INSTITUT Montaigne

[Scenarios] **India 2050:** The Environmental Challenge

EXPLAINER - JUNE 2024

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India 2050:
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Institut Montaigne's Explainers are analytical short-reads, setting out key facts and figures to make sense of the world we live in and how it is evolving

This paper is part of a series of short and medium-term scenarios that outline potential trajectories for certain countries, with the aim of supporting decision-making.

Foreword

How can France and Europe fully capitalize on the "Indian moment" that is shaping the 21st century? Both are key players in India's pursuit of a balanced global power dynamic, as India will remain committed to diversifying its partnerships.

India is far from being absent from our foreign policy priorities: France and India signed a strategic partnership as early as 1998, and the EU-India relationship was upgraded to the same status in 2004. Despite India's robust economic growth – 8.4% in the last quarter of 2023 – the economic relationship between Europe and India remains underwhelming. India is only the EU's tenth-largest trading partner, accounting for just 2.1% of European exports of goods.

The term "untapped potential" frequently describes our relationship with India. Yet European companies are well-positioned to meet some of India's needs. The country, despite its macroeconomic successes, still faces classic development challenges indeed. Christophe Jaffrelot and his co-authors delve into these issues in two insightful papers on India's food security and environmental concerns (water stress, air pollution, and deforestation).

These papers provide forward-looking scenarios up to 2050 – with agriculture and the environment being particularly suited to twenty-five-year horizon scenarios – , outlining concrete avenues for reflection and opportunities for French and European businesses in specific sectors.

The coming years are a prime opportunity for France to enhance its economic ties with India and establish a robust agenda for collaboration in environmental and agri-food sectors. For both France and Europe, it will be a matter of overcoming bottlenecks and points of tension (notably divergences in the context of the EU-India FTA negotiations, especially as an FTA could be beneficial to the food and environmental issues that

India wishes to address today), and of taking advantage of the many steps forward in the Europe-India agenda (solar, hydrogen, wind power, resilience of European industrial supply chains), in order to base the relationship on an encouraging and tangible dynamic.

By contributing to the debate on the conditions for India's success, each paper provides input for a revitalized France-India and Europe-India dialogue.

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Introduction

As the entire planet is subject to environmental challenges of unprecedented magnitude, how India – the world's most populous country[1] with over 18% of the global population but only 4% of renewable water resources – will cope in the coming years is of major importance, not only for its society and economy, but also on a global scale. The international ramifications of the issue first stem from the impact of Indian CO_2 emissions on climate change. In the past decade, India has recorded a higher growth rate in emissions than China, 3.8% against 1.5%. Therefore, India has become in 2022 **the third largest global emitter after China, the United States, and before the European Union[2]**. This process is accelerating. Two years ago, the International Energy Agency (IEA) already predicted that India's share of global CO_2 emissions would rise from 7% to 10% between 2021 and 2030[3]. However, the environmental challenges India faces also concern the rest of the world for another reason as well – international migrations that will undoubtedly occur if the ecological crisis deprives the Indian economy (and agriculture in particular) of essential resources.

The environmental issue that India is facing will be addressed here through three challenges: **water stress, air pollution, and deforestation**. This paper takes stock of the situation in the country and analyzes the public policies enacted by New Delhi in terms of water management, air quality, and forest conservation. Beyond this, it studies the projections made for the middle of this century to measure their implications and

[1] *United Nations Department of Economic and Social Affairs, "India to Overtake China as World's Most Populous Country by April 2023, United Nations Projects", Nations Unies, April 2023, https://www.un.org/en/desa/india-overtake-china-world-most-populous-country-april-2023-united-nations-projects.*

[2] *"Report At COP27: India Records Highest Emission Increase Among Top Global Contributors", Outlook India, November 11, 2022, https://www.outlookindia.com/international/report-at-cop27-india-records-highest-emission-increase-among-top-global-contributors-news-236452.*

[3] *"World Energy Outlook 2021", Agence internationale de l'énergie, October 13, 2021, https://www.iea.org/reports/world-energy-outlook-2021.*

strives to open some perspectives for positioning Europe as a partner of India's environmental policy.

1 The Water Issue

India is currently facing the worst water crisis in its history, endangering millions of lives and threatening economic growth, particularly due to its impact on the agricultural sector.

1.1. CAUSES

India is confronted with this situation not only because climate change is affecting the monsoon patterns, and thus the availability of surface water, but also because of the depletion of groundwater reserves and inadequate management of consumer supply, notably due to a lack of proper infrastructure.

The average annual temperature in India has increased by about 0.7°C between 1900 and 2018. Climate change made last year's heatwave 30 times more likely than it would have been otherwise, according to World Weather Attribution[4].

This trend, by favoring evaporation, depletes the water resource but India also suffers from new rainfall patterns. The monsoon regime is indeed changing, with rains more difficult to predict and concentrated over a shorter period, which makes agriculture work more complicated and

[4] *Puja Das, "Driest and warmest August in India's history raises concerns for agriculture and water reserves", Livemint, August 31, 2023, https://www.livemint.com/news/india/driest-and-warmest-august-in-india-s-history-raises-concerns-for-agriculture-and-water-reserves-11693504910272.html.*

exacerbates soil erosion – in addition to flooding. Under these conditions, surface waters are reduced, as evidenced by the trickle of water that many rivers resemble, even shortly after the rainy season.

This is one of the reasons why the largest part of the supply of water for agriculture and drinking water for the population comes from groundwater – 50% of the water needs of urban populations and as high as 85% of the consumption of rural populations. About 89% of groundwater in India is used for irrigation. Domestic use comes in second at 9%, followed by industry which uses only 2% of it.

However, the introduction, since the Green Revolution, of water-intensive crops such as rice, sugarcane, cotton, or maize has had a significant impact on supplies. It has led to a reduction in India's groundwater levels by 61% between 2007 and 2017, according to a report by the Central Ground Water Board (CGWB), presented to the Lok Sabha (lower house of the Indian Parliament) in 2018[5]. In Punjab, Gujarat, Haryana, and Rajasthan, it is necessary to drill over 40 meters on average to find water[6] – and to irrigate fields – a technical challenge that only large operators willing to invest in tubewell infrastructure can afford to tackle.

In cities, water scarcity leads to water cuts – linked to the falling levels of dams and groundwater. Some neighborhoods are now only supplied by tanker trucks due to the absence of running water at the tap or access to a public water point (collective tap, hand pump…) as is normally the case in slums.

[5] *Prabhash K Dutta, "Why India does not have enough water to drink", India Today, June 28 2019, https://www.indiatoday.in/india/story/why-india-does-not-have-enough-water-to-drink-1557669-2019-06-28.*

[6] *See the maps from the Ministry of Water (Ministry of Jal Shakti), Annual Report. 2019-20, New Delhi, Government of India, 2020, pp. 55, https://jalshakti-ddws.gov.in/sites/default/files/Annual-report-2019-2020-eng.pdf.*

To the problem of scarcity is added that of contamination. Indeed, many surface and groundwater sources are made unfit for consumption due to toxic wastes and infiltrations, whether from industrial discharges (into rivers), landfills or chemical fertilizers. It is estimated that about 70% of surface water in India is unfit for consumption[7], with the pollution of rivers and lakes being mainly due to inadequate or non-existent sewage treatment. In 2018, according to the Central Pollution Control Board (CPCB), which monitors the water quality of rivers and other bodies of water in the country[8], 351 polluted river stretches were identified, and in 2019, 252 lakes did not meet the criteria allowing for swimming.

Groundwater pollution makes the problem of leaks even more delicate. It is estimated that **about 40% of the water distributed is lost due to leaks** associated with the state of the distribution network[9], which would not be as severe a problem if some of this water was not polluted *en route*, in the water tables themselves.

It is worth noting that water is not equitably distributed where it is supplied through pipes. Megacities like Delhi and Mumbai receive more than the standard municipal norm of 150 liters per capita per day (LPCD), while others receive about 40 to 50 LPCD. But these are averages because the slums of these cities remain poorly supplied[10].

[7] *"Water pollution is killing millions of Indians. Here's how technology and reliable data can change that", Priyank Hirani and Vikas Dimble, World Economic Forum, October 4, 2019, https://www.weforum.org/agenda/2019/10/water-pollution-in-india-data-tech-solution/.*

[8] *"Conservation of Lakes and Rivers", Ministry of Water (Ministry of Jal Shakti), July 26, 2021, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1739096.*

[9] *Prabhash K Dutta, "Why India does not have enough water to drink", India Today, 28 juin 2019, https://www.indiatoday.in/india/story/why-india-does-not-have-enough-water-to-drink-1557669-2019-06-28.*

[10] *Ministry of Jal Shakti, Annual Report. 2019-20, New Delhi, Government of India, 2020, pp. 55, https://jalshakti-ddws.gov.in/sites/default/files/Annual-report-2019-2020-eng.pdf.*

1.2. CONSEQUENCES

The accumulation of water stress factors mentioned above explains why, according to the Aqueduct Water Risk Atlas of the World Resources Institute, **India ranks thirteenth among nations most affected by water shortages globally**[11]. While the World Health Organization recommends a minimum of 25 liters of water per person per day to meet all basic hygiene and food needs, 600 million Indians do not have access to this amount of water today, and about 200,000 people die each year due to insufficient access to safe drinking water[12].

In cities, the victims of this shortage are mainly the 65 million people living in slums[13]. Shortages also lead to costly logistical challenges. In 2020, the city of Chennai at large (with a population of 9 million) was supplied with water by a train with 50 tanker wagons, carrying up to 525 million liters daily. The cost of such a system should not be calculated solely on the basis of the effort made by the public authorities: the time spent queuing at the station by the residents must also be taken into account. In the countryside, the situation is even more critical: only about one-fifth of rural households have a connection supplying them with drinking water at home, which means traveling to a well or a public tap, leading to time loss and sometimes very strenuous efforts. In both urban and rural areas, water scarcity indeed leads to significant time losses for those responsible for water chores – mainly women. In the slums, they queue at the tap and in the countryside, they sometimes walk several kilometers per day to reach water points.

[11] *"Updated Global Water Risk Atlas Reveals Top Water-Stressed Countries and States", World Resources Institute, August 6, 2019, https://www.wri.org/news/release-updated-global-water-risk-atlas-reveals-top-water-stressed-countries-and-states.*

[12] *"NITI Aayog Composite Water Management Index", NITI Aayog, June 2018, https://social.niti.gov.in/uploads/sample/water_index_report.pdf.*

[13] *Ritwika Mitra, "Hunger, poverty, and disease stalk India's slum population as Sustainable Development Goals ignored", Alliance for Science, May 16, 2023, https://allianceforscience.org/blog/2023/05/hunger-poverty-and-disease-stalk-indias-slum-population-as-sustainable-development-goals-ignored.*

1.3. TOWARDS 2050: TOO MUCH AND NOT ENOUGH WATER AT THE SAME TIME

If the current state of affairs is indicative of a true crisis, the water issue is acquiring new dimensions in India, not only because the problems reviewed above are worsening but also because new challenges are emerging, such as the rise in sea levels, the impact of glacier melting, and changes in rainfall patterns.

The Water Resources Group report estimates that approximately **40% of the Indian population will be deprived of access to drinking water by 2030**, implying a severe water shortage for hundreds of millions of people[14]. In addition, according to the United Nations World Water Development Report 2023, about 80% of people living under water stress will be in Asia, particularly in Northeast China, India, and Pakistan[15]; "the global urban population facing water scarcity is expected to rise from 933 million (one-third of the global urban population) in 2016 to 1.7-2.4 billion people (from one-third to nearly half of the global urban population) by 2050, with India expected to be the most severely affected country."[16] By 2030, water demand is expected to be twice as high as the quantities that will be available in India, both due to population growth and the scarcity of this resource.

[14] 2030 Water Resources Group, "Charting Our Water Future: Economic Frameworks to Inform Decision-Making", McKinsey & Company, 2009, https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/sustainability/pdfs/charting%20our%20water%20future/charting_our_water_future_full_report_.ashx.

[15] This situation is linked to climate change (particularly the melting of glaciers on the Tibetan plateau) and to the even more direct impact of human activity on the Himalayan water basins (see the proliferation of dams).

[16] He, C., Liu, Z., Wu, J., Pan, X., Fang, Z., Li, J. and Bryan, B. A., "Future global urban water scarcity and potential solutions", Nature Communications, August 3, 2021, https://www.nature.com/articles/s41467-021-25026-3 ; l'article est cité dans "The United Nations World Water Development Report 2023 Partnerships and cooperation for water", Perugia, Unesco, 2023, p. 2.

According to the WWF Water Risk Filter, a hundred cities globally, home to approximately 350 million individuals, are highly exposed to a substantial increase in water-related risks by 2050. Among these, fifty are located in China and thirty in India, including Delhi, Jaipur, Indore, Amritsar, Pune, Srinagar, Kolkata, Bengaluru, Mumbai, Kozhikode, and Visakhapatnam[17]. According to the World Economic Forum, by 2030, 21 cities, including Chennai and New Delhi, will be devoid of groundwater, thus affecting 100 million people.

Furthermore, water shortages are expected to severely impact the Indian economy, with a loss of about 6% of the country's GDP by 2030, according to a 2009 report[18]. Water availability has already had an impact on India's electricity supply: droughts and water shortages caused the country to lose 14 terawatt hours (TWh) of thermal power production in 2016[19]. 70% of Indian thermal power plants are at risk of facing significant water stress by 2030, which will severely hinder power production and India's economic activity.[20] It should be noted that **thermal energy currently represents more than three-quarters of India's electricity production[21]**.

The scarcity of water resources will result in the desertification of entire areas, mostly located in the west of India, in Rajasthan and Gujarat. Some districts will thus lose their population, as inhabitants will be forced to migrate further east.

[17] *Tomás de Oliveira Bredariol, Molly Walton, Vaibhav Chaturvedi, "Managing the Water-Energy Nexus Is Vital to India's Future", Agence internationale de l'énergie, March 22, 2021, https://www.iea.org/commentaries/managing-the-water-energy-nexus-is-vital-to-india-s-future.*

[18] *"Cities across the Globe Face an Alarming Rise in Water Risks", WWF India, November 2, 2020, https://www.wwfindia.org/?19602/Cities-across-the-globe-face-an-alarming-rise-in-water-risks.*

[19] *"Cities across the Globe Face an Alarming Rise in Water Risks", WWF India, November 2, 2020, https://www.wwfindia.org/?19602/Cities-across-the-globe-face-an-alarming-rise-in-water-risks.*

[20] *Luo Tianyi, Deepak Krishnan et Shreyan Sen, "Parched Power: Water Demands, Risks, and Opportunities for India's Power Sector", World Resources Institute, January 16, 2018, pages 1-7, https://www.wri.org/parched-power-water-demands-risks-and-opportunities-indias-power-sector.*

[21] *Ibid.*

Other climate migrants will be dislodged from their living areas by the rising sea levels, especially in deltas where population densities are very high – notably because rice is cultivated there.

In the Himalayas, the issue of water takes on a very different form, linked to the melting of glaciers. A reduction in snowfall is projected between 2070 and 2100 (compared to the average snowfall between 1971 and 2000) of 30 to 50% in the Indus basin, 50 to 60% in the Ganges, and 50 to 70% in the Brahmaputra.

This development will jeopardize the livelihoods of more than 100 million farmers in the Indus, Ganges, and Brahmaputra basins[22].

1.4. GOVERNMENT INITIATIVES

The Indian National Water Policy (NWP), initiated in 2012, was supposed to propose an action plan and an appropriate legislative framework for more than ten years. This NWP is based on ten fundamental principles that stipulate, in particular, that water should be managed as a common good and that the state must ensure the country's food security. Integrated Water Resources Management (IWRM) here uses the river basin as the basic unit[23].

Following the change of government in 2014 that brought Narendra Modi to power, the Indian government, in partnership with the states, decided to implement the Jal Jeevan Mission (JJM) – Har Ghar Jal, which aims to provide safe and adequate drinking water on a regular and sustainable

[22] *Rohini Krishnamurthy, "Melting Hindu Kush Himalayas Will Decrease Water in River Basins by 2100, Warns ICIMOD", DownToEarth, June 20, 202, https://www.downtoearth.org.in/news/climate-change/melting-hindu-kush-himalayas-will-decrease-water-in-river-basins-by-2100-warns-icimod-90129.*

[23] *Ministry of "Jal Shakti" (Water), "National Water Policy (2012)", Food and Agriculture Organization of the United Nations, 2012, https://faolex.fao.org/docs/pdf/ind163536.pdf.*

basis to every rural household by the end of 2024. These goals have not been reached. **As of July 2023, only 64% of rural households had access to running water**[24]. Even this figure seems implausible because it is incompatible with those provided by the National Sample Survey Office (NSSO), according to which, in 2023, less than a quarter of rural households and less than two-thirds of urban households in India reported having running water at home.[25]

The Indian government also launched the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2015. This mission aims to ensure universal coverage of water supply in 500 cities. At the start of AMRUT, the water supply coverage was 64%; it aims to reach 100% of households. The AMRUT 2.0 mission, launched in October 2021, continues this goal by focusing on the establishment of a circular water economy.[26]

The Central Ground Water Board conducted artificial recharge works in some districts in 2018 and completed them in 2020. These works included the construction of dams, percolation reservoirs, and recharge wells.

The National Water Mission has launched several campaigns, including *Sahi Fasal*, which encourages farmers in areas affected by water stress to grow less water-intensive crops and to use water more efficiently. Additionally, a campaign titled *"Catch the Rain"* has been initiated to encourage the creation of rainwater harvesting structures adapted to local climatic conditions. Alongside, the ministry is implementing the *Namami Gange* program for the rejuvenation of the Ganges River and its tributaries.

[24] *"No Har Ghar Jal by 2024: Report", The Wire, July 2, 2023, https://thewire.in/government/no-har-ghar-jal-by-2024.*

[25] *Atul Thakur, "3 out of 4 rural homes without piped drinking water: NSSO", The Times of India, March 15, 2023, https://timesofindia.indiatimes.com/india/3-out-of-4-rural-homes-without-piped-drinking-water-nsso/articleshow/98643790.cms?from=mdr.*

[26] *"Jal Shakti Abhiyan", Ministry of Water (Ministry of Jal Shakti), July 21, 2022, https://pib.gov.in/PressReleasePage.aspx?PRID=1843395.*

These various measures call to be supplemented by others, more ambitious, to truly tackle the problem head-on, which the government is already striving to do.

1.5. PERSPECTIVES AND OPPORTUNITIES

In the field of water, as in many others, the most relevant solutions, as the ongoing initiatives already demonstrate, combine technical innovations and changes in public policies, and even individual behaviors.

- In terms of technical innovations, the efforts which have been initiated for **limiting leaks in the water distribution network in urban** areas are bound to intensify, not only to avoid wasting water but also for not polluting aquafers with infiltrations though contaminated soils. Development aid policies and companies – including foreign ones – specialized in these activities have a role to play here.

- For such policies to succeed, the **reform of the governance of local bodies**, which have started in the 1990s in order to give more autonomy to municipal corporations, are greatly appreciated by the private sector actors, which often regret the interferences from the state governments, or even the central government.

- Still under the heading of technological innovations, initiatives concerning the **desalination of seawater are more and more debated**. This technique, which primarily concerns coastal cities, has already been implemented in Chennai. The project, carried out by VA Tech Wabag, is valued at 44 billion rupees (approximately 490 million euros) and aims to significantly alleviate Chennai's water issues by

[27] *Saurav Anand, "Va Tech Wabag Secures ₹4,400 Crore Order from Chennai Metro Water to Build Desalination Plant". Livemint, March 31, 2023. https://www.livemint.com/companies/news/va-tech-wabag-bags-rs-4-400-cr-order-from-cmwssb-to-build-asia-s-largest-desalination-plant-in-chennai-11680244228904.html.*

adding 750 million liters per day (MLD)[27] of desalinated water to the city's supply, thus ensuring a more stable and reliable source of fresh water. Two other projects by the Israeli company IDE Technologies are underway in Gujarat (where a plant with a capacity of 100 million liters is being built) and in Visakhapatnam, where a desalination plant worth 10 billion rupees (approximately 111 million euros) with a capacity of 100 MLD is under construction[28]. Another ambitious project is ongoing for Mumbai's BMC, with a capacity of 200 MLD, demonstrating the potential impact of desalination on water supply security.

- These projects are drawing sharp criticism from environmentalists who highlight how much energy desalination plants consume – often from fossil fuels – and who raise the (lesser-known) issue of solid discharges into the sea: a desalination plant capable of producing 400 MLD of potable water would need to draw in eight to ten times that volume of seawater, then discharging brine with high levels of total dissolved solids (TDS) into the ocean[29]. According to Indian ONGs, this discharge poses a threat to marine ecosystems, potentially reducing fish catches and affecting the livelihoods of small fishermen. Furthermore, the alteration of coastal habitats could turn these areas into ecological dead zones over time. There are also concerns about the quality of water produced by desalination plants. Reports indicate that TDS levels in the water from the Nemmeli desalination plant range from 700 to 1,000 parts per million (ppm), far exceeding the safe limit of 500 ppm[30].

[28] *Anoop Verma, "India Partners with Israel to Implement Best Technologies for Ensuring Water Security". ET Government, August 1, 2023. https://government.economictimes.indiatimes.com/news/governance/india-partners-with-israel-to-implement-best-technologies-for-ensuring-water-security/102303781.*

[29] *Akshaya Nath, "Chennai to Get 4th Desalination Plant to End Water Woes, Environmentalists Question Need", The Print, August 24, 2023, https://theprint.in/india/governance/chennai-to-get-4th-desalination-plant-to-end-water-woes-environmentalists-question-need/1728473/#:~:text=It%20will%20treat%20400%20million,be%20a%20severe%20environmental%20impact.*

- Environmentalists opposed to desalination advocate **for the exploration of more sustainable alternatives, such as rainwater harvesting and the rejuvenation of existing water bodies**. Chennai, with an average annual rainfall of approximately 1,400 millimeters,[31] receives a significant amount of precipitation, suggesting that the region could leverage rainwater harvesting more effectively. The state of Tamil Nadu utilizes merely 1% of the rainwater it receives. By harnessing just 2% of this resource, Chennai and its adjoining districts – Tiruvallur, Kanchipuram, and Chengalpet – could meet their water needs without resorting to desalination. Tamil Nadu's environmentalists, therefore, argue in favor of the **desilting and capacity expansion of the 4,000-odd lakes in the region**, which could serve as adequate storage systems, potentially negating the need for new desalination plants.[32]

- In the same vein, particularly in urban environments, several Indian urban planners argue in favor of the **de-artificialization of soils in order to transform major cities into "sponge cities"** and to address one of the current problems: monsoon rains, instead of recharging the aquifers beneath the cities, are drained into rivers and cause devastating floods.

- The incentives offered to residents of Indian cities to **outfit their roofs with rainwater harvesting systems and reservoirs** are bound to increase in the form of subsidies or fiscal deductions.

[30] *Padmaja Jayaraman, "Chennai Residents Question Quality of Water from Nemmeli Desalination Plant". Citizen Matters, May 5, 2023. https://citizenmatters.in/desalination-plant-nemmeli-minjur-chennai-metro-water-cmwssb-tds-turbid/.*

[31] *"How Chennai – One of the World's Wettest Major Cities – Ran Out of Water". Livemint, February 4, 2021, https://www.livemint.com/news/india/how-chennai-one-the-world-s-wettest-major-cities-ran-out-of-water-11612412943308.html.*

[32] *Akshaya Nath, "Chennai to Get 4th Desalination Plant to End Water Woes, Environmentalists Question Need". The Print, August 24, 2023. https://theprint.in/india/governance/chennai-to-get-4th-desalination-plant-to-end-water-woes-environmentalists-question-need/1728473/#:~:text=It%20will%20treat%20400%20million,be%20a%20severe%20environmental%20impact.*

- These innovations are already adapted to rural areas where traditional water collection and storage techniques – overshadowed by the construction of large dams – are revived in semi-desertic states like Gujarat and Rajasthan: while large dams are suffering from an increasingly problematic evaporation rate due to global warming, traditional wells with wide margins, or even in the shape of vast inverted pyramids, have been restored and other states have started to do the same.

- In the agricultural sector, some states have started **to reduce the area dedicated to water-intensive crops** such as rice, sugarcane and corn, to the benefit of millets.

- In both urban and rural settings, **wastewater treatment is now considered as a priority by the competent authorities**. Some significant initiatives have already emerged in this area. The Municipal Corporation of Greater Mumbai's recent initiative, awarding Suez a €700 million contract to design, build, and operate a 500-MLD wastewater treatment facility at Worli, is an example of the scale of investment in urban wastewater management. This project is part of a broader plan to upgrade seven sewage treatment plants (STPs) to process 2,464 million liters of sewage daily, with a particular focus on water reuse, aiming to recycle 67% of treated water.[33]

- The central and state governments are actively **planning the expansion of sewage treatment capabilities across various urban centers**, with an anticipated capacity of around 4,827 MLD. Upcoming projects include the construction of at least 10 more STPs in locations such as Pinjore, Hansi, Loniapurva, Hathras, and Kota, among others. Notably, the STP in Okhla, Delhi, which is set to be the largest in Asia with a capacity of 564 MLD, represents a significant portion of this initiative[34]. **Water reuse initiatives are gaining traction as well**,

[33] *Suez Group, "SUEZ Wins the Largest Contract in Its History in India", September 27, 2022, https://www.suez.com/en/news/press-releases/suez-wins-the-largest-contract-in-its-history-in-india.*

with projects like the one in Nagpur, where 190 MLD of wastewater is being repurposed for cooling thermal power plants. This approach not only conserves fresh water but also demonstrates the feasibility and economic viability of water reuse models for industrial applications. Such initiatives should be conducted more systematically, with the support of international funders such as the World Bank, to enable India to draw upon international companies that have the appropriate technologies.

2 The Air Pollution Crisis

2.1. CAUSES

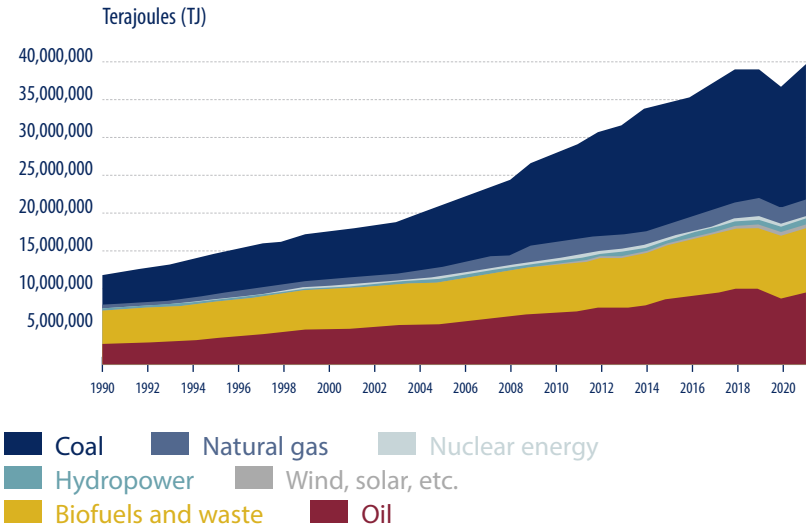
The degradation of air quality in India coincides with the increase in greenhouse gas emissions due to the economic growth the country has experienced since the liberalization of the 1990s. This growth has been reflected in increased industrial production, higher oil consumption linked to the expansion of the automobile fleet and transportation in general, and – most importantly – a continued reliance on coal to generate the electricity the country needs.

In 2021, **45% of the energy demand was met by coal, which generated 75% of the consumed electricity**. Oil accounted for 25% of energy consumption, gas 6%, and renewables 24% – the majority of which were biofuels. The share of renewables in India's electric production is the subject of debate. At COP21 in 2015, India had committed to producing more than 15% of its electricity from renewable energies by 2020. It claims

[34] *PERI India, "Okhla Sewage Treatment Plant, New Delhi", https://www.peri.in/projects/infrastructure/okhla-sewage-treatment-plant.html.*

to have reached this milestone, while some foreign observers consider that "the share of renewable energies in electrical production is less than 15%".[35] Solar energy still represents only 5% of electricity production despite remarkable efforts in this area.[36] Under these conditions, the goal set by the National Electricity Plan unveiled in 2022 by the government **seems largely unrealistic:** it plans to increase the solar share from 5 to 25% by 2032, which would imply an annual growth rate of 36%.

The evolution of energy sources in India between 1990 and 2022



Source : International Energy Agency (https://www.iea.org/countries/india).

[35] *French Treasury, La transition énergétique en Inde : un enjeu stratégique pour l'atteinte des objectifs de l'accord de Paris, Ministry of Economy and Finances, Paris, March 16, 2023, https://www.tresor.economie.gouv.fr/Articles/2023/03/16/la-transition-energetique-en-inde-un-enjeu-strategique-pour-l-atteinte-des-objectifs-de-l-accord-de-paris.*

[36] *Ministry of Power, National Electricity Plan, 2022, p. 279, https://powermin.gov.in/en/content/national-electricity-plan-0.*

Some statistics illustrate the magnitude of the challenge that India is currently facing in terms of emissions, and therefore atmospheric pollution:

- In 1991, there were 21.04 million registered vehicles in India. This number has jumped to 295.8 million in 2019, an increase of 1306% in 28 years.[37]

- Most notably, three-quarters of electricity production is achieved through thermal power plants – among them, 55% is due to coal.[38] Over the past fifteen years, coal has been the most significantly growing energy source in the Indian energy mix.[39] As a result, CO_2 emissions per capita related to coal have increased by 29% between 2016 and 2023.[40]

More generally speaking, according to the International Energy Agency, CO_2 emissions in India increased from 530.12 million tons in 1990 to 2,279 million tons in 2021, rising by 156% between 2000 and 2021.[41] In cities, the air is also polluted by microparticles from industrial sites and public works, as well as housing construction. The building of new transport infrastructures and the real estate boom have indeed remarkably energized the construction sector since the 2000s.

[37] *Ministry of Road Transport and Highways, Road Transport Year Book (2019-20), New Delhi, Government of India, 2020, https://morth.nic.in/sites/default/files/RTYB_Publication_2019_20%20(1).pdf.*

[38] *Ministry of Coal, Coal. Indian energy choice, New Delhi, 2024, https://coal.nic.in/en/major-statistics/coal-indian-energy-choice.*

[39] *Year-to-year change in primary energy consumption by source, India, 1966 to 2022, https://ourworldindata.org/grapher/annual-change-primary-energy-source?time=1966..2022&country=~IND.*

[40] *« Climat : l'Inde est encore loin d'atteindre ses objectifs en matière de mix énergétique », La Tribune, October 3, 2023, https://www.latribune.fr/climat/energie-environnement/climat-l-inde-est-encore-loin-d-atteindre-ses-objectifs-en-matiere-de-mix-energetique-978498.html.*

[41] *International Energy Agency, "India – Countries & Regions", https://www.iea.org/countries/india. According to the IEA, coal accounts for 45% of India's total energy consumption.*

2.2. CONSEQUENCES

According to a report by the Global Burden of Disease, in 2015, about 1.1 million deaths in India (10.6% of the total number of deaths in the country) were associated with air pollution from fine particles.[42] This number increased in 2019, with ambient and indoor air pollution causing **1.7 million premature deaths** in India.[43]

The health impacts of pollution also represent a high cost to the economy. Income losses related to deadly diseases caused by particulate matter pollution in 2017 ranged from 30 to 78 billion dollars, approximately 0.3 to 0.9% of the country's GDP.[44]

Air pollution is also responsible for the "smog" which, in winter, reduces visibility so drastically that some airports in Northern India operate at a slower pace, many trains are delayed or canceled, and the movement of cars and trucks is very complicated, which also represents a considerable cost to the economy – not to mention the closure of schools and stadiums.

2.3. GOVERNMENT INITIATIVES

India demonstrates some ambivalence in its approach to greenhouse gas emissions. On the one hand, since the COP21 in 2015, the country has made ambitious commitments in this area.

[42] *"Burden of Disease Attributable to Major Air Pollution Sources in India", GBD MAPS Working Group, Health Effects Institute, 2018, https://www.healtheffects.org/system/files/GBD-MAPS-SpecRep21-India-revised_0.pdf.*

[43] *"Catalyzing Clean Air in India", The World Bank, August 27, 2021, https://www.worldbank.org/en/country/india/publication/catalyzing-clean-air-in-india.*

[44] *"Clearing the Air: A tale of three cities", The World Bank, 2020, https://openknowledge.worldbank.org/server/api/core/bitstreams/7dddabbc-507d-5664-96a5-ecf7f02f9bdb/content.*

India's first Nationally Determined Contribution (NDC) had two main objectives. The first was to reduce the emissions intensity of its economy by 33-35% below 2005 levels. The second was to achieve 40% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.

However, India updated its NDC in 2022. It indicates that India commits to reducing the carbon intensity of its emissions by 45% by 2030 compared to 2005 levels and to increase the share of non-fossil fuel energy sources in its electricity production to 50%, and to create an additional cumulative carbon sink of 2.5 to 3 gigatons of carbon dioxide equivalent ($GtCO_2e$) by 2030 through an increase in forest and tree cover.[45]

In the same document, however, India has only committed to achieving carbon neutrality by 2070,[46] a later date than most other participants in the annual COP meetings, where India opposes (more or less openly) the phase-out of fossil fuels and also calls for rich countries, responsible for the climate crisis, to spend a trillion dollars to help poorer countries accomplish their energy transition.

How can we evaluate India's trajectory in terms of energy transition today?

On the one hand, the country has made significant progress in installing new renewable energy capacities, **even ranking fourth in the world in 2021 for installed electric renewable energy production capacity, largely due to the share of hydroelectricity and biomass (mainly wood).**[47] However, the Indian government has also invested in solar as

[45] *Avantika Goswami, "India's updated climate pledge to Paris Agreement gets Union Cabinet nod", DownToEarth, August 3, 2022, https://www.downtoearth.org.in/news/climate-change/india-s-updated-climate-pledge-to-paris-agreement-gets-union-cabinet-nod-84138.*

[46] *India's Updated First Nationally Determined Contribution Under Paris Agreement (2021-2030), August 2022, https://unfccc.int/sites/default/files/NDC/2022-08/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf.*

[47] *https://www.irena.org/Data/View-data-by-topic/Capacity-and-Generation/Country-Rankings.*

well as wind energy[48], and has streamlined administrative processes and increased incentives for domestic production of solar technologies.

On the other hand, fossil fuel sources, starting with coal, remain dominant. According to the Central Electricity Authority (CEA) report of February 2023, renewable energies still only represented 19.3% of the total energy (including 7% for hydroelectricity) – while nuclear power plants only accounted for 3%.[49] However, it is necessary to add the very important part of biomass to these figures. More importantly, the government still encourages the production of coal. It plans the construction of new coal-fired power production capacities, such that they will probably not reach their peak until 2030, and emissions will continue to increase beyond that. The International Energy Agency (IEA) estimates that Indian coal demand should continue to grow at an average pace of 1.3% per year, to reach 540 million tons in 2040 compared to 410 in 2019.[50] The Central Electricity Authority of India announced an update to its "master plan" for the energy sector with a National Electricity Plan (NEP) for the period 2022-2027, which forecasts a need for new coal-fired electricity production capacities. The new project mentions the need to create new coal-fired electricity production capacities, ranging from 17 GW to 28 GW by 2031-2032, in addition to the 25 GW already under construction.[51] The NEP made public in 2022 envisages an increase in the load factor of coal thermal power plants, from 55% until 2026-2027 to 62% in 2031-2032.[52] The rise in coal's share is partly due to the stagnation of hydroelectricity,

[48] *"India stands 4th globally in wind power capacity", Press Information Bureau, Indian Government, December 20, 2022, https://pib.gov.in/PressReleasePage.aspx?PRID=1885147#:~:text=India%20stands%204th%20globally%20in,the%20period%20Jan%20to%20Oct.*

[49] *Utpal Bhaskar, "India's renewable energy capacity at 122 GW in February", Livemint, March 30, 2023, https://www.livemint.com/news/india/indias-renewable-energy-capacity-at-122-gw-in-february-11680179203975.html.*

[50] *India also plans to increase its imports of liquefied natural gas (LNG).*

[51] *Ashima Sharma, "India to add over 300 GW of coal-based capacity by 2030", Energy Monitor, April 6, 2023, https://www.mining-technology.com/news/additional-coal-based-capacity-in-india/.*

[52] *Ibid.*

penalized by the declining trend in the levels of rivers and reservoir lakes due to the more limited nature of monsoon rains. In 2023, during the summer, due to low rainfall, the share of hydroelectricity in the overall production dropped to 14.8% of the total, compared to 18.1% during the same period the previous year.[53]

The blatant contradiction observed here between the declared objectives and the policies actually pursued is naturally explained **by the scale of the country's needs and the lower cost of coal**, but also by the influence of big business owners close to power, like Gautam Adani, the new coal magnate in India. In its annual report for 2023, the German NGO Urgewald shows that the "coal boom" India is experiencing is not only due to the public enterprise Coal India, but also to the Adani group, "the world's largest private coal mine developer".[54]

As a result, according to the analysis by Climate Action Tracker (CAT), India's effort to reduce its CO_2 emissions remains "highly insufficient".[55]

[53] *S. Vadharan et Carman Crew, "India steps up coal use to stop outages triggered by unusually dry weather", Reuters, September 4, 2023, https://www.reuters.com/business/energy/india-steps-up-coal-use-stop-outages-triggered-by-unusually-dry-weather-2023-09-03/#:~:text=India%20steps%20up%20coal%20use%20to%20stop%20outages%20triggered%20by%20unusually%20dry%20weather.-By%20Sudarshan%20Varadhan&text=SINGAPORE%2C%20Sept%204%20(Reuters),pace%20with%20record%20power%20demand.*

[54] *The 2023 Global Coal Exit List: Failing the Phase-Out, Berlin, October 19, 2023, https://www.urgewald.org/en/medien/2023-global-coal-exit-list-failing-phase-out. Voir aussi https://www.irena.org/Data/View-data-by-topic/Capacity-and-Generation/Country-Rankings.*

[55] *"India | Climate Action Tracker", https://climateactiontracker.org/countries/india/.*

2.4. WHAT AIR QUALITY CAN INDIA EXPECT IN 2050?

If India's economic growth has been the cause of a 55% increase in CO_2 emissions over the last decade, it should lead to a 50% increase in these emissions by 2040[56]. One of the major correlative factors of this pollution will be urbanization, which leads to a significant increase in the consumption of fossil fuels and the dispersion of fine particles.

The report from the International Energy Agency predicts that, on average, 2,500 individuals could die daily in India due to the effects of air pollution by 2040[57]. According to the report from the Health Effects Institute and IIT Bombay, **if no action is taken, deaths attributable to air pollution in India could reach up to 3.6 million people annually by 2050.**[58] The combustion of coal in power plants will significantly increase morbidity related to air pollution, with a tenfold increase in deaths linked to this factor between 2015 and 2050.[59]

To avoid such a deterioration of an already compromised situation, India must accelerate its energy transition. It has not managed to reach the goal of 175 GW of green electricity production. It is now aiming for 500 GW by 2030, but this means 43 GW more every year…[60]

[56] *"Air Quality and Climate Policy Integration in India", International Energy Agency, May 2021, mai 2021, https://www.iea.org/reports/air-quality-and-climate-policy-integration-in-india.*

[57] *PTI, "2,500 people may die daily due to polluted air by 2040: Report", The Times of India, June 28, 2016, https://timesofindia.indiatimes.com/city/delhi/2500-people-may-die-daily-due-to-polluted-air-by-2040-report/articleshow/52961660.cms.*

[58] *"GBD-MAPS Special Report 21: Air Pollution in India – 2021", Health Effects Institute, https://www.healtheffects.org/system/files/GBD-MAPS-SpecRep21-India-press-release.pdf.*

[59] *Malavika Vyawahare, "Air pollution-linked deaths will triple by 2050 if no action taken: report", Hindustan Times, January 19, 2018, https://www.hindustantimes.com/environment/air-pollution-linked-deaths-will-triple-by-2050-if-no-action-taken-report/story-zAfsoSamrwcI43izfOnrDP.html.*

[60] *Sudarshan Varadhan and Carman Chew, "India steps up coal use to stop outages triggered by unusually dry weather", Reuters, September 4, 2023, https://www.reuters.com/business/energy/india-steps-up-coal-use-stop-outages-triggered-by-unusually-dry-weather-2023-09-03/#:~:text=India%20steps%20up%20coal%20use%20to%20stop%20outages%20triggered%20by%20unusually%20dry%20weather,-By%20Sudarshan%20Varadhan&text=SINGAPORE%2C%20Sept%204%20(Reuters),pace%20with%20record%20power%20demand.*

Here again, technological innovations are not the only paths to prioritize, as hydrogen and nuclear energy, for example, are not suitable for the needs and means of the country.[61]

- The emphasis should be placed on renewable energies. **Solar energy**, that has been promoted by France and India within the framework of the International Solar Alliance launched in 2015, will continue to be a **priority of India's energy policy**. Besides the creation of new solar farms, **European companies may contribute to the maintenance of the grid and, in particular, of local connections in isolated areas where solar could contribute even more to the villagers' energy autonomy:** according to Smart Power India, only 5% of the 3,300 local networks (called "mini-grids") managed by public authorities were operational in 2023.[62]

- The government is already trying to **equip the roofs of buildings** (belonging to individuals, administrations, or companies) with solar panels, and may well continue. This policy addresses the problem of "mini-grids". Second, it avoids the competition for land (especially with farmers) that solar panel fields entail.[63] Third, it allows the State to offload a part of the policy of developing solar in a decentralized mode.

- Indian experts who have measured the energy efficiency of thermal plants assess that **some old coal plants could produce 60 to 70% more electricity (given the coal they burn) if they were**

[61] *Nuclear power is not only expensive but also constrained by water resources – which would force India to install its plants by the sea where the risk of tsunamis has been proven in the recent past.*

[62] *K. Mehrotra, "India joins rush to renewables, but its rural solar systems fall off grid", The Washington Post, July 31, 2023, https://www.washingtonpost.com/world/2023/07/31/india-solar-energy/.*

[63] *In 2023, the government announced the creation of 50 solar farms representing 180,000 acres of land (S. Sharma, "180,000 acres may be 'diverted' for proposed 37,490 MW solar power capacity farms", Counterview, January 3, 2024, https://www.counterview.net/2024/01/180000-acres-may-be-diverted-for.html.*

modernized.[64] As for the transmission lines, some of them lose, on average, one-fifth of the energy they transport along the way.

- While in northern countries, thermal isolation mostly aims at reducing the need for heating buildings during the winter, in India, **the energy consumption peaks are due to heat waves during the summer** – which are more frequent because of climate change and result in the massive use of air conditioning. August 2023 turned out to be the hottest August for over a century, causing a record increase in electricity production to 162.7 billion kilowatt-hours, according to a Reuters analysis based on data from the national grid operator. In this context, the greening of facades and roofs of buildings reduces the need for air conditioning.

- The challenge of the energy transition is more difficult to meet in a country like India, which does not already produce enough electricity to guarantee the supply to users seven days a week, 365 days a year. Not only does the country need to produce more green energy to replace coal-fired power plants, but it also has to produce more to meet the needs of consumers not yet covered. And this is all the more difficult with a renewable energy source that is intermittent, like the sun and wind. In such a case, developing storage capacities is not a priority but can be useful for electric vehicles – whose numbers are estimated to be 6.8 million in 2030 (compared to 500,000 in 2020). India has just discovered a lithium deposit in the Salal-Haimana (Jammu and Kashmir)[65] that may be used for batteries. **Japanese companies are investing massively in India to develop this very promising sector, but their European counterparts could do the same.**[66]

[64] *S. Sharma, "India's energy sector planners failing to gauge 'escalating threat' of climate change", Counterview, December 16, 2023, https://www.counterview.net/2023/12/indias-energy-sector-planners-failing.html.*

[65] *Y. Jhunjhunwala, "India's Strategic Lithium Reserves and the Future of Clean Energy", Invest India, April 17, 2023, https://www.investindia.gov.in/team-india-blogs/indias-strategic-lithium-reserves-and-future-clean-energy.*

3 Deforestation

According to a report published by Utility Bidder, a consultancy firm based in the United Kingdom, India, globally, ranks second in terms of deforestation rate, with a loss of 668,400 hectares of forest cover over the last 30 years. Brazil and Indonesia hold the first and third places respectively, with 1,695,700 hectares for Brazil and 650,000 hectares for Indonesia.[67]

3.1. CAUSES

The deforestation that is rampant in India is partly due to demographic growth,[68] which leads farmers to encroach on the forest to develop new cultivable areas.[69] However, urbanization plays an even more significant role. Between 1990 and 2022, India's urban population jumped from 222.37 million to 508.37 million, an increase of 286 million inhabitants.[70] **The urban population is expected to continue to grow to reach 600 million people by 2030, which will lead to urban centers encroaching on wooded areas of varying densities.**[71] Another variable to consider is the opening of new mines – particularly coal mines – which

[66] *Ashima Sharma, "India to add over 300 GW of coal-based capacity by 2030", Energy Monitor, 6 avril 2023, https://www.mining-technology.com/news/additional-coal-based-capacity-in-india/ and Florence Jones, "India targets 90% renewable energy by 2047", Power Technology, April 5, 2023, https://www.power-technology.com/news/india-renewable-energy-90-2047/.*

[67] *"Why it matters: India has lost 668,400 ha of forest cover in the last 30 years", The Hindu, March 21, 2023, https://www.thehindu.com/sci-tech/energy-and-environment/why-it-matters-india-has-lost-668400-ha-of-forest-cover-in-the-last-30-years/article66645294.ece.*

[68] *"Deforestation Report: Key Statistics, Causes & Impact", Utility Bidder, https://www.utilitybidder.co.uk/compare-business-energy/deforestation-report/.*

[69] *It should be noted that the Forest Survey of India defines "forest cover" as any land of one hectare or more with tree patches having a canopy density of more than 10%.*

[70] *"Urban population (% of total population) – India", World Bank, https://data.worldbank.org/indicator/SP.URB.TOTL?locations=IN.*

[71] *"India's urban population is projected to grow about 60 crore by 2030: Economic Survey", Deccan Herald, January 29, 2021, https://www.deccanherald.com/india/india-s-urban-population-is-projected-to-grow-about-60-crore-by-2030-economic-survey-944953.html#.*

has resulted in the felling of thousands of trees, especially in areas populated by indigenous people. This has only been made possible through a relaxation of legislation and forest protection practices, as we will see below.

Finally, fires are destroying more and more forests. According to the 2021 India State Forest Report, the country recorded a total of 345,989 forest fires from November 2020 to June 2021. This is the highest figure ever recorded in the country. Approximately 258,480 forest fires "only" had been reported during the same period in 2018-2019.[72] **Warmer and drier weather conditions and human factors, such as land conversion for agricultural purposes and poor forest management, are the main drivers of the increase in forest fires**. More than 36% of the country's forest cover is estimated to be subject to frequent wildfires.[73]

The North-Eastern States, which represent 23.75% of the Indian forest cover[74], have undergone massive deforestation. Between 2011 and 2019, the forest cover of seven of these states – Arunachal Pradesh, Manipur, Nagaland, Tripura, Mizoram, Meghalaya, and Sikkim – decreased by nearly 18%, and the region lost nearly 25,012 km^2 of forest cover over the previous decade.[75]

Deforestation, beyond its effects on humans (including the dispossession of certain tribal populations of their resources and lifestyle), has detrimental consequences on the environment in general. Forests indeed perform essential ecological functions, such as carbon sequestration, regulation of hydrological cycles, and preservation of biodiversity. Moreover,

[72] *Ditsa Bhattacharya, "What Does the India State Forest Report 2021 Say?", NewsClick, January 16, 2022, https://www.newsclick.in/what-does-india-state-forest-report-2021-say.*

[73] *"India State of Environment Report 2021", Ministry of Environment, Forest and Climate Change of India, January 20, 2022.*

[74] *DTE Staff, "Every Northeastern State Reports Loss in Forest Cover: State of India's Forest Report 2021", DownToEarth, January 13, 2022, https://www.downtoearth.org.in/news/forests/every-northeastern-state-reports-loss-in-forest-cover-state-of-india-s-forest-report-2021-81113.*

[75] *Ibid.*

deforestation contributes to air pollution by releasing fine particles and greenhouse gases.

3.2. GOVERNMENT INITIATIVES

Here too, it is necessary to distinguish between discourse and actual policies. Cultivating its image as a protector of nature, the Indian government has assured the rest of the world that it was working to improve India's forest cover and that, as a consequence, India was contributing to carbon storage thanks to its forests.[76] In 2022, the total carbon stock in India's forests was estimated at 7,204 million tons, an increase of 79.4 million tons in the country's carbon stock compared to the last assessment in 2019, and an annual increase of 39.7 million tons.[77]

However, these figures are debatable because what is considered a "forest" by the Forest Survey is gauged by satellite images of inadequate resolution. Indeed, Indian remote sensing satellites produce images with a resolution of 23.5 meters per pixel, too coarse to unequivocally identify small-scale deforestation and to distinguish forests from plantations. The officials of the Forest Survey acknowledge that they should instead use images with a resolution of 5.8 meters per pixel. Even under these conditions of imperfect measurement, it is estimated that of the 21.5% of Indian territory considered forested, 9.3% and 9.1% fall under "moderately dense forest" and "open forest" respectively, according to the ISFR 2019 report. Only 2.9% would constitute "dense forests."[78] For obvious

[76] *Regarding the strategy displayed by the Indian government on this matter, see Ministry of Environment, Forest and Climate Change, National REDD+Strategy, India, New Delhi, Government of India, 2018, https://redd.unfccc.int/media/india_national_redd__strategy.pdf.*

[77] *"India State of Environment Report 2021", Ministry of Environment, Forest and Climate Change of India, January 20, 2022, https://static.pib.gov.in/WriteReadData/specificdocs/documents/2022/jan/doc20221207001.pdf.*

[78] *Natasha Gilbert, "India's Forest Area in Doubt", Scientific American, September 4, 2012, https://www.scientificamerican.com/article/indias-forest-area-in-doubt/.*

reasons: **between 2015 and 2020, 256,000 hectares of primary forest were cleared, the equivalent of six times the territory of Switzerland, and an increase of 37% compared to the last six years.**[79]

The CAMPA (Compensatory Afforestation Fund Management and Planning Authority), established in 2006 and reformed by a 2016 law, justifies rapid deforestation in the name of economic growth. This institution has thus authorized the creation of 21 airports and 23 highways with a total length of 7,800 kilometers, as well as the auctioning of forests to the private sector for the first time after existing laws have been diluted.

In 2022, the government amended the Forest Conservation Rules by giving the right to forest owners to deforest without the prior consent of the indigenous populations, in contempt of the Scheduled Tribes and Other Traditional Forest Dwellers Recognition of Forest Rights Act – mainly to create open-pit mines.[80] In July 2023, the amendments made to the Forest Conservation Act of 1980 removed protection from nearly 200,000 square kilometers of forests that can now be destroyed for infrastructure development or national defense.[81] The forests of the Himalayan ranges are the first threatened, even though deforestation there already promotes landslides – and therefore the disappearance of the vegetative cover.[82]

[79] *"India State of Forest Report 2021", Rural India Online, 2021, https://ruralindiaonline.org/en/library/resource/india-state-of-forest-report-2021/.*

[80] *M. Joshi et N. Sethi, "Government to approve cutting down of forests without consent from tribals and forest dwellers", Newslaundry, July 7, 2022, https://www.newslaundry.com/2022/07/07/government-to-approve-cutting-down-of-forests-without-consent-from-tribals-and-forest-dwellers.*

[81] *T.V. Dutta, "'Everyone is aghast.' India's move to weaken forest protection outrages conservationists", Science, August 1, 2023, https://www.science.org/content/article/everyone-aghast-india-s-move-weaken-forest-protections-outrages-conservationists.*

[82] *Sushmita, "India's Himalayan forests under threat with new bill", The Third Pole, July 26, 2023, https://dialogue.earth/en/forests/analysis-indias-himalayan-forests-under-threat-with-new-law/.*

3.3. ADDRESSING THE CHALLENGE OF DEFORESTATION

What does the future hold for the Indian forest cover? The 2019 India State of Forest Report mapped for the first time the hotspots of climate change in the country to envisage future scenarios. The report estimates that by 2030, 45 to 64% of Indian forests will be affected by climate change and the rise in temperatures, and that the forests of Ladakh, Jammu and Kashmir, Himachal Pradesh, and Uttarakhand are expected to be particularly affected.[83] To date, this is the only foresight exercise that the Indian government seems to have undertaken in this field.

- India intends to acquire the technical means to measure the forest cover and assess its density – in order to no longer include in the statistics areas of plantations or equivalents with very low vegetative density. **Cooperation in space observation (satellite) with the best-equipped operators could be initiated with European partners**.

- The protection of forests (and of the people that live there) implies enforcing the laws that have the mission to consider their ecological impact before authorizing, for instance, a mining project or the construction of a factory.

***

[83] *Vishwa Mohan, "In a first, potential climate change hotspots mapped", The Times of India, January 14, 2022, https://timesofindia.indiatimes.com/india/in-a-first-potential-climate-change-hotspots-mapped/articleshow/88887105.cms.*

Conclusion

India, like many other regions of the globe, is grappling with multidimensional environmental challenges. Water scarcity, exacerbated by pollution, urbanization, and climate change, as well as air quality degradation and deforestation, are major issues that have a considerable impact on human health, the economy, and ecosystems.

When we study environmental issues, the inertia of relevant variables is such that it has been possible to evaluate what the future situation in India will be in terms of water resources, air quality, and even forest cover by the middle of the century. However, when considering a foresight perspective, it is also necessary to take into account another consequence of the environmental crisis: **the reduction of livable space linked to the effects of climate change, ranging from desertification to sea-level rise**. By 2050, in India alone, 45 million people will be forced to migrate from their homes due to climate disasters, three times the current number of people displaced by extreme weather events.[84] These mass migrations are already such that the question of the Indian environment is now of concern to the rest of the world.

Immediate and integrated measures should be taken to mitigate these problems and promote a more resilient future. This requires collective action at all levels, including the implementation of sustainable policies, investment in adequate infrastructure, and the promotion of water, energy, and forest conservation practices. **By working together, India and France as well as Europe can strive for innovative solutions**, clean technologies, responsible management of natural resources, and a better efficiency of public policies.

[84] *Murali Krishnan, "India migration from climate change getting worse", DW News, April 19, 2023, https://www.dw.com/en/india-migration-from-climate-change-getting-worse/a-65369043#:~:text=Highest%20number%20of%20displacements,result%20of%20extreme%20weather%20events.*

Institut Montaigne welcomes thoughts and ideas on how to address these issues collectively to put forward recommendations which serve the public interest.

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EDF
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Water crisis, air crisis, and forest crisis: India's environmental challenges are staggering. The country ranks thirteenth in water shortages, suffers from a surge in premature deaths due to air pollution, and has the second-highest rate of deforestation globally. In 2022, India has also become the third-largest carbon emitter globally, amplifying the far-reaching implications of the challenges it is facing.

This paper delves into the magnitude of these challenges and reviews local initiatives that are emerging in India to tackle them.

France and Europe, as privileged partners, can play an essential role in supporting India's search for innovative solutions, with a focus on better natural resource management and more effective public policies. The avenues for reflection put forward by the authors highlight potential opportunities for French and European companies.

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