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MK Yadav Sir

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BUSINESS STANDARD

Page 10

EXCHANGE TRADED FUND

(Syllabus: GS Paper 3 - Economy)

ETF liquidity falls short despite breaching ₹1 trillion mark

Traded value has not risen at the same pace as the increase in assets under management

SACHIN P MAMPATTA
Mumbai, 19 June

The value of exchange-traded funds (ETFs) changing hands on the stock market has crossed ₹1 trillion, but surging inflows may mean investors find it harder to exit in certain situations.

The value of ETF trades has nearly trebled since 2018-19 (FY19) to ₹1.2 trillion in 2022-23 (FY23).

The value of money invested in ETFs is up nearly 4x from FY19 levels to ₹5.1 trillion as of March 2023.

This means it will take longer today for investors to redeem money through selling ETF units on the stock exchange than it would have taken them before the pandemic.

The traded value was 39.9 per cent of the average assets in FY19. This is down to 25.5 per cent in FY23.

Low liquidity can increase the costs for ETF investors, observes Sundeep Sikka, executive director and chief executive officer (CEO) of Nippon Life India Asset Management.

This can result in a tracking error, which is the difference between the value of the ETF and the index it tracks. There is also an impact cost.

Impact cost refers to the price changing due to large orders when liquidity is low.

Higher impact cost affects returns. Globally, ETFs with high trading volumes and liquidity have attracted more investors, according to Sikka.

"The ETF industry globally is dominated by very few asset managers who have high liquidity. After that, there is a (long) tail," he says.

ETFs based on stocks outside the largest blue-chip names may face some difficulty because of lower trading activity, says Dhirendra Kumar, CEO of fund tracker Value Research.

The more liquid ETFs which invest in Nifty companies will not be as affected if the ETF was actively traded, he adds.

Many large investors can get liquidity by unbundling ETFs into underlying securities. This option may not be available to the average retail investor.

Eventually, more money inundating ETFs could lead to greater trading activity, with each affecting the success of the other, according to Kumar.

"It will happen with time... it is a chicken-and-egg story," he says.

The ETF segment has grown increasingly popular because it is seen to be a low-cost alternative to actively managed mutual funds.

Many new funds are thematic, which means they invest in stocks outside the blue-chip universe.

The ETF segment as a whole saw ₹1 trillion worth of inflows in FY19 and nearly ₹57,000 crore of redemptions. The net inflow was ₹43,351 crore.

Inflows rose to ₹1.6 trillion in FY23 and outflows to ₹97,000 crore. The net inflow was about ₹59,526 crore.

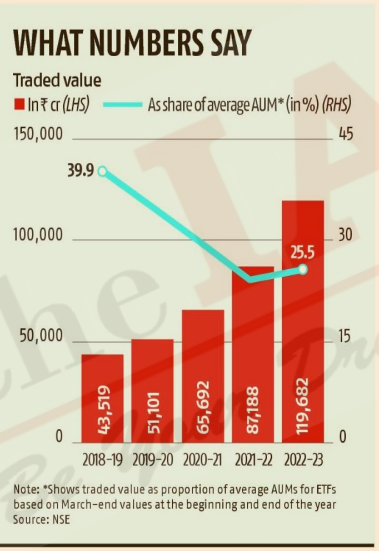
The number of ETFs has risen from 78 in FY19 to 172 in FY23. The number of equity ETFs is up from 60 to 131 in the same period. Debt ETFs are up from six to 22. Gold and silver ETFs rose from 12 to 19.

The December 2022 data on ETF investors showed ₹4.6 trillion coming from investors classified as corporates. This was over 90 per cent of the total investor capital.

Retail investors accounted for 11.5 million accounts, or 98 per cent of total accounts.



ILLUSTRATION: BINAY SINHA



Context: The value of **exchange traded funds (ETFs)** changing hands on the stock market has crossed ₹ 1 trillion, but surging inflows may mean investors find it harder to exit in certain situations.

Exchange Traded Fund

- **About:** An ETF, or exchange traded fund, is a marketable security that **tracks an index, a commodity, bonds, or a basket of assets like an index fund**.
  - ETFs are funds that track indices such as CNX Nifty or BSE Sensex, etc.
- **Trading value:** Based on the Net Asset Value (NAV) of the **underlying stocks (such as shares) that it represents.**
- **Share prices:** ETF share prices **fluctuate all day** as it is bought and sold.
  - This is **different from mutual funds** that only trade once a day after the market closes.
- **Stocks basket:** An ETF can own hundreds or thousands of stocks across various industries, or it **could be isolated to one particular industry or sector.**

LIVE MINT

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NABARD

(Syllabus: GS Paper 3 - Economy)

Improve rural income as a top priority, FM tells NABARD

Staff Writer
feedback@livemint.com
NEW DELHI

Finance minister Nirmala Sitharaman on Monday told senior officials of the National Bank for Agriculture and Rural Development (NABARD) to work toward ensuring efficiency and outcomes at the ground level, with improvements in rural income as a top priority, the finance ministry said in a social media post.

The suggestion to NABARD came at a review meeting in which senior officials of the bank and the department of financial services took part.

The minister asked NABARD to facilitate the aggregation of organic producers by Farmer Producer Organisations (FPOs), with a focus on northeastern states.



Nirmala Sitharaman, Union Finance Minister. PTI

The minister also told NABARD to encourage farmers to enhance the area covered under millets, and to protect the returns for farmers who are already growing millets.

Sitharaman emphasised the need for concerted efforts to sensitize farmers to shift to more remunerative but less water-guzzling crops, especially millets, pulses and oilseeds. The minister also advised NABARD to take steps to augment rural credit.

Separately, Sitharaman chaired a meeting of the consultative committee attached to the ministry to discuss financial inclusion. The meeting was attended by senior officials, lawmakers and bankers. She recommended identifying credit-deficient districts in each state and carrying out special credit outreach camps in those districts.

She suggested that district-level meetings may be held for a month from 15 July and that lawmakers from each district may be invited to brainstorm on financial inclusion. She requested lawmakers to proactively participate in financial inclusion efforts and guide banks in this regard.

Context: Finance minister told senior officials of the **National Bank for Agriculture and Rural Development (NABARD)** to work toward ensuring efficiency and outcomes at the ground level, with improvements in rural income as a top priority.

- The minister asked **NABARD to facilitate the aggregation of organic producers** by Farmer Producer Organisations (FPOs), with a focus on northeastern states.

National Bank for Agriculture and Rural Development (NABARD)

- **About**: An **apex regulatory body** for overall **regulation of regional rural banks** and apex cooperative banks in India.
- **Origin**: NABARD was established on the recommendations of **B. Sivaramman Committee** (by Act 61, 1981 of Parliament) on 12 July **1982** to implement the National Bank for Agriculture and Rural Development Act 1981 (statutory body).
    - It **replaced the Agricultural Credit Department (ACD) and Rural Planning and Credit Cell (RPCC) of Reserve Bank of India,** and Agricultural Refinance and Development Corporation (ARDC).
- **Owner**: Set up with an initial capital of Rs.100 crore, its' paid up capital stood at Rs.17,080 crore as on 31 March 2022.
    - Consequent to the revision in the composition of share capital between Government of India and RBI, NABARD today is **fully owned by Government of India.**
- **Functions**: The bank has been entrusted with "**matters concerning policy, planning, and operations in the field of credit for agriculture and other economic activities in rural areas in India".**
    - NABARD also **supervises the Regional Rural Banks (RRBs) and Cooperative Banks** along with developing their banking practices and integrating them to the Core Banking Solution (CBS) platform.
    - NABARD also **helps handicraft artisans** sell their products by training and providing a marketing platform for them.
    - NABARD has **partnered with various leading global organisations and institutions** affiliated with the World Bank that have played a role in transforming agriculture.

DTE

June 20

HUNGER CRISIS IN IGAD REGION

(Syllabus: GS Paper 3 - Food Security)



Over 30 million in 5 African countries may need food aid this year: Report

More than 55 million in 7 IGAD member states faced acute hunger in 2022 — an increase of 13 million from 2021

NEXT NEWS >

By Madhumita Paul
Published: Monday 19 June 2023

Context: The escalating hunger crisis in African countries needs urgent intervention as up to 30 million people in ive of the eight IGAD countries in the continent are projected to require humanitarian food assistance this year, according to a report the **IGAD Regional Focus of the Global Report on Food Crises (GRFC) 2023.**

Key Points

- The **Intergovernmental Authority on Development (IGAD)** is a regional economic community and comprises eight member states: **Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan and Uganda.**
- The projections are available for five of the eight IGAD countries: **Kenya, Somalia, South Sudan, Sudan and Uganda.**
- **Ethiopia, Kenya, Somalia, South Sudan and Sudan** all had the largest populations facing high levels of acute food insecurity in the seven-year history of the Global Report on Food Crises (GRFC).
- The compounding effects of multiple shocks, including **drought, macro-economic challenges and conflict,** drove rising levels of acute food insecurity across the IGAD region.

INDIAN EXPRESS Page 10

CRIMINALISATION OF POLITICS

(Syllabus: GS Paper 2 - Polity & Governance)

ADR seeks action against parties for contempt of SC order on candidates with criminal record

DAMINI NATH
NEW DELHI, JUNE 19

FLAGGING WHAT it called was a "deliberate act of contempt" by political parties, the Association for Democratic Reforms (ADR) on Monday wrote to the Election Commission seeking action against parties that fail to publish details of criminal antecedents of candidates as per orders of the Supreme Court and the poll panel.

The apex court had on September 25, 2018 directed all political parties to publish the details of criminal antecedents of their candidates, including the reason for selecting them. Hearing a contempt petition on its order not being implemented, the Supreme Court on February 13, 2020 directed the parties to list out the reasons for nominating such candidates within 72 hours of their selection. The EC issued directions to the parties on October 10, 2018 and March 6, 2020 in compliance with the SC's orders, making it mandatory for all parties to publish the details on their websites.

The ADR said it moved the court again to raise the issue of parties not complying with the earlier orders. It said the court directed ADR on March 17 to "pursue its remedies before the Election Commission", leading to Monday's letter to the three-member commission.

"In this backdrop, ADR is seeking strict action to be initiated against the defaulting political parties, which had contested 2023 Assembly elections held in Tripura, Meghalaya, Nagaland and Karnataka, 2022 Assembly elections held in Gujarat, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Goa, Manipur and Punjab and 2021 Assembly elections held in West Bengal, Tamil Nadu, Kerala, Assam and UT of Puducherry," the letter said.

The ADR said its analysis of C2 and C7 forms, which contain the information on criminal antecedents in a prescribed format published by parties from 2021 to 2023, showed that several parties "regardless of their current political outreach and popularity, did not have a functional website to publish details".

Context: Flagging what it called was a "deliberate act of contempt" by political parties, the **Association for Democratic Reforms (ADR)** wrote to the Election Commission seeking action against parties that fail to **publish details of criminal antecedents** of candidates as per orders of the Supreme Court and the poll panel.

Background

- The apex court had on September 25, 2018 **directed all political parties to publish the details of criminal antecedents** of their candidates, including the reason for selecting them.
- Hearing a contempt petition on its order not being implemented, the Supreme Court on February 13, 2020 **directed the parties to list out the reasons for nominating** such candidates within 72 hours of their selection.
- The EC issued directions to the parties on October 10, 2018 and March 6, 2020 in compliance with the SC'sorders, making it **mandatory for all parties to publish the details on their websites.**

Legal Aspects To Deal With Criminalisation Of Politics

- **No Constitutional provision**: Constitution does not specify as to what disqualifies a person from contesting elections for the Parliament, Legislative assembly or any other legislature.
- **Representation of Peoples Act 1951**: Currently, under the Representation of Peoples (RP) Act, lawmakers cannot contest elections **only after their conviction** in a criminal case.
    - **Section 8 of the RPA act 1951** states that an individual punished with a jail term of more than two years cannot stand in an **election for six years** after the jail term has ended.
    - The law does not bar individuals who have criminal cases pending against them from contesting elections.
        - Therefore the disqualification of candidates with criminal cases **depends on their conviction** in these cases.

PIB June 20

DAKSHTA FOR YOUNG PROFESSIONALS

(Syllabus: GS Paper 2 - Governance)

'DAKSHTA For Young Professionals' now Live at iGOT Karmayogi

Context: A new curated collection, **DAKSHTA (Development of Attitude, Knowledge, Skill for Holistic Transformation in Administration) For Young Professionals**, is now Live on the iGOT Karmayogi Platform.

Key Points

- Tailored for Young Professionals & Consultants engaged in Government, this collection (consisting of 18 courses) seeks to **build functional, domain and behavioural competencies** by acquainting learners with subjects crucial for discharging their duties, and responsibilities effectively.
- Currently, **40 Young Professionals, and Consultants in NITI Aayog** are undergoing phase-wise induction training through this curated collection of courses on the iGOT Karmayogi Platform.
- The **curated collection of courses** is available on the iGOT Karmayogi Platform for consumption by Young Professionals, and Consultants engaged in various Ministries, Government Departments, and Organizations to enhance their knowledge, skills, and abilities.
- The **iGOT Karmayogi Platform** is a comprehensive online portal to guide government officials in their capacity building journey.
- The portal combines **6 functional hubs** for online learning, competency management, career management, discussions, events and networking.
- In line with the Prime Minister's vision for building a Viksit Bharat, **Mission Karmayogi (National Programme for Civil Services Capacity Building)** has been playing an integral role in nurturing a smart, citizen-friendly and future-ready public workforce.
- Driving the Mission's core objectives, Karmayogi Bharat, a government-owned, not-for-profit SPV, has been established by DoPT, Ministry of Personnel, Public Grievances, and Pensions, and is entrusted with the responsibility for owning, managing, maintaining and improving the iGOT (Integrated Government Online Training) Karmayogi Platform.

TIMES OF INDIA

Page 8

MISSILE CORVETTE

(Syllabus: GS Paper 2 - International Relations)

Eye on China, India to gift Vietnam missile corvette

Rajat.Pandit@timesgroup.com

New Delhi: With China's aggressive muscle-flexing figuring high on their radar screens, India will now "gift" an indigenously-built missile corvette to Vietnam as well as look to step-up training of Vietnamese personnel in submarine and fighter jet operations, cybersecurity and electronic warfare, among other fields.

The delegation-level talks led by defence minister Rajnath Singh and his Vietnamese counterpart General Phan Van Giang on Monday also "identified means" to enhance existing areas of collaboration, especially in field of defence-industrial cooperation, maritime security and multinational cooperation.

Towards the possible acquisition of Akash surface-to-air missile systems, BrahMos supersonic cruise missiles and other military hardware, the Vietnamese defence minister also visited the DRDO headquarters later in the day to discuss ways to enhance defence industrial capabilities through cooperation in defence research and joint production.

"Vietnam, which has been in discussions on acquiring systems like the indigenous Akash air defence missiles, expressed keenness on transfer of technology," an official said.

At the ministerial meeting, Singh announced the gifting of INS Kirpan, the 1,350-tonne Khukri-class missile corvette in service with the Indian Navy, "as a milestone in enhancing the capabilities of the Vietnam People's Navy".

ANI



INS Kirpan is a 1,350-tonne Khukri-class warship

China has been regularly sending warships and survey vessels into Vietnam's exclusive economic zone (EEZ), stoking tensions in the already contentious South China Sea due to Beijing's expansionist territorial claims against its neighbours.

Facing similar China's salami-slicing tactics on its land borders, India has been upgrading defence ties with Asean countries like Vietnam, Indonesia, Singapore and the Philippines through regular joint exercises, military exchanges and training programmes. India also aims to crank up arms supplies to Asean countries after the $375 million deal with the Philippines for the 290-km range BrahMos missiles in January 2022.

"Vietnam is an important partner in India's Act East Policy and the Indo-Pacific region," the official said. India has been training Vietnamese fighter pilots to fly Sukhoi-30 jets as well as sailors in underwater combat operations in Kilo-class submarines, both of which are operated by the two countries.

Vietnam on Monday also asked for an increase in its "annual 60 training slots" in various Indian military institutions, with India agreeing to favourably consider it.

India, China and 18 other nations to join Mongolia drill

India is taking part in the 'Khaan Quest' multi-nation peacekeeping exercise being hosted by Mongolia, which includes military contingents and observers from over 20 countries including China. India has dispatched a contingent from the Army's Garhwal Rifles for the 14-day exercise, which was inaugurated by Mongolian President Ukhnaagiin Khurelsukh on Monday.

"The exercise, which is co-sponsored by Mongolian Armed Forces and United States Army Pacific Command is aimed at enhancing interoperability of the participating nations, sharing experiences and training uniformed personnel for the UN peacekeeping operations," an officer said. "The exercise will enhance the level of defence co-operation between the Indian Army and the participating countries, especially with the MAF." TNN

Context: With China's aggressive muscle-flexing figuring high on their radar screens, India will now "gift" an **indigenously-built missile corvette** to Vietnam as well as look to step-up training of Vietnamese personnel in submarine and fighter jet operations, cybersecurity and electronic warfare, among other fields.

- A corvette is a **small warship.**
- It is traditionally the smallest class of vessel **considered to be a proper (or "rated") warship.**
- The warship class above the corvette is that of the frigate, while the class below was historically that of the **sloop-of-war.**

Key Points

- Towards the possible acquisition of **Akash surface to-air missile systems**, **BrahMos supersonic cruise missiles** and other military hardware, the Vietnamese defence minister also visited the DRDO headquarters later in the day to discuss ways to enhance defence industrial capabilities through cooperation in defence research and joint production.
- China has been regularly sending warships and survey vessels into **Vietnam's exclusive economic zone (EEZ),** stoking tensions in the already contentious South China Sea due to Beijing's expansionist territorial claims against its neighbours.
- Facing similar **China's salami-slicing tactics** on its land borders, India has been upgrading defence ties with Asean countries like Vietnam, Indonesia, Singapore and the Philippines through regular joint exercises, military exchanges and training programmes.
- India also aims to crank up arms supplies to Asean countries after the $375 million deal with the Philippines for the **290-km range BrahMos missiles** in January 2022.
- India has been training Vietnamese fighter pilots to **fly Sukhoi-30 jets** as well as sailors in underwater combat operations in Kilo-class submarines, both of which are operated by the two countries.

PIB June 20

EX KHAAN QUEST 2023

(Syllabus: GS Paper 2 - International Relations)

INDIAN ARMY CONTINGENT PARTICIPATES IN MULTINATIONAL JOINT EXERCISE "EX KHAAN QUEST 2023" IN MONGOLIA

Context: Multinational Peacekeeping Joint Exercise **"Ex Khaan Quest 2023"** featuring participation from military contingents and observers from over 20 countries has commenced in Mongolia.

Key Points

- The President of Mongolia inaugurated the Exercise in a ceremony organised at the **exercise location in Mongolia.**
- The exercise is co-sponsored by **Mongolian Armed Forces (MAF) and United States Army Pacific Command (USARPAC)**.
- The Indian Army is represented by a contingent from the **GARHWAL RIFLES.**
- The 14-day exercise is aimed at **enhancing interoperability of the participating nations,** for sharing experience and to train uniformed personnel for the United Nations Peacekeeping Operations (UNPKO).
- The exercise will prepare participants for future **UN Peacekeeping missions,** develop peace operations capabilities and enhance military readiness.
- The exercise includes **Command Post Exercise (CPX), Field Training Exercises (FTX)**, combat discussions, lectures and demonstration.
- The military exercise will **enhance the level of defence co-operation** between Indian Army and participating countries especially with the Mongolian Armed Forces which will enhance bilateral relations between the two countries.



THE HINDU Page 12

MESOLITHIC PERIOD ROCK PAINTING

(Syllabus: GS Paper 1 - Art & Culture)

Archaeologist finds Mesolithic-era rock painting in Andhra's Guntur

Ramesh Susarla
ANANTAPUR/GUNTUR

A Mesolithic period rock painting depicting a person tilling a piece of land has been found by D. Kanna Babu, former Superintending Archaeologist of the Temple Survey Project (Southern Region) of the Archaeological Survey of India, Chennai, in Orvakallu village in Guntur district, Andhra Pradesh.

Mr. Kanna Babu told *The Hindu* that while surveying the lower River Krishna Valley to ascertain the architectural features of shrines, he identified a new prehistoric rock painting on the walls and ceiling of natural rock shelters on a hillock at Orvakallu.

"After an intensive exploration, it was noticed that these were shelters for prehistoric humans who lived at this place. Among these five naturally formed caves, two are embellished with distinguished depictions of rock paintings on the back walls and ceilings executed by people of Mesolithic Age, roughly [from] 5000 BC," he said.



Painting of a man tilling land found at cave shelters at Orvakallu village in Guntur district. SPECIAL ARRANGEMENT

Mr. Babu added that the paintings were made with "natural white kaolin and red ochre pigments", as well as that most of them had been "badly damaged" due to exposure to "air and wind". "However, some of the sketches and outlines are still intact for the visitors," he said.

Ochre is a pigment composed of clay, sand, and ferric oxide. Kaolinite is a soft, earthy, and usually white mineral produced by the chemical weathering of aluminium silicate minerals like feldspar.

Culture of people

According to Mr. Babu, the find throws light on aspects of the social life and culture of the people who lived in the area.

One of the paintings depicted a man catching wild goat with his left hand while wielding a hook-like implement to control it. Another showed two couple standing with their hands raised while a child stood behind them.

Mr. Babu also singled out a painted figure of a man holding a plough and appearing to be tilling land – an indication, in his telling, "of a semi-settled life pattern" in which members of this community cultivated crops.

Context: A **Mesolithic period rock painting** depicting a person tilling a piece of land has been found in **Orvakallu village in Guntur district, Andhra Pradesh.**

- While surveying the lower **River Krishna Valley** to ascertain the architectural features of shrines, Archaeologist identified a new prehistoric rock painting on the walls and ceiling of natural rock shelters on a hillock at Orvakallu.

Key Points

- The paintings were made with **"natural white kaolin and red ochre pigments"**, as well as that most of them had been "badly damaged" due to exposure to "air and wind".
- However, some of the sketches and outlines are still intact for the visitors.
- **Ochre is a pigment** composed of clay, sand, and ferric oxide.
- **Kaolinite** is a soft, earthy, and usually white mineral produced by the chemical weathering of aluminium silicate minerals like feldspar.
- One of the paintings depicted a **man catching wild goat** with his left hand while wielding a hooklike implement to control it.
- Another showed **two couple standing** with their hands raised while a child stood behind them.
- Archaeologist also singled out a **painted figure of a man holding a plough** and appearing to be tilling land - an indication, in his telling, "of a semi settled life pattern" in which members of this community cultivated crops.

ECONOMIC TIMES

Page 2

RESEARCH AND ANALYSIS WING

(Syllabus: GS Paper 3 - Security)

Ravi Sinha Appointed RAW Chief

Before promotion, he was heading agency's Op wing

Our Political Bureau

New Delhi: Senior IPS officer Ravi Sinha, considered a specialist on neighbourhood countries, was on Monday appointed as the chief of external spy agency Research and Analysis Wing. He will succeed Samant Kumar Goel, who will complete his four-year tenure on June 30. Sinha, a 1988-batch Indian Police Service officer of the Chhattisgarh cadre, is currently special secretary in the Cabinet Secretariat.

The Appointments Committee of the Cabinet has approved Sinha's appointment as RAW secretary for two years.



The officer has worked extensively in Jammu and Kashmir, northeast and foreign countries

Sinha has been with the prestigious intelligence agency for over two decades. He was heading the operational wing of RAW before his promotion. The officer has worked extensively in Jammu and Kashmir, northeast and foreign countries.

Context: Senior IPS officer Ravi Sinha, considered a specialist on neighbourhood countries, was **appointed as the chief** of external spy agency Research and Analysis Wing.

- The Appointments Committee of the Cabinet has approved Sinha's appointment as RAW secretary **for two years.**

Research and Analysis Wing

- **About**: It is the **foreign intelligence agency** of India.
- **Origin**: The **Indira Gandhi administration** decided that a full-fledged second security service after Intelligence Bureau (IB) was needed. R. N. Kao, then a deputy director of the Intelligence Bureau, submitted a blueprint for the new agency.
  - Kao was appointed as the **chief of India's first foreign intelligence agency, the Research and Analysis Wing.**
- **Power & Functions**: The R&AW was given the **responsibility for strategic external intelligence,** human as well as technical, plus concurrent responsibility with the Directorate-General of Military Intelligence for tactical trans-border military intelligence up to a certain depth across the Line of control (LOC) and the international border.
  - The agency's primary function is **gathering foreign intelligence, counter-terrorism, counter-proliferation, advising Indian policymakers**, and advancing India's foreign strategic interests.
  - It is also involved in the **security of India's nuclear programme**.
- **Structure and organisation**: The head of R&AW is designated as the **Secretary (Research) in the Cabinet Secretariat,** and is under the authority of the Prime Minister of India without parliamentary oversight.
  - On an administrative basis, the Director reports to the Cabinet Secretary, who reports to the Prime Minister.

DST June 20

ACOUSTIC SHOCK WAVES

(Syllabus: GS Paper 1 - Geography)

New study reveals higher temperature enhancements during acoustic shocks in the solar chromosphere

Context: A new study has found that **bright grains observed in the chromosphere of the Sun** are due to upward propagating shocks in the solar plasma, and show higher temperature enhancements than previous estimates.

- The study can help **improve understanding of the mechanism of heating of the chromosphere** situated between the bright solar surface and the extremely hot corona.

Key Points

- The chromosphere is a **highly active layer** within the solar atmosphere and plays a crucial role in transferring energy (specifically non-thermal energy) that heats the corona and fuels the solar wind, which extends outward into the surrounding regions of the solar atmosphere.
- Although a large portion of this energy is **converted into heat and radiation**, only a small fraction is actually used to heat the corona and power the solar wind.
- There are **currently two widely accepted mechanisms** regarding how energy is transmitted from the lower layers to the higher regions of the solar atmosphere.
    - The first involves the **rearrangement of the magnetic field lines**, transitioning from higher to lower potential.
    - The second involves **propagation of different types of waves** including acoustic waves.
- **Acoustic shock waves** are heating events in the chromosphere that appear as transient brightening in images and are called grains.
- The amount of energy these acoustic waves carry and how it **heats the chromosphere** is of fundamental interest in solar and plasma astrophysics.
- A team of Solar physicists from **India, Norway, and the USA** have quantified the temperature enhancements during these acoustic shock events.
- The team used **high-quality observations** of the grains from the Swedish Solar Telescope and a state-of-the-art inversion code called STiC on a supercomputer provided by the IIA.
- The team has also **used machine learning techniques** to optimize the process of inversions, thus speeding up the computation significantly.

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