

EDITORIAL HIGHLIGHTS

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GS 3: INFRASTRUCTURE NDIAN EXPRESS PAGE: 10

EQUIPPED WITH HEAT, FLAME DETECTORS

PM flags off India's first hydrogen train: 2-hour Jind-Sonipat travel, 14 halts and zero emission

With 10 coaches, it can carry maximum of 2,600 passengers; 2 round trips a day

Dheeraj Mishra
Jind, July 17

INDIA JOINED a select group of nations on Friday as Prime Minister Narendra Modi flagged off the country's first hydrogen-powered train connecting Jind and Sonipat in Haryana — a significant achievement for the Indian Railways in the use of zero emission, clean fuel technology.

The first hydrogen-powered non-AC passenger train will cover the 89-km Jind-Sonipat railway section in around two hours, running at a maximum operational speed of 75 kmph. The journey includes halts at 14 stations. The Northern Railway is expected to soon announce the date for the commencement of commercial operations.

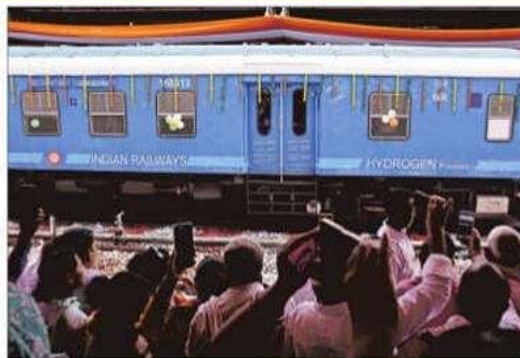
After flagging off the train from Jind, Modi said, "Even today, we read that India's first train ran between Bombay — now Mumbai — and Thane [in 1853]. Similarly, whenever hydrogen trains are mentioned in the future, the names of Jind, Sonipat and Haryana will inevitably be mentioned."

"If we look at the history of railways, the 19th century was defined by steam engines. The

20th century was characterized by diesel and electric trains, and now, the 21st century belongs to hydrogen-powered trains. Today, Indian Railways has taken a major step forward with this 21st century technology," said Modi.

The train was essentially created by replacing the diesel engines on old diesel electric multiple unit (DEMU) rakes with a zero-emission hydrogen-electric propulsion system. The train will make two round trips a day, covering 356 km and consuming around 300 kg of hydrogen. For refuelling, a 3,000-kg hydrogen capacity storage plant has been developed in Jind.

The Prime Minister said there are immense possibilities of expansion. "We will continue researching how to reduce costs, how to increase efficiency, and step by step, after thorough investigation, we will keep moving forward. Hydrogen trains have only recently come into existence in the world only around 7-8 years ago. Currently, only three or four countries in the world have the capability to run hydrogen trains. And even in those countries, hydrogen trains are still in their early stages," he said.



During the flag-off ceremony of India's first hydrogen-powered train in Jind on Friday. REUTERS

With 3200 horsepower (HP), the 10-coach train — eight passenger and two driving power cars — can carry a maximum of 2,600 passengers. It is equipped with 15 hydrogen leak detectors, seven heat detectors and three flame detectors.

"Not only the most powerful, India's hydrogen train is also the longest. In other countries, hydrogen trains run with three or four coaches. But India, in its very first attempt, has run a 10-coach hydrogen train," the PM said. Chandrakant Kumar, the train's additional loco pilot, said he underwent training in Shakurbasti in Delhi and Integral Coach Factory in Chennai, but added that "there is not much of a difference between driving the hydrogen train and DEMU train".

"Since hydrogen is very flammable, the safety standards in the train are very high. Leak detectors have been installed in the train and the system will shut down automatically in case of such an incident," said Kumar.

"There is 440 kg of hydrogen at a 350 bar pressure on the train — 220 kg in each driving power car — from where the fuel cell will take the hydrogen to produce electrical energy. It will take around four hours to refill the hydrogen cylinders on board from the plant. There are eight fans and six CCTVs in each driving power car. The hydrogen leak detectors and flame detectors are installed at the plants as well."

Nitin Parikh, a train manager on board, said the primary

job is to run the train safely and on time. "However, it is great that we have accepted the new and clean technology for Railways. It will help in cutting down the emission significantly. In this train, the emission is only the water vapour. This is not the main line, but the branch line and number of passengers are higher."

On board the country's first hydrogen train were students of Nav Vidya Senior Secondary School, Jind. "It is a beautiful train. I am a Class 9 student and I have learnt how electrolysis splits water into hydrogen and oxygen. I have not travelled very far by train yet. I want to travel to Delhi by train," said Alisha, as the train chugged off from Jind.

Other projects

Modi also inaugurated the Haryana section of the Delhi-Amritsar-Katra Expressway (158 km), the Jind-Gohana National Highway (40.60 km), Ambala-Kala Amb four-lane highway (33.81 km) and Sikh museum in Kurukshetra. The PM laid the foundation stone and inaugurated various projects worth around Rs 14,700 crore in Jind.

Referring to the West Asia conflict, he said that due to 99% electrification of Railways, trains ran continuously despite the oil crisis in the wake of the Strait of Hormuz situation.

GS 3: ECONOMY
INDIAN EXPRESS PAGE: 12

India now has the funds, the talent and the opening for a research leap

SHIVKUMAR KALYANARAMAN
AND V ANANTHA NAGESWARAN

FOR THREE months this spring, the most consequential number in the Indian economy was the distance between a tanker and the Strait of Hormuz. When the strait closed in March, a country that imports the overwhelming share of the oil it uses found its lifeline pinched at a single point and rerouted at a cost to longer voyages for Russian crude. The lesson was salutary, but incomplete. In the end, oil can be rerouted. A nation that is aspiring to be self-reliant in critical technologies enjoys no such latitude.

The deeper lesson is not that supply chains are fragile, but that they have become instruments of policy — an export licence a lever, a chokepoint a weapon, a technology freely traded one year, an object of denial the next. China spends 2.43 per cent of its output on research and development, three-quarters of it financed by its own companies, with one ambition: To end its dependence on technologies others control and deepen the world's dependence on those it controls.

India knows where it stands, because it has taken its own measure without flinching. As of 2023, it spends 0.64 per cent of GDP on research and development — against a global average more than twice that — and

barely two-fifths of even that is financed by private enterprise, whereas in China, Korea and America the share is three-quarters or more. However, the state has, for the first time, put real weight behind the proposition.

The Anusandhan National Research Foundation, notified in 2024 — a statutory body chaired by the Prime Minister, convening academia, industry, start-ups, philanthropy and the diaspora — exists to change the arithmetic of risk. Its Research, Development and Innovation Fund commits Rs 1 lakh crore over six years to the private sector alone, a fund of funds supplying patient capital built to outlast the quarterly cycle; its ANRF Core adds Rs 50,000 crore over five years for underlying science. The design is catalytic: For every rupee companies invest in pre-commercial research in partnership with the foundation, they are likely to commit five to 10 of their own to commercialise and scale up these research outputs. All-of-government and all-of-society collaboration is a means to higher productivity and impact for all parties. And it goes beyond the cheque, aligning government procurement and regulation with the landscape it is building.

A firm may enter as a limited partner alongside the foundation's anchor capital in a second-level fund manager; participate directly as an eligible technology entity; or do so through a joint venture with start-ups and the global capability centres (GCCs) already here. On the science side, it may partner on a national mission, set a pre-competitive challenge for the foundation to co-fund, route its corporate social responsibility (CSR) through the ANRF Innovation Fund, or

share the cost of a single project before committing further. So many doors exist for one reason: The threshold should never be what keeps a willing firm outside.

But the argument must move on from what is offered to what is required, for a catalyst is not a substitute, or a crutch. The foundation can lower the risk of the climb; it cannot make it. Three acts remain the industry's own. The first is to mobilise one's own capital behind the public catalyst. The second is to choose, with strategic seriousness, the arenas that matter — the technologies in which dependence is most dangerous and capability most valuable — over the incremental gains a captive market rewards. The third, least glamorous and most important, is institutional: To build inside the firm the machinery long-horizon goals demand — dedicated research units, corporate venture arms, planning functions insulated from the tyranny of the next quarter, India can be the world's research and development partner. All of us have to build it together: The foundation's logic is partnership with academia and deep-technology start-ups that outpace incumbents. Building it yields a dividend, no income statement records: Employment, for the doctoral talent India trains at cost and too readily watches depart, with the world-class research culture and context.

Indian industry can rise to such a challenge and history provides the evidence. When India accepted the World Trade Organisation's intellectual property regime in the mid-1990s, agreeing to honour product patents in pharmaceuticals, the expectation was that the

domestic drug industry, built on reverse-engineering molecules others had discovered, would be overrun by the very multinationals whose patents it had worked around. That is not what happened. Indian firms chose to build rather than retreat: They mastered process chemistry and the world's strictest regulatory requirements, and made themselves the pharmacy for much of the world. The inflection now before Indian enterprise is broader; its logic is identical.

The climb, moreover, can be swifter than it was for those who went before. India faces the task with the pieces in place at once — a demographic dividend available now, not forever; unmatched digital public infrastructure; funds and architecture now in place; and a global moment that rewards any economy offering an alternative to a single dominant supplier. These are the conditions under which a country does not merely catch up but leaps — from the consumer of intellectual property it has too long been, to the generator its aspirations demand. But the window is the one thing the state cannot hold open alone. Hormuz showed what it costs to depend on others for what one needs; the technological independence that will enhance resilience and, eventually, build indispensability can be achieved only by building capabilities from the ground up. The state has walked the first stretch of that road; the laboratories are ready; the capital is available, and industry's commitment will complete the compact.

The writers are respectively the CEO of the Anusandhan National Research Foundation and the Chief Economic Advisor to the Government of India. Views are personal

All of us have to build it together: The foundation's logic is partnership with academia and deep-technology start-ups that outpace incumbents

GS 3: ECONOMY

INDIAN EXPRESS PAGE: 18

• ECONOMY

Will FY27 growth rate rise or fall? Depends on the metric you pick



GRAPHS,
DATA,
PERSPECTIVES
BY UDIT MISRA

WEEKLY ECONOMIC AND POLICY INSIGHTS USING DATA

AMID THE severe economic turbulence brought on by the US and Israel's war against Iran, there is growing concern about whether India will be able to retain its growth momentum. India's economy grew at over 7% in each of the past three years. This figure is crucial because it is the bare minimum needed to achieve the goal of becoming a developed country by 2047.

Factors at play

Over the past few months, the overall economic environment has turned particularly challenging. This can be attributed to:

WAR IN WEST ASIA: This is possibly the most important factor in the short term. India imports 90% of its crude oil and if hostilities heighten further, it could not only lead to crude oil prices rising again but also constrain supply itself.

MONSOON: Even though agriculture

only contributes around 17%-18% of India's total economic output, it still engages close to 45% of the population. The spread and quantity of rainfall are not only the biggest determinants for agricultural output but also the key factors that make or break rural household budgets.

TRADE DEFICIT, INVESTMENTS: India's exports have largely been stagnant over the past few years, with higher imports than exports leading to an outflow of foreign exchange. Weakening of foreign investments into India has been a key underlying reason for the slide in the rupee's exchange rate relative to major currencies.

INFLATION AND AFFORDABILITY: A natural corollary of higher crude oil prices is the spike in domestic inflation, affecting purchasing power and domestic growth.

UNCERTAINTY: Sustained levels of uncertainty undermine business confidence and hold back even domestic firms from investing in new capacities (read factories and jobs).

The outlook

India's growth outlook can be read as both better and worse, depending on the variable being examined.

The actual observed variable on the ground is the nominal gross domestic prod-

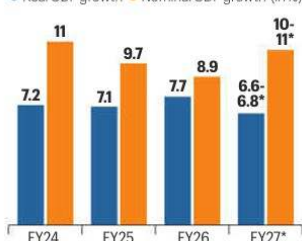
Real vs nominal GDP

• Thanks to higher inflation, the nominal GDP growth rate will likely improve this year.

• However, most estimates expect a deceleration in the real GDP growth — which is essentially the growth rate after taking away the effect of inflation.

• Diverging variables

• Real GDP growth • Nominal GDP growth (in %)



SOURCE: CEIC, BANK OF BARODA RESEARCH; *ESTIMATES

uct (GDP). It determines how much money the government can spend and how much it needs to borrow to make up the gap. Generally, another measure is used: real GDP growth, which is essentially the GDP growth rate after taking away the effect of inflation or higher prices.

This year, the nominal GDP growth rate may be higher, even as the real GDP growth rate may falter. Over the past few years, India's nominal GDP has been experiencing

deceleration. This has been a matter of concern because it sets the ceiling for real GDP growth. It is also a key determinant in the profitability of India's companies and, as a result, determines the fortunes of stock markets. Thanks to higher inflation, the nominal GDP growth rate is likely to improve this year.

However, most estimates — both international (such as the IMF's recent World Economic Outlook) and national (such as by the Bank of Baroda) — expect a deceleration in the real GDP growth. Most estimates peg India's GDP to grow by anywhere between 6.4% and 6.8%.

As a recent Bank of Baroda analysis noted, India's manufacturing is likely to register a substantially lower (real) growth rate — from 10.5% in FY26 to 6.5%-7.5% in FY27. A higher base effect and the war's impact on supply chains and overall demand are some contributing factors.

Corporate investments are also expected to grow at a slower pace. India's trade deficit, too, is likely to widen, but thanks to the measures undertaken by the RBI aimed at attracting foreign capital into India, overall Balance of Payments is likely to improve. This, in turn, is likely to provide support for the rupee's exchange rate in the year ahead.

GS 2: INTERNATIONAL RELATIONS

THE HINDU PAGE: 12

China pitches AI governance model for Global South

Ananth Krishnan

It is the clearest signal yet of China's global leadership ambitions in Artificial Intelligence. On Friday, Chinese President Xi Jinping unveiled a new initiative on global AI governance, pitched largely at the Global South and developing countries. China, along with 29 other countries, mostly from Asia, Africa, and Latin America, has established a World Artificial Intelligence Cooperation Organisation (WAICO) based in Shanghai.

Mr. Xi described the effort as "a major move by China to answer the call of the Global South and unite the international commun-

ity together to promote vigorously AI development and governance."

"It will be an important milestone in the history of AI development," he told a summit on AI governance in Shanghai.

He announced that in the next five years, China would provide developing countries "with 5,000 opportunities in AI training and seminar programmes", as well as set up joint AI application cooperation centres with ASEAN, the League of Arab States, the African Union, the Community of Latin American and Caribbean States, the Shanghai Cooperation Organisation, and BRICS.



Xi Jinping

The broader context is China's push to both develop its alternatives to Western AI models and to offer them to developing countries. Beijing is concerned about the security implications of relying on models based in the West such as OpenAI's ChatGPT and Anthropic's Claude.

Mr. Xi hinted at these concerns in his speech,

saying countries "should jointly oppose overstretching the national security concept in the field of AI and placing one country's security over that of others". He did not name the U.S., but Chinese officials have previously hit out at Washington for what they have described as securitisation of technologies, including AI.

A day before the launch of WAICO, Chinese AI firm Moonshot announced its latest Kimi K3 model that has surprised Western analysts with its capabilities. Chinese companies like Moonshot and DeepSeek are offering open-source models, which Beijing sees as giving them an edge n

developing countries seeking technology for AI adoption. Mr. Xi said China would "encourage open source, openness, collaboration and sharing."

If security implications of using Western AI models are one concern, ideology is another. Chinese officials have also spoken of what they see as an "infiltration" of Western values through AI platforms and an erosion of sovereignty. This is a message that, Beijing believes, will find resonance in many developing countries and in the Global South.

"We should tend to the garden of civilisations with great care to ensure that the beauty of each civilisa-

tion is appreciated and shared," Mr. Xi said. "We often say in China, 'A single string cannot make music, and a single tree does not make a forest.' AI development should not be a solo performance by a single country, but a symphony of international cooperation."

Among the nations signed on to WAICO are Brazil, Russia, South Africa, Indonesia, Kazakhstan, Kenya, Malaysia, Pakistan, Uzbekistan and Venezuela. India, which was present at the Shanghai summit and sent a Joint Secretary-level delegation, is alone among the five founding BRICS countries in its absence in WAICO.