Science and Technology

In Context: Recently, the Council of the European Union (EU) adopted a set of recommendations to strengthen action against antimicrobial resistance (AMR).

About Antimicrobial resistance (AMR)

- **About:**

✓ Antimicrobial Resistance (AMR) occurs when **bacteria, viruses, fungi and parasites change over time** and no longer respond to medicines making **infections harder to treat** and increasing the **risk of disease spread, severe illness and death**.

✓ Resistant microbes can pass between **animals, plants** and **food** and in the environment.

- **Challenge of AMR:**

✓ This phenomenon has many **health and economic implications**, with an estimated **4.95 million deaths** associated with bacterial AMR in 2019.

✓ It is estimated that **more than 35,000 people die each year in the EU /** European Economic Area as a direct consequence of an infection due to bacteria resistant to antibiotics.

✓ Experts predict that if the problem remains unsolved, **10 million people could die as a result by 2050**.

- **Causes:**

✓ Antibiotic resistance occurs when **bacteria evolve to evade antibiotics**. **Overuse and misuse** of antibiotics are the biggest drivers of resistance.

✓ That means that the **more we use antibiotics, the worse the problem** of antibiotic resistance becomes.

✓ **Other drivers of antimicrobial resistance include:**

- The lack of access to clean water, sanitation and hygiene (WASH) for both humans and animals,
- Poor infection and disease prevention and control in healthcare facilities and farms,
- Poor access to quality, affordable medicines, vaccines and diagnostics,
- Lack of awareness and knowledge.

- **How does it work?**

✓ Antibiotics work by **binding to a specific target protein** on a bacteria, then entering to kill it from the inside.

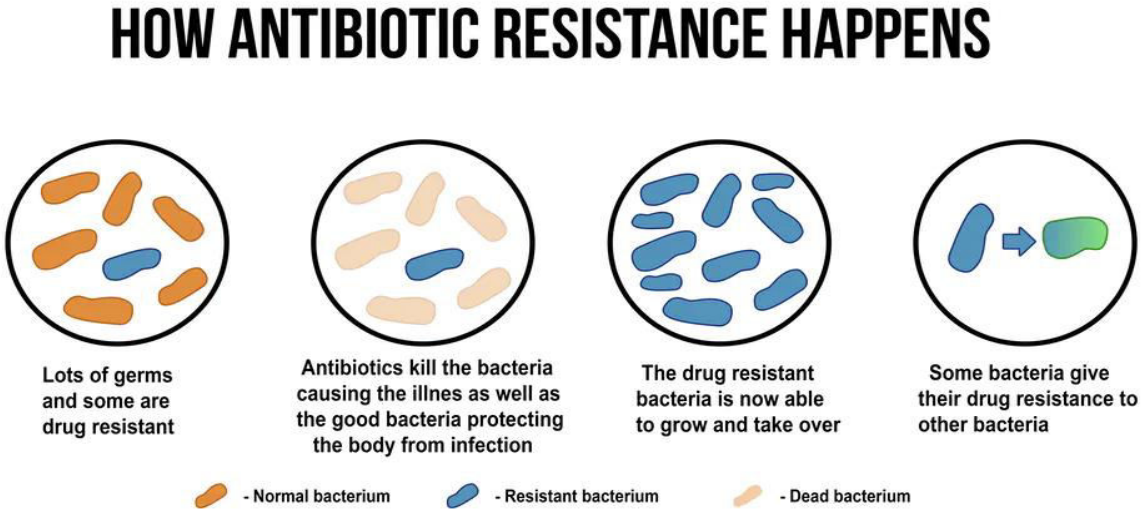
- Penicillin, for example, weakens the bacterial cell wall, causing the cell to disintegrate.

✓ The most common ways bacteria evade antibiotics come from **mutations** that allow them to stop drugs from binding to bacteria.

- It's like the bacteria changed the locks so the antibiotic key no longer opens the cell door.

✓ **Bacteria can also achieve resistance** by producing proteins that inactivate or modify the antibiotic, so it no longer binds to the bacteria. Or the target protein is mutated so the antibiotic can no longer bind to it.

✓ But worst of all is when bacteria evolve many of these mechanisms in backup, so even if you overcome one, other resistances might fill the gap.



EU's action to combat antimicrobial resistance

- **Combating AMR in a One Health approach:**

✓ The commission submitted the proposal for a recommendation on stepping up EU actions to combat AMR in a **One Health approach**.

✓ These recommendations were part of a proposal submitted by the **European Commission** to the European Council.

- **Focussing on the health of humans, animals and the environment:**

✓ It recommended the prudent use of antimicrobials such as antibiotics in **human and animal health** for **reducing the risk of microorganisms** becoming resistant to medical intervention.

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- ✓ The approach was adopted because the health of humans, animals and the environment is intrinsically linked.
- ▪ AMR can only be overcome through joint efforts across all three areas.
- **The proposal included a series of actions to:**
- ✓ Strengthen **national action plans** against antimicrobial resistance.
- ✓ Reinforce **surveillance and monitoring** of AMR and antimicrobial consumption (AMC).
- ✓ Strengthen **infection prevention and control** as well as antimicrobial stewardship and prudent use of antimicrobials.
- ✓ Recommend targets for AMC and AMR in human health.
- ✓ Improv**e awareness, education and training**.
- ✓ Foster **research and development**, incentives for **innovation** and access to antimicrobials and other AMR medical countermeasures.
- ✓ Increase **cooperation**.
- ✓ Enhance global actions.
- **The target:**
- ✓ **Surveillance and monitoring:**
- ▪ The targets called for **closing existing surveillance and monitoring gaps** and ensuring the completeness of data, including real-time information.
- It also includes **timely access to data** on both AMR and AMC **at all levels**, like the **community, hospitals** and long-term care facilities.

Reducing the consumption of antibiotics:

Reducing the total consumption of antibiotics in humans by 20 percent in the Union compared with the baseline year of 2019 is also another target.

- This would be applicable for the community and hospital sectors combined, including in long-term care facilities and in home-care settings.

AWaRe classification of WHO:

The member states must also ensure that **at least 65 percent** of the total consumption of antibiotics in humans belongs to the access group of antibiotics as defined in the **AWaRe classification of the World Health Organization**.

Farm to Fork strategy:

The members must also put in place **appropriate measures** to contribute to the **farm-to-fork strategy** and **zero pollution action plan target** of a 50 percent reduction of the overall EU sales of antimicrobials used for farmed animals and aquaculture, the targets further said.

The farm-to-fork strategy by the EU is aimed at redesigning our food systems to reduce the environmental and climate impact of primary production whilst ensuring fair economic returns for farmers.

Measures Taken to Rising Anti-Microbial Resistance in India

- **National programme on AMR containment:**
- ✓ It was launched during the 12th FYP in 2012-17
- **National Action Plan on Antimicrobial Resistance (NAP-AMR):**
- ✓ It has a focus on the One Health approach & was launched on 19th April 2017 with the aim of involving various stakeholders ministries/departments.
- **AMR Surveillance Network:**
- ✓ ICMR has established the AMR surveillance and research network (AMRSN) in 2013, to generate evidence and capture trends and patterns of drug resistant infections in the country.
- **AMR Research & International Collaboration:**
- ✓ ICMR has taken initiatives to develop new drugs /medicines through international collaborations in order to strengthen medical research in AMR.
- **India's National Action Plan for containment of AMR:**
- ✓ It focuses on an integrated One Health approach and involves coordination at the state, national and international levels.
- **Key priority of National Health Policy 2017:**
- ✓ In its National Health Policy 2017, India has identified managing AMR as a key priority and since then the health ministry has taken several initiatives to nip the epidemic that is growing fast globally.

Suggestions & way ahead

- **Modifying existing antibiotics:**
- ○ Scientists have been working on the issue from many different angles. One approach is to modify old antibiotics so they overcome resistance.
- **Developing new antibiotics:**
- ○ Another strategy is to make brand-new drugs, but this approach hasn't been very successful in recent decades.
- ○ But there are some signs of progress. For one, scientists are now armed with much more sophisticated drug discovery technologies, not least artificial intelligence (AI).
- ○ But central to the issue is that antibiotic resistance develops quickly whereas antimicrobials — the basis of antibiotic drugs — are developed slowly.

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- **Global efforts:**
  - Overcoming antibiotic resistance will require tremendous international effort dedicated to the problem.

ENVIRONMENT

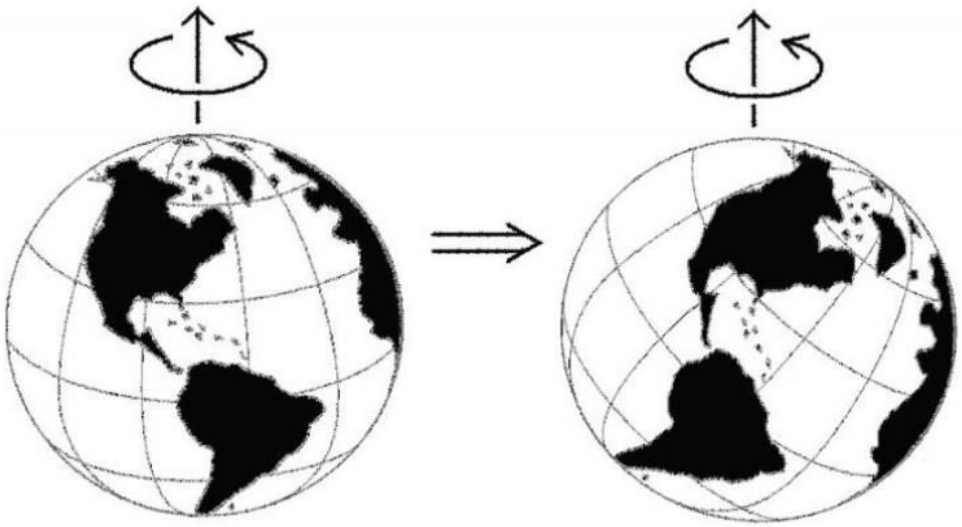
Groundwater extraction has tilted Earth's spin

In News: According to a new study humans have caused marked tilts in the Earth's axis by pumping water out of the ground and moving it elsewhere.

Findings of the study

- Groundwater pumping has tilted the planet nearly 80 centimetres east between 1993 and 2010 alone.
- The water circulated across the planet determines how mass is distributed. Scientists had predicted that between 1993 and 2010, people pumped 2,150 gigatons of groundwater, or more than 6 millimetres (0.24 inches) of sea level increase.
- The planet's geographic north and south poles are where its axis intersects the surface; however, they are not fixed. The axis and hence the poles fluctuate due to variations in the Earth's mass distribution.
- In the past, the poles' drift was only caused by natural forces like ocean currents and the convection of heated rock deep beneath the Earth. But the new research pitched the redistribution of groundwater as the primary culprit for the drift.
- In the new study, researchers analysed changes first by accounting for just ice sheets and glaciers and then by adding different groundwater redistribution scenarios.
- A 2021 study published in the journal Geophysical Research Letters found that the direction of polar drift moved from southward to eastward in 1995 and that the average drift speed from 1995-2020 was 17 times quicker than from 1981-1995.
- In the past 50 years, humans have extracted 18 trillion tonnes of water from aquifers without replacing it, it added.

How does the Earth's axis shift?



Shifts in the geographic location of Earth's North and South Poles is called polar drift, or true polar wander.

- The Earth's axis of rotation is the line along which it spins around itself as it revolves around the Sun. The points on which the axis intersects the planet's surface are the geographical north and south poles.
- The location of the poles is not fixed, however, as the axis moves due to changes in how the Earth's mass is distributed around the planet. Thus, the poles move when the axis moves, and the movement is called "polar motion".
- According to NASA, data from the 20th century shows that the spin axis drifted about 10 centimetres per year. Meaning over a century, polar motion exceeds 10 metres.
- Generally, polar motion is caused by changes in the hydrosphere, atmosphere, oceans, or solid Earth. But now, climate change is adding to the degree with which the poles wander.

What will be the impact?

- Pronounced shifts in the Earth's axis of rotation can impact our planet's climate, noted the study.
- Earth's rotational pole normally changes by several metres within about a year, so changes due to groundwater pumping don't run the risk of shifting seasons. But on geologic time scales, polar drift can have an impact on climate.
- Redistributing water from the mid-latitudes significantly influences polar drift; therefore, the location of redistribution determines polar drift. During the study period, most redistribution occurred in western North America and northwestern India — both located at mid-latitudes.

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- Change to the Earth's axis isn't large enough that it would affect daily life. It could change the length of day we experience, but only by milliseconds.

Way Ahead:

- Attempts to slow groundwater depletion rates, especially in those sensitive regions, could alter the change in drift, but only if such conservation approaches are sustained for decades

PRE FACT

1. Gita Press awarded Gandhi Peace Prize

CONTEXT: The **Gandhi Peace Prize for the year 2021** is being conferred on **Gita Press, Gorakhpur by PM Modi-led jury.**

About

- Gita Press is **one of the world's largest publishers** of Bhagavad Gita, the Ramayana and the Upanishads, having published 41.7 crore books in 14 languages, including 16.21 crore **Bhagavad Gita.** It completes **100 years of its establishment in 2023.**
- The institution has never **relied on advertisement in its publications, for revenue generation.**
- **Past awardees:** Former President of South Africa Nelson Mandela, social worker Baba Amte, Archbishop Desmond Tutu of South Africa, environmentalist Chandi Prasad Bhatt, Sultan Qaboos Bin Said Al Said, Oman and Bangabandhu Sheikh Mujibur Rahman of Bangladesh (2020).
  - Also include organizations such as ISRO, Ramakrishna Mission, Grameen Bank of Bangladesh, Vivekananda Kendra, Kanyakumari, Akshaya Patra, Bengaluru, Ekal Abhiyan Trust, India and Sulabh International, New Delhi.

Gandhi Peace Prize

- **Intitution**: It is an annual award instituted by Government of India in 1995, on the **occasion of 125th Birth Anniversary of Mahatma Gandhi** as a tribute to the **ideals espoused by Mahatma Gandhi.**
- **Eligibility:** This is an annual award given to individuals and institutions for their contributions towards social, economic and political transformation through non-violence and other Gandhian methods. The award is open to all persons regardless of **nationality, race, language, caste, creed or gender.**
- **Rewards:** The award carries an amount of **Rs. 1 crore, a citation**, a plaque and an exquisite traditional handicraft/handloom item.
- **Selection Committe:** The Jury chaired by Prime Minister and comprises two ex-officio members, namely the Chief Justice of India and
- Leader of the single largest Opposition Party in Lok Sabha. Two eminent members are also part of the Jury, Speaker of the Lok Sabha, and Founder of Sulabh International Social Service Organisation.

2. World Refugee Day 2023:

World Refugee Day 2023 Date: World Refugee Day is celebrated annually on June 20 to honour the courage and tenacity of refugees all across the world. The United Nations observes this day in memory of all refugees who were compelled to leave their homes.

History of World Refugee Day

The origins of World Displaced Person Day can be traced back to the 1951 United Nations General Assembly's presentation of the show relating to the situation of outcasts. The legal basis for refugees' protection was established by this convention, together with the definition of a refugee and their associated rights and obligations.

The Convention also established the UNHCR to be in charge of managing refugee protection and assistance. In 2000, the United Nations General Assembly declared June 20 to be World Refugee Day to mark the 50th anniversary of the Refugee Convention. World Refugee Day was first marked in 2001, and ever since then, it has been observed annually to raise awareness of the suffering of refugees and to highlight the fortitude and strength of refugees in the face of hardship.

Theme: World Refugee Day Theme 2023 is "hope away from home."

World Refugee Day Significance: The day serves as chance to recognise the courage and resilience of refugees as well as the challenges they encounter while trying to find safety and start over in their new lives. The day also serves as a reminder of the need of upholding the rights and respect of marginalised people and fostering compassion and empathy for their struggles.

3. 4th National Water Awards

IN CONTEXT: The Vice President of India will confer upon the fourth National Water Awards in New Delhi on 17th June 2023.

About the 4th National Water Awards:

- ✓ The first edition of the National Water Awards was introduced by the Department of Water Resources, River Development and Ganga Rejuvenation in 2018.
- ✓ They have provided a good opportunity for start-ups as well as leading organizations to engage and deliberate with senior policymakers on how to adopt the best water resources management practices in India.
- ✓ These awards have been instituted to recognize and encourage exemplary work and efforts made by States, Districts, individuals, organizations, etc across the country in attaining the vision of a 'Jal Samriddh Bharat'.
- ✓ It covers 11 categories Best State', 'Best District', 'Best Village Panchayat', 'Best Urban Local Body' etc.

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- ✓ The 1st Prize for the Best State will be conferred on Madhya Pradesh; Best District will be conferred on Ganjam District, Odisha; Best Village Panchayat will be conferred on Jagannadhapuram Village Panchayat, Bhadradri Kothagudem district, Telangana; Best Urban Local Body will be conferred on Chandigarh Municipal Corporation, Chandigarh.
- ✓ The award winners in different categories will be given a citation, trophy and cash prize.
- ✓ The cash prizes for the 1st, 2nd, and 3rd rank winners are Rs.2 lakhs, Rs.1.5 lakhs, and Rs.1 lakh, respectively.
- ✓ Nodal Ministry: Ministry of Jal Shakti.

ANSWER WRITTING

Q. know days space debris become a global concerns ; explain about space debris and its consequences?

Introduction: After multiple incidents of space debris potentially colliding with the International Space Station last year, a recent incident that has now brought back the attention to this deep threat is from last week. Four spherical metal balls fell from the sky in some villages of Gujarat over the past few days, which as per some experts are most likely the debris of a Chinese rocket or fuel storage tanks of space launch vehicles. US-based astronomer Jonathan McDowell has claimed in a tweet that these metal spheres are likely debris of the Chinese rocket Chang Zheng 3B. He says the debris might have fallen over Gujarat during the re-entry of the rocket. While retired ISRO scientist B S Bhatia has been quoted as saying that these metal balls might be the fuel tanks used in rockets and satellites to store hydrazine, which is a type of liquid fuel. As scientists determine the specific nature of the objects that fell from the sky in Gujarat - whether the debris belonged to a satellite or a fuel tank or some other object - the larger concern is incidents like these pose multiple threats – to the Earth and its inhabitants, to functional satellites and other numerous space objects. With more & more space launches and events like space tourism kicking off, the space above Earth is overcrowded – calling for urgent attention from countries to declutter it.

Space Debris:

• Space debris poses a global threat to the continued use of space-based technologies that support critical functions like communication, transport, weather and climate monitoring, remote sensing.

• Predicting collision probability from these space objects is crucial from the national security perspective as well as for the protection of public and private space assets of Indian origin.

• The real amount of space debris is said to be between 500,000 and one million pieces as current sensor technology cannot detect smaller objects.

• They all travel at speeds of up to 17,500 mph (28,162 kmph) fast enough for a relatively small piece of orbital debris to damage a satellite or a spacecraft.

Causes

• Sources of space debris are dead spacecrafts, spent rocket stages, lost equipment, boosters, weapons etc.

• Space debris has become a pressing issue, with objects in orbit flying out of control, posing a risk to satellites and to astronauts.

Impacts

• Space debris poses a global threat to the continued use of space-based technologies that support critical functions like communication, transport, weather and climate monitoring, remote sensing.

• Space junk is a threat to active satellites, unmanned spacecrafts and spaceships.

• International space station: Although the ISS uses Whipple shielding to protect itself from minor debris, portions (notably its solar panels) cannot be protected easily.

• There is also the risk, known as the Kessler Syndrome or Kessler Effect, where one piece of debris breaks off and hits another so that it becomes a cascade, which could end up polluting an entire orbit for satellites.

• Earth:

Although most debris burns up in the atmosphere, larger objects can reach the ground intact. According to NASA, an average of one catalogued piece of debris has fallen back to Earth each day for the past 50 years

Technologies:

- NASA's Space Debris Sensor orbits the Earth on the International Space Station. REMOVE debris, satellite contain two cube sats that will release simulated space debris so that it can then demonstrate several ways of retrieving them.
- Deorbit mission: There are two emerging technologies being developed under what's known as the e. Deorbit mission to grasp the wayward space junk, or to catch it.
- Other technologies include moving objects with a powerful laser beam. It is important to start doing that soon, current scientific estimates predict that without active debris removal, certain orbits will become unusable over the coming decades.

Way forward:

• An old-fashioned bridge-building between space faring nations would help.

• The 1967 Outer Space Treaty, negotiated during an earlier space race with little input from China, is badly in need of an update.

• In particular, provisions that grant countries permanent property rights to their objects in space may complicate efforts to clean up debris.

• Space agencies should fund research into debris-removal technologies—such as those recently demonstrated by Astroscale, a Japanese startup, which hold promise— and consider partnerships with companies developing them.

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• The US should also seek to expand the Artemis Accords, a framework for space cooperation that includes (so far) 11 other countries.
• As more nations join, debris-mitigation protocols, such as a requirement to specify which country has responsibility for end-of-mission planning, should become routine.

Conclusion: Space debris are a point of concern due their large momentum despite small size. The debris of Mission Shakti Anti-satellite mission was generated at an altitude much below the orbit of ISS. So, as the possibilities of them hitting ISS are seen quite low by Indian experts. But NASA is keeping a track on them for its own safety concern.

MCQs

1. Considered the following statement regarding 4th National Water Awards.
1. The 1st Prize for the Best State will be conferred on Madhya Pradesh.
2. Best District will be conferred on Ganjam District, Odisha.
3. The Vice President of India will confer upon the fourth National Water Awards
How many pairs are correct?
a) Only 1 pair
b) Only 2 pair
c) Only 3 pair
d) None

2. Considered the following statement regarding 4th National Water Awards.
1. World Refugee Day Theme 2023 is "hope away from home."
2. World Refugee Day is celebrated annually on June 20.
3. United Nations General Assembly celebrated this.
How many pairs are incorrect?
a) Only 1 pair
b) Only 2 pair
c) Only 3 pair
d) None

3. Consider the following statements:
1. All humans have linear chromosomes arranged in pairs within the nucleus of the cell.
2. Histones are the unique structure of chromosomes that keep DNA tightly wrapped around spool-like proteins.
3. Humans have 23 pairs of autosomal chromosomes.
How many of the statements given above is/are correct?
a) Only 1 pair
b) Only 2 pair
c) Only 3 pair
d) None

4. Consider the following statements, with reference to the high net-worth individuals (HNWIs):
1. These are investors who have an investible surplus of more than Rs 5 crore.
2. In 2022, India saw the highest outflow of the high net-worth individuals (HNWIs) globally. :
Which of the statements given above is/are correct?
a) Only 1
b) Only 2
c) Both1 and 2
d) None

5. Which one of the following is the best description of 'Tapas, that was in the news recently?
a) It is a missile defence system.
b) **It is an Unmanned Aerial Vehicle**.
c) It is an anti-tank guided missile.
d) It is a stealth destroyer.

6. Consider the following statements regarding Gulf of California which is experience earthquake of magnitude 6.4 recently.
1. It is a large inlet of the eastern Pacific Ocean along the northwestern coast of Mexico.
2. It experiences a 'continental' climate rather than an 'oceanic' climate.
Which of the statements given above is/are correct?
a) 1 only
b) 2 only
c) **Both 1 and 2**
d) Neither 1 nor 2

7. With reference to the Leadership in Energy and Environmental Design (LEED) certificate, consider the following statements:
1. It is a widely used green building rating system in the world.
2. It is given by the United Nations Environment Programme.
Which of the statements given above is/are correct?
a) 1 Only
b) 2 Only
c) Both 1 and 2
d) Neither 1 nor 2

8. INS Vagir, which was recently seen in the news, belongs to which class of submarine?
a) Kalavari class
b) Sindhughosh class
c) Delhi class
d) None of the Above

9. The central government of India has recently taken a proactive step towards improving the well-being of its employees by introducing the "Y-Break – Yoga at Office Chair" protocol. Chose the correct ministry which developed this?
a) Ministry of AYUSH
b) Ministry of health and family welfare.
c) Ministry of culture
d) None

10. Indian Renewable Energy Development Agency (IREDA) recently took part in the prestigious Intersolar Europe 2023.
1. This exhibition held in Munich, Germany.
2. It held annually.
Chose the correct answer
a) Only 1
b) Only 2
c) Both1 and 2
d) none

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