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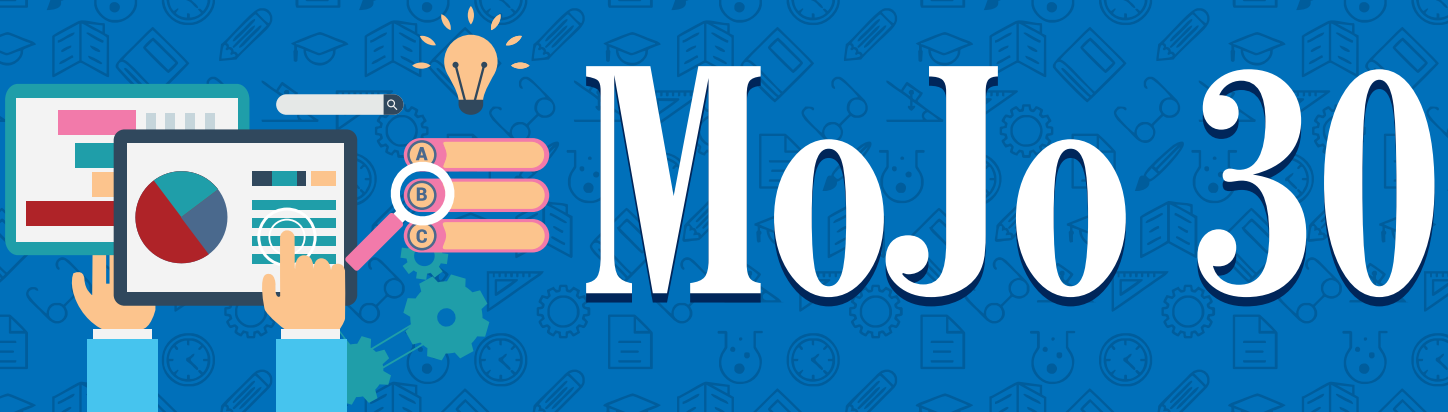
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EARTH MAY HAVE BEEN WET EVER SINCE IT FORMED: STUDY

Relevant for: Geography | Topic: The Earth, its Evolution and Origin of Life on Earth

LONDON : Earth's water may have come from materials that were present in the inner solar system at the time the planet formed -- instead of far-reaching comets or asteroids delivering such water, according to a study.

Researchers, including those from the Universite de Lorraine in France, determined that a type of meteorite called enstatite chondrite contains sufficient hydrogen to deliver at least three times the amount of water contained in the Earth's oceans.

The scientists noted that enstatite chondrites are entirely composed of material from the inner solar system -- essentially the same stuff that made up the Earth originally.

"Our discovery shows that the Earth's building blocks might have significantly contributed to the Earth's water," said Laurette Piani, lead author of the study published in the journal Science.

"Hydrogen-bearing material was present in the inner solar system at the time of the rocky planet formation, even though the temperatures were too high for water to condense," Piani said.

The findings are surprising because the Earth's building blocks are often presumed to be dry, the researchers said.

These blocks come from inner zones of the solar system where temperatures would have been too high for water to condense and come together with other solids during planet formation, they said.

The meteorites provide a clue that water didn't have to come from far away, according to the researchers.

"The most interesting part of the discovery for me is that enstatite chondrites, which were believed to be almost 'dry,' contain an unexpectedly high abundance of water," said Lionel Vacher, a postdoctoral researcher at Washington University in the US.

Vacher prepared some of the enstatite chondrites in this study for water analysis while he was completing his PhD at Universite de Lorraine

Enstatite chondrites are rare, making up only about 2 per cent of known meteorites in collections, the researchers said.

However, their isotopic similarity to Earth make them particularly compelling, they said.

According to the researchers, enstatite chondrites have similar oxygen, titanium and calcium isotopes as Earth, and their study showed that their hydrogen and nitrogen isotopes are similar to Earth's, too.

This story has been published from a wire agency feed without modifications to the text.

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LANDSLIDE SUSCEPTIBILITY MAPPING OF MUSSOORIE AND ITS SURROUNDING AREAS IN UTTARAKHAND HIMALAYA

Relevant for: Geography | Topic: Mountains, changes therein and in Flora & Fauna and the Effects of such changes

Like most hill townships, Mussoorie, the popular hill station in Uttarakhand, has witnessed several landslides, probably resulting from an increased spate of developmental activities. The increased disaster hazard has led scientists to map the landslide susceptibility of Mussoorie and surrounding areas, showing that 15 percent of the region is highly susceptible to landslides.

Scientists from Wadia Institute of Himalayan Geology (WIHG), an autonomous institute under the Department of Science and Technology, Govt. of India, carried out the study in Mussoorie township and its surroundings covering 84 square km in the Lesser Himalaya. They found that dominant part of the area falling under very high and high landslide susceptible zone lies in the settlement area --. Bhataghat, George Everest, Kempty fall, Khatapani, Library road, Galogidhar, and Hathipaon and are covered by highly fractured Krol limestone exhibiting slope more than 60 degrees.

The Landslide Susceptibility Mapping (LSM) published in the Journal of Earth System Science also showed that about 29% of the area falls in the moderate landslide susceptible zone and 56% in low to very low landslide susceptible zone.

The researchers from WIHG carried out the study using bivariate statistical Yule Coefficient (YC) method utilizing Geographic Information System (GIS) and high-resolution satellite imageries.

According to their study, various possible causative factors of landslides in the study area include lithology, landuse-landcover (LULC), slope, aspect, curvature, elevation, road-cut drainage, and lineament. The WIHG team obtained Landslide Occurrence Favourability Score (LOFS) for a particular class of the causal factor of landslide and subsequently calculated the weight of each factor of landslide to finally generate Landslide Susceptible Index (LSI) in GIS platform. This has been reclassified into five zones using natural break criteria.

The accuracy of this map was verified by using the Success Rate Curve (SRC) and Predication Rate Curve (PRC) exhibiting the Area Under Curve (AUC) for SRC as 0.75 and for PRC as 0.70 indicating a good correlation between different landslide susceptible zones and the occurrence of landslides.

The study could help initiate a large scale landslide hazard, risk, and vulnerability assessment (HRVA) of the hilly townships in different parts of India.

(Publication link: <https://doi.org/10.1007/s12040-020-01428-7>)

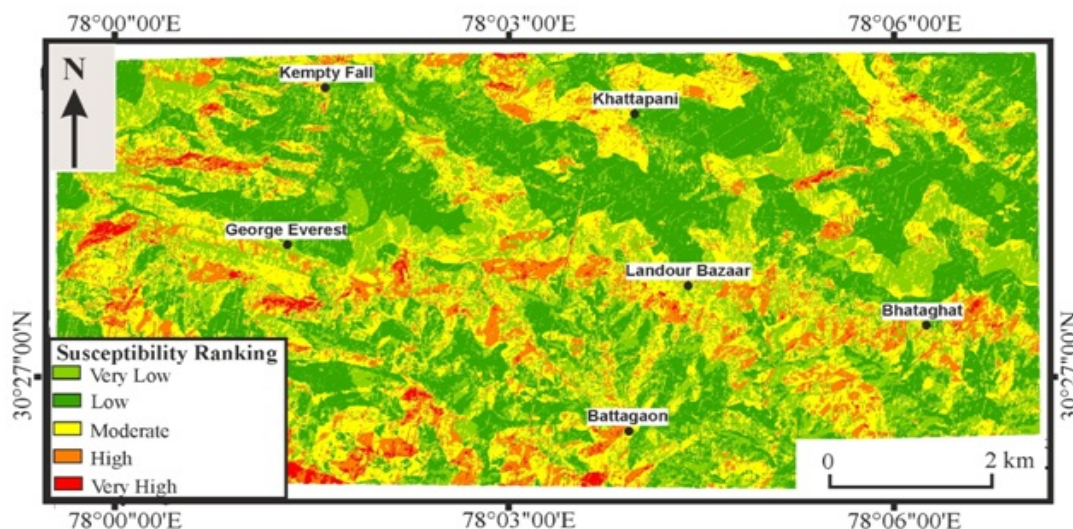


Figure - Landslide susceptible map of the Mussoorie Township and its surrounding areas

NB/KGS(DST Media Cell)

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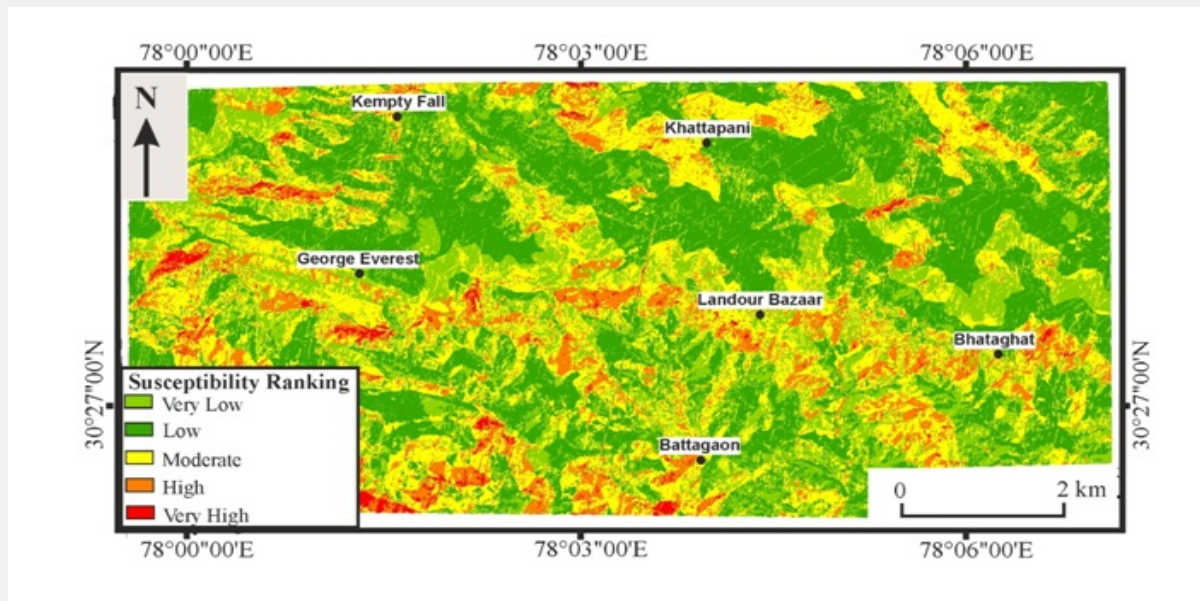


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THE GREAT GREYING OF CHINA

Relevant for: Geography | Topic: Demography of the World - Population Trends

China's one child policy (OCP) was conceived by Senior Leader Deng Xiaoping in 1979 to seek popular support for the Chinese Communist Party (CCP) after Mao's disastrous 'Great Leap Forward' and 'Cultural Revolution' (which led to the death of about 60-65 million people). Prof. David Lampton, an American sinologist, has observed that Deng was worried that "if the party did not produce significant gains in per capita income, it would lose what little legitimacy" it had retained.

The results of the one child policy have been disastrous. Average birth rate in China has fallen to 1.6 births per woman (National Bureau of Statistics of China) in 2017, though the unofficial figures put it as low as 1.05 (the United States: 1.77, India: 2.24) and much less than the population replacement rate of 2.1. Fewer children were born and of them, fewer were females (given China's preference for boys like in some other countries). Research by Prof. Yi Fuxian (2019) at the University of Wisconsin-Madison, U.S., reveals that the proportion of China's population aged above 65 years would increase from 10% in 2010 to 32.6% in 2050 (corresponding figures for India are 5.6% and 14.2% and the U.S. 14.6% and 23.2%). Its labour force (ages 20-64) will reduce from about a billion in 2017 to 787 million by 2050. Thus, China will be a country dominated progressively by older people in the coming years.

Also read | [The challenge to arrest the greying of China](#)

Despite the [raising of the limit to two children in 2016](#), the number of newborns has not improved and slipped to the pre-2016 level. The one child policy has changed China's child-bearing attitudes for the worse as many young couples do not want to have two babies for economic and lifestyle reasons. Prof. Fuxian has affirmed that China's population has started contracting from 2018 onwards; local authorities in China bloat the births and school enrolment figures to seek more funds from the central government. If China can stabilise its fertility rate at 1.2, its population will fall to 1.07 billion in 2050 and 480 million by 2100.

The aging population will have a multi-dimensional impact. China will need huge expenditures on health, social welfare and pensions; its savings rate will decline; a fall in the number of young people will lead to a decline in manufacturing, exports, and also mean lower revenues for government. With its annual per capita income at \$10,000, increasing population of older people and slowing economic growth rates, China will get old before reaching the levels of rich countries like the United States, Singapore, Japan and others. China's armed forces are already struggling as many one child policy children are often misfit for fighting in tougher conditions.

Will the population decline create a richer society in China? Japanese economist Prof. Hisakazu Kato, says, using Japan's experience, that it is unlikely as a smaller population reduces intellectual exchanges among diverse human groups, reducing chances of the emergence of great innovators. Developed countries have reduced the impact of declining population by raising the total factor productivity (TFP) growth (ratio of output versus cost of inputs per hourly basis).

China has already availed its rapid TFP growth by shifting its large population of migrant workers from agriculture to manufacturing and reforms in state-owned enterprises, housing and other sectors (China's TFP grew by 5% annually in 1980s, 7% during 1991-95, 4% from 1995 to 2010 and 2% from 2010-2015, before declining to lower levels afterwards).

Three factors are considered critical for increasing the TFP: market reforms, improvement of governance and scaling of human skills in manufacturing and services. Many economists have argued that faster rates of TFP growth are associated with rapid and liberal economic reforms. In China's case, while President Xi has talked of market reforms and increasing consumption, there has been little progress on the ground on issues such as opening of services such as banking, insurance, education or the establishment of an independent legal system for the enforcement of contracts or a creative education system. Post-2008, China's economic growth has been driven progressively by higher government investment which has created unproductive assets in many cases, i.e., overcapacity in metals, cement and other industries, empty apartment complexes, or rarely used infrastructure such as metro networks, oil pipelines and ports.

China has never ranked very high in governance indicators of international organisations such as the World Bank; in 2016, it was in 68th percentile for 'government effectiveness' and 77th in the annual Corruption Perceptions Index of Transparency International (2017). Instead of giving representation to new interest groups such as industrialists, micro, small and medium enterprises (MSMEs), professionals, media and academics, Mr. Xi has moved in the direction of curbing any dissent and establishing absolute control over Chinese society.

In improvement of China's human resources, there are big variations in high school pass rates of urban (90%) and rural children (24%). Considering that about 40% of China's population still lives in rural areas, this huge gap will be an inhibiting factor in raising TFP. In the last 70 years, only 15 countries have managed to climb from middle to high income status, e.g. Singapore, South Korea, Taiwan, others and all of them had skilled their workforces with three quarters or more of their working population having completed high school.

Under Mr. Xi, China is not moving in the direction of reforms incorporated by developed countries, but evolving its own agenda mainly focused on administrative and bureaucratic improvements concomitantly enhancing party's control over the economy. Even many Chinese economists are doubtful if Mr. Xi's plans for augmenting TFP and high economic growth through induction of emerging technologies such as 5G, artificial intelligence or rapid urbanisation will succeed in the absence of much-needed reforms in economy, governance and the education system.

Also, unlike the past, China will face a hostile external environment in the coming years as a reaction to Mr. Xi's unfair and aggressive policies, which will further constrain cooperation in new technologies. In this background, a more likely scenario is that China's economic growth will stutter and decline as the impact of aging gets more pronounced in the coming years.

Yogesh Gupta is a former Ambassador

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NEW INFORMATION ON ATMOSPHERIC TURBULENCE PARAMETERS OF HIMALAYA REGION CAN HELP WEATHER PREDICTION

Relevant for: Geography | Topic: Important Geophysical Phenomenon - Atmosphere, its Composition and Circulation

Weather predictions becoming more certain and help in preventing air traffic disasters may now be easier and, especially in the Himalaya region. Thanks to certain atmospheric turbulence parameters specific to the Himalaya region that scientists have calculated.

Scientists at the **Aryabhata Research Institute of Observational Sciences (ARIES)**, an autonomous institute under the Department of Science & Technology (DST), Govt. of India, have estimated turbulence parameters in the lower troposphere over the central Himalayan region for the first time.

The researchers have calculated the magnitude of refractive index structure (C_n^2), a constant that represents the strength of the atmospheric turbulence using observation from their Stratosphere Troposphere Radar (S T Radar). In the **study published in Radio Science Journal** led by Aditya Jaiswal, a Ph.D. student at ARIES Nainital and ARIES faculties D.V. Phani Kumar, S. Bhattacharjee, and Manish Naja have found that the refractive index structure constant (C_n^2) is as large as $10^{-14} \text{ m}^{-2/3}$. Such large values at the lower altitudes are due to the mountain wave activities and presence of low-level clouds.

Proper and timely information of the higher values of the atmospheric turbulence parameters and understanding of time and space distribution of turbulence structure in the troposphere could help improve performance of numerical weather prediction and climate models.

While the turbulence parameters for southern India were known earlier, the same were not known over the Himalayan region. Thus some approximate values were used by modelers for calculation. They have now been found to be much higher over the Himalayan region. Now modelers will be able to update these values in their existing models. This will help in improving weather predictions. Also, precise knowledge on turbulence over this region will help in safe air traffic movements.

It is also important to model clear-air turbulence as that would aid in limiting the air traffic disasters, particularly over the complex mountainous regions. Low levels of cloud are generated in a mountainous region with complex topography. Because of this, stable air in this region is set into oscillations known as mountain waves and lee waves. Characterization of turbulence in the mountainous region is vital to understand the dynamics of mountain induced wave disturbances and other related phenomena, which has crucial role in modulating the general circulation wind patterns.

Talking about the SERB, DST funded indigenously developed ST Radar used in the study, DST Secretary Professor Ashutosh Sharma said, "Development of such radar at 206.5 MHz, within the country, will further strengthen our efforts to better understand the regional changes in weather and climate, particularly in the Himalayan region, which is having complex topography."

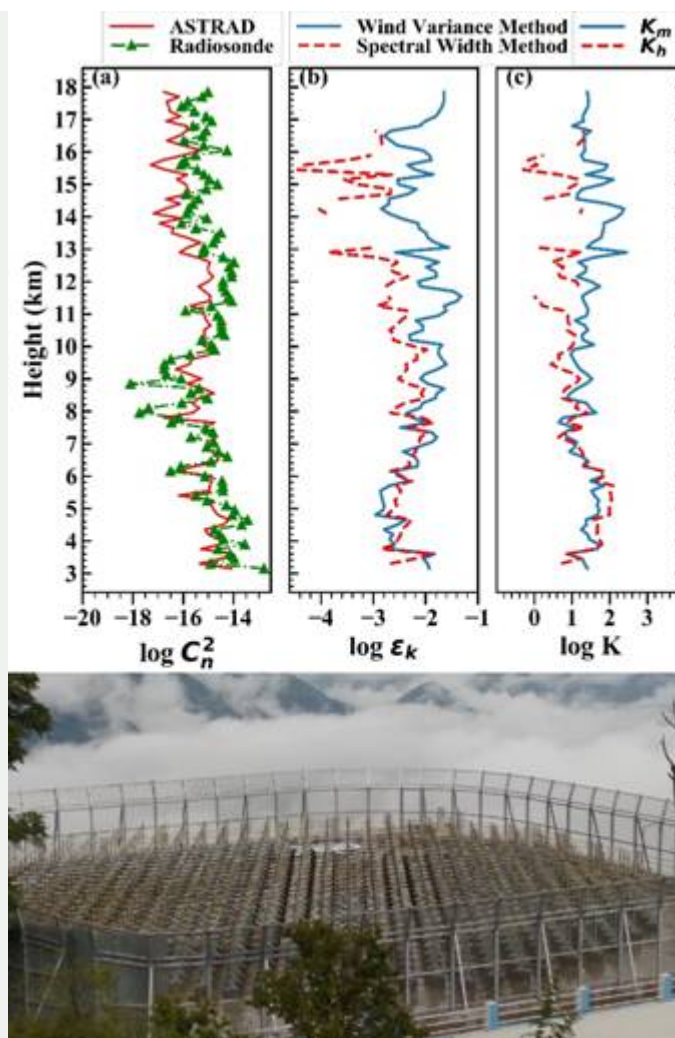


Figure 1: Vertical variations in (a) C_n^2 ($m^{-2/3}$), (b) turbulence parameters, kinetic energy dissipation rate, ϵ_k ($m^2 s^{-3}$), and (c) thermal eddy diffusivity coefficient, K_h ($m^2 s^{-1}$) by spectral width method and coefficient of eddy diffusivity due to momentum, K_m ($m^2 s^{-1}$) by wind variance method obtained from ARIES ST Radar on 20 April 2019. C_n^2 derived from balloon-borne GPS radiosonde, launched from ARIES Nainital, is also shown. Array of 588 antennae on the rooftop of the ARIES ST Radar building is shown in the bottom panel.

[Publication link: <https://doi.org/10.1029/2019RS006979> .

For more details, contact Manish Naja (manish@aries.res.in, 9411793315).]

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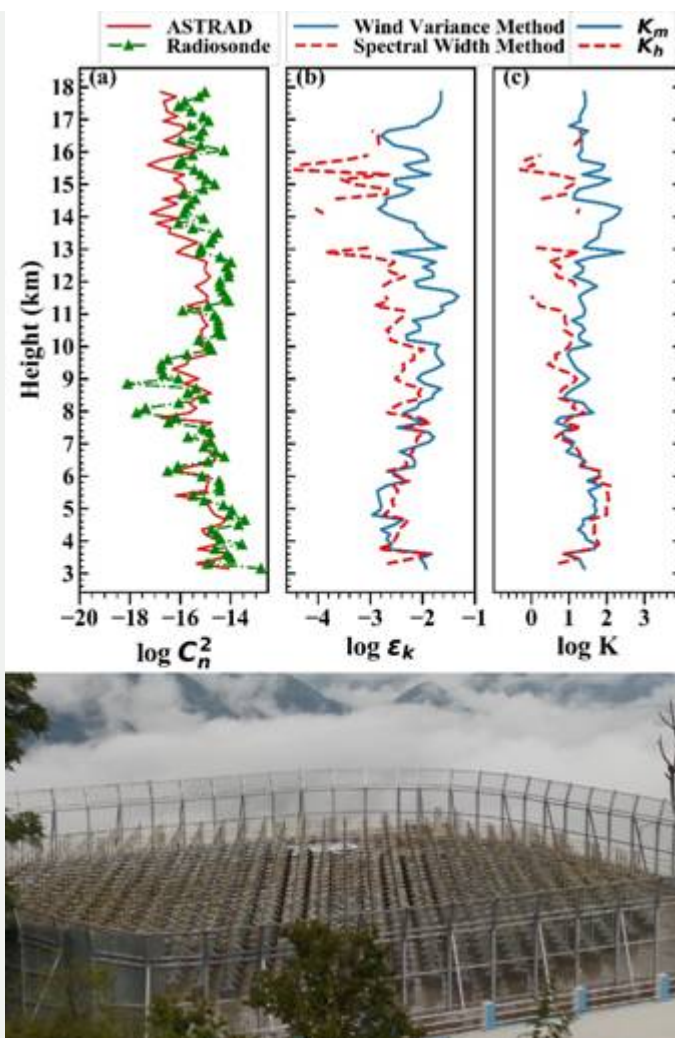


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NATIONAL RIVER CONSERVATION PROGRAMME

Relevant for: Geography | Topic: Rivers, changes therein and in Flora & Fauna and the Effects of such changes

Cleaning and rejuvenation of rivers is a continuous process, and Central Government is supplementing the efforts of the State Governments and Union Territories in addressing the challenges of pollution abatement of rivers by providing financial and technical assistance through National River Conservation Plan (NRCP) for identified polluted river stretches. Under NRCP, various pollution abatement works relating to interception & diversion of raw sewage, construction of sewerage systems, setting up of sewage treatment plants, low cost sanitation, river front/bathing ghat development, public participation & awareness programme, etc are taken.

State/ Union Territory-wise details of sewage treatment plants sanctioned, constructed and capacity created in million liters per day (MLD) since 2018 till date under NRCP are as under

S.No.

State/UTs Name

Sewage Treatment Capacity Sanctioned (MLD)

No. of Sewage Treatment Plants Sanctioned

Sewage Treatment Capacity Created (MLD)

No. of Sewage Treatment Plants setup.

1

Gujarat

250.00

37

48.00

1

2

Jammu & Kashmir

13.60

3

-

-
3.
Manipur
17.00

2

-

-

4.

Sikkim

3.25

1

1.60

1

This information was given by the Minister of State for Jal Shakti & Social Justice and Empowerment, Shri Rattan Lal Kataria in a written reply in Rajya Sabha.

APS/MG/AS

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1

Gujarat

250.00

37

48.00

1

2

Jammu & Kashmir

13.60

3

-

-

3.

Manipur

17.00

2

-

-

4.

Sikkim

3.25

1

1.60

1

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VENUS IN FOCUS

Relevant for: Geography | Topic: The Earth and the Solar System

Venus, the hottest planet in the solar system, has not enjoyed as much recent attention as Mars, as far as space missions are concerned. With surface temperatures of above 460° Celsius that can melt even a metal like lead, and a heavy atmosphere of carbon dioxide, the planet was considered hostile to life. This despite its being similar in size to the Earth and rocky, so much so that it is often called the Earth's "sister planet". There was some excitement when the European Space Agency's mission, Venus Express, found signs of ozone, made of three oxygen atoms and considered a biomarker, in the upper atmosphere of Venus, in 2011. But the recent [discovery of traces of phosphine](#), another biomarker, in its atmosphere has just given the search for extraterrestrial life a shot in the arm. Phosphine, a compound of one phosphorous atom and three hydrogen atoms, is given out by some microbes during biochemical processes. In an atmosphere rich in carbon dioxide, it is likely to get destroyed soon. However, the researchers estimate that phosphine forms about 20 parts per billion of Venus's atmosphere. This fact, when added to the hostile conditions on its surface, yields tantalising possibilities — of phosphine's survival through extraordinary chemistry and thermodynamics or the stubborn triumph of biology and life.

This finding was the result of years of careful study by a team of international astronomers led by Jane S. Greaves of Cardiff University and was announced in a paper published in *Nature Astronomy*. Prof. Greaves first identified phosphine in Venus's atmosphere in 2017, using the James Clerk Maxwell Telescope in Hawaii. Further study and precise observations using the Atacama Large Millimeter/sub-millimeter Array facility in Chile confirmed the suspicions of the researchers in 2019. The very caution exercised by the researchers in announcing the fact underlines the lack of knowledge about these systems and the need to make sure before celebrating the discovery of extraterrestrial life. This can now only be taken further by making *in situ* measurements in the atmosphere of Venus. This poses its own challenges. Apart from the high surface temperature and dense atmosphere, the presence of sulphuric acid in the atmosphere of Venus makes it a highly corrosive environment. Perhaps flying at a height and sending down drones or balloons would be more feasible than a landing. Missions to Venus have been planned by NASA and ISRO. While NASA's mission is slated for launch next year, ISRO is looking at 2023 right now. As is not uncommon in space missions, a spate of collaborations may well improve chances of efficiently probing the dense atmosphere of the planetary neighbour.

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NEW ATOMIC POWER PLANTS

Relevant for: Geography | Topic: Distribution of Key Natural Resources - Energy Resources of the World

During the last three years and the current year, the Government has accorded administrative approval and financial sanction for construction of twelve (12) nuclear power reactors - ten (10) indigenous 700 MW Pressurized Heavy Water Reactors (PHWRs) to be set up in fleet mode & two (02) units of Light Water Reactors (LWRs) to be set up in cooperation with Russian Federation to enhance nuclear power capacity in the country. The details of these projects are given below:

State

Location

Project

Capacity

(MW)

MW)

PHWRs to be set up in fleet mode

Madhya Pradesh

Chutka

Chutka -1&2

2 X 700

Karnataka

Kaiga

Kaiga - 5&6

2 X 700

Rajasthan

Mahi Banswara

Mahi Banswara - 1&2

2 X 700

Haryana

Gorakhpur

GHAVP - 3&4

2 X 700

Rajasthan

Mahi Banswara

Mahi Banswara - 3&4

2 X 700

LWRs to be set up in cooperation with Russian Federation

Tamil Nadu

Kudankulam

KKNPP - 5&6

2 X 1000

Presently, two public sector companies of the Department of Atomic Energy, Nuclear Power Corporation of India Limited (NPCIL) and BharatiyaNabhikiyaVidyut Nigam Limited (BHAVINI) are involved in nuclear power generation.

There is no proposal under consideration at present to permit non-Government sector in the area of nuclear power generation. However, the private sector participates in the nuclear power sector by providing core reactor components, equipment, materials and services in areas that include construction, fabrication & erection of equipment, piping, electrical, instrumentation, consultancy, auxiliary and logistical services.

This information was given by the Union Minister of State (Independent Charge), Development of North Eastern Region (DoNER), MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, DrJitendra Singh in a written reply in Lok Sabha today.

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INVESTMENT IN ATOMIC ENERGY

Relevant for: Geography | Topic: Distribution of Key Natural Resources - Energy Resources of the World

There are presently twenty-two (22) reactors with a capacity of 6780 MW in operation in the country. In addition, nine (9) reactors, with a total capacity of 6700 MW are presently under construction. The Government has also accorded administrative approval and financial sanction for twelve (12) more reactors with an aggregate capacity of 9000 MW in June, 2017.

The Capital investment for the nuclear power projects is being funded with a debt to equity ratio of 70:30. The equity part is funded from internal resources of Nuclear Power Corporation of India Limited (NPCIL) and Government Budgetary Support.

The present policy (Consolidated FDI Policy of Government) puts atomic energy in the list of prohibited sectors. However, there is no restriction on FDI in the nuclear industry for manufacturing of equipment and providing other supplies for nuclear power plants and related other facilities.

Government of India has amended the Atomic Energy Act, 1962 in 2015 to enable the licensing of NPCIL's Joint Ventures for setting up nuclear power projects. To boost domestic investment, Joint Ventures have been formed by NPCIL with public sector majors National Thermal Power Corporation Limited (NTPC), Indian Oil Corporation Limited (IOCL) and National Aluminium Company Limited (NALCO).

This information was given by the Union Minister of State (Independent Charge), Development of North Eastern Region (DoNER), MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, DrJitendra Singh in a written reply in Lok Sabha today.

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THE HINDU EXPLAINS

Relevant for: Geography | Topic: The Earth and the Solar System

This artistic illustration depicts the Venusian surface and atmosphere, as well as phosphine molecules. Photo: ESO via Reuters

The story so far: An international team of astronomers led by Jane S. Greaves of Cardiff University and University of Cambridge, U.K., has [announced the discovery of traces of a molecule known as phosphine on Venus](#). This has caused great excitement because, given the chemical and geological composition of Venus, this can imply the existence of life forms that release this substance through bio-chemical pathways.

The researchers say in the paper, “[Phosphine] could originate from unknown photochemistry or geochemistry, or, by analogy with biological production of [phosphine] on Earth, from the presence of life.” The paper, published on September 14 in *Nature Astronomy*, is a careful exposition of the work done over many years. Professor Greaves first observed phosphine on Venus using the James Clerk Maxwell Telescope in the Mauna Kea observatory in Hawaii in 2017. Pursuing the search further with the 45-telescope array ALMA (Atacama Large Millimeter/submillimeter Array) in Chile led to a confirmation of their observations by this extremely sensitive instrument in 2019.

Editorial | [Venus in focus](#)

The detected presence of phosphine on Venus does convey the possibility of life there. After detecting the phosphine and estimating the amount in Venus’s atmosphere — 20 parts per billion — researchers have calculated whether this amount of phosphine can be produced by natural chemical processes, such as sunlight, volcanoes erupting and lightning. The other mechanisms could at most produce only ten-thousandth of the amount of phosphine they have detected. However, they do not rule out the possibility that there could be unknown natural processes (photochemistry or geochemistry) that can produce this amount of the biomarker. Therefore, more work is needed to prove that it is indeed because of bacteria, or some sort of life, that there is so much phosphine on Venus.

A molecule of phosphine gas consists of a phosphorus atom surrounded by three hydrogen atoms, just like ammonia consists of a nitrogen atom surrounded by three hydrogen atoms. On Earth, this molecule is produced by industrial processes. It is also produced by some anaerobic bacteria, which live in oxygen-sparse environments such as sewers, landfills, or even animal guts. If you can rule out the production of the gas through chemistry, it is the biochemical processes that form a source of the gas — the anaerobic bacteria — hence it is considered a biomarker in astronomy.

Yes, it has been seen on Jupiter and Saturn. As early as the 1970s, when the first exoplanets were not even discovered experimentally, phosphine was seen on Jupiter. But there it is said to form deep in the interiors of the gas giant and rise to the top, in a purely chemical process. But now, on Venus there is a doubt.

The surface temperature of Venus, at about 470 degrees Celsius, is too hot to harbour life as we know it. It is hot enough to melt lead. It is hotter than Mercury which is closest to the sun. According to a senior astronomer who is a member of the Astronomical Society of India, this is because Venus has experienced a runaway greenhouse effect which traps all heat that falls on it. But high up in its atmosphere, there are clouds which can provide a cooler home for microbial

life. Even there, the atmosphere is teeming with sulphuric acid vapour which makes it extremely hostile, thereby reducing the chance of finding life forms. According to the expert, the phosphine signature could be the sign of some extraordinary chemistry, as it could be of life forms. The next logical step is to actually do *in situ* measurements from Venus's atmosphere by sending space probes there.

Also read | [Venus may have once been habitable: NASA](#)

There have been several space missions to study Venus, and some of the recent dedicated missions are the [European Space Agency's Venus Express](#) and [JAXA's Akatsuki](#). Many space missions have flown by Venus: for example, [NASA's Parker Solar Probe used the gravity of Venus](#) to achieve gravity-assisted boosts to its velocity on its journey to the Sun. NASA is planning a mission to Venus to be launched next year. The Indian Venus mission is being developed. Though formally unnamed, it is referred to as Shukrayaan-1.

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GROUNDWATER EXTRACTION NORMS TIGHTENED

Relevant for: Geography | Topic: Distribution of key natural resources - Water Resources incl. Rivers & related issues in world & India

A file photo used for representational purpose only.

The government has made it harder for industries to extract groundwater and asked the States to “review” policies that allow subsidised and free electricity to farmers as well bring in a “suitable water pricing policy” to reduce reliance on groundwater extraction.

The bulk of groundwater extraction today is from the agriculture sector though there is considerable uncertainty on the exact numbers.

Currently, industries and establishments must get a No Objection Certificate (NOC) from the Central Groundwater Authority as part of building permission.

According to the new rules made public late Friday, “no new major industries” would be given NOCs in over-exploited assessment blocks. Based on groundwater levels, areas across the country are split into three categories: Over-exploited, Critical and Semi critical. The first refers to groundwater being extracted more than what’s recharged, critical—where the groundwater taken out is 90-100% of what's recharged—and semi-critical where extraction rate is 70%-90%.

Places with lower extraction rates are deemed ‘safe’ blocks. Of the Central Groundwater Board’s, 6,584 groundwater assessment units across the country, 1034 are over-exploited, 253 are critical and 681 are semi-critical.

“Expansion of the existing industries involving increase in quantum of groundwater abstraction in over-exploited assessment units shall not be permitted. NOC shall not be granted to new packaged water industries in overexploited areas,” the notification says.

A previous version of the notification permitted extraction by packaged drinking water companies in the over-exploited areas.

However, those exempt from seeking NOCs in the latest guidelines are : Individual domestic consumers in both rural and urban areas for drinking water and domestic uses, rural drinking water supply schemes, Armed Forces Establishments and Central Armed Police Forces establishments in both rural and urban areas, Agricultural activities and Micro and small Enterprises drawing groundwater less than 10 cubic metres/day.

All residential apartments/ group housing societies/ Government water supply agencies in urban areas would be required to pay ground water abstraction charges.

All industries/mining/ infrastructure projects drawing groundwater in safe, semi-critical and critical assessment units will have to pay groundwater abstraction charges based on quantum of groundwater extraction and category of assessment unit.

On December 2018, the CGWB (Central Ground Water Board) issued a draft notification that proposed a ‘water conservation fee’ for industrial extraction and this was roundly criticised. The National Green Tribunal stayed the draft in January 2019 terming it “unsustainable,” and having “serious shortcomings.” This led to several applications by commercial and industrial units for NOCs being on hold.

The latest guidelines also impose heavy fines for not complying with NOC requirements. For instance, not constructing appropriate water recharge structures could bring a fine of up to Rs 500,000 and injecting treated/untreated water into an aquifer system could set back a company by 10,00,000.

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