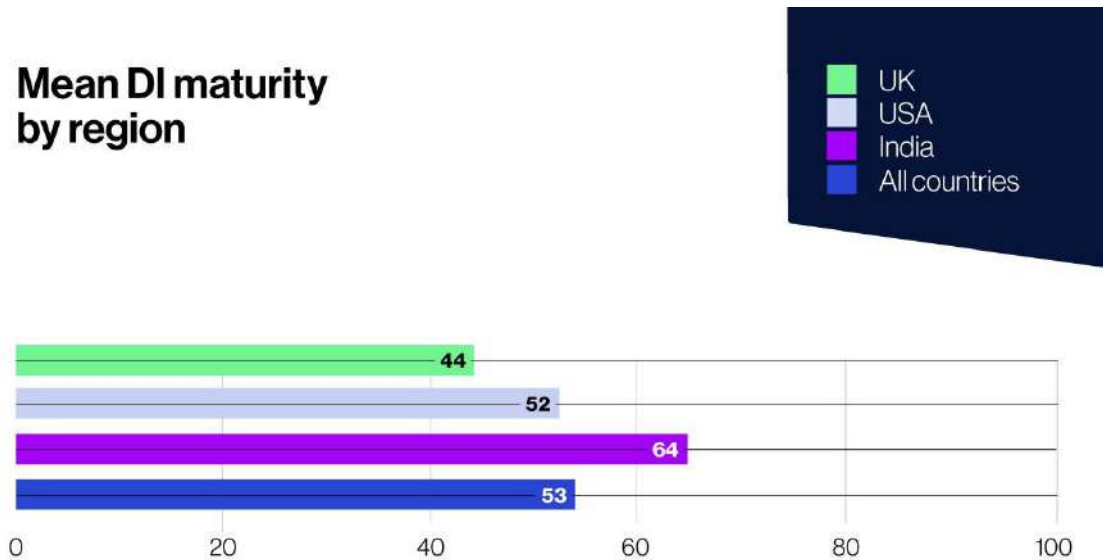
### 1.12.3 Report: U.S. loses AI leadership to India despite a 6-year head start



Peak’s inaugural Decision Intelligence (DI) Maturity Index found that while the U.S. was an early leader in artificial intelligence (AI), India is now the more mature market when it comes to readying their business to adopt AI.

While the U.S. was an early leader in AI, with 28% of U.S. businesses adopting the technology over six years ago – compared to 25% in India and 20% in the U.K. – India is the more mature market when it comes to leveraging AI, scoring 64 (out of 100) on Peak’s DI maturity scale, while the U.S. charted 52 and the U.K. just 44.

## Mean DI maturity by region



### How India does AI differently

What's setting Indian businesses apart is internal communication and education about AI to ensure broad support – 18% of U.S. workers weren't sure if their business used AI, compared to only 2% of Indian workers. Further, 78% of junior staff in India expect AI to have a positive impact on worker well-being over the next five years, compared to 47% of those in the U.S.

The report also found that the way businesses structure data teams is crucial to successful AI adoption, with the majority of Indian businesses having data practitioners embedded in commercial teams to support analysis – by contrast most U.S. businesses have a central data team.

<https://venturebeat.com/ai/report-u-s-loses-ai-leadership-to-india-despite-a-6-year-head-start/>

### 1.12.4 Here's how India is leading the AI revolution

As a country that quickly switched from paper to digital administration during the pandemic, India brings sheer expertise and scalability of solutions to AI implementation.

Being an IT powerhouse and the second-largest online market in the world, India has a conducive environment for artificial intelligence(AI) to flourish .At the some time, democratizing this technology in the country, has a different stance than the rest of the world, owing to India's diverse population, the abundance

of data, and the scalability of use cases. The pandemic-ushered nationwide digital wave has fed into AI adoption and awareness. By 2025, the Indian AI market will reach 7.8 bn USD with organizations integrating AI with vision, edge computing, real-time tracking, and Industrial Revolution 4.0 to create unique and complex solutions.

<https://cio.economictimes.indiatimes.com/news/next-gen-technologies/heres-how-india-is-leading-the-ai-revolution/94800748>

### 1.12.5 Top 10 Reasons Why India Could Emerge as the Global Leader in AI in 2023



Amidst the fast-paced advancements in technology, artificial intelligence has been one of the most revolutionary creations in the history of tech. AI has the potential to drastically improve the efficiency of a workplace by augmenting the work of humans and implementing efficiencies by removing repetitive tasks for business operations. AI frees up the human workforce and allows us to advance humanity toward a better lifestyle. Among the countries that are introducing massive improvements in AI, India is one of the top countries that are enhancing artificial intelligence innovation and development at a rapid scale. Experts predict that India's rapid adoption and development of disruptive technologies will make it the next global leader in AI. Here, we have listed the top reasons why Indian could emerge as the global leader in AI and will continue to reign the industry.

## **Most Indian businesses will shift to AI**

Reports suggest that most businesses will shift to AI-powered systems, applications, security systems, data analysis, and other applications in the future. The number of AI startups has risen dramatically in India in 2022 and the trend is expected to continue in 2023 as well.

Indian Leaders are deploying AI for enhanced operational outputs

In India, leaders are primarily using artificial intelligence to enhance operational effectiveness like in sales forecasting and improving e-mail marketing. Data science startups in India are extensively using AI to extract insights and patterns from large datasets and predict the behavior of customers in the future.

## **Increased exposure to the Internet and technology**

India has developed its approach to making technology and the internet extensively approachable to its citizens. Now with increased exposure to the internet, Indians can now readily access technology, even advanced ones like artificial intelligence.

## **Artificial intelligence education is becoming more affordable**

To work with AI, businesses need to constantly innovate and fund a huge team of researchers and scientists to ensure that they can avail the best resources possible and innovate efficiently. To make innovation more productive, educational institutes in India are introducing AI education in a more affordable manner, preparing the masses for advanced tech adoption and development.

## **AI is fueling other small businesses in India**

Indians are achieving several milestones with the help of AI. Not just large-scale businesses but also medium and small business leaders are deploying the best practices of AI to ensure growth and development into the mainstream market. AI is offering new businesses a chance to see how its competitors have been working to develop their systems and adopting which trending technology will ensure success for them.

## **Rising number of AI startups**

With the growing prominence of tech in India, the number of AI service providers is also rising in the country. These AI startups are making a significant mark in the international sphere, ensuring the global customers can democratize AI in the best way possible. Indian AI startups are fueling the growth of artificial intelligence on a global scale.

### **Increasing number of Government initiatives to adopt AI**

The Indian government is uniquely placing the country's leaders to take advantage of the developments in AI. Various initiatives taken by the government is helping professionals and aspiring techies to use AI to advance their careers and in turn help the industry to grow.

### **Large number of AI or STEM graduates**

India has a large number of graduates from originating from the AI and STEM backgrounds. The government's NITI Aayog project enables students to gain training to work in new jobs created by AI and contribute to the development of AI research in India.

### **Machine learning job market is projected to 40% in India**

Triggered by the rising prominence of AI, the machine learning job market is also soaring. The demand for skilled ML professionals has risen significantly in India and to meet those needs, professionals are constantly upskilling themselves and are competing with international AI experts.

### **Indian business operations are becoming more fast-paced**

Leaders are changing the rules of conducting business in India. Operations are becoming more fast-paced to keep up with the changing dynamics of the tech industry and AI is playing a huge part in this. In a nutshell, it is quite evident that the Indian industry leaders are leveraging AI to its best.

<https://www.analyticsinsight.net/top-10-reasons-why-india-could-emerge-as-the-global-leader-in-ai-in-2023/>

### 1.12.6 Indian AI Hub tasked with identifying critical projects for the Army: Report



Artificial Intelligence Incubation Hub has been set by the Army and BEL, the Navratna Defence PSU

The hub has been tasked to identify artificial intelligence projects which are pivotal for the Army. It will also work in matters related to machine learning, big data analytics, robotics, and cyber security, etc.

As per News18, Navratna Defence PSU Bharat Electronics Limited (BEL) has teamed up with the Army and established an Artificial Intelligence Incubation Hub, as a part of the agreement signed this year, for collaborating in the field of Artificial Intelligence (AI) to identify related projects which are critical for the Army.

Further, AIH will also be entrusted with spotting and connecting with partners from the industry, academia as well as start-ups to ascertain the viability of the said AI projects for execution. Moreover, it will be responsible for recruiting the requisite resources and hardware for the same.

Also, the Artificial Intelligence Incubation Hub will work in matters related to AI-based swarm technology, machine learning, big data analytics, robotics, cyber security, and heaps more.

It is pointed out that in March 2022, both the Army and BEL signed an MoU, i.e., a Memorandum of Understanding, to work together in the field of AI for defence applications. The said MoU aims to bring

together the synergies of the Indian Army, BEL, and Army Design Bureau (ADB) under one roof and carry out research activities for the development of innovative AI solutions for the Indian Army.

<https://www.indiatoday.in/cryptocurrency/story/indian-ai-hub-to-identify-critical-ai-projects-for-the-army-2301630-2022-11-25>

## 1.13 Smart city

### 1.13.1 Smart Cities Mission: Objective, Projects, & List of Cities Included 2023

The Smart Cities Mission is an initiative by the Government of India to improve the lifestyle of citizens living in that particular city or town. This initiative will be taken further by the best practices, information, and smart technologies. Several public-private partnership firms are also going to be a part of the Smart Cities Mission.

This mission was first launched on June 25, 2015, by Indian Prime Minister Narendra Modi. Furthermore, the Union Ministry of Urban Development is in charge of executing the mission throughout the cities. A Special Purpose Vehicle (SPV) has also been created in each state and is headed by the CEO. It is done in order to look after the proper implementation of the Smart City projects. In order to make it a successful implementation of new age development, funding of ₹ 7,20,000 crore has been provided by the government.

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### Features of Smart Cities Mission in India

The major motto of the Smart Cities Mission is to drive economic growth and enhance lifestyle quality. But how will these objectives be achieved? Get to know how the objectives of Smart City India are going to implement for growth with its features.

The mission promotes the use of mixed land according to its per-area usage plan. Therefore, this allows the state to have vast land for multi-purposes and make the bye-laws accordingly. Under this mission, the multiple uses of a land area will be completed by undertaking environmental-friendly measures.

Providing housing choices to everyone is another major goal of the Smart City projects. Living quarters are the building blocks to achieving smart development goals. Hence, more housing construction projects will be taken out to provide shelter for lower-income groups.

The mission is set to give the people relief from congestion. Smart City India will also ensure the security of the people, promote communication, and reduce smog at the same time. New pedestrian streets are also being constructed for cyclers and walkers to avoid accidents.

Developing recreational spots like gardens, parks, open gyms, playgrounds, and more are other major goals of the mission. This will help in promoting a good lifestyle among Indian citizens.

Government-related services are gradually going digital to promote transparency and accountability in the system and the people. Therefore, now citizens can simply go to the portal instead of visiting the municipal office for requesting a service or assistance.

More transportation choices are also being promoted throughout the country. These include public transport and transit-oriented development (TOD).

Each city is also given identification in several areas like education, local cookery, health, arts, sports, fashion, culture, and many more.

Smart technologies are brought and implemented in services and infrastructure for the development of the area.

## Smart City List Map



### Current Status of Smart City Mission in India

The status of the Smart City India mission according to the data furnished by the relevant authority as of February 16, 2022, are as follows:

Particulars	Numbers
Cities	100
Projects	5151
Amount	₹ 2,05,018 crore
Tendered	6809 Projects / ₹ 189,737 crore
Work orders issued	6222 Projects / ₹ 164,888 crore
Work completed	3480 Projects / ₹ 59,077 crore

<https://www.squareyards.com/blog/smart-cities-india-smcart>

## 1.14 Solar power

### 1.14.1 'Sunny Makes Money': India installs a record volume of solar power in 2022

MUMBAI, India – It's smog season in India, when industrial and vehicular emissions mix with crop-burning smoke, and winter temperatures pull a huge sooty cloud down over much of the country.



But through the haze, there are twinkling signs of hope popping up on rooftops across India's sprawling megacities: solar panels.

Despite having lots of tropical sunshine, India gets about 70% of its electricity from burning coal – which exacerbates air pollution that's already some of the worst in the world. But this year, the country has also installed a record volume of solar energy.

It's a sign of what climate scientists say is a much-needed push for renewable energy in what's soon to become the world's most populous country. (The United Nations predicts India will overtake China next year.)

As India develops, and its 1.4 billion people get richer, its energy needs are expanding. Unlike many Western countries, which have pledged to cap overall emissions, India measures its emissions in proportion to its gross domestic product. This year, the government pledged to reduce by 45% the so-called "emissions intensity of its GDP" by 2030.

And at the U.N.'s recently-concluded COP27 climate talks, India repeated a pledge to get half of its energy needs from non-fossil fuels by that same year.

Scientists say that's ambitious, and that India will need to boost its solar capacity even more if it has any hope of keeping that promise.

<https://www.npr.org/sections/goatsandsoda/2022/11/21/1138409818/sunny-makes-money-india-installs-a-record-volume-of-solar-power-in-2022>

### 1.14.2 How one Indian state is leading a solar power boom

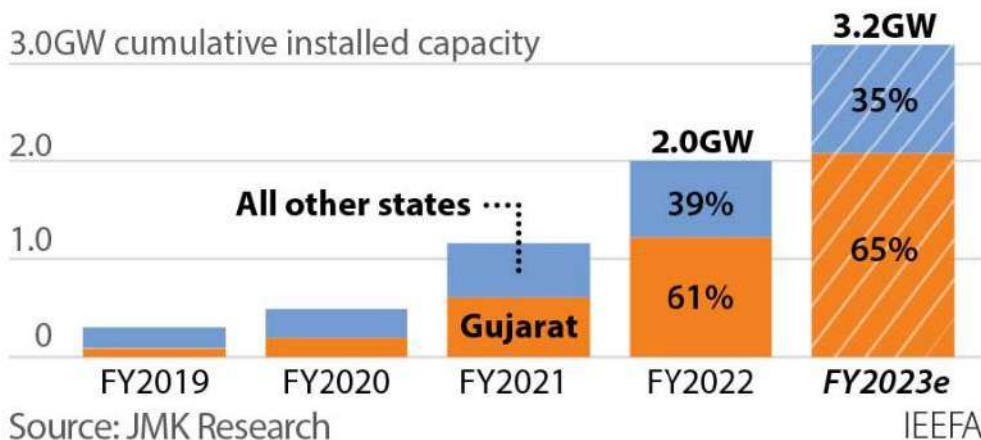


In Gujarat, India, a quiet solar revolution is underway that is completely out of step with the rest of the country.

Gujarat has nearly two-thirds of all residential rooftop solar power in India, despite having just 5% of India's 1.4 billion population and 6% of its land mass.

#### Residential Rooftop Solar Gains Led by Gujarat

Cumulative capacity for residential installations (subsidised and non-subsidised) projected to reach 3.2GW in FY2023



India needs a lot more solar power as part of its plans to get half of its electricity requirements from renewable energy sources by 2030, and ultimately reach net-zero emissions by 2070. Solar now accounts for around 7% of India's electricity generation – according to the Central Electricity Authority of India – at more than 60GW.

The good news is India has enormous solar energy potential. It gets on average 300 sunny days a year, and the IEA says solar power there is set for “explosive growth”, not least because solar will be cheaper than coal-fired power by 2030, even if including associated battery storage costs.

But there is a long road ahead. Solar capacity needs to be nearer 370GW by 2030 in the IEA’s Sustainable Development Scenario for India, and progress has been sporadic across the country.

### **So what did the state of Gujarat do to become such a clear leader in rooftop solar installations?**

A new study from the Institute for Energy Economics and Financial Analysis (IEEFA) and partner organization JMK Research lays out what Gujarat is doing differently to other Indian states.

#### **4 steps to solar power uptake**

It started in 2010 when the government launched its National Solar Mission policy to promote solar power, and provide residential rooftop subsidies. In 2019, Gujarat introduced its own subsidy system called Surya — named after the Hindu sun god — with a target of 1.6GW of solar capacity from 800,000 residential rooftop solar units by the end of March 2022.

Gujarat’s residential rooftop solar segment grew from 0.085GW in 2019 to 1.2GW by March 2022. Although the state only achieved 77% of the target capacity, the state’s residential market share grew rapidly in that time. The report illustrates how Gujarat achieved such large-scale deployment by doing the following:

##### **1. Ensuring adequate supply**

Gujarat built up a large number of preferred — or empanelled — vendors of solar power installation for residential consumers.

##### **2. Ensuring adequate demand**

A campaign of advertising the initiative through SMS, social media and other mediums got the message of rooftop solar subsidies out to the population.

### 3. Digitization

The state created a single digital portal that makes the scheme easier for both consumers and vendors to navigate, from initial registration for the subsidy all the way to the final payment. And the digital portal also helps to keep transactions transparent.

### 4. Timely disbursement of subsidy

The digital portal also updates on the status of the subsidy on a daily basis, giving valuable updates to those involved.

<https://www.weforum.org/agenda/2022/11/india-solar-power-gujarat/>

#### 1.14.3 India's solar-powered future clashes with local life



"Bhadla is almost unliveable," says Keshav Prasad, the chief executive Saurya Urja, a renewable energy company.

He is talking about part of the Thar desert located in Rajasthan in the northwest of India.

Temperatures there can top 50C and frequent sandstorms add to the inhospitable conditions.

But what makes Bhadla an unforgiving place to live also makes it an ideal place to generate solar power.

Thanks to the abundant sunshine, Bhadla is home to the world's biggest solar power farm, in part built and operated by Mr Prasad's Saurya Urja.

Soaking up the sunshine are 10 million solar panels with the capacity to generate 2,245MW, enough to power 4.5 million households.

While keeping the solar panels clean in such a sandy and dusty environment is a challenge, Mr Prasad says running such a vast solar plant is still much simpler than operating almost any other kind of power station.

"There is not much equipment involved. Solar panels, cables, inverters and transformers are almost all that are needed to run a plant," he says.



The plant, which was completed in 2018, has brought investment and opportunities to one of India's most remote regions.

"Most of the boys in my village did not study much. They were not ambitious, as our life was limited to the village, and our parents are farmers or into breeding cattle. But since the construction of the park, I realised the world is much bigger than my village," says 18-year-old Mukhtiyar Ali.

"Because of Bhadla Park many engineers, officers and educated people visit our villages, which has changed my perspective towards life.

"I want to be an officer [in the solar park] who has authority, respect, someone who can bring change in other people's lives," he says.

But not everyone is thrilled about the giant solar park that has been built on their doorstep.

Most of the 14,000 acres used for the park were owned by the state, but it was also where local farmers grazed their cattle.



"Most of our livelihood was cattle rearing," says Sadar Khan, the head of Bhadla village.

"Because all the government lands have been taken back, we don't have enough land for cattle grazing. We are left with few animals," he says.

He accepts that jobs have been created by the park, but says many of those jobs do not pay enough to survive on.

"There are not many solar jobs for locals except labourers, as most of us are uneducated."

Mr Khan also complains that many locals still have no electricity connection.

"We produce electricity, but still a number of villages in the nearby area are without electricity. So it's good we are the largest solar park - but it should bring changes in our life."

<https://www.bbc.com/news/business-62848096>

#### **1.14.4 Why India may be "the only country that has something to show as progress at COP27," despite its coal habit**



New Delhi — When the COP27 United Nations climate conference kicks off this weekend in Egypt, India will likely approach the international gathering with a well-earned boast about its success in going green and an appeal for more help to continue down that path. But despite significant strides that one analyst says have made India the only nation with anything to brag about, it may find an international community with little appetite for generosity.

Ahead of the climate summit, and clearly aiming to impress, India has set itself tougher targets for cutting carbon dioxide emissions and increasing its clean energy generation capacity by 2030, largely off the back of significant progress in its solar power industry.

## **Setting the bar higher**

As all nations were asked to do ahead of COP27, India submitted its updated "nationally determined contributions" (NDCs) to the U.N. Framework Convention on Climate Change (UNFCCC) in August.

Under the terms of climate treaties signed by the COP nations, every country must submit its own goals for reducing emissions and explain how they'll be met — and every year the nations are expected to show progress and make their goals more ambitious. With India's new NDCs, it has pledged to reduce the intensity of the emissions from its national economic output by 45% by 2030, compared to its 2005 level. The target was previously set at 30%.

India has also promised to increase its total share of installed renewable power capacity to 50% by 2030. Currently it's less than 30%, as 70% of India's electricity still comes from coal.

The country has also added a new target: It has pledged to create a "carbon sink," to absorb the equivalent of 2.5 to 3 billion metric tons of carbon dioxide by 2030, through mass-tree planting.

## **A solar powerhouse?**

India has set its ambitious targets based largely on significant progress made in its solar energy sector. The country has a current solar energy generation capacity of 59 gigawatts. That makes it the fifth-highest producer, behind the U.S. and China, but given the country's solar capacity growth rate of 47% annually between 2016 and 2021, many hope to see it emerge quickly as a global hub for solar energy.

<https://www.cbsnews.com/news/india-cop27-solar-power-success-bragging-rights-funding-appeal/>

### 1.14.5 India saved over USD 4 bn in fuel costs through solar power from Jan to June: Report



New Delhi: India saved USD 4.2 billion in fuel costs through solar generation in the first half of 2022 and 19.4 million tonnes of coal that would have further stressed an already strained domestic supply, according to a new report released on Thursday.

<https://economictimes.indiatimes.com/industry/renewables/india-saved-over-usd-4-bn-in-fuel-costs-through-solar-power-from-jan-to-june-report/articleshow/95413414.cms>

### 1.14.6 India's first solar-powered village promotes green energy, sustainability and self-reliance



Gadvi Kailashben, a 42-year-old widow, lives in Modhera, home to the centuries-old Sun Temple and now the first village in India that runs on solar energy.

She earns a meagre income from agriculture which she uses to take care of her family. The Government has installed solar panels on her house which has given her much-needed relief from household expenses.

“Earlier, when solar was not there, I had to pay huge amount for the electricity bill - close to 2,000 rupees. However, with the installation of the solar, my electricity bill is now zero. Everything from the refrigerator to washing machine now runs on solar in my house. I am not paying even 1 rupee electricity bill now,” said Ms. Kailashben.

“The extra money is now saved in my account. I use that money for daily house expenses, and for the education of my children,” she added.

#### **Renewable energy as an income source**

Conversion to a clean, renewable energy source is not only enabling the villagers to run more electrical household gadgets to make life comfortable, without worrying about the electricity bill. It is also becoming a source of income for them.

Ashaben Mahendrabhai, 38, lives with her husband and two children. “We work in our farm and used to pay huge electricity bill for agriculture. Since solar installation in our village, we are now saving a lot of electricity. Earlier our electricity bill used to come around 2,000 rupees. Now it is in minus,” she said.

With the electricity bill in minus, Ashaben is not only saving the money that she used to spend on electricity, but the excess electricity generated is sold back to the grid and she gets money in return.

<https://news.un.org/en/story/2022/10/1129802>

#### 1.14.7 India's first fully solar powered village is helping residents to save time and money



Kesa Bhai Prajapati beams with a smile as he moulds blocks of clay into jugs and vases on a potter's wheel.

These days, Prajapati, 68, from the village of Modhera in western India's Gujarat state, has doubled the amount of earthenware he makes compared to a few months ago. Then, he had to turn the wheel manually as he could not afford high electricity bills that cost up to 1,500 Indian rupees (around €18) a month.

Now, however, his machine moves on solar power. Last month, Prajapati's village of around 6,500 residents - consisting mainly of potters, tailors, farmers and shoemakers - was declared India's first village to run entirely on solar energy all the time.

#### India aims to produce half of its energy with renewables

India, the world's third-largest carbon dioxide emitter, aims to meet half of its energy demands from renewable sources, such as solar and wind, by 2030. It is a boost over its previous target of 40 per cent, which the government said it achieved in December 2021.

<https://www.euronews.com/green/2022/11/01/indias-first-fully-solar-powered-village-is-helping-residents-to-save-time-and-money>

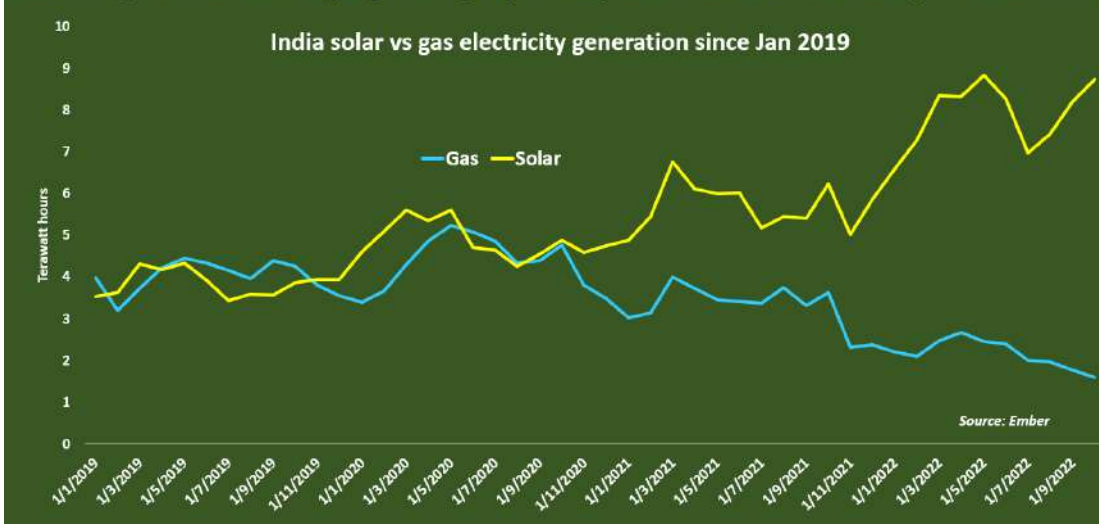
#### 1.14.8 Column: India's solar boom reverses gas momentum, cements coal use



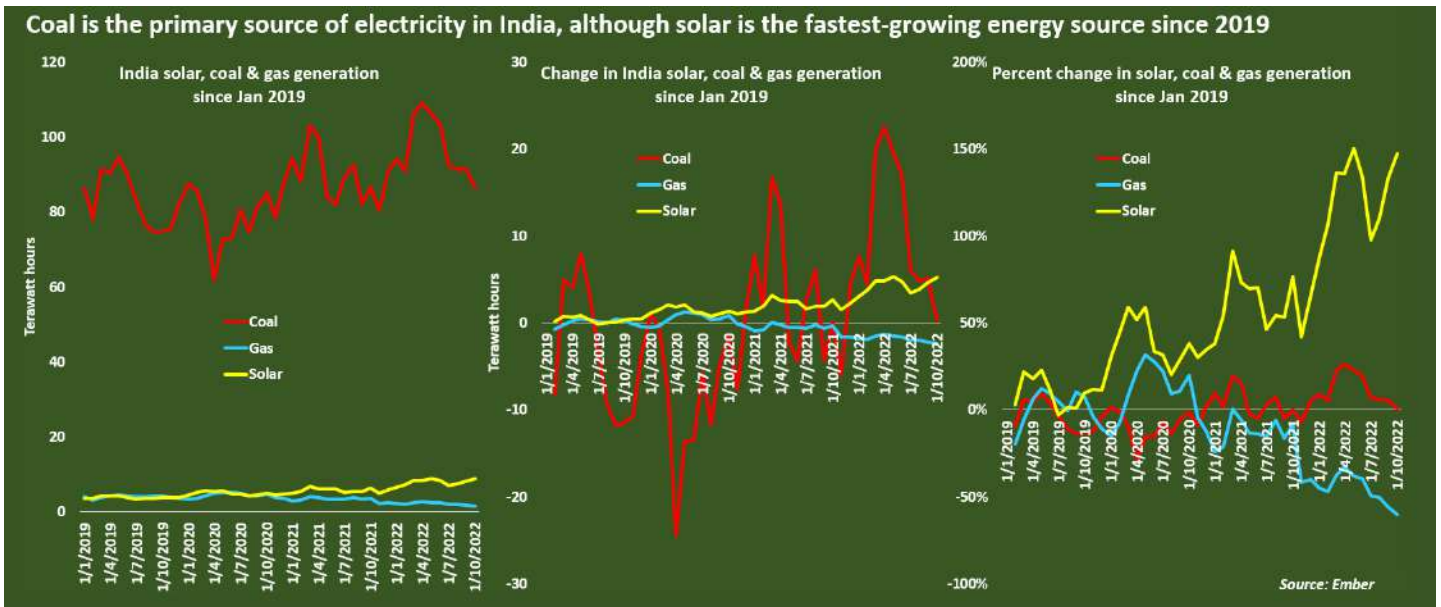
LITTLETON, Colo., Dec 13 (Reuters) - India's rapid advances in solar power production have been widely celebrated for showing how fast-developing economies can accelerate the decarbonisation of their energy systems without jeopardising economic growth.

But while the pace of India's solar rollout has been impressive, the advances have come mainly at the expense of natural gas - they have had little impact on the country's use of coal as the primary source of electricity.

**Solar capacity has rapidly climbed in India since 2019, while use of gas to generate electricity has fallen as high global gas prices spur utilities to use other power sources**



Indeed, India increased the amount of electricity generated from coal in the opening 10 months of 2022 compared with the same period in 2021, and slashed gas-powered generation by nearly 40%, according to data from Ember.

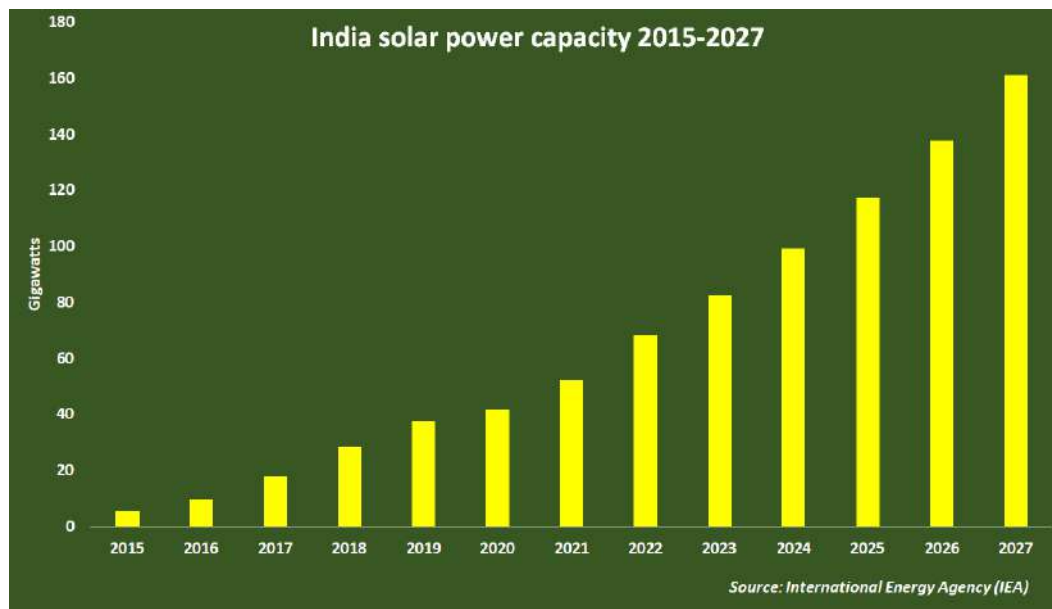


This has resulted in a continuing climb in India's power sector emissions, even as solar's share of the country's electricity generation mix has more than doubled since 2019.

## SOLAR SURGE

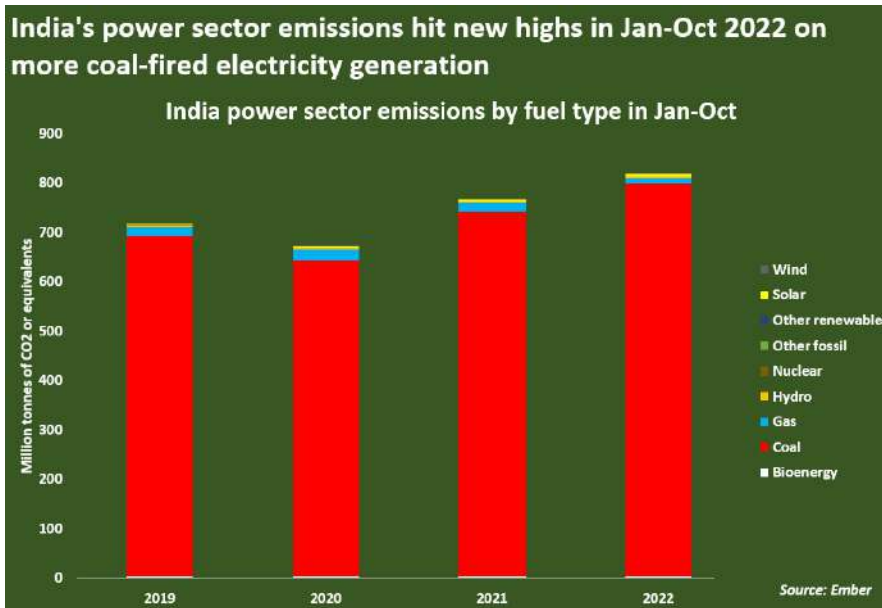
Between 2017 and 2021, India's solar power production capacity more than tripled, ranking third globally in terms of solar capacity additions during that window, according to the BP Statistical Review of World Energy.

And the country plans to more than double that solar capacity base again by 2025, leaving it highlighted by the International Energy Agency (IEA) as a key driver behind its recent dramatic upward revision to its global renewable energy supply outlook.



On paper, such rapid advances in green energy supplies should result in reduced pollution from the country's energy producers.

However, cumulative emissions from India's power sector have scaled new highs in the opening 10 months of 2022, topping 818 million tonnes of carbon dioxide and equivalent gases. That's up nearly 7% from the same period in 2021.



The main driver of the climb in power pollution has been a 7.7% climb in discharges from coal-fired generation, which accounted for 72% of the country's electricity and 97% of power sector emissions through October, Ember data shows.

<https://www.reuters.com/world/india/indias-solar-boom-reverses-gas-momentum-cements-coal-use-maguire-2022-12-14/>

### 1.14.9 India to almost double its renewable power capacity in next 5 years: IEA report



Renewable energy will comprise 90 per cent of global electricity capacity expansion in the next five years and much of it will be in India, according to a new study by the autonomous intergovernmental organisation, International Energy Agency (IEA).

China, the European Union and the United States will be three other geographies contributing majorly to this upward trend besides India. This is primarily owing to the favourable policies and market reforms in all four.

Renewable energy's installed power capacity addition will grow to 2,400 gigawatts (GW) between 2022 and 2027, according to the study. The forecast said this expansion was 85 per cent faster than the previous five years and will be equal to the entire installed power capacity of China today.

<https://www.downtoearth.org.in/news/renewable-energy/india-to-almost-double-its-renewable-power-capacity-in-next-5-years-iea-report-86458>

### 1.14.10 Key to net-zero strategy, India's solar power capacity grew by over 6,000 times in past 12 yrs



New Delhi: At COP27, India released its Long-Term Low Emission Development Strategy that outlined how the country will transition away from fossil fuels to achieve net-zero emissions by 2070. Much of this strategy depends on diversifying India's energy sources, chief among them solar.

<https://theprint.in/environment/key-to-net-zero-strategy-indias-solar-power-capacity-grew-by-over-6000-times-in-past-12-yrs/1266634/>

### 1.14.11 India's Solar Power Generation Rises by 36% YoY to 70.2 BU in 9M 2022



India generated around 70.24 billion units (BU) of solar power in the first nine months (9M) of the calendar year (CY)2022, a 36% increase compared to 51.67 BU during the same period last year.

Solar generation has been on an upward trend since 9M 2018, when it hit 26.45 BU. The increase in overall solar power generation is attributed to the new capacity additions during the first nine months of the year.

<https://mercomindia.com/indias-solar-power-generation-rises-by-36-yoy-in-9m-2022/>

## 1.15 Wind power

### 1.15.1 After little success in past, India revisits plan to repower its ageing wind turbines



The Ministry of New and Renewable Energy of the Indian government has now come forward with its latest draft policy, aimed at repowering old and low-performing wind turbines to maximise the potential of these wind projects.

Out of a total 41.66 GW installed wind energy capacity in the country, more than 25 GW of wind turbines need repowering, as per the estimate made by the National Institute of Wind Energy (NIWE). However, the country has not been able to move forward in this direction so far.

In 2016, the ministry had issued a similar policy to repower old wind energy plants but failed to achieve the desired result. Now, with some revision and additional provisions in the new draft policy, the ministry is making a fresh attempt to revitalise the wind energy sector.

Repowering means the upgradation of under-performing wind turbines to make them more efficient and ensure maximum utilisation of the wind potential available in the country.

<https://india.mongabay.com/2022/10/after-little-success-in-past-india-revisits-plan-to-repower-its-ageing-wind-turbines/>

## 1.15.2 Wind sector in India needs an overhaul — here's why



Globally, India has the fourth-highest installed capacity to generate wind energy. However, the potential is higher and can be accelerated with changes to the bidding system and policies.

The country's total installed capacity was 41.67 GW as on September 30, 2022, according to the Union Ministry of New and Renewable Energy. Around 60.15 billion units were generated in 2020-21.

The Indian government set a target for 175 gigawatts (GW) of renewable energy capacity by 2022. The goal included achieving 60 GW of onshore and 5 GW of offshore capacity for wind energy.

The country has potential for more than 602 GW of onshore wind energy at 120-metre hub height and 100 GW of fixed and floating offshore, according to estimates by the National Institute of Wind Energy (NIWE) and the World Bank Group.

Even though India's wind sector is performing well, the pace of the wind energy sector has slackened, believe experts in the industry.

The procurement model was changed from state procurement based on feed-in tariff (FiT) to central procurement through an e-reverse auction in 2017.

This is when the downside of wind-based electricity began, a senior official in India's wind energy sector told Down To Earth.

A feed-in tariff is an energy policy focused on supporting the development and dissemination of renewable power generation. A reverse auction is a type of auction in which the traditional roles of buyer and seller are reversed. Thus, there is one buyer and many potential sellers.

“Currently, there is only one procurement model through the central public sector undertaking Solar Energy Corporation of India (SECI), where the bid size is 50 megawatts. Also, low tariffs resulted in exploitation only in Gujarat and Tamil Nadu. However, even Gujarat halted when the government stopped allotment of land for wind projects,” the official said.

Since the bid size is 25 MW for state bids and 50 MW for SECI bids, it eliminated small and retail investors from participating in procurement. The government is now considering closed bidding with eligibility criteria for bidders and allotment of bids on bucket filling method.

### **Challenges in meeting targets**

“With 37.5 GW of onshore wind power installed at the end of 2019, India may fall short of its 2022 targets due to pricing, payment risk mitigation, transmission capacity and land use challenges,” said energy forum Global Wind Energy Council’s report, India Wind Outlook towards 2022.

Even in a best-case scenario, wherein these bottlenecks are resolved, the cumulative installed base of onshore wind would reach only 54.2 GW by 2022, it added.

Current bidding is based on tariffs derived from site plant load factor (PLF). PLF is the ratio of average power generated by the plant to the maximum power that could have been generated in a given time.

Also, Gujarat and Tamil Nadu are the highest PLF states and to realise better tariffs, most projects are being planned in these states only (60 per cent in Gujarat and 30 per cent in TN).

Competitive bidding at low tariffs has led to the concentration of wind projects in Gujarat and Tamil Nadu. This has put pressure on land availability and power evacuation infrastructure in these states, leading to

delays in project commissions — Bhuj II, Jam Khambhaliya and Tirunelveli extension projects were due in 2021.

The issue of land availability in Gujarat may have been covered, but experts believe the greater issue of grid planning persists. There is a need for more consultation from industry stakeholders to implement the green corridor and for the transmission of power.

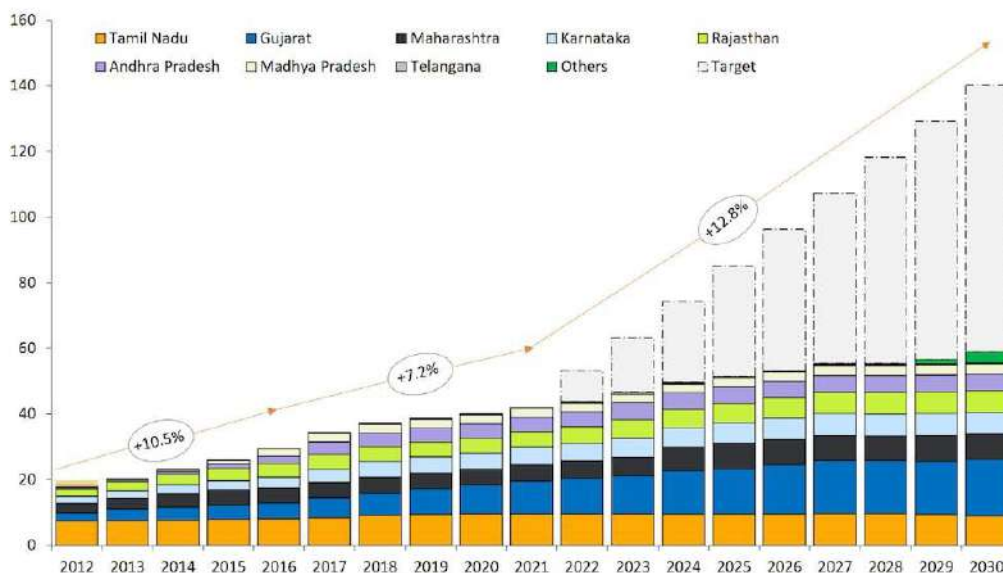
For example, projects awarded by SECI in 2020 are yet to take off due to delays in the commissioning of substations at Koppal and Gadag in Karnataka.

Apart from the concentration of projects that create severe pressure on land, the creation of infrastructure for power evacuation leads to a choking situation, as seen in Gujarat. This is creating execution challenges at the state level.

In spite of the availability of land and infrastructure in other states, investors do not prefer Madhya Pradesh, Rajasthan and Maharashtra as the proposed projects cannot compete with projects in Gujarat and Tamil Nadu due to PLF and economic constraints.

<https://www.downtoearth.org.in/blog/energy/wind-sector-in-india-needs-an-overhaul-here-s-why-85694>

### 1.15.3 Repowering could revitalize India’s wind sector as auctions drive investments



INDIA — India has an ambitious 140-GW target for installed offshore and onshore wind capacity by 2030, which it stands to fall remarkably short of at present, according to a recent Rystad Energy report.

The compound annual growth rate for the wind sector has been only about 7.9% for the past five years, and India's current installed wind capacity is only about 40.2 GW. As such, the country would require adding about 11 GW each year until 2030 to reach its target.

Rystad Energy expects about 1.8 GW of onshore wind capacity to be installed this year across India, thus even the target for this technology set for 2022 year-end of 60 GW (installed wind capacity) is likely to be missed.

However, as long as wind-focused and hybrid auctions continue driving the project pipeline and installations in India, repowering the country's roughly 4.4 GW of onshore turbines—which were installed before 2007 and have capacities of less than 1 MW—could help revitalize the wind sector and meet targets.

India's Ministry of Power released in July the long-term growth trajectory for renewable purchase obligations (RPO), which mandate that all electricity distribution licenses should purchase or produce a minimum specified quantity of their requirements from renewables. As such, states in India would need to meet a quarter of their individual energy demand from renewables under the new RPO mandate, a requirement which then increases to 43% by the end of this decade, Rystad said.

<https://www.offshore-mag.com/renewable-energy/article/14283818/repowering-could-revitalize-indias-wind-sector-as-auctions-drive-investments>

### 1.15.4 Power hungry India seeks developers for 4GW of offshore wind power



The government of India has kicked off plans for offshore wind by releasing a consultation paper to call for bids to lease 870 square kilometres of seabed area in the power hungry South Asian nation.

The area on offer is spread over five blocks near the southern tip of the country off the coast of Tamil Nadu. The blocks are at a depth of 20m to 50m and lie 10km to 39km from India's coastline. The indicative capacity for project installation is 4GW with assumed capacity of 4.5MW per sq km.

The seabed leases are to be awarded for a period of five years and can be extended by a period of two years. They are planned to be awarded before March 2023, which seems ambitious considering that India does not have any offshore development and developers will need time to understand the risks.

This will be the first of eight rounds planned to be held over the next eight years as the country plans to auction areas offshore the states of Tamil Nadu and Gujarat every year until 2030.

<https://www.energyvoice.com/renewables-energy-transition/461971/power-hungry-india-seeks-developers-for-4gw-of-offshore-wind-power/>

### 1.15.5 India's first 4.20-MW wind turbine generator to be commissioned soon in Tirunelveli district



India's first 4.20-MW wind turbine generator, a single unit with the largest generation capacity, has been installed at Vadalivilai near Valliyoor in Tirunelveli district.

The Brazil-based WEG, involved in a range of businesses, including power generation, mining, oil, gas, and sugar industries and having its manufacturing unit at SIPCOT Industrial Estate, Hosur, has installed the state-of-the-art gearless wind turbine generator at a cost of ₹88 crore at Vadalivilai, which is close to the

advantageous Aralvaimozhi Pass. So far, the 3,000-odd windmills installed in the Aralvaimozhi Pass have the capacity to generate power up to 2 MW.

<https://www.thehindu.com/news/national/tamil-nadu/indias-first-420-mw-wind-turbine-generator-to-be-commissioned-soon-in-tirunelveli-district/article65972665.ece>

### 1.15.6 Danes help identify 15 Indian offshore wind sites



The Danish Energy Agency and the Indian Ministry of New and Renewable Energy have published a conceptual plan with a pipeline identifying 15 locations for offshore wind in India.

The conceptual plan provides “substantial inputs” to the stakeholder dialogue on the recently released draft tender document from the Indian Ministry of New and Renewable Energy (MNRE).

The joint study was presented at a high-level event in Chennai, India on 23 November 2022 as an activity under the Centre of Excellence for Offshore Wind and Renewable Energy, a joint initiative between the Danish Energy Agency (DEA) and MNRE.

It highlights a conceptual build plan for the selected zones off the coast of Tamil Nadu and Gujarat and is based on Denmark’s approach to maritime spatial planning for offshore wind.

The projects provide “significant input” to the undergoing stakeholder consultation on the draft tender document for the first offshore wind parks in India, released by MNRE on 14 November.

The conceptual build-out plan proposes identification of 14 sites in Tamil Nadu (south east India) and one site in Gujarat (north west India) corresponding to the planned upcoming auctions announced in the Strategy Paper for Offshore Wind, released by Government of India in July 2022.

The report puts forward four initial sites in Tamil Nadu for the first auction of 4GW equivalent seabed in 2022-2023 for leasing to carry out required studies and surveys and subsequent project development under an open access model (under model-3 of the strategy paper).

Adopting a relatively high capacity density would allow for up to 25GW across the identified areas in Tamil Nadu alone.

This provides a clear pipeline and contribution to the 30GW government target for offshore wind in 2030.

<https://renews.biz/82021/danish-indian-offshore-effort-identifies-15-sites-off-india/>

### **1.15.7 Tamil Nadu could add 25GW of wind by 2030**



A new roadmap from the Global Wind Energy Council has found that Tamil Nadu could add 25GW of new wind capacity by 2030.

This would attract billions of dollars of investment and generate over 100,000 jobs in the best-case scenarios of GWEC's new roadmap for the state, which was developed in partnership with the SED Fund and Deloitte.

The roadmap outlines how enacting a policy that embraces the state's wind potential could help the Indian state become one of the key investment destinations in Asia and deliver enormous green-impetus into the state's economy.

Among the roadmap's findings is that wind power constitutes 84% of the state's renewable energy potential. Tamil Nadu's installed wind power capacity currently contributes to almost a quarter of India's installed wind power capacity.

It is noted that an additional 4GW of wind capacity could be added by 2030 if major power evacuation and transmission infrastructure challenges and other legacy challenges are not addressed.

But in the base case, 13GW of new wind capacity could be added by 2030, rising to 25GW in the best-case scenario.

Adding the additional 13GW would require around \$10bn of investment.

<https://renews.biz/82388/tamil-nadu-could-add-25gw-of-wind-by-2030/>

## **2. China**

### **2.1 Green agriculture**

#### **2.1.1 Experts suggest accelerating the development of green agriculture and promoting rural revitalization**

At the 2022 Green Agriculture High-quality Development Symposium hosted by the China Well-off Society Association, experts said that promoting the development of green agriculture is an inevitable requirement for facilitating sustainable agricultural development and comprehensively stimulating rural revitalization.

Green agriculture should be promoted through technological innovation in all areas of China to ensure high output, product safety, resource conservation, and environmental friendliness.

Yin Chengjie, a member of the Rural Revitalization Expert Advisory Committee of the Ministry of Agriculture and Rural Affairs, said that all localities should protect and make good use of agricultural resources, accelerate the innovation of seed industry and agricultural machinery equipment, speed up the improvement of rural infrastructure shortcomings, and focus on rectifying outstanding problems in the rural environment, in particular the comprehensive treatment of rural sewage and garbage to reduce environmental pollution.

[http://www.news.cn/fortune/2022-11/17/c\\_1129136469.htm](http://www.news.cn/fortune/2022-11/17/c_1129136469.htm)

### **2.1.2 Qihe County, Shandong: Planting an experimental field of green agriculture**

In the wheat field of Zhao Jincheng, a major grain grower in Qihe County, Dezhou City, Shandong Province, the intelligent crop warning platform displays data such as weather, temperature and humidity in real time. "This device covering the county's high-standard farmland can not only monitor the moisture, seedlings, insects, and disasters in agricultural production in real time, but also automatically give early warnings, effectively shortening the forecasting period." said Wang Yi, a senior agronomist from the Qihe County Agriculture and Rural Bureau.

In order to promote the comprehensive green transformation of agricultural modernization, Qihe County accelerates the application of agricultural digitalization, networking, and artificial intelligence. Thanks to the fixed observation and experiment station of the National Agricultural Green Development Pioneering Zone, good performance can be achieved in organic and inorganic fertilizer application and technological tests of multi-functional vegetation buffer zone, and integrated water and fertilizer irrigation in 45,000 mu (around 30 square kilometers) of farmland. Meanwhile, a national agricultural industrial park and a traceability platform of agricultural product quality and safety will be created.

<https://cn.chinadaily.com.cn/a/202211/30/WS6387228aa3102ada8b224a3b.html>

## 2.2 Green buildings

### 2.2.1 Three departments issued a document to comprehensively promote green buildings and relevant materials

The Ministry of Finance, the Ministry of Housing and Urban-Rural Development, and the Ministry of Industry and Information Technology recently issued the "Notice on Implementation Scope of Expanding Government Procurement Supporting Green Building Materials to Promote Building Quality", which clarifies that starting from November 2022, building qualities will be improved and green building material will be encouraged through governmental procurement in 48 cities (and/or districts) including Chaoyang Districts, Beijing (including the previous 6 pilot cities).

According to the Notice, the projects covered by the government procurement policy include hospitals, schools, office buildings, complexes, exhibition halls, convention centers, gymnasiums, affordable housing and other government procurement projects, including other government procurement projects that apply the bidding law. Relevant cities can choose to implement some projects first, gradually expand the scope on the basis of experience, and achieve full coverage of government procurement project policy by 2025.

At the same time, the project price settlement must be carried out first. For projects included in the scope of policy, the proportion of project price settlement must be increased, and the proportion of project payment shall not be lower than 80% of the completed project amount.

[http://www.gov.cn/xinwen/2022-10/29/content\\_5722485.htm](http://www.gov.cn/xinwen/2022-10/29/content_5722485.htm)

## 2.3 Prefabricated buildings

### 2.3.1 Guangdong's prefabricated buildings will account for more than 50% of the new building area in 2030

Recently, 14 departments including the Department of Housing and Urban-Rural Development of Guangdong Province jointly issued the "Implementation Opinions on Accelerating the Development of New-type Building Industrialization". It points out that by the end of 2030, the new-type building industrialization will be guided by the government. Also, high efficiency, high quality, low consumption, and low emission

of building industrialization will be basically realized, and prefabricated buildings will account for more than 50% of the new building area.

<http://m.fangchan.com/news/6/2022-10-19/6988308238718800884.html>

## **2.4 Cultural tourism**

### **2.4.1 Gansu province makes every efforts to promote cultural tourism**

The Gansu Provincial Department of Culture and Tourism earnestly fulfills the duties of the province's cultural tourism and health building industry and makes every effort to promote their development.

The Provincial Department of Culture and Tourism explores advantages and integrates resources, and in accordance with the requirements of the "Implementation Plan for the Development of the Provincial Cultural Tourism and Health Care Industry Chain", proposes the "Outline of the Development Plan for the Provincial Cultural Tourism and Health Care Industry Chain", focusing on establishing core area of cultural tourism and health building with the Yellow River culture and urban leisure as the themes and creating cultural tourism and health building industry belt with Silk Road as the major theme. Given that the tourism revenue was 39 billion yuan in 2019 and the target should be an annual increase of 15%, the tourism income is expected to exceed 78 billion yuan in 2025.

[http://gs.news.cn/news/2022-09/20/c\\_1129016045.htm](http://gs.news.cn/news/2022-09/20/c_1129016045.htm)