

Water Board in Hyderabad takes comprehensive measures to meet water demand

Hyderabad: To meet the drinking water demand in the coming months of summer, the Hyderabad Metropolitan Water Supply & Sewerage Board is procuring an additional 100 tankers with 5KL capacity, with plans for another 70 mini tankers with 2.5 KL capacity to cater areas affected by polluted water. Reviewing section-wise water supply along with tanker bookings and deliveries at a meeting held here on Saturday, MAUD Principal Secretary M. Dana Kishore directed officers to ensure that there were no disruptions in water supply.

With the weather changes in the city, the number of tanker bookings has come down drastically. While tankers made 6,000 trips earlier, in the last few days it was reduced to 5,000 trips. Efforts were underway to reduce the delivery time and procurement of additional tankers will bring the expected delivery time to 12 hours, he said. While there were 13 lakh connections in the city, only 31,000 people booked tankers. To reduce that number, an opportunity will be given to enhance their water con-

nection size so that better water supply could be facilitated, he added. Dana Kishore further directed officials to ensure that along with special plans for high-demand areas, additional filling stations were also set up. More water from twin reservoirs:

An additional 20 MLD is being drawn from the Himayatsagar and Osmansagar and arrangements were underway. For future requirements, filter beds near Mir Alam and Asif Nagar were being repaired to purify the water. Sites are also being examined to construct water treatment plants, stated a press release. Moreover, identifying the slums where water tankers are being supplied for free, officials were directed to take up the construction of pipelines as a permanent solution to their water woes. SCR sets up water coolers: In anticipation of potential heat waves and to ensure the availability of drinking water for passengers, the South Central Railways (SCR) has arranged 48 water coolers across 170 stations. Along with a round-the-clock monitoring system through the Divisional Central Control Office, periodic



water quality checks were also being conducted. Further, automatic water supply systems (CAMTECH) have been provided at all major stations to ensure the supply of

water within the least possible time. Special attention was being paid to the group water pedestal on platforms located near general coaches.

National highway turns paddy drying platform in Karimnagar



Though it is a routine practice to dry paddy on local and internal roads, a shortage of drying areas and platforms has forced farmers to depend on even national highways now

Karimnagar: The under construction Jagtial-Warangal national highway-563 has become a platform to dry paddy in some places in Karimnagar district.

Though it is a routine practice to dry paddy on local and internal roads, a shortage of drying areas and platforms has forced farmers to depend on even national highways now. As part of work on the Jagtial-Warangal national highway, earthen roads and culverts are being constructed in some areas. Works on earthen roads are under progress in Thadikal, Ambapur, Keshapatnam, Molangur crossroads, Gollapalli and Kothagattu. Farmers from Kothagattu and Gollapalli are utilizing these roads to dry their produce since it is more spacious and comfortable for them. Usually, farmers would occupy one side of local and internal roads to dry the paddy. Compared to local roads, the space on national highways is much bigger, prompting farmers to spread the paddy on the roads placing tarpaulins before covering it with tarpaulin again. Speaking to Telangana Today, a farmer from Kothagattu, Rajaiah, said they had no other options to dry the harvested paddy since there were no drying platforms arranged by the authorities. When asked about ob-

jections by national highway authorities, Rajaiah said the officials were also cooperating. Moreover, they were using spots where the work of the national highway was not in progress. Farmers also reserve roads in advance by placing empty fertilizer bags on the roads before the beginning of the harvesting season. Such scenes can be witnessed all across the district, especially in Huzurabad, Veenavanka, Manakondur, Jammikunta and other areas. Paddy is sowed in 2.66 lakh acres in the Yasangi season in Karimnagar district and 5.6 lakh metric tons of paddy is expected. Earlier, farmers used to engage labourers to harvest the crop and shift it to the market only after completely drying in the field itself. Nowadays, drying the crop has become a big problem since harvester machines have been engaged to harvest the crop since the field is not suitable for drying purposes after using harvester machines. As the authorities at paddy purchasing centers are asking farmers to bring the crop only after drying, ryots are forced to look for options since a majority of them do not have adequate space in their houses. However, road safety activists have expressed concern, pointing out motorists drive bikes through the paddy spread on the road, leading to accidents.

In seat facing Lanka, highlight is OPS's fight, not Sethusamudram or Katchatheevu

Under the UPA government at the Centre, it waged a battle against the Sethusamudram project to create a shipping route between India and Sri Lanka, whose one end would have touched Ramanathapuram, claiming it would destroy the bridge Lord Ram's army made as per the Ramayana. Last year, a buzz began that Prime Minister Narendra Modi, whose government has been making extensive outreach to Tamils, would contest from Ramanathapuram. Once the Lok Sabha poll battle began, the BJP rolled out yet another dice – accusing the Indira Gandhi-led Congress government of giving away Katchatheevu island located 33 km off the Ramanathapuram coast, and the ruling DMK (which was also in power in the state then) of being complicit in the decision. In the Ramanathapuram constituency itself, which directly faces Sri Lanka, none of the above is an issue, despite it being a fishermen constituency. The most distinctive feature of the fight here is the candidature of O Panneerselvam or OPS, the man who has become the face of the transformation the AIADMK has undergone since J Jayalithaa's demise in December 2016, much of it seen as wrought by the BJP.

Having lost successive battles for control of the AIADMK – at party fora, and in courts – OPS has been forced to take shelter in the BJP-led alliance, after the AIADMK parted ways with it. The ex-CM is now contesting as an Independent, with BJP support. Now making perhaps his last stand, in a seat that was won in 2019 by DMK ally IUML, and where the party remains strong, the 73-year-old is campaigning late into the evening, trying to cover as much ground as he can. Close to midnight on Tuesday, driving down in a convoy from a campaign meeting at a small village near Ramanathapuram town, OPS remains unflagging – at least in his desire to wrest back the AIADMK. No, there is no regret about rebelling against the official faction led by E Palaniswami. Or any desire to “time travel” and change the sequence of events leading to his expulsion from the party, in which he had spent more than 45 years. “Why should I want to time travel?” OPS retorts. “All my steps were to retrieve the party from certain people, and hand it to ordinary AIADMK cadres.”

It is hard not to take OPS's words with a pinch of salt. “The certain people” he talks about are Jayalithaa's confidante V K Sasikala and her nephew T T V Dhinakaran – now also expelled from the AIADMK and part of the BJP camp, like OPS. OPS, in fact, has agreed to let Dhinakaran contest the Theni seat, which had been won by OPS's son O P Ravindranath Kumar in 2019 (the only constituency not won by the DMK-led alliance then). Ravindranath is now actively working for Dhinakaran in Theni, OPS's native town.

On the other hand, Ramanathapuram, from where OPS is contesting, is relatively new ground for him. He has taken on the risk despite already being a sitting MLA. Aides say the BJP kept him waiting till the last minute on assurance of support, as it probed the scope of a patch-up with the



AIADMK. OPS's biggest hope is that the Thevars, the OBC community to which he belongs and which is dominant here, will stand by him. The DMK alliance has reelected the IUML's 2019 winner, K Navas Kani. The AIADMK's P Jeyaperumal and Naam Tamilar Katchi's Chandraprabha are also in the fray. Denying reports that he was forced to give up Theni, OPS says it was he who picked Ramanathapuram “because it is the place where Lord Ram built the bridge across the ocean to rescue Sita Devi”. The fact that the BJP has been making slow gains here would have been another factor. If in the 2009 Lok Sabha elections, it got 16.5% of the votes, by 2014, it was up to 17.20%. In 2019, the BJP-AIADMK together got 32.31% votes.

While the winner in 2014 was the AIADMK, with 40.81% of the votes, and the runner-up the DMK with 28.81% votes, in 2019, DMK ally IUML got 44.29% of the votes and the AIADMK-BJP alliance was second placed. The IUML 2019 win was not a fluke given Ramanathapuram's significant minority population, another reason that the BJP has treaded here on the back of allies. This time, if the DMK has the IUML with it, the AIADMK has the PFI political wing SDPI (Social Democratic Party of India) as an ally. OPS says he is confident that Muslims too would vote for him seeing the Modi government's record. “No minority community has been targeted under Modi. Everyone is treated equally,” he says.

While OPS admits he hasn't had any detailed interaction with Modi since the poll dates were announced, he claims “respect”

for him since 2016. “Everyone respects him, and it is certain that he will be elected for a third time.” Returning to Palaniswami and why he thinks the AIADMK is no longer the party it was, OPS says: “When MGR started the party, it had bylaws, and the most important was the direct election of the party general secretary by the crores of cadres. That has been sabotaged by Palaniswami.”

He denies that his description of Palaniswami as “dictatorial, undemocratic” has long held true for the AIADMK. “Amma (Jayalithaa) was very democratic. Everything she did was in consultation with people like me, officers and experts... not like Palaniswami,” OPS says. However, not all believe OPS's portrayal of himself as a victim of the internecine AIADMK fight. Many see him as the man who betrayed the AIADMK soon after Jayalithaa's demise, particularly as he was officiating as the CM at the time on her behalf (as he had done earlier as well). Within the BJP alli-

ance too, some are not happy with the ticket to him and, on condition of anonymity, admit to working to defeat him. “OPS was the man who triggered a revolt within the AIADMK without leaving the party. The people don't accept this, even if they forgive leaders jumping ship,” says a Madurai-based leader of the Tamil Maanila Congress, which is also a part of the NDA. This is why other AIADMK rebels such as Dhinakaran (Theni) and Nainar Nagendran (Tirunelveli) are viewed more favourably. Many point out that while Nagendran quit the AIADMK back in 2017, Dhinakaran had fought a long and hard battle against the BJP. It has been difficult for OPS to shake off the impression that he acted as an RSS stooge in fomenting rebellion within the AIADMK. In 2019, senior RSS ideologue S Gurusurthy claimed at the golden jubilee function of the Tughlak magazine that it was on his advice that OPS had rebelled against Sasikala, who saw herself as the natural successor to Jayalithaa.

Aparna Garg assumes charges as Director General of IRIFM

Hyderabad: Aparna Garg, IRAS (Indian Railways Accounts Service) officer of Civil Services 1987 batch, has assumed the charge of Director General, Indian Railways Institute of Financial Management (IRIFM). Prior to taking over charge, Aparna Garg has worked as Principal Financial Advisor, Rail Wheel Factory, Bengaluru, Divisional Railway Manager of Mysore and in various other capacities in Southern Railway, Western Railway and South-Western Railway spanning over a period of 35 years of service.

How are hydrocarbons extracted from under the ground? | Explained

Over millennia, mighty geological processes in the earth's crust heated and compressed together pieces of life-forms that had been dead for a while. Eventually, this mulch of organic matter accumulated as hydrocarbons inside rock formations. The two Industrial Revolutions were the result mainly of people finding a way to extract these hydrocarbons and using them to drive many and great engines, whose foul breath polluted the air and water and eventually gave us global warming.

Where are hydrocarbons located?

The most common forms in which these hydrocarbons exist in subterranean rock formations are natural gas, coal, crude oil, and petroleum. They are usually found in reservoirs underground created when a more resistant rock type overlays a less resistant one, in effect creating a lid that causes hydrocarbons to accumulate below it. Such formations are important because otherwise, the hydrocarbons would float to the surface and dissipate. Experts use the tools, methods, and techniques of the field of petroleum geology to assess these rocks, including to check for their porosity and permeability. If a rock formation is highly porous, it could hold a larger quantity of hydrocarbons. Similarly, the more permeable a rock is, more easily the hydrocarbons will flow through it.

The primary source of hydrocarbons in this rocky underground is called kero-

gen: lumps of organic matter. Kerogen can be deposited from three possible sources: as the remains of a lake (lacustrine), of a larger marine ecosystem, or of a terrestrial ecosystem. Rocks surrounding the kerogen can become warmer, more compactified over time, exerting forces on the kerogen that cause it to break down. Lacustrine kerogen yields waxy oils; marine kerogen, oil and gas; and terrestrial kerogen, light oils, gas, and coal. The rock containing the kerogen is called the source rock, and petroleum geologists are tasked with looking for it, understanding its geophysical and thermal characteristics, and characterising its ability to yield hydrocarbons. They also undertake modelling activities informed by observational data and dig smaller exploration wells to estimate the amount of hydrocarbons there, and report it to the relevant regulatory body. Once a particular location is determined to be a profitable source of hydrocarbons, drilling can begin.

How are the hydrocarbons accessed?

Drilling and reservoir engineers are responsible for extracting as much of the hydrocarbons as is gainful without damaging the reservoir, to which end they deploy a variety of methods.

The first task is to create a production well, the principal hole through which the reservoir will be drained to the surface; its



location is chosen to maximise the amount of drainage. The well is created with a drilling machine. The drill consists of the drill pipe, the drill collars towards the bottom, and the drill bit at the bottom. The drill bit is the object that breaks through the rock, creating a hole as it tunnels further down. Once the tunnelling is underway, engineers lower steel casings that are slightly less wide than the hole itself into the tunnel, and pump cement slurry in the gap between the outer edge of the tunnel and the casings. As the cement solidifies, it protects the upper parts

of the tunnel from caving in and prevents fluids in the surrounding soil from entering the well. The tunnel is also filled with drilling fluid, which reaches and swirls around the drill bit. Its primary purposes are to keep the bit from overheating and to bring the pieces of rock being cut away with it when it is pumped to the surface, where they can be removed from the tunnel.

The pressure at which the drilling fluid is delivered needs to be carefully controlled or it could force the hydrocarbons in the

Ather Energy starts retailing its electric scooters in Mahabubnagar, Telangana

Ather Energy, one of the leading electric scooter manufacturers in India, has recently inaugurated its Ather Experience Center, in Mahabubnagar, Telangana. At the new Ather Space, consumers can test ride all of Ather's scooters, including the Ather 450X, the Ather 450S and the Ather Apex. Ather also recently launched their first family scooter, the Rizta, pre-bookings for which are available on the website.

The Rizta will have 2 models and three variants – Rizta S and Rizta Z with a 2.9 kWh battery and a top-end model Rizta Z with a 3.7 kWh. The 2.9 kWh variants will deliver a predicted IDC range of 123 kms and the 3.7 kWh variant will deliver 160 kms. With focus on comfort, convenience and safety, the 'Rizta', comes with a spacious and comfortable seat, generous boot space, and safety features such as SkidControlTM, as well as FallSafe TM, Emergency Stop Signal (ESS), Theft & Tow Detect, and Find My Scooter which were previously seen in Ather's 450 series of scooters. Rizta and will also be available in Experience Centres for test-ride and purchase starting June.

On the second edition of Ather Community Day, along with the Rizta, the company also unveiled its first smart helmet, Halo and the new AtherStack 6.0, which comes with a host of new and exciting features. Speaking on the occasion, Mr Ravneet Singh Phokela, Chief Business Officer, Ather Energy, said, "Over the past

year, we have been rapidly expanding our product offerings, retail network, and charging infrastructure across the country. Telangana has been one of the early markets for us, and the opening of the 11 Experience Centres here ensures consumers have easier accessibility to our newly launched family scooter, Rizta and the 450 series. Rizta has been designed keeping family needs in mind, with emphasis on providing them with comfort, convenience and safety. We believe we will be able to reach out to a larger set of consumers with Rizta."

Mr. Teja Pavan Reddy, RP Principal at VT Automotives Private Limited, said "We are extremely delighted to announce the opening of our first Ather "Experience Centre" in Mahabubnagar, Telangana. We are seeking to explore a potential collaboration with Ather that could be mutually beneficial for both our businesses, as well as for the customers in Mahabubnagar. We have been following Ather closely, on leading electric two-wheeler revolution in India and have been impressed by the expertise and innovative approach by the team. Our trust and confidence in the Ather brand & its products have grown in leaps & bounds. We look forward to serving Ather customers in this part of the district."

Ather Energy, as an electric scooter manufacturer, has also been investing in establishing charging infrastructure, an essential part of the EV ecosystem. Their



Ather Grid, recognized as the largest fast-charging network for two-wheelers in India, offers more than 1900 fast charging points. The company has already installed 70 fast charging stations, Ather Grid across Telangana to provide the customers with smooth and stress-free rides. The newly launched Rizta S with 2.9 kWh will be priced at INR 1,09,946 (ex-showroom Mahabubnagar). The Ather Rizta Z with 2.9 kWh and Rizta with 3.7 kWh will be available at INR 124,946 and INR 144,947 (ex-showroom Mahabubnagar). The 450S is priced starting at INR 1,25,546 (ex-showroom Mahabubnagar). Meanwhile, the 450X, which comes with a 2.9 kWh battery,

is available at a starting price of INR 1,40,546 (ex-showroom Mahabubnagar) and for the variant with a 3.7 kWh battery, the cost is INR 1,54,946 (ex-showroom Mahabubnagar). Ather has also partnered with eminent financial institutions such as IDFC First, Bajaj Finance, and Hero FinCorp to ensure ease of purchase for its customers. This collaboration introduces a specially crafted 60-month loan tailored for electric two-wheelers that facilitates monthly repayments, with equated monthly instalments (EMIs) plunging to as low as Rs 2,999, thus providing customers with agreeable financial solutions to purchase Ather Electric two-wheelers in India.

Bengalureans feel trapped in one big 'heat island'

Unprecedented in scale, unrelenting in its intensity, the hottest summer in recent memory has caught Bengalureans in a tizzy. But how did the city, celebrated for its all-year generosity in weather, get reduced to one big heat island? Concretised beyond limits, polluted by an explosive vehicular onslaught, parched and clueless, has Bengaluru reached a dead-end? Heat islands are called so for a reason: They experience temperatures higher than the outlying areas, a trend fuelled by a high concentration of buildings, roads and other concrete infrastructure that absorb and re-emit the sun's heat more than green expanses and water bodies. This 'heat island effect' in areas across the city has amplified the already unbearable summer discomfort. Recent studies have clearly established that Bengaluru's average temperature has risen by nearly a degree over the last 42 years. The increase has been more pronounced in the last two decades. Inevitably, this has spiked the evaporation rate of water bodies. Reduced rainfall over the last three years has directly impacted groundwater recharge and replenishment of reservoirs, a perfect recipe for the current water crisis.

White-topping of roads across Bengaluru is part of a concretisation overdrive, which has accelerated the growth of heat islands in the city. It has impacted infiltration of rain water leading to a further drop in the groundwater table. White-topping of roads across Bengaluru is part of a concretisation overdrive, which has accelerated the growth of heat islands in the city. It has impacted infiltration of rain water leading to a further drop in the groundwater table. | Photo Credit: The Hindu

Rapid concretisation, dubbed white-topping of the city's roads with hardly any option for rainwater to percolate and recharge the groundwater table, might be among the most tell-tale signs of a policy gone haywire. But this trend has been going on for decades, as a recent revision by the Indian Institute of Science (IISc) of its earlier findings clearly indicates. "Unplanned developmental activities leading to rapid changes altering land uses in the region had adverse ecological and environmental impacts, evident from the decline of forest cover (by 26%), agricultural lands (by 23%), with a sharp escalation of paved surfaces (urban area 34% increase in five decades)," notes the study, "Environmental Consequences in the Neighbourhood of Rapid Unplanned Urbanisation in Bangalore City." If this trend continues, the warnings are dire for the city's future. "The city of Bengaluru will be choked with paved surfaces (to the extent of more than 98%) and 69.9% of the landscape in the Bangalore Urban district would be paved areas," says the study. Combined with the loss of vegetation, water bodies and open spaces, the study warns that the urban heat island effect will enhance ambient temperature and humidity levels and lead to heat stress and heat-related illnesses including behavioural

changes. "We need to plan for water urbanism by making the city's landscape porous. Our study shows that in areas with vegetation of native species, about 55 to 60% of the rainwater gets infiltrated. When vegetation cover is less than 30%, only about 25% of the water gets infiltrated. But concretisation completely stops infiltration," notes Dr. T.V. Ramachandra, who authored the report, along with three other researchers. He cites the case of the city's Sarakki Lake, rejuvenated three years ago. "Within a year of that upgrade, the water table rose by 320ft. Today, after three years, there is enough water and the groundwater table is very good. And because of the higher moisture content, the temperature there is two to three degrees lower than the surrounding," he points out.

To arrest the spread of heat islands, he recommends creation of mini forests of about 2-3 hectares in each Bruhat Bengaluru Mahanagara Palike (BBMP) ward. "Vegetation, water bodies and mini forests create a heat sink. Our study shows that wherever vegetation is there, temperature is two to three degrees lower than the surroundings. Even the IISc mini forest has shown that. We had planted saplings of native species such as mango, tamarind and jackfruit in a 45-acre plot that was earlier parthenium-infested." Hot air from ACs

Inevitably, the soaring summer heat has pushed up sales of air conditioners in the city. But this will only aggravate the crisis, warns former Indian Meteorological Department (IMD) Director General Dr. K.J. Ramesh. "The hot air exhaust pushed outside while buildings are cooled inside, will add another 1-2 degrees to the temperature. There is not enough green cover to absorb this," he explains. The mushrooming of massive multi-storeyed complexes, shopping malls and steel and glass skyscrapers is bound to amplify this problem. "It has a cascading effect: The power demand increases, and thus also the reliance on fossil fuel coal-based power." The construction industry too has not kept pace with the changing climate dynamics. Environmentalists note that glass is used as a popular material to ensure the entry of natural light and aesthetic appeal. However, glass also traps heat leading to excess power consumption to cool the building. Energy-efficient building designs consider factors such as sun movement, orientation, wind direction and more.

Most makeshift houses in slum areas have tin roofs, which absorb heat and emit radiation both inside and outside. Dr Ramesh elaborates, "Tiled roof buildings are limited. Our housing construction, new modern built-up area expansion, added power consumption for cooling, all are creating cascading effects for warming. Unless we account for all the factors, you cannot look for a solution. Incrementally, everybody has to contribute." The elephant in the room is the dire need to decongest the city so that its infrastructure is not stretched. This, as Dr. Ramachandra points out, can happen only through cluster-based devel-



opment. "I have been telling the government in various forums to adopt this. This means, locating industries depending on resource availability. If cotton is grown somewhere, it makes sense to locate the garment industry there, not in Bengaluru. This way, we can also reverse the migration," he elaborates. How transport helps He cites an example from Tamilnadu. "If you go to the Thanjavur, Kumbakonam, Thiruvallur triangular junction, because of better connectivity and infrastructure, the youth from the nearby villages travel to the town, work in the industries and go back in

the evening. In the process, the three towns are not densified." But do these insights make any difference to the policy makers? Most Bengalureans are convinced that once the monsoon sets in and the summer crisis passes over, it would be business as usual. The official antennas would get worked up only when the next heat record kicks up a storm. Last week, the city recorded its daytime temperature at 37.6 degrees Celsius, the highest in eight years and the third highest for April in the last 15 years. The next record could be just days away!

This is how Tesla can produce a Rs 20 lakh 'Make in India' EV

New Delhi: Elon Musk is coming to India for the first time to spend at least 48 hours in the country later this month. As all eyes are on what the billionaire would announce during his meeting with Prime Minister Narendra Modi and industry leaders, Tesla lovers have only one question: When will they finally be able to drive a 'Make in India', affordable EV?

Model 3, which is the entry-level Tesla, can only be possible with local manufacturing of battery components and a strong EV supply system, for which Musk will surely have a substantial announcement to make during his maiden visit to the country. Currently, Tesla prices are almost the same worldwide.

Model 3 is priced at over \$40,000 (nearly Rs 33.5 lakh). According to senior analyst Soumen Mandal from market intelligence firm Counterpoint Research, the import duty will be eliminated by setting up local production by Tesla, thus paving the way for an affordable Tesla car.

Also, the cost reduction could be

achieved if Tesla cars manufactured in the country come with fewer features compared to the ones available globally. Mandal told IANS that certain hardware required for Full Self-Driving (FSD) mode could be eliminated and "Advanced Driver Assistance System (ADAS) Level 2 could be included". Tesla can eventually produce 5 lakh electric vehicles annually that start from Rs 20 lakh in India.

To produce a Rs 20 lakh car, Tesla can also have a battery pack with a lower capacity than 50kW and the electric motors could be of lower power. The in-vehicle electronics could also be reduced with a smaller centre display. In the new EV policy, the Indian government has cut the customs duty to 15 per cent (with certain riders) from the earlier 100 per cent on imported cars. A minimum investment of Rs 4,150 crore (about \$500 million) will be required to set up the manufacturing facilities for EVs in the country. According to industry experts, Tesla can generate at least \$3.6 billion in revenue in India by 2030.

How fast is the universe expanding? New data keeps mystery open

A big open problem in cosmology is the Hubble tension. There are two equally valid ways to measure how fast the universe is expanding, but they have yielded two very different estimates. No amount of rechecking and refining calculations has made this tension go away. In a study published recently in *Monthly Notices of The Royal Astronomical Society (MNRAS)*, scientists from Germany and the U.K. led with a radical explanation for the tension: our model used to understand the universe is wrong.

This model is called Λ cold dark matter, or “ Λ CDM”. It’s currently the simplest model that explains various features of the universe, including radiation leftover from the Big Bang, the arrangement of galaxies in the universe, and the fact that the universe is expanding. But cosmologists are also looking for a new, better model that can explain some things the Λ CDM model can’t, such as the Hubble tension. Repeated measurements and computations have ascertained the Hubble tension exists and that it’s not some aberration in the data. In a paper published after the MNRAS one in *The Astrophysical Journal Letters*, a different group disproved a flaw some scientists had suspected in one of the two ways to measure the universe’s expansion – meaning the tension is real. For now, the model does seem to be the problem. These results also come against the backdrop of a meeting this week in London, where cosmologists will gather to discuss whether this model has become outdated for other reasons as well.

Is our universe open, closed or flat?

Our universe started to expand after the Big Bang event around 14 billion years ago. It may continue to expand unabated forever. If it does, it will be an open universe. But if at some point the expansion stops, because of the gravitational forces exerted by the galaxies, say, the universe could collapse and become closed. A closed universe is said to have a positive curvature of space – like a sphere. Such a universe will be finite even if it has no bounds. That is, in this universe, we can travel forever without falling off an ‘edge’. In an open universe, space will warp in the opposite direction. That is, it will have a negative curvature, resembling a saddle.

There is another possibility between these assumptions: that the universe will continue to expand forever, but the rate of expansion, which is currently increasing, will eventually start decreasing thanks to the gravitational forces. The rate will take an infinite amount of time to drop to zero, so the universe will keep expanding, just slower and slower. This special approximation leads to a flat universe. And according to many cosmologists, this is the state of our universe at this time. That the universe is flat doesn’t mean it’s like a 2D sheet of paper. Instead, flatness means if you start to draw two parallel lines in space and you keep drawing them, they will remain parallel no matter how far you go. (In a spherical or a saddle-like space, the lines will intersect somewhere.)

Cosmologists deduced this based on studying the cosmic microwave back-

ground (CMB). This is a sea of photons, the particles of light, present throughout the universe. They are leftover from the Big Bang, its afterglow. Scientists have measured temperature changes in the CMB and studied its large-scale properties using complicated trigonometry. And they found that it has nearly zero curvature. The Wilkinson Microwave Anisotropy Probe (WMAP), BOOMERanG, and ‘Planck’ are three telescopes in space. They study the CMB and their data is clear: the observable universe is flat with a 0.4% margin of error. In 2021, researchers with the Atacama Cosmology Telescope reported based on astronomical data that they could find no evidence that the space of our universe is non-flat. Based on these studies, cosmologists have estimated space to be expanding at around 68 kilometres per second per megaparsec ((km/s)/Mpc). That is, an object one megaparsec (3.26 million lightyears) away is moving away at 68 km/s. The cosmic distance ladder

The CMB is one way to study the universe’s expansion. The other is called the cosmic distance ladder – a set of techniques used to measure the distance to objects that are close, further away, and very far away from the earth. One object in particular is the Cepheid variable star. The Cepheid variable star RS Puppis as imaged by the Hubble space telescope in 2010. The Cepheid variable star RS Puppis as imaged by the Hubble space telescope in 2010. | Photo Credit: NASA

The Cepheid variables have a unique



feature: their brightness varies in a predictable way over time. Based on how bright a Cepheid variable is, scientists can estimate how far away it is. Using this, cosmologists have estimated based on various Cepheid variables (and other such objects) is 73 (km/s)/Mpc. The best way to follow these stars is using the near-infrared radiation they emit. Unlike visible light, such radiation can pass through intervening dust clouds and reach us. Cepheid variable stars may also be crowded in some places. Fortunately, NASA’s James Webb Space Telescope (JWST) can track both near-infrared radiation and has instruments good enough to distinguish between radiation from two Cepheid variable stars close to each other in the sky. In the study

published in *The Astrophysical Journal Letters*, researchers checked a concern that the data collected by NASA’s previously best space telescope, the Hubble, had some flaws in its readings that gave rise to the Hubble tension. They analysed more than a thousand sharp observations of Cepheid variables recorded by JWST. “The superior resolution of JWST negates crowding noise, the largest source of variance in the near-infrared [brightness] relations measured with the Hubble space telescope,” they wrote. In the end, they found “no significant difference” in estimates of the stars’ distance based on Hubble telescope and JWST data, even after correcting for “local crowding” and “choice of filters”.

Bengalureans feel trapped in one big ‘heat island’

Unprecedented in scale, unrelenting in its intensity, the hottest summer in recent memory has caught Bengalureans in a tizzy. But how did the city, celebrated for its all-year generosity in weather, get reduced to one big heat island? Concretised beyond limits, polluted by an explosive vehicular onslaught, parched and clueless, has Bengaluru reached a dead-end? Heat islands are called so for a reason: They experience temperatures higher than the outlying areas, a trend fuelled by a high concentration of buildings, roads and other concrete infrastructure that absorb and re-emit the sun’s heat more than green expanses and water bodies. This ‘heat island effect’ in areas across the city has amplified the already unbearable summer discomfort.

Recent studies have clearly established that Bengaluru’s average temperature has risen by nearly a degree over the last 42 years. The increase has been more pronounced in the last two decades. Inevitably, this has spiked the evaporation rate of water bodies. Reduced rainfall over the last three years has directly impacted

groundwater recharge and replenishment of reservoirs, a perfect recipe for the current water crisis. White-topping of roads across Bengaluru is part of a concretisation overdrive, which has accelerated the growth of heat islands in the city. It has impacted infiltration of rain water leading to a further drop in the groundwater table.

White-topping of roads across Bengaluru is part of a concretisation overdrive, which has accelerated the growth of heat islands in the city. It has impacted infiltration of rain water leading to a further drop in the groundwater table. The rapid concretisation, dubbed white-topping of the city’s roads with hardly any option for rainwater to percolate and recharge the groundwater table, might be among the most tell-tale signs of a policy gone haywire. But this trend has been going on for decades, as a recent revision by the Indian Institute of Science (IISc) of its earlier findings clearly indicates. “Unplanned developmental activities leading to rapid changes altering land uses in the region had adverse ecological and environmental impacts, evident from the decline of forest cover (by 26%), agricultural lands (by

23%), with a sharp escalation of paved surfaces (urban area 34% increase in five decades),” notes the study, “Environmental Consequences in the Neighbourhood of Rapid Unplanned Urbanisation in Bangalore City.” Women drinking water as temperature shoots up in Bengaluru. Women drinking water as temperature shoots up in Bengaluru. | If this trend continues, the warnings are dire for the city’s future. “The city of Bengaluru will be choked with paved surfaces (to the extent of more than 98%) and 69.9% of the landscape in the Bangalore Urban district would be paved areas,” says the study. Combined with the loss of vegetation, water bodies and open spaces, the study warns that the urban heat island effect will enhance ambient temperature and humidity levels and lead to heat stress and heat-related illnesses including behavioural changes. “We need to plan for water urbanism by making the city’s landscape porous. Our study shows that in areas with vegetation of native species, about 55 to 60% of the rainwater gets infiltrated. When vegetation cover is less than 30%, only about 25% of the water gets infiltrated.”

Why Andaman and Nicobar Islands are key to Indo-Pacific security

The aftermath of the 1857 War of Independence saw the British establish a penal colony in the Andaman and Nicobar (A&N) islands, where many Indian revolutionaries and freedom fighters were incarcerated for life. The dark symbolism of kalapani, as the A&N came to be known, coupled with the remoteness of the islands, led to years of benign neglect by a distant New Delhi. It was only in 1962, when the Indian Navy (IN) raised an alarm about the reported sighting of a Chinese submarine, that the government sanctioned a detachment of 150 sailors to form a “naval garrison” to guard this huge archipelago of 836 islands spread across 450 miles of sea. Against this backdrop, recent reports regarding the government’s heightened security focus on these strategic islands are to be welcomed, especially because in the past, these islands nearly slipped from India’s grasp. Liberated by INA

In February 1942, just a month after the fall of Singapore, the islands were occupied by the Japanese as a prospective springboard for the invasion of India. Towards the end of 1943, they became the first part of India to be “liberated” from British rule, when Netaji Subhas Chandra Bose visited Port Blair and hoisted the INA tricolour. However, this was mere symbolism because the British reoccupied the A&N after the Japanese surrender in 1945. On the eve of Independence, the fate of these islands hung in balance. It is not commonly known that the British Chiefs of Staff had recommended that, given their strategic oceanic location, the A&N should be retained as a Crown possession. According to contemporary accounts, so relieved was British PM Clement Atlee when Indian leaders reluctantly swallowed the bitter pill of the Partition plan that he overruled the Chiefs of Staff and let India have these islands.

In September 1965 after the commencement of India-Pakistan hostilities, President Ayub Khan sent retired Air Marshal Asghar Khan as an emissary to seek support from fraternal Indonesia. In his memoirs, Asghar Khan records his surprise when the Indonesian navy chief, Admiral Martadinata, asked him: “Don’t you want us to take over the Andaman Islands? They are an extension of Sumatra and are, in any case, between East Pakistan and Indonesia. What right have the Indians to be there?” As it happened, the Indo-Pak conflict concluded before the Indonesians initiated any action. After Kargil War

In 1976, the A&N naval garrison, having been supplemented by army troops, was upgraded to Fortress Andaman & Nicobar. In 2001, the post-Kargil War security review saw the establishment of India’s first joint/unified operational command — the Andaman Nicobar Command (ANC) in Port Blair. By placing forces of all three services and the Coast Guard, under the command of the newly-created commander-in-chief, A&N, the military had taken a great leap of faith. In the 23 years that have elapsed, the ANC has proved an unqualified success, as a “theatre” in microcosm and provided tangible proof that the concept of “jointness” can work suc-



cessfully in the Indian environment. Regrettably, the tried-and-tested ANC template has not found favour in the military’s vain, four-year-old quest for “theaterisation”.

Turning to other security-related aspects of the A&N islands, note must be taken of their unique geography. In the north, the islands are separated from Myanmar territory by a mere 22 miles. At the southern end, Indira Point is just 90 miles from Indonesia’s Aceh province and the coast of Thailand lies 270 miles to the east. In stark contrast, Port Blair is about 850 miles from Chennai, as well as Kolkata. Although the surface area of these islands is only 8,300 sq km, they add 300,000 sq km to India’s exclusive economic zone with the promise of undersea hydrocarbon and mineral deposits. Only 31 of the archipelago’s 836 islands and islets are inhabited. This means there is a possibility of surreptitious occupation — a la “Kargil heights” — by a covetous neighbour. A theatre command to obviate the possibility of intrusions by state and non-state entities, ANC will need to maintain three-dimensional maritime domain awareness through networked assets, including radars, aircraft, satellites and unmanned vehicles. The command must be invested with adequate defensive and offensive firepower, as well as rapid-reaction forces with amphibious and airlift capabilities. The frequent transits of PLA Navy (PLAN) warships, submarines and research/intelligence-gathering vessels in these waters portend a sustained Chinese naval presence, including nuclear attack submarines. This would require the IN to maintain a substantial anti-submarine warfare capability in the A&N.

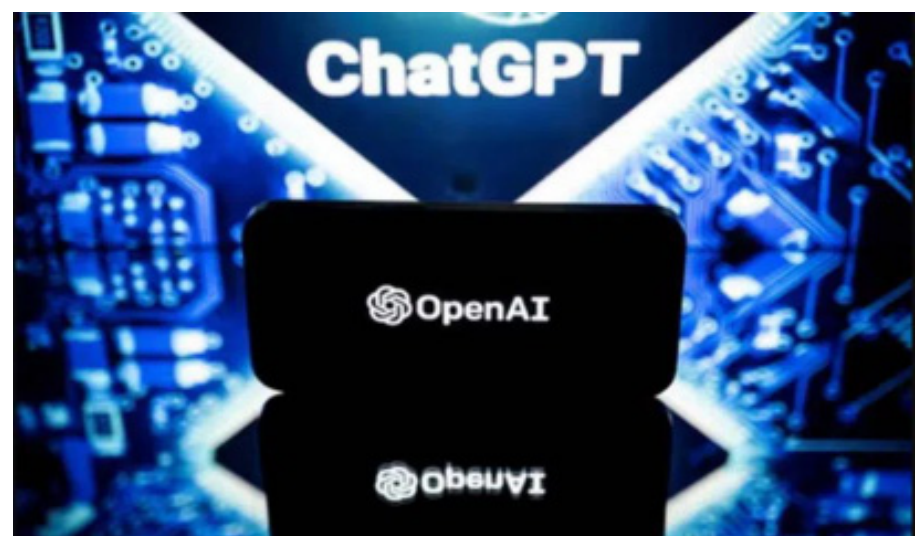
The severe disruption and re-routing of shipping, occasioned by the Houthi attacks in the Red Sea, have served as yet another harsh and expensive reminder that “maritime choke points” constitute critical vulnerabilities for world trade and commerce. In this context, the Malacca Strait — more than 90,000 merchant ships carrying about 30 per cent of the world’s traded goods pass through it every year — presents a challenge as well as a latent opportunity for India. Of significance for Indian strategists is the location of the Great Nicobar Island, which sits astride the west-

ern entrance/exit of the Malacca Strait and can comprehensively dominate all shipping — merchant as well as naval — in transit. This was the reason that as far back as 2003, Chinese Premier Hu Jintao warned the PLAN about a future “Malacca Dilemma”. The Andaman and Nicobar Islands are of great strategic importance since they straddle one of the busiest sea lanes in the world and give India the reach to monitor the flow of traffic from the South China Sea (Pacific Ocean) to the Andaman Sea (Indian Ocean) via the Strait of Malacca that’s key to trade and oil shipments in the Indo-Pacific. One hopes that the reported security infrastructure upgradation is part of a cohesive strategy, which aims

to convert the A&N islands into a formidable maritime bastion that will not only extend India’s defensive perimeter but also bestow the ability to project power or extend a hand of friendship to maritime neighbours. Such a strategy must acknowledge that for the foreseeable future, India would need to enlist the cooperation of like-minded partners to maintain peace and tranquillity in the Indo-Pacific.

In this context, Port Blair could become a regional hub for navies to acquire interoperability in areas like disaster-relief, medical aid, countering piracy and human smuggling, aircraft/submarine search and rescue and other such cooperative maritime endeavours.

OpenAI updates ChatGPT for concise responses



New Delhi: Sam Altman-run OpenAI on Friday said it has made its AI chatbot called ChatGPT more direct and less verbose. In a post on X social media platform, the company said its new GPT-4 Turbo model is now available to paid ChatGPT users. “We’ve improved capabilities in writing, math, logical reasoning, and coding,” said the company. The new AI model has been trained on publicly avail-

able data up to December last year.

“When writing with ChatGPT, responses will be more direct, less verbose and use more conversational language,” OpenAI posted. The company said it continues to invest in making its AI models better and looks forward to seeing what the users do with those. “If you haven’t tried it yet, GPT-4 Turbo is available in ChatGPT Plus, Team, Enterprise, and the API,”

Halt in India-Pak. trade ties: Political boundaries, personal losses

There is a short period between spring and summer when temperatures begin to rise across India's Gangetic plains. Mercury hovers around 35-38 degrees Celsius, but coming out of winter, the sun suddenly feels too hot. It's this dry heat that ripens the wheat in Punjab, one of the country's biggest producers of the grain — which the world trades most in. Just outside Amritsar, a sea of green-gold flanks the Grand Trunk Road, a historic trade route connecting Bengal to Afghanistan, built by Sher Shah Suri in the 16th century. It made Amritsar and Lahore, twin cities pre-Partition, prominent centres of trade. The drive from Amritsar, down 28 km, leads to Attari village, adjacent to Wagah, a village broken into an Indian and a Pakistani side.

At Attari-Wagah border, every day, men from the Border Security Force and the Pakistan Rangers display their might in a perfectly rehearsed synchronised drill, with the Beating Retreat ceremony, where the two countries' flags are lowered in the evening. Patriotism peaks, with hundreds of people, mostly from out of town, cheering the soldiers on. The trading area is now almost empty, with only sparse trade with Afghanistan.

Just a few metres away in Attari though, there is distress. Once bustling with cargo-laden trucks, India's first land port at Attari — set up in 2012 along the international border between India and Pakistan — is almost deserted. Spread across 120 acres, the port aimed at providing secure, seamless, and efficient systems for cargo and passenger movement. But bilateral trade came to a halt in February 2019 after the Pulwama terror act in Jammu and Kashmir, with India withdrawing the Most Favoured Nation status to Pakistan, an international system of extending best-access conditions. Since the halting of trade between the neighbours, there has only been sparse cargo movement from Afghanistan, too little to sustain the people and businesses dependent on border economies. India also hiked its import duty on Pakistani goods by 200%. After India's move to revoke Article 370 in Jammu and Kashmir in August 2019, Pakistan stopped all direct trade ties with India. The deterioration in relations between the neighbours has hurt the local economy and put livelihoods in jeopardy. Data from the Land Ports Authority of India show that in 2017-18, there was trade worth ₹4,148.15 crore through Attari-Wagah, the only land route allowed for trade between India and Pakistan. In 2018-19, trade was worth ₹4,370.78 crore, which dropped significantly to 2,772.04 crore in 2019-20, and further to 2,639.95 crore in 2020-21. From April to December 2023, trade worth 3,100.05 crore took place. Cargo movement came down sharply from 48,193 trucks in 2017-18 to 5,747 in April-December 2023. Porters at the Attari-Wagah border lamenting the lack of work now that trade has been suspended between India and Pakistan.

Clad in a dark-blue kurta and loose pants, and standing tall on the edge of a

truck docked at the cargo terminal at Attari's Integrated Check Post (ICP), situated next to National Highway 1, Mohan Singh, 30, with fellow porters, is hurriedly unloading sacks of an apple consignment that has arrived from Afghanistan.

"If I can do this quickly, I can get some more unloading work at another truck in the terminal," says the third-generation porter, adding that he earns ₹300-₹350 for unloading goods from one truck. "It's not easy to get work here nowadays. Only 10 to 15 trucks arrive daily from Afghanistan, against 250-300 when trade with Pakistan was happening. Also, 150-200 trucks used to go from India to Pakistan," he says. The lean period has begun and will last until June. "During the peak business season between July and February, around 60 to 80 trucks come from Afghanistan; now that has drastically reduced," adds Mohan, who lives in Attari, a village spread across farms dotted with homesteads. Most porters are daily wagers; some own small pieces of land, just a few acres, enough for subsistence farming. Concerned about the lack of an alternative source of livelihood, Harmesh Singh, another porter, who shoulders the responsibility of his eight-member family, says there are 1,433 porters registered at the ICP. "We have divided ourselves into two groups of around 700 each. There's an arrangement among us to work on alternate days. So, each porter gets only a maximum of 15 days of work in a month. But with truck arrivals dwindling in the current lean season, there's no surety of work even on alternate days," he says. Harmesh remembers pre-Pulwama, when he would earn between ₹1,500-₹2,000 daily. "Now, we are forced to find work outside as labourers, masons, helpers, but the biggest problem is that people avoid engaging us as they prefer workers who stay for relatively longer periods. We are in a kind of meethi jail (sweet prison), from where we can't leave even if we want to." He hopes the government will come up with an employment plan in the long run.

The end of bilateral trade came as a setback for many, including traders, custom house agents, and truckers, among others, eventually hitting businesses in Amritsar, a major commercial hub and strategically located city as it holds potential for opening trade through roads connecting Pakistan, Afghanistan, Iran and beyond, to Central Asian countries. A few kilometres from Attari is Amritsar's prominent Majith mandi, a wholesale-cum-retail market for dry fruit. Here, traders have been upset over the drop in business amid a sharp rise in prices of different products. The market, in the older part of the city, has sackfuls of dry fruit spilling out onto narrow roads.

"Soon after the bilateral trade ended, the prices of dry dates shot up. The wholesale price of dry dates, which — depending on the quality — was between ₹50 and ₹100, has gone up to ₹150 to ₹275 per kg. Dry dates are now reaching the Indian market via other countries like Dubai, but the prices have risen, eventually burden-



There is a short period between spring and summer when temperatures begin to rise across India's Gangetic plains. Mercury hovers around 35-38 degrees Celsius, but coming out of winter, the sun suddenly feels too hot. It's this dry heat that ripens the wheat in Punjab, one of the country's biggest producers of the grain — which the world trades most in.

ing the consumer," says Anil Mehra, a leading dry fruit trader and president of the Federation of Karyana and Dry Fruit Commercial Association, Majith mandi. He adds that when the ICP came up, traders had expanded their commercial work by making large investments on infrastructure. Manwinder Singh, a customs broker at the ICP, remembers that trade would begin at 7 a.m. and continue until late in the evening. "These days, activities are wrapped up in two to three hours. The ICP is mostly deserted during the day. I have lost a lot of clients since 2019. I had around 80 clients then. Now, I have only about 30 left," he says, adding that these are the ones trading with Afghanistan. Kulwinder Sandhu, a member of the Attari Truck Union, says there were 517 trucks in the union, but now down to 210. "Even for the current truckers, there's hardly any work to sustain their livelihood. Many owners had to sell their trucks; many surrendered them to banks as they were not able to pay the equated monthly instalments. Hundreds of drivers and helpers lost their jobs," he says. During the days of trade with Pakistan, 1,700-1,800 trucks were plying daily, but these days just 10-12 trucks are operating. "Many locals, who were working as mechanics, or had opened small tyre repair shops, tea stalls, eateries, had to shut down operations as trucks went off the road, adversely impacting the income source of local villagers," he says. Gulbagh Singh Sandhu, one of the owners of a local transport company, says trade should be opened permanently without any restrictions. "This would bring back

prosperity to the border districts that are facing a serious economic crisis," he says. In his comfortable home-cum-office, Amritsar-based Ashok Sethi, 76, director of the Confederation of International Chambers of Commerce and Industry, estimates that trade pre-Pulwama meant ₹35 crore pouring into Amritsar's economy every month. "The key products imported from Pakistan included gypsum, cement, rock salt, chemicals, furniture, and dry dates. India exported cattle feed, plastic raw material, cotton bales, parts of agricultural implements, and cycle and sewing machine parts, besides vegetables. Dry fruit trade also boomed after the opening of the ICP," he says. Sethi, who primarily exports basmati, hopes "economic sense" will prevail and ties will resume.

Mukesh Sidhwani, an exporter-importer of food products, echoes this sentiment. He points out that Amritsar is a link to Lahore in Pakistan, about 50 km away, and offers the lowest logistics cost, which makes it a great place to do business when it comes to the import of commodities of Pakistani origin. Pardeep Sehgal, a leading businessman in Amritsar, terms calling off trade ties a "financial fiasco" with long-term livelihood implications. A gypsum dealer who didn't wish to be quoted says his bank account was declared a non-performing asset and all his assets, including the transport fleet, were taken over by banks after bilateral trade stopped. "Amritsar has easy access to Delhi and other markets across north India," he says. He hopes the government of India will accept the offer of talks with Pakistan.

Tikamgarh seeks solace amid drought and loneliness

Kallu Ahirwar walks slowly, his pace betraying his lack of purpose. It is 10am, and the 62-year-old's feet kick up dirt from the unpaved path that runs through the tribal village of Nayagaon in Madhya Pradesh's Tikamgarh district. He ambles towards his two-bigha farm, but there is little point; it is March and there are no crops to tend to. All Ahirwar wants to do is eat away at time, waiting for the day his two sons, 26 and 30, and their families return to the village ahead of the harvest season. Around him are rows and rows of thatched huts. In most, there is either a lock dangling from the door, and some are firmly bolted from the inside -- many of Ahirwar's age have simply lost the strength to step out of their homes. For nine months of the year, as younger men from the village move to different corners of the country in the hunt for some sustenance for their families, Nayagaon is haunted by loneliness.

Tikamgarh is one of the seven districts in northern Madhya Pradesh — Chhattarpur, Niwadi, Panna, Damoh, Datia and Sagar are the others -- that form Bundelkhand. It's a region plagued by high unemployment rates, a crippling lack of industry, soil that is not conducive to agriculture, and a long-standing search for water. What this means is that, for much of the year, life in Tikamgarh can be unsustainable. Ahirwar's elder son, Rajesh, first left Nayagaon on a rickety bus to Delhi when he was 17. All that was on offer was life in a foreign city, away from the warm embrace of home, for a salary of 400 a month. Even that meagre income was more than Bundelkhand could provide. "Migration isn't new for any of us. I once spent years away from home, and now my son does. Nothing has changed for years," the senior Ahirwar said.

Less than 50 metres away, 61-year-old Ramkeshi Prajapati sits outside her bare, ramshackle hut, in the company of her 13 year-old grandson. Her husband died three years ago. Her son got married, and left like everyone else. The boy, Devkumar Prajapati, is sitting cross-legged near the rotting wooden door in a torn school uniform. He goes to the government middle-school nearby, but his dreams have already been coloured by reality. "What good will studies do? I think I will go out soon because even in our school, the teachers believe that the son of a labourer can only be a labourer," he said. The stigma of migration is Bundelkhand's identity, and fleetingly, once every five years, at the epicentre of its politics.

WHAT THE DATA SUGGESTS The numbers are damning. A 2022 study by the Atal Bihari Vajpayee Institute of Good Governance and Policy Analysis (AIGGPA), commissioned by the Bundelkhand Development Authority, pegged the unemployment rate for Tikamgarh at 4.31% for men, more than double the state average of 2.1% and far higher than the national average which is 2.9%. For women, the unemployment rate was 9.94%, much higher than the state average of 6.4% and the national average which hovers around 4.7%. Social

activist Pramod Khare, who has worked in Bundelkhand for 15 years, says that the lack of natural resources, year upon year of devastating drought, and a lack of state support, have coalesced into a dangerous cocktail that forces outward migration. "There is no major mineral that can be mined. A majority of the soil is low in organic carbon, low to medium in nitrogen and phosphorus, and medium to high in potash. There is both poor soil quality and terrible connectivity with major cities, but successive governments have done little to set up industry here," Khare said.

Right from when young men and women are in school, the only viable option is to leave for work. The AIGGPA study says that only 12.1% of students who completed their higher-secondary education went on to study at a level above than that. "This means that nearly 88% of people have negligible scope of employment in the organised sector," the study said. Rajshekhar Pandey, general manager of the Tikamgarh industries department, said that a developmental uplift was in the works, including a new industrial area built on 22 acres of land near Sinaura Khasi, and another spread across 32 acres, in Mohangarh. "As many as six industrial areas are to be developed in the coming years in public partnership mode. We are also promoting artifacts by pushing for GI tags so traditional art can contribute to economic development," Pandey said. But Bundelkhand's faith is shaky. Its people have heard these promises before; and seen them broken before. So people do the only thing they can -- they leave; even if sometimes that means leaving their children behind. **RESIDENTIAL SCHOOLS FOR MIGRANTS** The building could easily be mistaken for an abandoned home. It has no plaster; its walls are peeling from the outside; there is no name plate, no board. But even at 10:30am, filtering across from inside the decrepit structure, are the voices of children.

On the other side of the door, they sit in a courtyard; inhaling dust from bags of sand and cement next to them, as if on a construction site. There are 31 in all, sitting cross-legged on a torn "tat-patti" (a long, narrow rug), books in hand. Among the 31, are siblings Radhika and Raja Ahirwar, 10 and 11 years old respectively. In Harpalpur in Chhattarpur, the district which borders Tikamgarh, at least 40 unregistered schools have mushroomed to cater almost exclusively to the children of migrant labourers. Most of them offer no real schooling or facilities, but give a roof over their heads. In July 2023, Radhika and Raja helped their father Deepak Ahirwar lock up their two-room hut in Tikamgarh's Dikoli village, and boarded a bus to trundle the 95km to Harpalpur. He spent two days settling them in, paid ₹27,000 for the year for each of them, and then left for Noida. "I was compelled to admit them. No government has ever created residential schools where our children can stay and learn for the year. I can't take them to the city because I can't afford it. And I can't leave them at home all alone. So this is the next best,"



said Deepak.

The school where the Ahirwar children study is called the Gajanand school. There are four rooms for the 31 children, each with small boxes meant to store personal belongings. The beds are wooden and have no mattresses. Strings that criss-cross haphazardly from the walls double up as clotheslines. Several of the rooms have no fans. There is no peon, no warden, and there are no qualified teachers. Students study, but most of their day is daily chores; each one of them washes dishes, clean clothes, and sweeps the premises. Ramkishore Dwivedi, the sole caretaker-cum-teacher of the Gajanand school, admits that it has no registration and no affiliation as a residential school. "But this doesn't matter. People know me by my name and the quality of teaching. With me, these students become experts at the alphabet and numbers in a year," Dwivedi said.

The parent of another ward who spends the year in Harpalpur, Imaliyakot's Basantlal Prajapati, said that the schools have one overarching pull — the promise of a better life. "I have worked since I was a child, but I didn't want the same fate for him. If I took him to Delhi, I'd be forced to get him to work to sustain himself. So I enrolled him at a residential school with the hope that there will at least be an environment of education better than at the construction site where I work," Prajapati, who also paid ₹27,000 for the year for his child, said. Locals say that most of these schools have come up after Covid, but district administration officials say that not a single private boarding school has been registered in the district in the last few years. "There are no boarding schools in Chhattarpur. I have given no such permissions in the recent past. I will look into the matter," Chhattarpur district education officer MK Katariya said.

POLITICS IN BUNDELKHAND Both Chhattarpur and Tikamgarh are assembly segments under the Tikamgarh parliamentary constituency which goes to the Lok Sabha polls in the second phase on April 26. In many ways, there have been two clear epochs in its electoral history. Between 1952 and 1971, Tikamgarh was a

Congress bastion, as much of India was, except for a five-year aberration between 1962 and 1967, when Kure Mate, the Praja Socialist Party candidate, was the member of Parliament. It then ceased being a constituency between two delimitation exercises between 1971 and 2009. Then it was reborn as a seat reserved for Scheduled Castes, and in three successive elections, has voted the same party, the BJP, and the same man, Virendra Khatik. The district has a sizable Scheduled Caste population at 25%, 4.7% tribals, and 3.67% Muslims. Khatik's draw, BJP leaders say, is not his big-ticket development agenda, but his accessibility. In a poor region, he is constantly available, they say -- the quintessential politician that is "sukh-dukh ka saathi" (there in good times and bad). So influential is Khatik that in June 2021, when there was a Union Cabinet reshuffle, he was made the minister of social justice and empowerment.

Unsurprisingly, Khatik has been named once again as the BJP candidate, and will be up against 42-year-old Pankaj Ahirwar, the vice-president of the Madhya Pradesh Congress's Scheduled Caste wing who began his sojourn with the party as an NSUI leader in 2004. Polling day is weeks away, and like clockwork, migration is back on the political agenda. Pankaj Ahirwar says his campaign will focus on the lack of change in 15 years under the same member of Parliament. "They have done nothing to generate employment locally, or to improve the social standing of the poor. It is people from the scheduled castes that have to migrate the most, and it is them that face the brunt of social atrocities. Before every election they promise an industrial park, but on the ground, the situation is only worsening," he said. The BJP, however, argues that the past five years have brought a clutch of initiatives to mitigate the crisis. They point to the laying of a foundation stone of the "Artificial Limbs Manufacturing Corporation of India" campus across seven acres in Tikamgarh; a Vande Bharat train from Delhi to Khajuraho flagged off on March 2024, the Tikamgarh medical college where the foundation stone was laid in September 2023, and the construction of roads and bridges across the district. "In the next decade,