

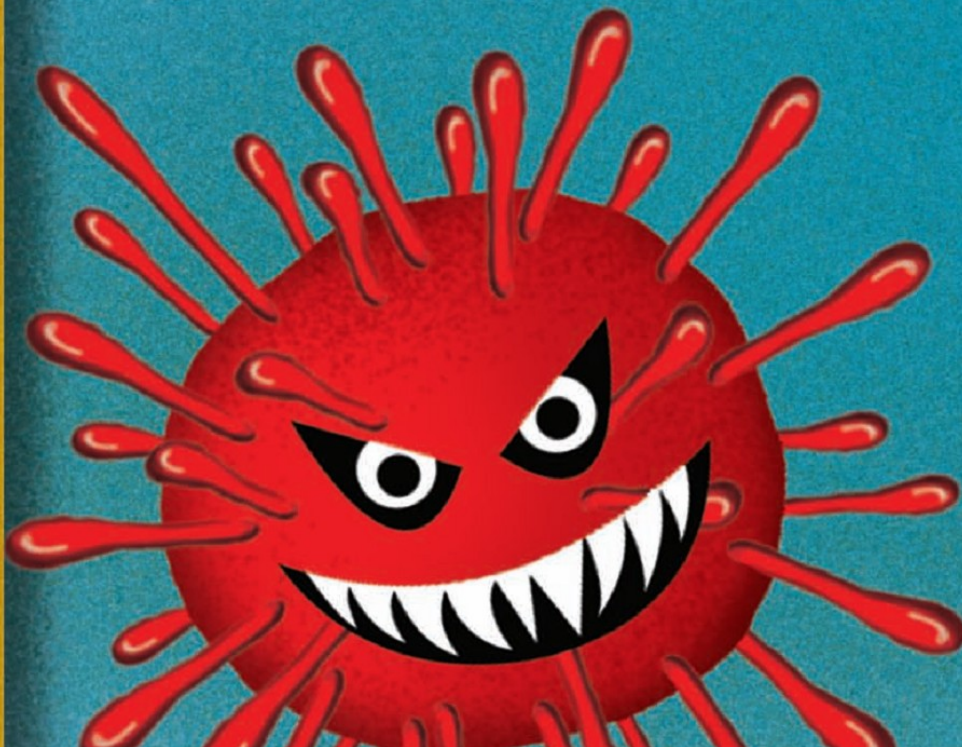
+ CLIMATE DIARY | HILARIOUS TIMES | SPOOF

gobar times

ISSUE NO: 223, April 1-15, 2020

A DOWN TO EARTH SUPPLEMENT FOR THE YOUNG AND CURIOUS

secret
~~diary~~ power
of a
super killer



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Green Schools Programme thanks schools for participating in GSP Audit 2019

6,787
schools registered
for the audit

1,998
schools completed
the audit process
and made
submissions

18
schools took part in
the audit but could
not complete it

19
schools completed
the audit but did
not make
submissions

Schools that have completed the submission process of GSP Audit 2019 can access all audit reports— Performance Report, Response Report and digital certificates—from <http://www.greenschoolsprogramme.org/audit/19/downloadLogin>

OR click on the **"Download reports and certificates"** tab on the GSP website (See arrow below)



To log in, enter your GSP Audit username and password.

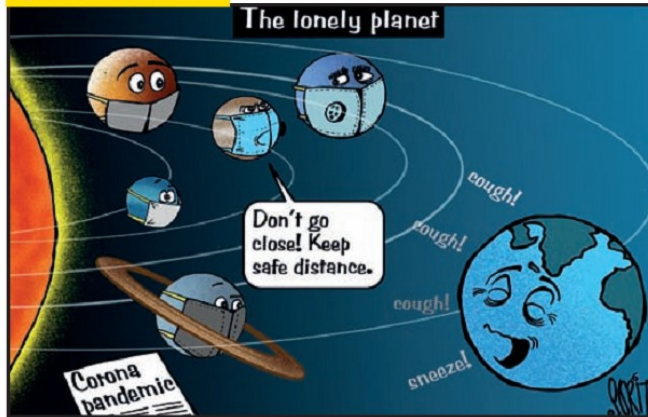
See you in Audit 2020 with continued growth in your school's performance!

Note: Names on digital certificates are according to the entries received during the GSP Audit 2019 and cannot be changed. For GSP Audit 2020, participants are requested to check the correct spelling of names before sharing them with us. In case participating schools wish to change/correct the name of the school or update the names of the Principal or the GSP co-ordinator, please write to us at support@greenschoolsprogramme.org

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Inbox

Green Strokes



Pandemic vs "The Great Lafayette"

On May 9, 1911, around 3,000 people living in Scotland's capital Edinburgh went to see Sigmund Neuberger, the magician famous by the name of "The Great Lafayette", at The Palace Empire Theatre. Just as the act was coming to an end, a lantern hanging above the stage caught fire. The audience were not alarmed by this. Special effects were always a part of Neuberger's show, therefore, they thought it was part of his act.

Neuberger, however, sensed danger and acted spontaneously. He dropped the curtains in place, ensuring that the audience was at once separated from the stage. He, then, told the unsuspecting audience to leave the auditorium calmly. As if, there was a final act waiting for them outside.

Imagine what would have happened if Neuberger panicked at that time? Thanks to his presence of mind, the entire audience was evacuated from the auditorium without any injury or harm. That day, Neuberger saved 3,000 lives.

Today, our world is under the grip of a catastrophe and this time it is not limited to an auditorium. It's a pandemic known as COVID-19. It's disturbing to see how people across world are responding to this crisis. Fear and panic have taken over people. This is reason why they're stockpiling masks, hand sanitisers and day-to-day essential items. In the US, people have reportedly started stockpiling weapons! Yes, weapons in anticipation of food riots.

Will panic-driven stockpiling help us to fight the pandemic? NO. Instead, we need to act calmly and responsibly. Just like "The Great Lafayette" did in 1911. This is our only way to win the fight against the virus.

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Dear GT,
 Mosquitoes are cold-blooded creatures. In GT's December 2019 edition, the word warm-blooded has been used to describe them in the *Climate Diary* section. This is incorrect.



**Pranav Sarkar, Jeet Das,
 Md Afsar and Suraj Jena of
 Sahayata Kendra, Noida,
 Uttar Pradesh via letter**

Dear friends,

You are correct. Mosquitoes are cold-blooded creatures and this is why they cannot adapt to extreme temperatures. However, while most mosquitoes do not survive in cold conditions, few species are found in Russia, Canada, Alaska, Norway and Greenland. These are located in the Arctic Tundra region, which remains cold and dry almost throughout the year.

We regret the error and hope that you will keep writing to us—**Editor, Gobar Times**

We are waiting for your letters, responses and stories. Send them to Sorit Gupto, Editor, Gobar Times, 41, Tughlakabad Institutional Area, New Delhi-110062.

Email: sorit@cseindia.org

Scrapbook



Freeze frame by Vishwa Kulanthaivel

Tooth connection: Cats and dogs are part of a common order of animals known as the Carnivora order. This group consists of animals with blade-like carnassial teeth designed for flesh-eating. Among other Carnivorans are bears, seals and walruses.

Vishwa Kulanthaivel is a 16-year-old photographer from Madurai, Tamil Nadu who aspires to pursue photography as a profession.

Send your best clicks to sorit@cseindia.org

Digits speak

Since the 1980s, Earth has been getting greener, says a recent review paper published by the *Nature Reviews Earth & Environment* journal. This can help moderate global warming. Here are a few facts shared by the report:

52%
of global vegetated
lands recorded
increasing leaf area
index in growing season

52 lakh km
of rainforest showed
increase in leaf area
between 2000 and 2017

30%
of the total increase in
global leaf area index
came from India and
China



Note: Leaf area index (LAI) refers to the amount of leaf area relative to ground area

Source: "Characteristics, drivers and feedbacks of global greening", *Nature Reviews Earth & Environment* (December 9, 2019)

Eat what you grow

Viswema is a village located in Nagaland's Kohima district where organic farming has become a trend in several schools and homes. It all began in 2011 when a group of students from the K Khel Government Middle School (GMS) started growing organic crops in a small patch of wasteland in their campus. Students from classes 1-8 grew beans, cabbage, pumpkin, squash, pomegranate, lemons, maize and Naga dal following conventional farming methods.



These were then used to prepare mid-day meals. Soon, other schools started practicing organic farming. For Viswema, where more than half the working population is engaged in farming, organic farming has helped villagers eat healthy without compromising on nutrition and soil quality.

Sapling in a bottle

Shabnam CS, a class 5 student of the Jyothi Niwas School, in Karnataka's Srirangapatna town loves painting. One day she found a plastic bottle outside her house and decided to try her artistic skills on it. She cut the bottle and painted it with bright colours. Taking the advice of her mother, the 11-year-old planted saplings in the discarded bottles and made plant holders out of them.

So far she has made over 1,000 of these plant holders. Some she used to decorate her house, others she distributed as gifts. As a result of this, brightly-coloured plant holders can be seen adorning many houses in Srirangapatna.



We're not waiting 5, 10, 20 years to take action. We're not the future of the world, we're the present. We're acting now.



Salvador Gómez-Colón

In 2017, this 16-year-old from Puerto Rico distributed solar-powered lamps and hand-powered washing machines in communities with poor access to clean water and electricity. Due to Hurricane Maria, the country was struggling to meet supplies back then

The curious Curies

On April 20, 1902, Marie and Pierre Curie successfully isolated radioactive radium salts from pitchblende, a mineral, in a laboratory in Paris, France. Inspired by French physicist Henri Becquerel's 1896 experiment on phosphorescence, or the phenomenon that allows certain objects to glow in the dark, the Curries were able to find traces of two radioactive elements—polonium (Element 84) and radium (Element 88). In 1903, Marie Curie received the Nobel Prize in Physics making her the world's first woman to win the prize. Curie shared the 1903 Nobel with her fellow researcher Pierre Curie and Becquerel for their combined work on radioactivity.

In 1911, she created history again by becoming the first woman to have won two Nobel awards.

The 1911 Nobel Prize in Chemistry was awarded to Marie after she managed to produce radium as a pure metal. This proved the new element's existence beyond doubt.

However, this was not the last Nobel for the Curie family. The 1935 Nobel in Chemistry went to Irène Curie and her husband and co-researcher Frédéric Joliot for their joint work on the artificial creation of new radioactive elements. The Curies have received a total of four of Nobel prizes, the highest won by a single family. They also have the unique distinction of having three Nobel-prize winning members in the family.

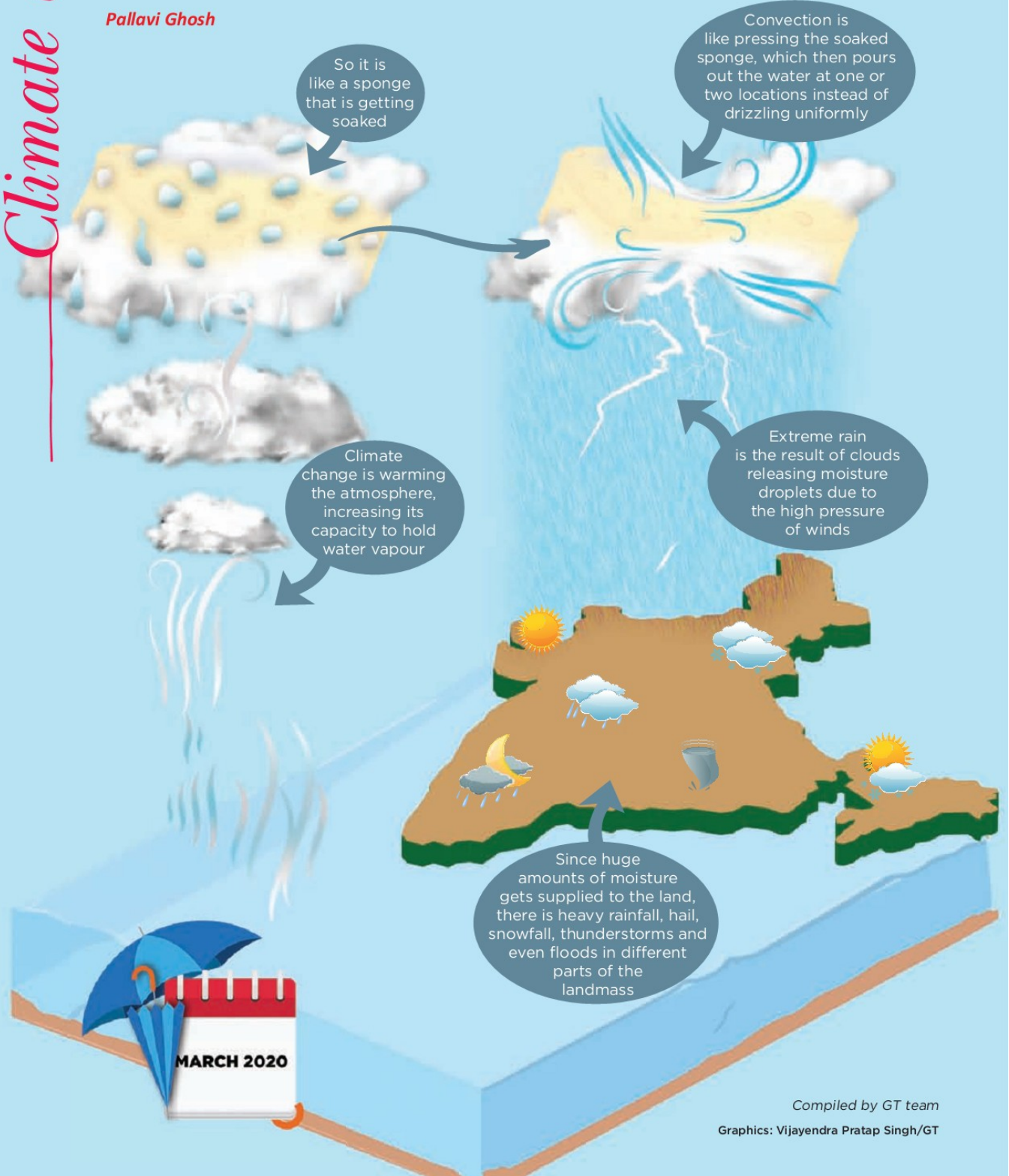


Compiled by Pallavi Ghosh

UMBRELLAS OUT IN MARCH

West Bengal, Jharkhand, Odisha and Madhya Pradesh were among the six states that received rainfall exceeding their long-term averages between March 1 and March 12

Pallavi Ghosh



Holi, famously known as the festival of colours, is celebrated in the month of March every year. Typically the day involves playing with dry and wet colours to mark the beginning of the spring season. In 2020, however, things were different. Instead of a bright, sunny day that we are used to during *Holi*, we woke up to a morning that was cold and breezy. In some parts of the country, there was even fog! Winter had not ended.

The winter-like conditions also encroached upon *Holi* celebrations, which had to be cut short to avoid catching a cold or fever. Between March 1 and 5, 222 meteorological districts in the country received 60 per cent more rainfall than

normal, according to data from the India Meteorological Department (IMD), India's apex weather forecasting body.

Heavy rainfall in Delhi, Uttar Pradesh and Madhya Pradesh; hail in parts of Rajasthan and snowfall in the Western Himalayan region kept temperatures below normal in these regions. The freak weather phenomenon was attributed to

western disturbances, storms that originate over the Mediterranean region and typically hit India in winter, bringing rain.

This is mainly happening due to global warming-induced climate change, according to experts. "Climate change is warming the atmosphere that can hold more water vapour. So it is like a sponge that is getting

different parts of the country is part of a pattern that has been observed since the past few years. During the Southwest monsoon, when most of India receives a majority of its rainfall, there were simultaneous floods and droughts in the same region, causing problems for people and their livelihoods.

As many as 1,808 lives were lost due to floods in 2018, shared the Union government in response to a question raised in the Parliament. Nearly 4.9 million hectares of land, roughly the size of India's largest district Kutch, were affected by the 2018 floods. The cost of flood-related damages was pegged at

₹95,000 crore.

Sudden meteorological changes are also making it difficult for weather forecasting agencies to predict weather. "Convection cells are like popcorn kernels. The entire popcorn kettle can be warm and of the same temperature, but which kernel will pop is very difficult to predict," Murtugudde explained. ♣



soaked. Convection is like pressing the soaked sponge which then pours out the water at one or two locations instead of drizzling uniformly. So we get extreme rain," said Raghu Murtugudde, a climate scientist at the University of Maryland, United States.

The uneven distribution of rainfall leading to droughts and dry spells at the same time in

Word stock

Foehn winds

are strong, gusty winds that cause downslope windstorms on mountains, often bringing warm air with them

Action

Smile Foundation is a New Delhi-based non profit that provides assistance to people in times of calamities such as floods, tsunamis and earthquakes

Visit: <https://www.smilefoundationindia.org/>

Weather news

At least six Indian states recorded "large excess" rainfall compared to their respective long-term averages between March 1 and March 12



Innovate and implement

Schools can play a key role in meeting India's 2022 renewable energy target. Here are a few learnings from the solar initiative of Centre for Science and Environment

Aditi Sharma

Once upon a time humans depended on the labour of animals and other humans to meet their daily energy requirements. From transport to agriculture, humans made use of natural resources like wind, water and gravity for their energy needs. Then came the fossil fuels. The discovery of coal, petroleum and natural gas marked the beginning of a new era in the 1700s, known as the Industrial era, when new energy sources paved the way for setting up the

energy-intensive factories that shape our economy today.

Benjamin Franklin's discovery of electricity in 1752 was followed by a series of related inventions by scientists like Alessandro Volta, Michael Faraday and Thomas Alva Edison in the 19th century. These, together, helped the human civilisation lay the foundation of modern urban cities, where electricity is a key component. The entities capable of fulfilling the needs of this energy-intensive society

were the fossil fuel-dependent power plants, currently the world's primary source for electricity. But they have one side effect. They release large amount of carbon dioxide, a greenhouse gas (GHG) responsible for global warming.

The good news is that humans have taken note of the harmful effects of fossil fuel combustion and are making efforts to switch to renewable energy (RE) sources like the sun, wind and water. India, for



example, has set an ambitious target of adding 175 gigawatts (GW) of renewable energy by 2022 and schools can play a key role in meeting this target.

CSE's solar initiative

The "Solar On Schools" (sos) initiative of the New Delhi-based Centre for Science and Environment (CSE) identifies schools as key institutions of ground-level change. Besides helping young minds understand why a change in existing patterns of energy consumption is needed, they can serve as active grounds for solar initiatives in the country.

As part of the sos initiative, CSE's GSP team conducted a series of activities and awareness programmes on solar energy for schools in Himachal Pradesh and New Delhi. Through workshops and exposure visits, teachers were sensitised towards the need to switch to renewable energy. A science fair was also organised to help students understand the basics of solar energy through activity-based learning.

The GSP Energy Audit 2019 helped more than 1,800 schools assess their energy consumption patterns. Nearly 12 per cent of schools used solar energy, while only one per cent claimed to use biogas. Of the schools that had solar installations, 75 per cent did not avail subsidies under the various schemes launched by the Union and state governments.

What we learnt from SOS

At the end of a year-long marathon of solar energy-focused activities, the GSP team conducted a roundtable conference with government officials and its private partners

in New Delhi's India Habitat Centre on February 13, 2020. Here are a few major observations from the sos initiative:

- Hands-on activities like developing models on renewable energy and exposure visits, when made a part of classroom discussions, will help students learn and understand the practical, real-life aspects of solar energy.
- Students and teachers were made familiar with terminologies like the grid operation model, net metering, gross metering and installed capacity to improve their understanding of solar power generation.
- The Science fair gave students a platform to come up with practical solutions for alternative sources of energy. On-site development of these models can help bring about conceptual clarity through application-based learning.
- Students were excited to receive solar kits, which they used to develop a series of solar-powered models like fans, cars and games. Learning can, however, be maximised by distributing separate kits to students based on their respective learning levels.

A lot more can be done

The conference also helped in identifying some of the existing gaps in information related to renewable energy. There is an urgent need to develop an information portal on

Checklist for schools interested in solar installation

The following checklist has been prepared to help schools decide on the feasibility of installing a solar unit in their campus:

- Does your school receive 260 sunny days a year?
- For 1 kWp, you need at least 10 square meter space on rooftop or ground
- Check for your monthly demand (maximum and minimum in kWh) for the last 12 months
- Check the tariff rate or per unit charges of electricity

renewable energy, suggested experts. Schools can access this section for information on solar installation. For teachers, the section can act as an online information centre, which they can rely on to complement their teachings on RE in the classroom.

Solar Energy Corporation of India (SECI) is the nodal agency responsible for the implementation of several schemes of the Ministry of New and Renewable Energy Sources (MNRE). SECI's grid-connected solar rooftop scheme for 97.5 MW installations can also come handy for government schools looking to set up a solar unit. ◀

**For further queries, reach out to us at support@greenschoolsprogramme.org*

ON THE WALL

HILARIOUS TIMES

“All days for future,” says Trump



Washington (Reuters): Donald Trump began an indefinite sit-in protest outside the US White House in Washington, D.C., seeking world leaders to draft an immediate climate change mitigation plan to save our planet. In an interview with the BBC, Trump said that he has ordered the US army to start a major plantation drive across the world, especially in countries like Afghanistan, Iraq and Syria.

Small islands vs big continents

Washington (Reuters): Small islands have always been at the mercy of the actions of big continents. Rich nations of the big continents keep spewing carbon dioxide and other harmful gases into the atmosphere. This leads to global warming and the melting of polar ice, which causes sea levels to rise. And the very existence of islands like Tuvalu, Funafuti, Vaitupu and Nui, is threatened but not anymore. The Bubble Telescope of the Not Able to See Anything (NASA) has released images showing that islands are coming

Will bring down carbon emissions to pre-agrarian levels: World's top polluting countries

Davos (AFP): In the recent HOPE-20 conclave on the harmful impacts of rising carbon dioxide levels in the atmosphere the world's five most polluting countries-



together and forming a bigger land mass on the Pacific Ocean. Scientists also expect other poorer continents to join the global fight against exploitation by the rich countries of the big continents.

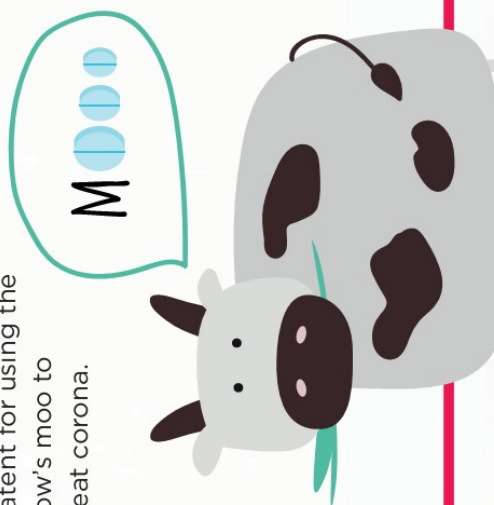
Sand made Africa fertile 3,000 years ago: Study

Egypt (AP): A book has been recovered from an excavation site in Egypt. Archaeologists have interpreted this book, written in a completely unknown language, and found that sand was once used as a fertiliser in Africa. The book, which dates back to some 3,000 years ago, cites the cases of many Pharaohs and farmers who used sand as a natural fertiliser. Soon after the discovery, scientists said that they would study sand's fertilising capacity with the help of Absolute Idiocy (AI).



Cow's moo, the game changer in fighting diseases

New Delhi (PTI): From plague influenza and small pox to AIDS, human progress has been disrupted by nasty viruses time and again. Point in case is the corona virus that has infected over 1 lakh people across the globe. But thanks to the recent discovery by the Morons Institute of Idiomatic Technology (MIT), now the cure is within our reach. In a research paper, scientists of MIT have claimed that the radio frequency of a cow's moo can destroy several viruses, including the COVID-19. The team of scientists have recently acquired the patent for using the cow's moo to treat corona.



China, US, India, Russia and Japan took a pledge to bring down global CO2 emissions to pre-agrarian levels to help check global warming.



Plastic food

Accra (New York Times): Agbogbloshie, an area in Ghana's capital Accra is known as the largest e-garbage dump in the world. Agbogbloshie is again in the news but for different reasons. Scientists in Ghana have developed the technology to convert plastics and e-waste into tasty and healthy food. According to the team of scientists from Ghana, this discovery will not only end the world's food problem but it will also have a big impact on our environment. Thanks to this discovery, the world's largest offshore plastic accumulation—the Great Pacific Patch lying between Hawaii and California —has now been renamed as the Great Pacific Food patch.

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Secret diary of a virus

Thanks to the trade and imperial ventures of humans, these disease-causing organisms could cross regional boundaries and spread infection

Sorit Gupto

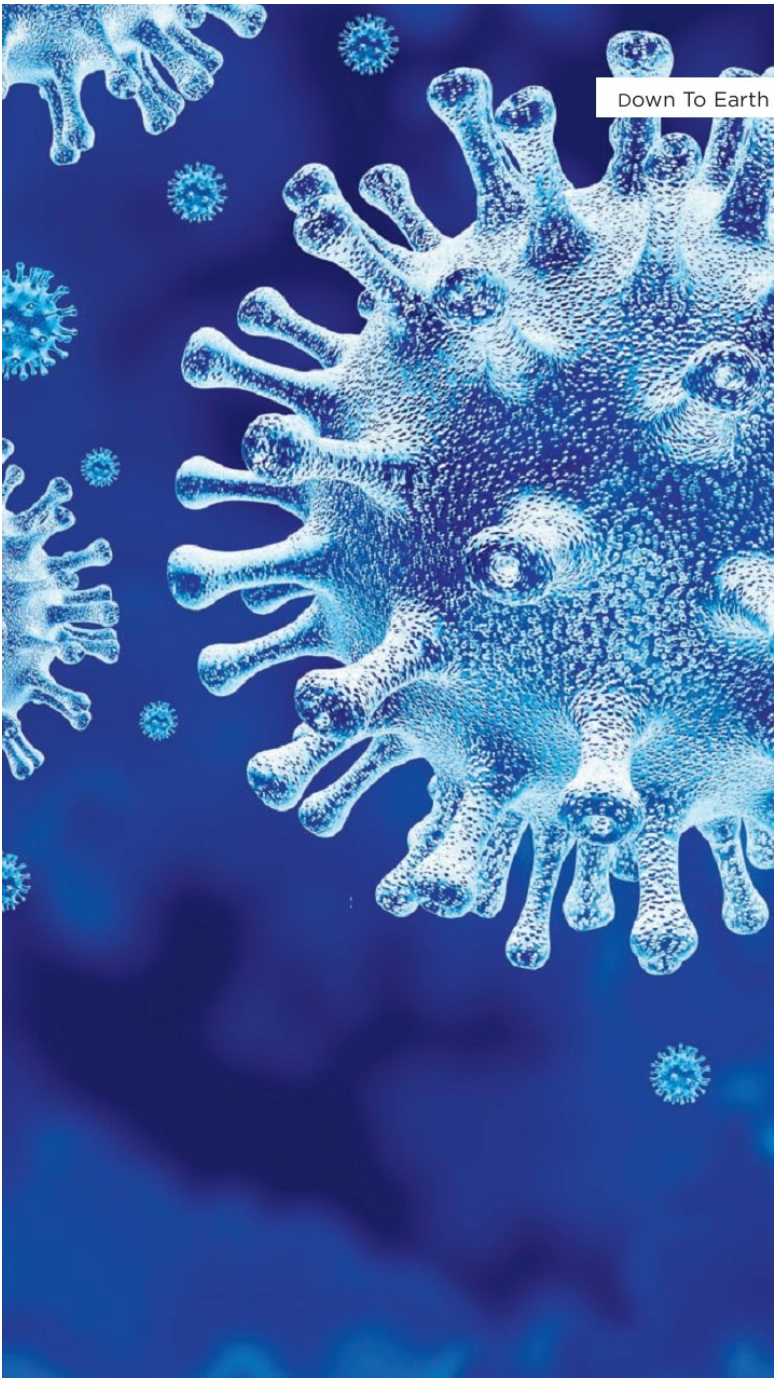
Humans are really strange. They love giving awkward names to other living beings. For example, I am called a "virus". In Latin, it means poison or poisonous liquid. Well, humans do seem to enjoy giving names carrying negative connotations. My other name, "pathogen", is not encouraging either. So, what is a pathogen?

If you *Google* it, you will get the following explanation:

"Pathos" is the Greek word for disease and genes means "born of". So according to *Google*, we are responsible for diseases. Well, if I have to be honest, it is true that we cause harm to other animals, including humans. It is just a part of our life. After all, we also need food to survive and want kids. And for all this, we use the

body of animals, our hosts. We depend on them for food and shelter. What's wrong in this?

Every other living being on the planet does the same thing. It's the never-ending war between a predator and its prey. It is all part of what we call a life cycle. Now, allow me to borrow the words of Charles Darwin, the first human to propose a theory of evolution. Darwin said that the natural world is defined

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Cover story

get nourishment and then destroy it. Our modus operandi is very simple. Come, attack and destroy. We attack in billions and we reproduce quickly to be joined by a million more. The result is the eventual death of our prey. Humans have termed our attack on other living organisms as 'infection'.

I am proud to say that when it comes to choosing our prey we are very, very liberal. We infect all types of life forms, from animals and plants to microorganisms, including bacteria. How cool!

Honestly speaking it's not much fun to infect a humble bacterium or for that matter weak or defenseless animal or plant. The real fun is to attack and destroy a human, the smartest of all creatures in the history of the evolution. We and humans are in this 'war-like situation' since the dawn of civilisation. At first, it was little boring because in pre-historic times humans lived in small isolated bands. As a result of this, viruses had very limited opportunity to spread and infect. And it at all we infected them, it was restricted to small community.

However, the situation changed dramatically some 10,000 years ago when the agricultural revolution began and humans switched to a sedentary lifestyle. Before this they were mostly nomadic. With every new human settlement, we received a fresh batch of soon-to-be-infected population. And guess what, we also got an added advantage from our very co-operative preys, the humans.

A book about human civilisation would probably have numerous chapters on exploitation, wars and poverty. In fact, poverty is our biggest enabler because it provides

by a war where only the fittest will survive.

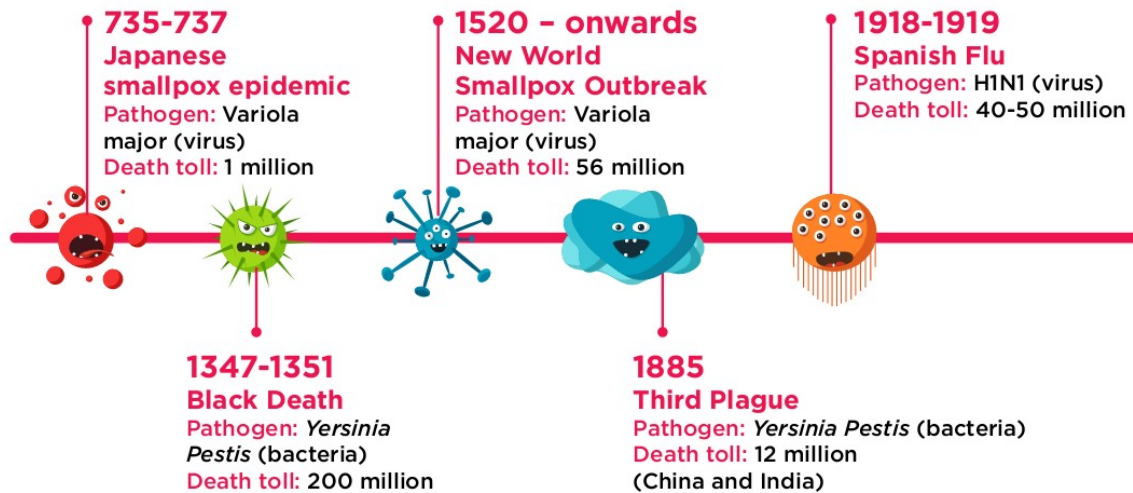
So what right do these humans, who are directly or indirectly responsible for wiping hundreds of species, have to give us such a nasty name? Pathogens, we are called! Even our life cycle is labelled as a disease. That's again categorised into three different kinds—endemic, epidemic and pandemic—depending on the area under our control.

Going by their definition, one can easily term humans as a pandemic disease! I mean it.

Though I like the name, Virus. It's very cute.

I am a virus, the real virus, not the eccentric professor from the blockbuster film *Three Idiots*. Like other living organisms, we depend on other organisms (read prey) for food and shelter. The cell is the building block of any organism. We attack the cell,

Pandemics in history



what all viruses wish for. Poor and crowded localities help us take down (read infect) vast populations quickly. Unsanitary or unhygienic living conditions and filth are like ammos of the virus brigade in their epic battle against humans.

The earliest civilisations experienced local epidemics now and then. However, there were no cases of a disease that has spread to different parts of the globe. This is because unlike today, human settlements remained mostly isolated from each another.

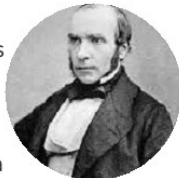
Next in line is the origin of big empires with big armies, the movement of humans (read armies and traders) from one

continent to the other across the globe. For a humble virus, it's not possible to cross oceans, climb high mountains or travel from one continent to the other. But our carriers, the humans, and their pets transported us from one corner of the world to the other. We benefited from the greed of humans. As they kept looking for new colonies to loot and exploit, we kept expanding our presence across the globe. But we did not stop here. Instead, we acquired strength and capability to infect humans in gigantic proportion. "Think global, act local" became our motto and we started spreading infection across the globe. That's a pandemic.

The plague outbreak in the Byzantine Empire during the reign of Justinian I in 6th century AD is one of the worst pandemics recorded in human history. But we were not responsible for that. It's actually a bacterium. Well, let me clear one thing that a bacterium is different than a virus. Let me explain, a virus is a virus and a bacterium is a bacterium. It's easy! Anyway, later scientists identified the culprit of the pandemic as the bacterium *Yersinia Pestis*, commonly known to humans as the bubonic plague. Contemporary accounts claim that at the height of the outbreak, around 5,000 people died per day in the capital of

Finding the culprit

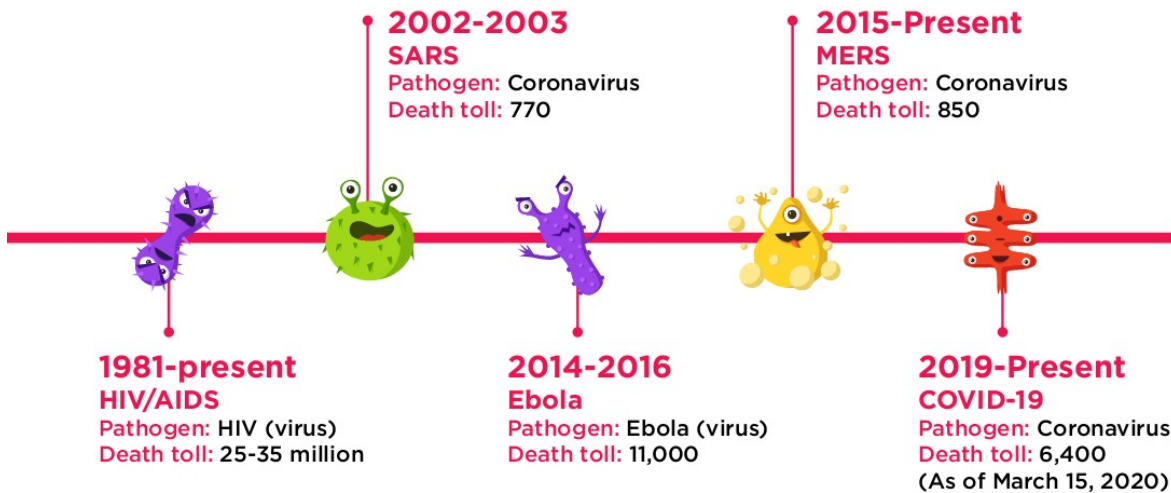
One of the first instances of relying on geography and statistical analysis was in mid-19th century London, during a cholera outbreak. In 1854, Dr John Snow decided to display neighborhood mortality data on a map and found a cluster of cases around a specific water pump, which was used to draw.



When Gandhi caught flu

The 1918 Spanish flu outbreak in India killed nearly 1.8 crore people. Mahatma Gandhi also contracted the deadly disease but he survived. It caused widespread suffering and disrupted the economy and infrastructure. The misery wrought by the pandemic fuelled the anger against the colonisers. And people rallied behind Gandhi and the independence movement. That sure was a silver lining for the disease-hit country.





Constantinople. By the time the plague had run its course, as many as 10 crore people or half the population of Europe, had died. That's not the end of the story.

Yersinia Pestis returned again some eight hundred years later and it was worse than the previous strike. In October 1347, ships docked at the Messina port in Italy's Sicily island filled with sailors suffering from a mysterious illness that produced dark swellings, or buboes, in the armpits and groin. These symptoms led to the

disease named "Black Death". The plague spread rapidly and within a few years killed at least one-third of the population of Europe.

For us, the viruses, opportunity came outside Europe. Due to prolonged exposure, the Europeans developed immunity against us. These were really depressing times for us. But the tides changed once we reached the 'New world' or the colonies of America, Latin America with the explorers (or exploiters?). In fact, the European colonisers helped us. They distributed small pox-infested blankets to the natives of America as a 'friendly gesture'. Only that the gesture was in reality for

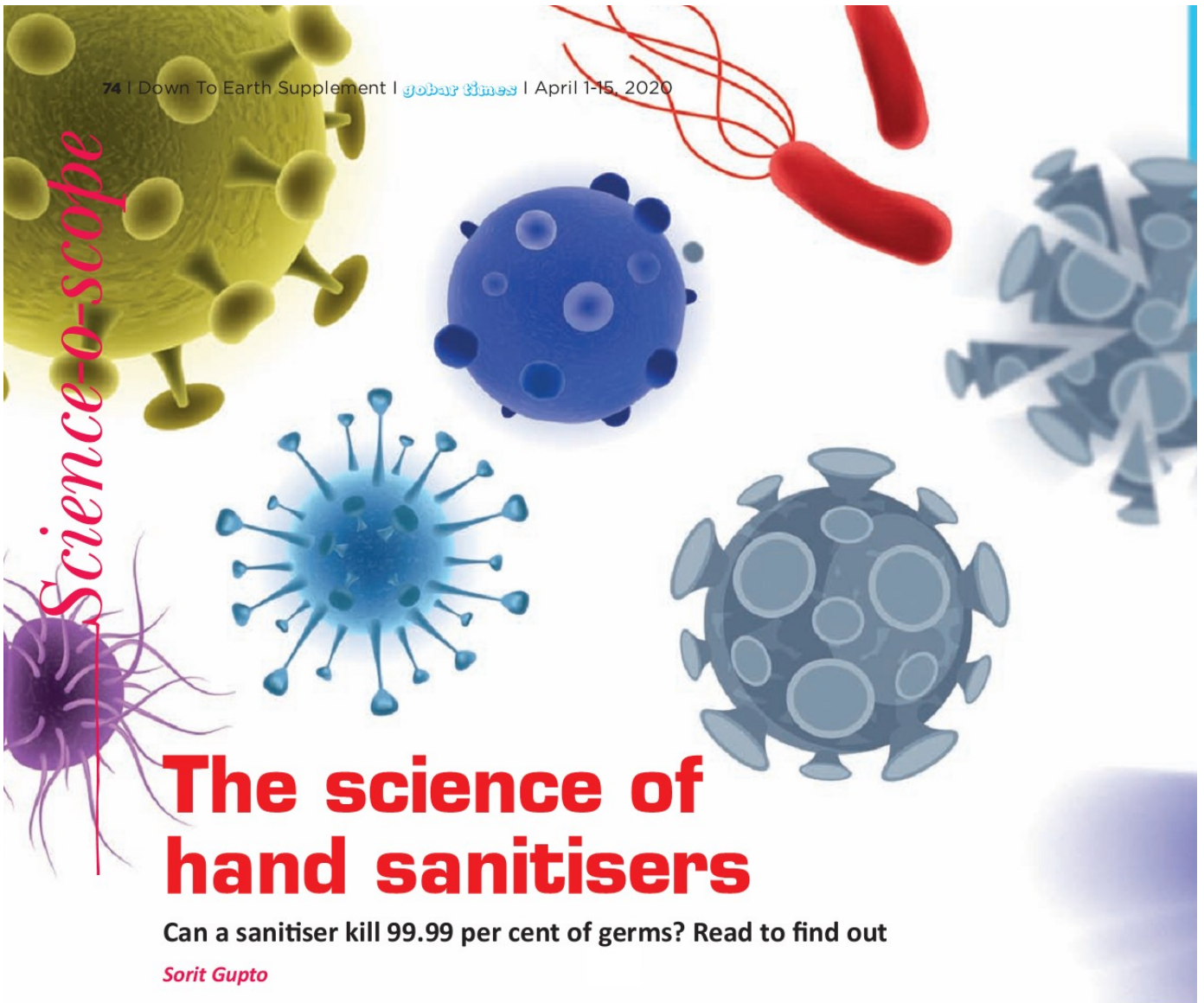
one of our relatives, the virus named Variola that cause the smallpox disease. With active support from the European colonisers, the mischievous Variola killed an estimated 2 crore people. What an achievement!

And for a long time, we, the viruses, remained undefeated. Humans were our

preys and thanks to the wars and trade routes, the whole world was presented to us as a platter. But things started changing at the end of 18th century, when the small pox vaccine was accidentally discovered by the British scientist Edward Jenner. Although Jenner discovered the vaccine, our existence remained mostly a mystery since not much was not about viruses back then. It was only in the 19th century when the experiments of scientists like Dmitri Ivanovsky, Martinus Beijerinck led to the discovery of viruses. But that doesn't mean that the war is over. We are still in winning because we continue to get active help from none other than humans.

It is indeed strange that instead of developing medicines, humans waste their energy, resources and intellect in developing nuclear bombs, and chemical and biological weapons. The more they destroy the biodiversity of Earth, the more active grounds they create for several disease-causing pathogens, including viruses. ⚡





The science of hand sanitisers

Can a sanitiser kill 99.99 per cent of germs? Read to find out

Sorit Gupta

The Corona virus or COVID-19 is the talk of the town. And thanks to the tsunami of messages we receive daily on our smartphones, there is no dearth of misinformation, rumors and gossips about the virus. So, how do we know which information is credible? For example, take the hand sanitiser.

It has suddenly become one of the biggest tools of the "culture corona". Yet in most medicine shops, a 50-ml bottle of hand sanitiser has become a rarity. Several shops have run out of them and are now selling bigger bottles, some of which cost as much as Rs 500! Needless to say how manufacturers of hand sanitisers are making a fortune because of this sudden rise in demand.

Prescribed as one of the basic precautions one can take to avoid the spread of corona virus, the hand sanitiser has acquired prime importance at a time when there are rising cases of corona infections around the world. But what makes

this little bottle so important, especially now? Well, let us look at the Chemistry of it.

The active ingredient of a hand sanitiser is alcohol. A regular solution or bottle contains around 70 per cent of alcohol. However, the type of alcohol used can vary. Ethanol, the chemical present in most alcoholic drinks, is used in many hand sanitisers, but there is one difference. The alcohol content in hand sanitisers is very high as compared to alcoholic beverages. Besides ethanol, isopropanol or n-propanol is another alcohol that is used in hand sanitisers.

Killing bacteria and viruses

Bacteria and viruses have an outer coating, which is made of protein and lipids. The alcohol molecule disrupts and eventually explodes this outer coat of bacteria and viruses. And that's the end of the pathogen. Antibiotic-based soaps can also be used for cleaning hands but unlike alcohol-based solutions, they target a specific



point of a pathogen's life cycle. Moreover, there is always a chance that the bacterium or virus develops antibiotic-resistance because of the soap. Since the alcohol molecule destroys bacteria and viruses by rupturing their outer membrane, resistance is not a problem with alcohol-based hand sanitisers. There is no way for bacteria and viruses to develop resistance to the effects of alcohol on their proteins and membranes.

Ethanol and isopropanol, however, have one drawback. They can dry the skin. To counter this effect, manufacturers add glycerol, a type of alcohol, in hand sanitisers. Chemically speaking, glycerol is also an alcohol, but it's not added in solutions/disinfectants to kill germs. Rather, it is added to increase the thickness of the solution. This makes it more potable and easier to use. Some brands also add tocopherol, an alcohol rich in Vitamin E and is good for the skin. Colours and fragrances can be added as well. These are not necessary for the hand sanitiser to work,

but they make your hands smell nice. And now comes the funniest part. Manufacturers typically add some bad-tasting compounds in the hand sanitiser. Why? Well, this is done to stop people from consuming it as a drink. After all it's alcohol. Hick!

Now, one may wonder if this chemical goo really kills 99.99 per cent of germs? Well, first of all we need to be careful that we don't fall prey to such marketing gimmicks of manufacturers. The effectiveness of a hand sanitiser varies depending on how dirty our hands are and most importantly, what kind of pathogen it is being used upon. In other words, it is not a magic potion that can eliminate the threat of infection entirely.

Another important fact is that hand sanitisers do not remove dirt. For that we need soap and water. Doctors, therefore, advise that it is best to use hand sanitisers in combination with regular hand washing. ✦

For the record

Free rides for all

An 8 per cent cut in State's earnings is not holding back Luxembourg, a country twice the size of Delhi, from making public transport free in the country

Rajit Sengupta



Delhi made bus rides free for women in October 2019 and it has been a mixed experience so far. Since the initiative was launched, women ridership has gone up from 30 per cent to 45 per cent but it has also left the Delhi Transport Corporation (DTC) worried about its mounting losses. The cash-strapped bus operator feels the losses will translate into poor bus service. This is worrying since 15 per cent of bus trips get cancelled every day due to poor maintenance. While the Delhi government plans to extend free bus services to students and senior citizens, many are wondering if the city can afford to make public transport free.

The capital city can, however, learn from Luxembourg, a country that made all forms of public

transport—buses and trains—free starting from March 2020. Nearly 2 lakh people or one-third of Luxembourg's population travels for work into the country from France, Belgium and Germany. The country also has the highest car density in the European Union (EU) region.

In 2018, the government brought in free transport for everybody under the age of 20. Soon after, it launched an elaborate sustainable mobility plan—Modu 2.0—that aims to reduce rush-hour congestion and boost the number of people taking public transport by 20 per cent from 2017 to 2025. And now it has abolished all tickets, except for first-class travel on trains.

"The project is primarily a dual social measure, which on the one hand means more money in the wallet of low

earners and on the other hand, the burden is shouldered by those who are better off because it is funded by taxpayers' money," says Dany Frank, public relations official, Ministry of Mobility and Public Works.

The country's mobility measures have offered an interesting benefit-sharing model. Affordability is expected to drive up use of public transport among low-income passengers. At the same time, an increase in high-income passengers would mean fewer private vehicles on the road, therefore, less traffic.

But the move also comes at a big economic cost. Ticket sales generate €41 million or ₹337 crore, which is 8 per cent of Luxembourg's public transportation costs, annually, said Frank. The government plans to make up for the loss in revenue from taxes. ❖

Snowflakes from salt

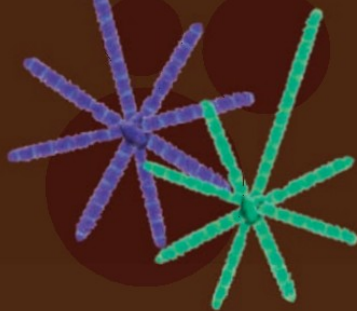
Hold on to winter's delight and decorate your room with salt crystal snowflakes

Pallavi Ghosh

Take two strands of chenille stems. Twist one stem on top of the other to form an X-shape. Cut out extra bits, if need be



Take another stem. Twist it on top of X-shaped structure to give it the form of a snowflake. Keep one end of the stem long



Take another stem and cut it into small parts. Attach them on top of each of the six strands. Repeat the process for more snowflakes



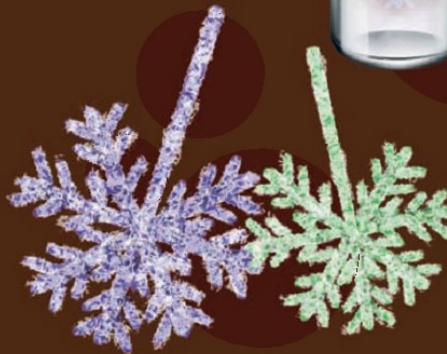
Take three cups of water and heat it. When it starts to boil add salt. Keep adding salt until crystals start to form on the surface of the water



Empty saltwater in mason jars and let it cool. Once the water cools down, suspend the snowflakes in the saltwater using a cloth peg or clip. Keep the jars in sunlight



6
After 2-3 days, remove the snowflakes and let them dry. Your salt crystal snowflakes are ready!



Vijayendra Pratap Singh / GT

CHECK RISING TEMPERATURE TO KEEP WATER

FROZEN II



Ritika Bohra & Pallavi Ghosh/GT

The Antarctic registered a temperature of more than 20°C for the first time on record, prompting fear of climate instability in the world's greatest repository of ice.