

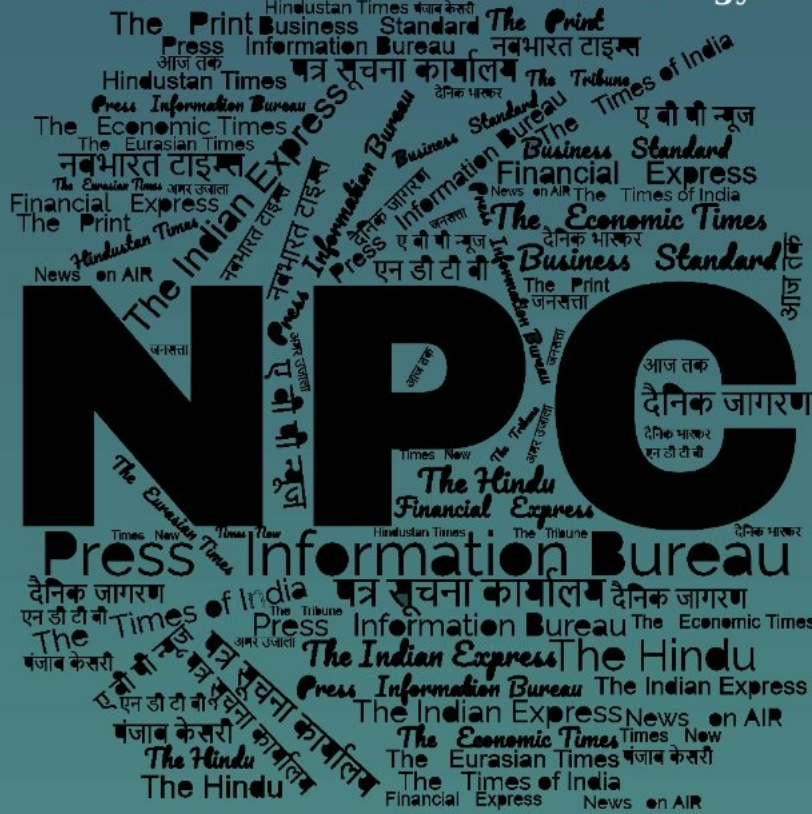
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India must Raise Defence R&D Spending to become Global Leader: House panel

India needs to spend more on defence research and development if it aspires to be a global leader, a Parliamentary panel said in its latest report on Wednesday, while drawing attention to the “continuous decline” in the DRDO’s spending as a percentage of the country’s overall defence expenditure during the last 10 to 15 years.

“With the current percentage of funding, our country can only aspire to become atmanirbhar and protect ourselves. However, to aspire to become a global leader, this percentage will not be sufficient,” the standing committee on defence said in the report tabled in Parliament on the working of the Defence Research and Development Organisation.

To be sure, in absolute terms, the R&D expenditure of the organisation has more than doubled since 2010-11 – from ₹10,149 crore to the current ₹23,264 crore, according to defence ministry data. However, as a percentage of the total defence expenditure, the spending on R&D has come down from 6.59% to the current 5.38%.

The spending on R&D hit a low of 4.62% (₹15,707 crore) in 2020-21.

The R&D expenditure as a percentage of defence budget should be increased in the coming years so that DRDO can achieve its objectives, the panel said, giving a breakup of figures related to the spending on defence R&D.

“A trend is emerging which is registering a continuous decline in DRDO expenditure percentage-wise. It was 6.59% in 2010-11, which was reduced to 5.79% in 2011-12. It was again reduced to 5.39% in 2012-13...further declined to 5.34% in 2013-14. The share slightly improved to 6.6% in 2014-15 but was again reduced to 5.89% during 2015-16.... In 2019-20, the percentage was enhanced and stood at 6.23%, but...in the last three financial years, the share was merely 5.89%, 5.53% and 5.38%,” the panel said in its report.

China has been spending billions of dollars on defence R&D and India cannot afford to lag, said Air Marshal Anil Chopra (retd), director general, Centre for Air Power Studies. “For India to be-

come a global player in defence production, it must be competitive and have its own intellectual property rights. Licensed production of weapons and systems is not enough,” Chopra added.

DRDO spends around 36% of its annual budget on the development of strategic systems required by the country’s military and many such systems have been inducted, the report said.

The panel flagged concern over the mismatch between the projected budget and the actual allocation.

“During the last two years, there has been a decrease in the budget estimation and the budget approved or allocated. In 2021-22, the projected amount was ₹23,460 crore and the allocated amount was ₹20,457 crore. Later, at the revised estimate stage, the allocation was reduced to ₹18,337 crore. Likewise, in 2022-23, the projected amount was ₹22,990 crore and the allocated amount stood at ₹21,330 crore. Since providing a budget to an organisation is a conscientious exercise envisaging R&D activities, making a cut at the last stage will have an adverse impact on the performance of the organisation.”

It asked the defence ministry to take steps to address this aspect and impress upon the finance ministry to provide sufficient budgetary support in line with the DRDO’s projections.

<https://www.hindustantimes.com/india-news/india-must-raise-defence-r-d-spending-to-become-global-leader-house-panel-101703144713429-amp.html>



Thu, 21 Dec 2023

Amity University Partners with Solid State Physics Laboratory, DRDO for Joint Research Initiatives

Amity University Noida signed MoU with Solid State Physics Laboratory (SSPL), DRDO, to foster joint research, during the sixth International Conference on Recent Trends in Materials and Devices (ICRTMD-2023), organised by Amity Institute of Applied Sciences and Amity Institute of Advanced Research and Studies, as per the official release.

“After the war between Russia and Ukraine, the importance of semiconductors has increased and therefore research in this area has also been enhanced.

The technologies developed by Solid State Physics Laboratory include High G MEMS switch, Design and Development of Acoustic Emission Sensor, Acoustic Emission Technology, Chemical Warfare Sensors, Infrared Technology for Night Vision, amongst many others and SSPL aims to strengthen scientific interaction with academia, industry and international centres of excellence,” Meena Mishra, director, Solid State Physics Lab (SSPL), DRDO, said.

“At Amity, students are encouraged to carry out path-breaking research in different areas so that they develop products and technologies to solve the problems of the society. At present climate

change and pollution is a serious problem for which we need to develop new materials and pursue research,” Ashok K Chauhan, founder President Amity Education Group, said.

<https://www.financialexpress.com/jobs-career/education-amity-university-partners-with-solid-state-physics-laboratory-drdo-for-joint-research-initiativesnbsp-3344599/>

Defence News

Defence Strategic: National/International



Thu, 21 Dec 2023

India Receives Price Bids for 26 Rafale-M jets, 3 Scorpene Submarines

India has received price bids from France for the purchase of 26 Rafale-M carrier-based fighters as well as three additional Scorpene-class conventional submarines.

While the Rafale-M is being processed through an Inter-governmental agreement, the submarine deal is a follow-on to the earlier contract with Naval Group, under which Mazagon Dockyard Shipbuilders Limited (MDL), Mumbai manufactured six submarines in India. The Defence Ministry has already set up a committee to arrive at the benchmark price for the submarine deal, sources said.

In response to India's request, France submitted a Letter of Acceptance earlier this week, outlining the pricing and other details of its offer for 26 Rafale-M jets, which are meant to operate from the Navy's two aircraft carriers, sources confirmed. Meanwhile, MDL has submitted its commercial offer for three more Scorpenes to the Indian Navy on December 11, it has been learnt.

Internal benchmarking

For the Scorpene deal, the Defence Ministry has formed a costing committee for internal benchmarking of the deal value. The commercial offer from MDL will be opened after the internal benchmarking is complete, sources said.

While the formal procurement process has now commenced for the Rafale deal, following receipt of the bid, it is not yet clear if a costing committee will be set up. The price and other terms of purchase will be negotiated with the French Government after taking into account all relevant aspects, including the “comparative procurement price of similar aircraft by other countries,” the Defence Ministry had earlier said.

The Indian Air Force already operates 36 Rafale jets customised for Indian requirements, which were procured in a €7.87 billion deal signed in September 2016.

On July 13, as Prime Minister Narendra Modi was enroute to Paris, the Defence Acquisition Council chaired by Defence Minister Rajnath Singh accorded its Acceptance of Necessity (AoN) for the procurement of the 26 Rafale-M fighters and three additional Scorpene-class diesel-electric submarines from France. The Rafale deal includes 22 single-seater Rafale-M fighters and four twin-seater Rafale trainers (which are not carrier compatible).

Filling the gaps

The 26 jets are meant to fill the gap in the numbers till the indigenous Twin Engine Deck-Based Fighter, still under development, is inducted into service. The Navy currently operates two aircraft carriers, the INS Vikramaditya procured from Russia and the indigenously built INS Vikrant, which was commissioned in September 2022.

As reported by The Hindu earlier, both the contracts are expected to be concluded by the end of 2024, and delivery of the submarines is likely to begin in 2031.

Indigenous features in new subs

The major difference between the existing Scorpene-class submarines and the new ones is their integrated combat system (ICS), sources explained. The earlier submarines had systems from France, while the new ones will have indigenous ICS, with significant localised solutions provided by Bharat Electronics Limited in collaboration with French suppliers, a source said. The ICS constitutes a significant part of the overall deal value.

The new Scorpene-class submarines are also likely to have their 1,250KW MAN diesel engines replaced with the Rolls Royce MTU 4000 series engines. The manufacturer has recently tied up with Garden Reach Shipbuilders & Engineers Limited, Kolkata for their final assembly in India.

A Defence Ministry statement had said that the additional submarines will have higher indigenous content and will also come fitted with an air independent propulsion (AIP) system, developed by the Defence Research and Development Organisation (DRDO), to enhance their endurance.

Refits for existing subs

India had contracted six Scorpene-class submarines from the Naval Group under a \$3.75 bn deal signed in October 2005, under which they were manufactured by MDL via technology transfer. The first submarine in the series, INS Kalvari, was commissioned in December 2017; the second, INS Khanderi, in September 2019; the third, INS Karanj, in March 2021; the fourth, INS Vela, in November 2021; and the fifth, INS Vagir, in January 2023. The sixth submarine, Vagsheer, is currently undergoing trials and is expected to be delivered to the Navy in early 2024.

The Navy has already drawn up plans to install the DRDO-developed AIP modules on all existing Scorpenes as they go for their refits, beginning with INS Kalvari, likely by the end of next year. Towards this, the Naval Group is currently supporting the DRDO in qualifying indigenous suppliers of liquid oxygen tanks and preparing for the future stage of jumboisation, which involves making the new hull, integrating the AIP safely, cutting the submarine and joining it with the new AIP section.

<https://www.thehindu.com/news/national/india-receives-price-bids-for-26-rafale-m-jets-3-scorpene-submarines/article67662323.ece>



Thu, 21 Dec 2023

Amid Threats from Pirates, Indian Navy Deploys Second Guided-Missile Destroyer in Gulf of Aden

The Indian Navy has deployed a second frontline ship in the Gulf of Aden to augment its anti-piracy mission, following the hijacking of a Malta-flagged cargo vessel by pirates. The Navy now has stealth guided-missile destroyers INS Kochi and INS Kolkata in the region, officials said.

Days later, it evacuated one of the 18 crew members onboard the vessel off the coast of Somalia to provide medical care after he was injured by the pirates. 'In a swift response, Indian Navy's maritime patrol aircraft deployed to investigate the incident arrived overhead MV Ruen on December 15 and established communication with the crew,' a Navy spokesperson said. 'All 18 crew (no Indians onboard) were reported to be safe in the citadel.'

Concurrently, in response to the incident, INS Kochi on anti-piracy patrol in the Gulf of Aden was also diverted immediately to render assistance,' he said. The official said INS Kochi intercepted MV Ruen in the early hours of December 16 and launched its integral helicopter to assess the situation. 'It was ascertained from the crew that the citadel onboard MV Ruen had been breached and all crew members were held hostage by the pirates.'

One of the crew members had also sustained injuries, but was reported to be stable,' he said. 'Whilst no armed intervention was undertaken to ensure crew safety onboard the hijacked MV, requisite actions were taken by the warship towards ensuring suitable treatment of the crew by the pirates,' he added. The Navy spokesperson said a Japanese warship also arrived in the area on December 16 and was relieved by Spanish warship ESPNS Victoria later in the day.

'Indian Navy ship maintained in close vicinity of hijacked vessel during its transit towards Somalia from December 16 to 17, suitably engaging with the pirates and coordinating actions with the other warships,' the official said. The hijacked vessel entered the territorial waters of Somalia on December 17 and INS Kochi was successful in ensuring that the injured crew member was released by the pirates in the early hours of December 18 for further medical management.

'The injured crew member was medically attended to onboard the Indian Navy ship, but due to urgent medical attention required, which was beyond the scope of the ship, he was transferred ashore at Oman on December 19,' the official said. 'In the light of the above incident and towards augmenting the anti-Piracy efforts in the Gulf of Aden region, the Indian Navy has deployed another indigenous guided missile destroyer in the region,' he said

<https://www.deccanherald.com/india/amid-threats-from-pirates-indian-navy-deploys-second-guided-missile-destroyer-in-gulf-of-aden-2821313>

THE ECONOMIC TIMES

Thu, 21 Dec 2023

Naval exercise MILAN- 2024 to be held at Visakhapatnam, 50 countries likely to participate

The 12th edition of the Multilateral Naval Exercise - 2024 (MILAN) is to be held at Visakhapatnam from February 19 to 27, and likely witness the largest ever participation by over 50 countries and nearly 20 ships from friendly nations. In accordance to the exercise a final Planning Conference was also held at Visakhapatnam in hybrid mode (VC + in-person) chaired by CSO (Ops), @IN_HQENC and attended by participating nations, said the Navy in an official statement. The Flagship event, MILAN is a biennial multilateral naval exercise, which was incepted by the Indian Navy in 1995.

Originally conceived in consonance with India's 'Look East Policy, MILAN expanded in ensuing years with the Govt of India's 'Act East policy' and Prime Minister Narendra Modi's Security and Growth for All in the Region (SAGAR) initiative, to include participation from other Friendly Foreign Countries (FFCs).

The harbour phase of MILAN 24 will comprise of International Maritime Seminar, City Parade at RK Beach, Swavlamban Exhibition, Subject Matter Expert Exchange and Milan of Young Officers. Ships, Maritime patrol aircraft and submarines of Friendly Foreign Countries would participate in the sea phase along with Indian Navy units. Indian Navy is likely to deploy both its aircraft carriers -- INS Vikramaditya and INS Vikrant -- at the Eastern seaboard in Visakhapatnam during the exercise.

They will involve large-force manoeuvres, advanced air defence operations, Anti-submarine warfare and Anti-surface warfare operations. The run-up to MILAN is concomitant to India's G20 Presidency and the conduct of the exercise would yet again realise the 'G20 theme Vasudhaiva Kutumbakam'. MILAN 22 was conducted at/ off Visakhapatnam from 25 Feb - 04 Mar 22 and witnessed participation from 39 countries

<https://economictimes.indiatimes.com/news/defence/naval-exercise-milan-2024-to-be-held-at-visakhapatnam-50-countries-likely-to-participate/articleshow/106170576.cms>

War Tank Requirement increases for Indian Army: Ordnance Factory GM

Yeddumailaram Ordnance Factory general manager Ratna Prasad said the requirement of army tanks for the Indian Army had increased in recent years. Saying that they were manufacturing 120 BMP (amphibious infantry fighting tank developed with Russian technology) vehicles a year, he said the Ordnance Factory was capable of manufacturing up to 155 vehicles per year to meet the increased requirement.

The Ordnance Factory carried out the mandatory floating trials for amphibious infantry combat vehicles (ICVs) (BMP variants), which they were manufacturing in their unit here, at the Malkapur minor irrigation tank close to Sangareddy town. Two war tanks were carried from the Ordnance Factory to the water body on a trailer truck on Thursday morning for the tests.

Speaking on the occasion, Ratna Prasad said the tanks would need to travel for two to three kilometres at a speed of 8 kmph on water which they did successfully. The vehicles could go at 30 kmph on land. Since the Ordnance Factory was founded in 1984, over 2,500 war tanks were manufactured at the Yeddumailaram unit, rolling out the first vehicle in 1986. While the vehicle's weight was put at 14 tonnes, it could carry 10 persons on it.

Joint General Manager Sarjith Reddy said the tanks would be used primarily for carrying out the troops to the warfront though they were mounted with guns. The Ordnance Factory Yeddumailaram has designed, developed and manufactured MPVs (mine-protected vehicles) and Closed Ranged Naval Guns (CRNs) which could be mounted on ships. However, the manufacturing of MPVs and CRNs were shifted to the Ordnance Factory Jabalpur a few years ago as the load of work increased here.

<https://telanganatoday.com/war-tank-requirement-increases-for-indian-army-ordnance-factory-gm>



India takes note of Pakistan Army chief's Meetings in Washington

In an indirect indication of its displeasure over talks between top US officials and Pakistani Army chief General Asim Munir in Washington, India on Thursday said its concerns for Islamabad's support to terrorism is well known and it hopes that other countries would also take it seriously.

The Pakistan Army chief arrived in Washington last week on his first official visit to the US.

Munir met US Secretary of State Antony Blinken, Secretary of Defence Llyod J Austin, Deputy Secretary of State Victoria Nuland, Deputy National Security Adviser Jonathan Finer and Chairman of Joint Chiefs of Staff General Charles Q Brown.

“Yes, we did see some reports in this regard about these meetings,” External Affairs Ministry spokesperson Arindam Bagchi said at his weekly media briefing. He said this while replying to a question on Munir’s visit to Washington and his meetings there.

“Our concerns for Pakistan’s support to terrorism, its support to cross border attacks is well known. We would hope that other countries would also take counter-terrorism seriously,” Bagchi said. Asked about the Maldivian government’s decision to not renew an agreement with India that allowed India to conduct hydrographic surveys in the island nation, Bagchi did not give a direct reply.

“India has a proven track record in the field of hydrography and we have been cooperating with many countries in the Indian Ocean region on hydrography and various elements related to that. The benefits to partner countries are visible,” he said.

To a question on Houthi rebels stepping up attacks on ships in the Red Sea, Bagchi said India has an interest in supporting free movement of commercial shipping in the region.

“We are monitoring the developments there. We are also part of international efforts to ensure free shipping. We will continue to monitor that,” Bagchi said.

“We have been part of efforts to ensure safe transit of ships in the Arabian Sea and we value the free movement of commercial shipping,” he added.

The safety of maritime traffic figured in a telephonic conversation between Prime Minister Narendra Modi and his Israeli counterpart Benjamin Netanyahu on Tuesday.

<https://indianexpress.com/article/india/india-pakistan-army-chiefs-meetings-washington-9078090/>



Thu, 21 Dec 2023

US has deepened Partnership with India; elevated cooperation through Quad: Antony Blinken

US State Secretary Antony Blinken has said the US has deepened its partnership with India. He said the country has elevated cooperation with India, Japan and Australia through the Quad.

"We've deepened our partnership with India. We've elevated cooperation through the Quad with India, Japan, Australia," the US State Secretary said in his remarks at an end-of-year press availability on Wednesday (US local time). The Quad is a diplomatic network between Australia, India, Japan and the US.

According to a press release issued by the US State Department, Blinken said the US' partnerships in the Indo-Pacific have never been stronger. He said the US is "working with the United Kingdom and Australia to produce nuclear-powered submarines. We launched new comprehensive strategic partnerships with Vietnam and Indonesia, a new Defense Cooperation Agreement with the Philippines, new trilateral initiatives with the Philippines and Japan, new embassies in the Solomon Islands and Tonga."

The US State Secretary further said that the US is more closely aligned than ever with the G7, with the EU, and with other allies and partners on the challenges presented by Beijing. "We're working together to address them. We're deepening cooperation and coordination between NATO and our Indo-Pacific allies. These efforts have allowed us to engage more effectively when tackling areas of concern, like China's coercive trade and economic practises, peace and stability in the Taiwan Strait and the East and South China Seas, and human rights," he said.

On the Israel-Hamas conflict, Blinken said the US will continue to focus intensely on its core priorities: "helping Israel ensure that what happened on October 7 can never happen again, bringing the conflict to an end as quickly as possible while minimising the loss of life and the suffering of civilians, getting the remaining hostages back home to their families, preventing the conflict from spreading, and once and for all breaking the devastating cycle of violence and moving towards durable, lasting peace."

"We continue to believe that Israel does not have to choose between removing the threat of Hamas and minimising the toll on civilians in Gaza. It has an obligation to do both and it has a strategic interest to do both," he said.

Blinken further said that the US is more determined than ever to ensure that "out of this horrific tragedy comes a moment of possibility for Israelis, for Palestinians, for the region to live in lasting peace and lasting security; that out of this darkness comes light." "Realising that possibility will require all parties to make tough choices about the steps that they're willing to take, including the United States. We will test this proposition with the urgency and creativity that it deserves and that America's interests demand." He said that this is the spirit that has long animated US President Biden in the face of seemingly intractable conflicts.

<https://www.hindustantimes.com/india-news/us-has-deepened-partnership-with-india-elevated-cooperation-through-quad-antony-blinken-101703124603322.html>

R. REPUBLICWORLD.COM

Thu, 21 Dec 2023

Strategic Partnership deepens as India and EU discuss Indo-Pacific Defence Cooperation

In a series of high-level meetings, India and the European Parliament Sub-Committee on Security and Defence (SEDE) explored avenues for deepening defence cooperation and enhancing collaboration in the Indo-Pacific region. The SEDE delegation engaged with Defence officials, including

the Chief of Defence Staff and the Defence Secretary, emphasizing mutual interests in expanding India-EU strategic security and defence cooperation. These discussions also underscored the importance of collaboration in addressing security challenges in the Indo-Pacific.

Parliamentary cooperation and economic ties in focus

The SEDE delegation met with the Parliamentary Standing Committee on Defence, exchanging views on security cooperation and the role of parliamentarians in fostering partnerships among democratic nations.

Parallely, the Delegation for Relations with India (D - IN) engaged with Indian officials, including External Affairs Minister S Jaishankar, highlighting shared values of democracy, rule of law, and multilateralism. The discussions encompassed geopolitical convergences, supply chain security, digital sensitivities, AI, and maritime security.

During their visit, the D-IN delegation, headed by Morten Lokkegaard, met with Minister of Commerce and Industry Piyush Goyal. Deliberations focused on the progress of the India-EU Free Trade Agreement negotiations and explored avenues to enhance economic ties between the two entities.

The delegation also called on key parliamentary figures, including Deputy Chairman of Rajya Sabha Harivansh Narayan Singh, and engaged with the External Affairs Committee of the Parliament chaired by Shri P P Chaudhary.

Exploration of defence industry synergies

The SEDE delegation's engagements extended to Mumbai, where they visited prominent institutions such as the Manohar Parrikar Institute for Defence Studies and Analyses (MP-IDSA), Bharat Electronics Limited, and met with members of the Society of Defence Industry Manufacturers. Discussions in Mumbai focused on exploring enhanced synergy and cooperation in the defence industry and manufacturing sector.

The visit culminated in a working dinner hosted by Sanjay Verma, the Ministry of External Affairs Secretary (West), on December 18, 2023. This diplomatic exchange further solidified India-EU relations, emphasizing shared parliamentary values and a collective commitment to deepen economic, political, and security cooperation.

Overall, the visit by Members of the European Parliament underscored the significance of fostering stronger ties between India and the EU, reinforcing their commitment to mutual collaboration across various domains.

<https://www.republicworld.com/defence/global-defence-news/strategic-partnership-deepens-as-india-and-eu-discuss-indo-pacific-defence-cooperation/>

ISRO to usher in New Year with XPoSat Launch

Indian Space Research Organisation (ISRO) is likely to usher in the New Year, with the launch of its first polarimetry mission XPoSat likely on January 1, according to persons in the know of the matter.

It will become the country's third space-based observatory after the recently launched solar mission Aditya-L1 and AstroSat launched in 2015.

The mission is meant to study the "polarisation" of astronomical X-rays, which can provide insights into the processes that resulted in its emissions. It is a method of studying astronomical phenomenon, in addition to imaging them, studying the fluctuations in light from a source, and the energy radiated by the celestial bodies. The observatory can help in understanding the emission mechanism from sources such as black holes and neutron stars (collapsed core of a massive star).

The planned life of the mission is five years. It will carry two payloads – POLIX (Polarimeter Instrument in X-rays) and XSPECT (X-ray Spectroscopy and Timing) – in a low earth orbit.

POLIX is designed to make observations in 8-30 keV. It is expected to observe about 40 bright astronomical sources of different categories during the planned lifetime, according to the ISRO.

XSPECT uses a method of observation called spectroscopy that studies the electromagnetic spectrum generated by different matter.

US space agency NASA had launched its polarimetry satellite Imaging X-ray Polarimetry Explorer (IXPE) in 2021. It takes measurements in the energy range of 2-8 keV. What this essentially means is that IXPE and XPoSat will be complementary and can provide coordinated observations of phenomena across a wide energy spectrum of 2-30KeV, the ISRO said.

After the opening of the Indian space sector to private players, there has been an increase in the number of scientific missions launched by ISRO. In 2023, Chandrayaan-3 landed on the South Pole of the Moon and ISRO sent a satellite hurtling towards the L1 point between the Earth and the Sun to allow uninterrupted observations.

In addition to the two missions, ISRO also undertook five other missions, including the first completely successful flight of SSLV, a navigational satellite for the Indian GPS-like service, and a commercial mission on board its heaviest LVM3 vehicle.

<https://indianexpress.com/article/india/isro-new-year-xposat-launch-9078150/>

How an AI tool can make Weather Forecasts more accurate and help tackle Climate Change

At the recent COP28, NASA and IBM announced that an Artificial Intelligence (AI) tool called watsonx.ai would be available on the open-source AI platform Hugging Space. Watsonx.ai will help users monitor the Earth from space, measuring environmental changes that have already happened while also making predictions about the future.

Utilising NASA's trove of data and IBM's AI technology, the model can help scientists estimate the past and future extent of wildfires, floods, and urban heat maps.

Here is a look at what the technology does, and how similar applications of AI help mitigate climate change.

How AI has helped in weather forecasting

A key factor in understanding and combating climate change rests in our ability to predict weather patterns. In recent decades, weather prediction has improved rapidly with today's six-day forecast as accurate as a five-day forecast 10 years ago. Hurricane tracks can be predicted with more accuracy three days in advance than they could 24 hours in advance 40 years ago.

This achievement is due to improvements in atmosphere and ocean technology, and in parallel, the progress made in high-computing power. Weather models today base their predictions on massive computing simulations that run on interpreted data. However, two key challenges remain.

First, access to that data is hard to come by. Second, analysing the same is an ever-harder task. Estimates from NASA suggest that by 2024, scientists will have 250,000 terabytes of climate data sets to work with. Climate data sets are massive and take significant time to collect, analyse and subsequently utilise to make informed decisions.

With advancements in technology, particularly the use of AI, these data sets become easier to interpret. In the last year, the European Center for Medium-Range Weather Forecasting started using deep-learning models known as AI emulators to generate forecasts based on historical weather patterns. According to IBM, while the laws of physics are not encoded into AI emulators, they can be inferred from the data, meaning that a forecast can be generated by a desktop computer in minutes instead of the hours typically taken by current systems.

So how have NASA and IBM built upon this?

How watsonx.ai works

Like Microsoft's Bing, OpenAI's ChatGPT, and other chatbots, watsonx.ai is also built on a foundation model — it's trained on a broad set of uncatagorised data allowing the model to apply information about one situation to another. In the case of watsonx.ai, NASA provides the datasets (in terms of satellite images instead of words,) and IBM created the foundation model to interpret them.

In order to train the model to comprehend visual sequences that unfold over time, scientists filled in blank areas in each image and asked the model to piece it back together. It became increasingly adept at figuring out how the photos connected to one another as it reassembled additional images. The model was then adjusted for certain tasks like segmenting and categorising photos.

In beta tests across the last year, the model has demonstrated a 15 per cent improvement in mapping flood and burn scars over the continental United States, using half as much labelled data compared to existing techniques.

“We believe that foundation models have the potential to change the way observational data is analysed and help us to better understand our planet,” said Kevin Murphy, Chief Science Data Officer, at NASA. “And by open sourcing the model and making it available to the world, we hope to multiply its impact.”

The model is also designed to be extremely simple to use. A user would merely need to select a location and a date, and the model will highlight changes in floodwater, reforestation efforts and other relevant factors.

What will be its impact?

According to IBM, this approach has the potential to minimise the amount of data cleaning and labelling needed to train a typical deep-learning model, and it could speed up geographical analysis by a factor of three to four. Information from the visualisations may be used to lessen the effects of flooding, develop infrastructure, assist in disaster response, and safeguard the environment.

When this type of generative AI is used in weather forecasting in the future, it may be possible to anticipate hurricanes, droughts, and other catastrophic weather occurrences with greater accuracy. This may clarify for us the precise ways in which alterations in the environment, such as the melting of ice in the poles, may affect our daily existence.

The technology could also apply to businesses, helping disaster response teams to prepare for fires impacting residential housing or helping supply chain logistics companies better understand macro weather patterns.

According to Juan Bernabe-Moreno, Director of IBM research for Ireland and the UK, in theory, this system could even be used to plan where to travel or buy a house. “There are many ideas about what you can do – the use of the application is really up to the people,” Bernabe-Moreno told *BBC Science Focus*. “But instead of having to be a big tech to create this application, making it open-source means putting it in the hands of the community.”

AI and Climate change

AI is already significantly impacting climate change strategies. According to the Boston Consulting Group (BCG) AI survey report, 87 per cent of private and public sector CEOs believe that AI is an essential tool in the fight against climate change.

In the transportation industry, AI-enabled vehicles have the potential to minimise energy use by mapping and identifying the most efficient routes. In agriculture, 40 per cent of freshwater usage is wasted on average but with AI technology, farmers can optimise crop irrigation, reducing water

wastage and leading to more productive harvests. In India, AI-equipped peanut farmers have already witnessed a 30 per cent increase in yield.

AI may also be used to assess emissions at the macro and micro levels, cut emissions and the impacts of greenhouse gases, and remove already-existing emissions from the environment. According to BCG's experience, AI may be utilised to help cut greenhouse gas emissions by five to 10 per cent of an organisation's carbon footprint.

<https://indianexpress.com/article/explained/explained-sci-tech/ai-tool-weather-forecasts-tackle-climate-change-9077964/>

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