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SATURN IS LOSING ITS RINGS

- New NASA research confirms that Saturn is losing its iconic rings at the maximum rate estimated from Voyager 1 & 2 observations made decades ago.

About:

- It is estimate that this 'ring rain' drains an amount of water products that could fill an Olympic-sized swimming pool from Saturn's rings in half an hour.
- From this alone, the entire ring system will be gone in 300 million years, but add to this the Cassini-spacecraft measured ring-material detected falling into Saturn's equator, and the rings have less than 100 million years to live.
- This is relatively short, compared to Saturn's age of over 4 billion years.
- The rings are being pulled into Saturn by gravity as a dusty rain of ice particles under the influence of Saturn's magnetic field.

Other findings

- Scientists have long wondered if Saturn was formed with the rings or if the planet acquired them later in life. The new research favors the latter scenario, indicating that they are unlikely to be older than 100 million years, as it would take that long for the C-ring to become what it is today assuming it was once as dense as the B-ring.
- Various theories have been proposed for the ring's origin. If the planet got them later in life, the rings could have formed when small, icy moons in orbit around Saturn collided, perhaps because their orbits were perturbed by a gravitational tug from a passing asteroid or comet.

Saturn's ring

- Saturn's rings consist of countless separate particles with sizes ranging from pea-sized to that of giant boulders. These particles are composed mainly of water ice, with a trace of rocky material. There are two basic possibilities for how Saturn got its rings.
- It is conceivable that Saturn formed with the rings from the great cloud of gas and dust that also formed our sun and the other planets, 4 1/2 billion years ago. Or as now seems more likely the rings started out as moons for Saturn that collided, or a moon that came too close (within Saturn's Roche limit) and was shattered by tidal forces.

Saturn:

- Saturn is the sixth planet from the Sun and the second largest planet in our solar system. Adorned with a dazzling system of icy rings, Saturn is unique among the planets.
- It is not the only planet to *have* rings, but none are as spectacular or as complex as Saturn's. Like fellow gas giant Jupiter, Saturn is a massive ball made mostly of hydrogen and helium.

- Surrounded by more than 60 known moons, Saturn is home to some of the most fascinating landscapes in our solar system.
- From the jets of water that spray from Enceladus to the methane lakes on smoggy Titan, the Saturn system is a rich source of scientific discovery and still holds many mysteries.
- The farthest planet from Earth discovered by the unaided human eye, Saturn has been known since ancient times. The planet is named for the Roman god of agriculture and wealth, who was also the father of Jupiter.

Orbit and Rotation:

- Saturn has the second-shortest day in the solar system. One day on Saturn takes only 10.7 hours (the time it takes for Saturn to rotate or spin around once), and Saturn makes a complete orbit around the Sun (a year in Saturnian time) in about 29.4 Earth years (10,756 Earth days).
- Its axis is tilted by 26.73 degrees with respect to its orbit around the Sun, which is similar to Earth's 23.5-degree tilt. This means that, like Earth, Saturn experiences seasons.

Surface:

- As a gas giant, Saturn doesn't have a true surface. The planet is mostly swirling gases and liquids deeper down. While a spacecraft would have nowhere to land on Saturn, it wouldn't be able to fly through unscathed either. The extreme pressures and temperatures deep inside the planet crush, melt and vaporize spacecraft trying to fly into the planet.

Moons:

- Currently Saturn has 53 confirmed moons with nine additional provisional moons awaiting confirmation.

SOMA — SELF-ORIENTING MILLIMETRE SCALE APPLICATOR

- Researchers at MIT may have found a futuristic solution -a high-tech smart pill called SOMA stands for "self-orienting millimeter-scale applicator" that releases periodic doses of insulin into your stomach with an integrated needle.

About:

- The project was led by Massachusetts Institute of Technology and funded by Novo Nordisk, the Danish drug company that specialises in diabetes medicines.
- Researchers have found that high-tech pills that inject insulin directly into the stomach wall could give people with diabetes an alternative to injecting themselves through the skin.
- Soma — self-orienting millimetre scale applicator contains a micro-needle with freeze-dried insulin.

- The needle is attached to a metal spring held in place by a tiny sugar disc. When it reaches its destination the sugar dissolves, releasing the spring and injecting the needle into the stomach wall. Most of the capsule is biodegradable, and its metal parts are excreted harmlessly. "When a drug is injected into the stomach wall, that drug can become distributed through the body very quickly.
- Researchers have tested a prototype oral insulin system inspired by an African tortoise — in pigs, and will next develop a version for human patients.
- The shape of the pea-sized device is based on the steeply domed shell of the leopard tortoise, which allows the animal to right itself if it rolls on to its back.
- In the same way, the pill automatically orients itself after being swallowed, with its flat side against the stomach lining. It then inserts a tiny needle of compressed insulin into the tissue wall, where it dissolves at a rate optimised for diabetes treatment.

Significances:

- Scientists have been trying for decades to develop an oral insulin formulation to save diabetic patients the unpleasant ordeal of injecting themselves with the hormone at least once a day.
- The difficulty is that the harshly acid environment of the stomach quickly destroys insulin, a large protein molecule, before it can enter the bloodstream. Some insulin pills are in clinical trials, but none of the pills is close to market.
- The scientific principles underlying the Soma system and the system itself have the potential to enable oral delivery of large molecules such as peptides, proteins and nucleic acids.
- "This discovery has the potential to transform not only drug delivery but drug discovery as well, since most current drug discovery efforts are aimed at creating small molecule drugs that patients can take orally." But it could take 10 years to become a commercial product.

VERTICAL FARMING

- **Vertical farming** is the practice of producing food and medicine in vertically stacked layers, vertically inclined surfaces and/or integrated in other structures (such as in a skyscraper, used warehouse, or shipping container).
- The modern ideas of vertical farming use indoor farming techniques and controlled-environment agriculture (CEA) technology, where all environmental factors can be controlled.

Significances: / Preparation for the future

- It is estimated that by the year 2050, the world's population will increase by 3 billion people and close to 80% will live in urban areas. Vertical farms have the potential to reduce or eliminate the need to create additional farmland.

Increased crop production:

- Unlike traditional farming in non-tropical areas, indoor farming can produce crops year-round. All-season farming multiplies the productivity of the farmed surface by a factor of 4 to 6 depending on the crop.

Weather disruption:

- Crops grown in traditional outdoor farming depend on supportive weather, and suffer from undesirable temperatures rain, monsoon, hailstorm, tornadoe, flooding, wildfires and drought.
- VF productivity is mostly independent of weather, although earthquakes and tornadoes still pose threats.
- Vertical farming would thus reduce the amount of farmland, thus saving many natural resources. Deforestation and desertification caused by agricultural encroachment on natural biomes could be avoided. Producing food indoors reduces or eliminates conventional plowing, planting, and harvesting by farm machinery, protecting soil and reducing emissions.

Resource scarcity:

- The scarcity of fertilizer components like phosphorus poses a threat to industrial agriculture. The closed-cycle design of vertical farm systems minimizes the loss of nutrients, while traditional field agriculture loses nutrients to runoff and leeching.

Mass Extinction:

- Withdrawing human activity from large areas of the Earth's land surface may be necessary to address anthropogenic mass extinctions.
- Traditional agriculture disrupts wild populations and may be unethical given a viable alternative. One study showed that wood mouse populations dropped from 25 per hectare to 5 per hectare after harvest, estimating 10 animals killed per hectare each year with conventional farming. In comparison, vertical farming would cause nominal harm to wildlife.

Human health:

- Traditional farming is a hazardous occupation that often affects the health of farmers. Such risks include: exposure to infectious diseases such as malaria and schistosomes, exposure to toxic pesticides and fungicides, confrontations with wildlife such as venomous snakes, and injuries that can occur when using large industrial farming equipment. VF reduces some of these risks.
- The modern industrial food system makes unhealthy food cheap while fresh produce is more expensive, encouraging poor eating habits. These habits lead to health problems such as obesity, heart disease and diabetes.

Poverty and Culture:

- Food security is one of the primary factors leading to absolute poverty. Constructing farms will allow continued growth of culturally significant food items without sacrificing sustainability or basic needs, which can be significant to the recovery of a society from poverty.

Urban Growth:

- Vertical farming, used in conjunction with other technologies and socioeconomic practices, could allow cities to expand while remaining substantially self-sufficient in food. This would allow large urban centers to grow without food constraints
- **Solid organic waste** produced by households, restaurants, hospitals, schools, supermarkets, public events and other commercial activities within the city, can be collected and delivered to the nearest Vertical Farm where they will be converted into energy and other bio-based products such as organic fertilizers, soil conditioners or biochemicals. Excess heat and energy generated by the anaerobic digestion of solid organic waste can be used as district heating or delivered to the local electricity grid.
- **Municipal wastewater** generated by households and commercial activities within the cities can be used as input in Vertical Farms. Specific plants can be used to recover drinkable water from grey water by exploiting their transpiration phenomena.
- **Exhaust gases** from other near industrial activities can be sent to Vertical Farms, where the CO_2 contained in the fumes can be used to boost plant growth
- **Other organic products** (such as spent coffee ground, citric peels or oils, and grease) can be separately collected to be further processed into higher-value products such as bio-pellets, textile materials or bio-fuels.
- An eventual **surplus of clean electricity** generated by the use of renewable energy systems in Vertical Farms (such as solar panels, micro-wind turbines, and anaerobic digestion) can be made available for the local surrounding community.

NATIONAL REPORT TO THE CONVENTION ON BIOLOGICAL DIVERSITY

- India has submitted its Sixth National Report (NR6) to the Convention on Biological Diversity (CBD).

About:

- The report was submitted online to the CBD Secretariat by the Union Environment Minister by the National Biodiversity Authority (NBA) in the Ministry of Environment, Forest and Climate Change (MoEFCC), New Delhi.
- The Ministry also released the document 'Progress on India's National Biodiversity Targets: A Preview' on the occasion.

- India is among the first five countries in the world, the first in Asia and the first among the biodiversity rich megadiverse countries to have submitted NR6 to the CBD Secretariat. "While globally, biodiversity is facing increasing pressure on account of habitat fragmentation and destruction, invasive alien species, pollution, climate change and overuse of resources, India is one of the few countries where forest cover is on the rise, with its forests teeming with wildlife.
- India is *on track to* achieve the biodiversity targets at the national level and is also contributing significantly towards achievement of the global biodiversity targets.

Highlights of Report:

- The Report highlights that while India has exceeded/overachieved two NBTs, it is on track to achieve eight NBTs and in respect of the remaining two NBTs also, India is striving to meet the targets by the stipulated time of 2020.
- With well over 20 percent of its total geographical area under biodiversity conservation, India has exceeded the terrestrial component of 17 percent of Aichi target 11, and 20 percent of corresponding NBT relating to areas under biodiversity management.
- Similarly, India has also made noteworthy achievement towards NBT relating to access and benefit sharing (ABS) by operationalizing the Nagoya Protocol on ABS.
- Having published the first internationally recognized certificate of compliance (IRCC) under the Protocol in 2015, India has since published nearly 75% of the IRCCs published so far on ABS Clearing House.
- India has done well on raising awareness about biodiversity, which is an important thrust area in several programmers of the Government. As a megadiverse country harboring nearly 7-8% of globally recorded species while supporting 18% of the global human population on a mere 2.4% of the world's land area, India's quest for inclusive economic development while maintaining integrity of its natural capital is being pursued through various programmes and strategies.
- Measures have been adopted for sustainable management of agriculture, fisheries and forests, with a view to provide food and nutritional security to all without destroying the natural resource base while ensuring intergenerational environmental equity.
- Programmes are in place to maintain genetic diversity of cultivated plants, farms livestock and their wild relatives, towards minimizing genetic erosion and safeguarding their genetic diversity.
- Mechanisms and enabling environment are being created for recognizing and protecting the vast heritage of coded and oral traditional knowledge relating to biodiversity for larger human welfare while safeguarding the interests and rights of the local communities as creators and holders of this knowledge.

- India has been investing a huge amount on biodiversity directly or indirectly through several development schemes of the Central and State Governments, to the tune of Rs 70,000 crores per annum as against the estimated annual requirement of nearly Rs 1,09,000 crores. India has nearly two third of the population of wild tigers in the world.
- The population of lion has risen from 177 in 1968 to over 520 in 2015, and elephants from 12,000 in 1970s to 30,000 in 2015. One-horned Indian Rhino which was on the brink of extinction during the early 20th century, now number 2400.
- Further, while globally over 0.3 % of total recorded species are critically endangered, in India only 0.08% of the species recorded are in this category. India is committed to protecting its rich heritage of biodiversity which are so vital to our economic and social development.

Background:

- Submission of national reports is a mandatory obligation on Parties to international treaties, including CBD. As a responsible nation, India has never reneged on its international commitments and has earlier submitted on time five National Reports to the CBD. Parties are required to submit their NR6 by 31 December 2018.
- The NR6 provides an update of progress in achievement of 12 National Biodiversity Targets (NBT) developed under the Convention process in line with the 20 global Aichi biodiversity targets.

AI IN HEALTH CARE SECTOR

- Many industries have been disrupted by the influx of new technologies in the Information Age. Healthcare is no different. Particularly in the case of automation, machine learning, and artificial intelligence (AI), doctors, hospitals, insurance companies, and industries with ties to healthcare have all been impacted – in many cases in more positive, substantial ways than other industries.

Background:

- The healthcare sector has always embraced technology. Since the advent of the computer, technologists and healthcare professionals have been working together to exploit technological breakthroughs so that they might improve patient outcomes while also minimizing costs and delivering high standards of care to a greater number of patients.
- When a technology becomes reliable, cost-effective and scalable, it is embraced and generally thrives. We saw this in the '70s with the adoption of mainframe computers, in the '80s with the widespread adoption of personal computers and local networking, in the '90s with internet-based systems and more recently with the adoption of mobile technologies.

- It appears now we are on the cusp of the next technological revolution within healthcare, combining the vast amounts of data available, cloud computing services and machine learning techniques in order to create artificial intelligence (AI)-based solutions that can provide expert insight and analysis on a mass scale, at a relatively low cost.

AI devices mainly fall into two major categories.

- The first category includes machine learning (ML) techniques that analyze structured data such as imaging, genetic and EP data. In the medical applications, the ML procedures attempt to cluster patients' traits, or infer the probability of the disease outcomes
- The second category includes natural language processing (NLP) methods that extract information from unstructured data such as clinical notes/medical journals to supplement and enrich structured medical data.

Applications:

- Healthcare apps can be used to deliver medication alerts, patient education material and human-like interactions to gauge a patient's current mental state. The application of AI in the form of a personal assistant can have an incredible impact on monitoring and assisting patients with some of their needs when clinical personnel are not available.

Advanced analytics and research

- The uses of AI in healthcare do not stop at understanding human commands and knowing what type of response is needed. For example, AI has been used in many advanced use cases in oncology to help detect abnormalities in X-rays and MRIs, in genomics to perform complex processing and in precision medicine to provide assistance in creating highly customized treatments for individual patients.

Personal life coach

- Healthcare providers who treat patients with chronic diseases recognize the importance of maintaining contact with their patients outside of the exam room. Several hospitals have introduced life coaching services as part of their overall care, but the cost of such services compared to the current shrinking reimbursements makes it difficult to sustain such programs.

Healthcare bots

- One of the new areas of AI that is beginning to gain adoption is in the field of customer service, and healthcare bots are likely to be available soon as part of what healthcare providers offer. A bot is an AI application patient can interact with through a chat window on a website or via telephone to receive help with their requests. Bots can be used in situations such as scheduling follow-up appointments with a patient's provider online.

Medical imaging analysis and diagnosis assistance

- One of the most valuable uses of AI in healthcare is in radiology. It can assist in the diagnostic processes by analyzing many of the medical images such as MRIs, X-rays and CT scans and providing feedback on what it can detect that the human eye may miss.

Dictation assistance with NLP:

- In order to help reduce the time spent by health professionals capturing documentation, natural language processing extracts data from dictated notes and enters the information into the EHR. Another use of NLP that has been introduced recently is around the analysis of existing clinical documentation. Modern NLP systems are able to sort through the existing content of the charts and highlight the relevant data for the clinical team.

Challenges:

- While the application of AI in delivery of healthcare has very promising potential, challenges- both technical and ethical exist.
- AI research is largely led and driven by computer scientists without medical training and it has been commented that this has led to a very technologically focused and problem-oriented approach in the application of AI in healthcare delivery.
- Contemporary healthcare delivery models are very dependent on human reasoning, patient-clinician communication and establishing professional relationships with patients to ensure compliance. These aspects are something AI cannot replace easily.
- Use of robotic assistants in healthcare has raised issues about the mechanization of care in vulnerable situations where human interaction and intervention is probably more appealing.
- There is also the reluctance of clinicians in adopting AI technologies that they envisage will eventually replace them. Yet there is no qualm in them using technologies that automate and speed up laboratory diagnostic process.
- This has led to some suggesting a model of co-habitation. This is a model that accommodates both the AI and human elements in healthcare delivery and anticipates the inevitable automatization of significant components of medical pro-cesses while preserving the human aspects of clinical care like communication, procedures and decision-making

MALNUTRITION PUZZLE IN INDIA

- The state of hunger and malnutrition in India is worrying. Statistics compiled by the Food and Agricultural Organization (FAO)show that while the Sub-Saharan countries of Africa have the highest prevalence of hunger, in absolute terms, India has the highest number (one quarter) of undernourished (hungry) people in the world (194.6 million or 15 percent of India's total 6 population)

About:

- Malnutrition in children under-five also results in nearly half of the 1.3 million deaths occurring in the country each year. Among India's adolescents, the proportion of overweight and obese was estimated at 11 percent and two percent, respectively, in 10 2007. Data on anaemia show that 56 percent of young girls and 30 percent of young boys in 11 the age group of 15-19 years are anaemic
- The undesirable impacts of malnutrition are significant in adults, too. For example, the Body Mass Index (BMI or the ratio of weight-for height) of a sizeable proportion of women (23 percent) and men (20 percent) in the age group 15-49 is found to be falling below the norm.
- Evidence exist that people with low BMI are more susceptible to tuberculosis than those who have normal BMI; thus, there is an immediate need to address the problem of undernutrition.
- Further, anaemia is prevalent in women (53 percent) and men (23 percent) in the 15-49 age group, indicating lack of iron, which is among the most prevalent manifestations of lack of proper nutrition. Meanwhile, about percent of women and percent of men in the same age group are either overweight or obese.
- There is dramatic increase in the prevalence of obesity and its consequent impact on the burden of non-communicable diseases (NCD) such as diabetes and cardiovascular disease.

NFHS:

- Nutrition data generated from the fourth National Family Health Survey (NFHS-4) conducted from it the following inferences may be drawn from the data on nutritional status

1. The nutritional status of children under five years is critical in the States/UTs of Bihar, Jharkhand, Uttar Pradesh, and Dadra and Nagar Haveli; Kerala and Mizoram are faring better.
2. BMI below normal is most evident in Bihar, Jharkhand, Madhya Pradesh, and Uttar Pradesh; status is better in Sikkim.
3. The incidence of overweight or obesity is highest in Chandigarh, Lakshadweep, Andaman and Nicobar Islands, and Puducherry; the situation is better in Bihar and Meghalaya.
4. Anaemia is most prevalent in Chandigarh, Dadra & Nagar Haveli, Bihar and Meghalaya; it is lowest in Manipur and Mizoram

POLICY AND PROGRAMME INTERVENTIONS

- India's Nutrition Policy of 1993 was shaped on the basis of a detailed understanding of the factors responsible for the occurrence of malnutrition. The policy called for the adoption of a multi- sector l approach and the implementation of a wide range of measures to achieve the goal of optimum nutrition for all.

- The policy and programme measures initiated in the health sector address various aspects of nutrition and are helping to mitigate the problem.
- **This is evident in the following patterns of decline in some of the country's key health variables:**

1. proportion of under-nourished persons in the total population from 24 percent in 1990-92 to 15 19 percent in 2014-16.
2. Maternal mortality ratio from 398 in 1997-98 to 167 per 100,000 live 20 births in 2011-13.
3. Infant mortality rate from 21 80 in 1991 to 41 per 1,000 live births in 2015-16.
4. under-five mortality rate from 115 in 1991 to 22 50 per 1,000 live births in 2015-16.
5. Percentage of children underweight, stunted, and anaemic. The UN has established international development goals to monitor the progress of numerous social, economic and environmental inequalities.

Direct Policy Measures:

- Expand the safety net through ICDS to cover all vulnerable groups (children, adolescent girls, mothers, expectant women)
- Fortify essential foods with appropriate nutrients (eg., salt with iodine and/or iron)
- Popularize low cost nutritious food
- Control micro-nutrient deficiencies amongst vulnerable groups
- Indirect Policy Measures
- Ensure food security through increased production of food grains
- Improve dietary pattern by promoting production and increasing per capita availability of nutritionally rich food
- Effecting income transfers (improve purchasing power of landless, rural and urban poor; expand and improve public distribution system)
- **Other:** Implement land reforms (tenure, ceiling laws) to reduce vulnerability of poor; increase health and immunization facilities, and nutrition knowledge; prevent food adulteration; monitor nutrition programmes and strengthen nutrition surveillance; community participation.

Reasons:

- As there are a multiplicity of factors that ensure that every single human being receives sufficient nutrition, similarly, there are manifold variables that contribute to the occurrence of malnutrition in India.
- There is a highly significant problem of uncertainty of income among the rural population (especially agricultural laborers), marginalized groups, and the informal sector.
- Besides income, also absent are sufficient health and nutrition awareness among the people.

- People's access to sufficient and nutritious food is equally important. India's situation in this regard has been noted as serious by the International Food Policy Research Institute (IFPRI). IFPRI's Global Hunger Index (GHI) shows India ranked 97 among 118 countries on hunger.
- Unsatisfactory progress in the implementation of government welfare schemes.
- There is also the Integrated Child Development Services (ICDS) Scheme that has benefitted India's over 100 million persons including children, pregnant women and 37 lactating mothers. However, problems are being observed in ensuring supply of quality food, and its uniform distribution
- Many workers are unable to play an effective role in attending to the problem of malnutrition because of low wages and inadequate training.
- Most of the anganwadi centres have been found to be non-functional due to the absence of funds.
- Compounding the economic and political factors that abet malnutrition are social and cultural challenges that tend to defeat the very purpose of a nutrition programme.

Nuclear Medicine:

- Nuclear medicine is a branch of medical imaging that uses small amounts of radioactive material to diagnose and determine the severity of or treat a variety of diseases, including many types of cancers, heart disease, gastrointestinal, endocrine, neurological disorders and other abnormalities within the body.
- Because nuclear medicine procedures are able to pinpoint molecular activity within the body, they offer the potential to identify disease in its earliest stages as well as a patient's immediate response to therapeutic interventions.

Diagnosis:

- Nuclear medicine imaging procedures are noninvasive and, with the exception of intravenous injections, are usually painless medical tests that help physicians diagnose and evaluate medical conditions. These imaging scans use radioactive materials called radiopharmaceuticals or radiotracers.
- Radiotracers are molecules linked to, or "labeled" with, a small amount of radioactive material that can be detected on the PET scan.
- They are designed to accumulate in cancerous tumors or regions of inflammation. They can also be made to bind to specific proteins in the body.
- The most commonly used radiotracer is F-18 fluorodeoxyglucose, or FDG, a molecule similar to glucose. Cancer cells may absorb glucose at a higher rate, being more metabolically active.

- This higher rate can be seen on PET scans, and that allows your doctor to identify disease before it may be seen on other imaging tests.
- FDG is just one of many radiotracers in use or in development for a variety of conditions throughout the body.
- Depending on the type of nuclear medicine exam, the radiotracer is either injected into the body, swallowed or inhaled as a gas and eventually accumulates in the organ or area of the body being examined. Radioactive emissions from the radiotracer are detected by a special camera or imaging device that produces pictures and provides molecular information.

Significances:

- Nuclear medicine also offers therapeutic procedures, such as radioactive iodine (I-131) therapy that use small amounts of radioactive material to treat cancer and other medical conditions affecting the thyroid gland, as well as treatments for other cancers and medical conditions.
- Non-Hodgkin's lymphoma patients who do not respond to chemotherapy may undergo radioimmunotherapy (RIT).
- Radioimmunotherapy (RIT) is a personalized cancer treatment that combines radiation therapy with the targeting ability of immunotherapy, a treatment that mimics cellular activity in the body's immune system.

Safety in Nuclear Medicine

- Too much radiation can potentially damage organs or tissues or increase the risk of cancer.
- However, when used for diagnosis, the level of radiation exposure is around the same as a person receives during a routine chest x-ray or a CT scan. As a result, nuclear medicine and imaging procedures are considered non-invasive and relatively safe. Their effectiveness in diagnosing disease means that the benefits normally outweigh the risks.
- Treatment with nuclear medicine involves larger doses of radioactive material.
- For example, a nuclear medicine lung scan would expose a person to 2 millisieverts (mSv) of radioactivity, while cancer treatment would expose a tumor to 50,000 mSv.
- This additional dose may affect the patient, and side effects are possible.
- However, since the treatment often targets potentially fatal diseases, the benefits tend to outweigh the risks.
- As technology advances, scientists hope that treatments will be more directed toward the tumor or disease, and less likely to affect the person as a whole.

DEVICE CONVERT WI-FI INTO ELECTRICITY

- The new rectenna, from a team led by MIT and the Technical University of Madrid, uses a radio-frequency antenna to capture electromagnetic waves (such as those produced by Wi-Fi) as alternating current (AC) waveforms.

About:

- The device is what is known as a rectenna - a portmanteau of 'rectifying antenna' - which is a type of antenna that converts electromagnetic energy into direct current (DC).
- A novel device comprised of a two-dimensional semiconductor connects to the antenna. The AC signal is converted into a DC voltage through the semiconductor and is utilized to recharge batteries or power electronic circuits.
- In the flexible rectenna, the team used molybdenum disulfide (MoS_2). It's just three atoms thick, and, when exposed to certain chemicals, forces a phase transition between semiconductor and metallic material.
- The structure is also known as a Schottky diode, mimicking the properties of the metal-semiconductor junction used in rectennas previously - producing a working rectenna that minimises parasitic capacitance, resulting in higher speed.
- In previous rectennas, it's been made from a material such as silicon or gallium arsenide, which is not only rigid, but would also be expensive for large areas. What the team has done to improve on it is the use of a different material for the rectifier - the part that converts AC into DC.
- This means it can capture higher frequencies than other flexible rectifiers, which can't capture the gigahertz frequencies in which Wi-Fi operates.

Significances:

- It is much better to harvest energy from the environment to power up these small labs inside the body and communicate data to external computers.
- And its relatively low cost at larger scales, so it could be used for much bigger applications.
- Such a design has allowed a fully flexible device that is fast enough to cover most of the radio-frequency bands used by our daily electronics, including Wi-Fi, Bluetooth, cellular LTE, and many others.
- The proposed rectenna can be applied in providing power to medical devices, wearable electronics, and sensors for the "internet of things." Major tech firms will catch on to this tech fever as smartphones are the trend. A 150-microwatt Wi-Fi signal power level can produce around 40 microwatts using the device of the researchers. This could drive silicon chips and light up an LED.

STUDY PINPOINTS HOW SALMONELLA SNEAKS INTO PLANT ROOTS

- A new study, by researchers at the Indian Institute of Science (IISc) and the University of Agricultural Sciences (UAS), Bengaluru, has found how does the E coli and Salmonella bacteria enter into foods and make it poison for human consumption.

About:

- Researchers have found that unlike other disease-causing bacteria that enter the root, fruit or leaf by producing enzymes to break down the plant's cell wall, salmonella sneaks in through a tiny gap created when a lateral root branches out from the plant's primary root.
- While other bacteria were spread across the root, salmonella clustered almost exclusively around areas where lateral roots emerge.
- When a lateral root pierces open the wall of the primary root to spread across the soil, it leaves behind a tiny opening. The researchers concluded that the bacterium was entering through the gap with the help of fluorescent tagging and imaging.
- They also noticed that under the same conditions, a plant with greater number of lateral roots harbored a greater concentration of salmonella than one with fewer lateral roots. Similarly, when plants were artificially induced to produce more lateral roots, salmonella concentration increased.
- Tomatoes plucked from these plants also tested positive for salmonella infection, revealing its ability to travel all the way up to the fruit. It is just like a systemic infection in humans .

Sources:

- Salmonella is increasingly becoming a notorious pathogen. It can cause a diverse range of infections in diverse hosts, from birds to reptiles, poultry and livestock. The mortality rate from salmonella infection is high because it is able to cross the blood-brain barrier.
- Various studies show that irrigation water gets contaminated by sewage water. When that irrigation water is applied in the field, the soil becomes the portal for salmonella to enter.
- Environmental factors also appear to aid its infiltration. They found that when salt concentration in the soil increases, plants produce more lateral roots and therefore become more vulnerable to salmonella infection.
- In follow-up studies, the researchers plan to look at salmonella infiltration in other edible vegetables and work on strategies to detect and prevent soil contamination. "If the soil is contaminated, there has to be a mechanism to either decontaminate it, or use some antidotes like bio-fertilizers that can out-compete the pathogenic bacteria.