science VIEW

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School of Science

GSFC UNIVERSITY
EDUCATION RE-ENVISIONED

INDEX

From the editor's desk:

Climate Change: Are we prepared for this battle?

Dear Readers,

Greetings to you.

The current issue of the Science View Magazine is based on the theme of 'Climate Change' which is one of the biggest challenge the mankind is about to face in very near future.

According to NASA and NOAA (the National Oceanic and Atmospheric Administration), 2019 was the second warmest year since 1880. The past five years have been the warmest years of the last 140 years (Source: NASA). GIlobally, the temperature was 1.110 warmer than the late 19th century. There are significant evidences of the reasons of this global increment in the temperature, i.e. increased emission of CO_2 to the atmosphere by human activities.

Study of increment in temperature in past few decades are challenging mankind to re-think about their procedure of progress and development.

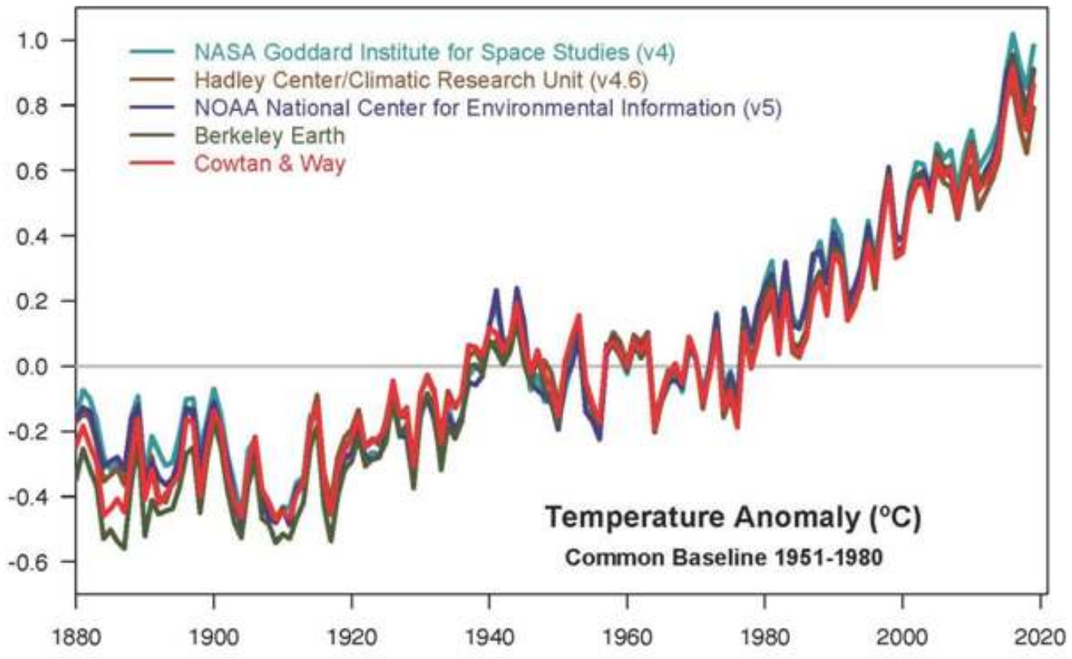


Fig: yearly temperature anomalies from 1880 to 2019,
with respect to the 1951-1980 mean (Ref: https://climate.nasa.gov/)

A study by Alan Buis (From NASA's Jet Propulsion Laboratory) indicates that the global temperature in near future will tend to increase further which will result in further increment in global warming. Another study by Kate Ramsayer, (From NASA's Goddard Space Flight Center) shows that the Hubbard Glacier has advanced 5 km in the last 48 years which is due to the melt of ice on the glacier and ultimately resulting in weakening of the glacier.

The melting of glacier further results in the rise of sea level, according to Andrew Shepherd (lead author and scientist from the University of Leeds), "As a rule of thumb, for every centimeter rise in global sea level, another 6 million people are exposed to coastal flooding around the planet. On current trends, Greenland ice melting will cause 100 million people to be flooded each year by the end of the century, so 400 million in total due to sea level rise". It's important to mention here that we have current track of 3.3 mm hike in sea level per year as per the records of NASA.

Now, with all these well-established facts, the issue is very simple: Are we ready for this upcoming disaster on the earth created by us? The most common reply is a big 'No'. Mankind is known for its intellectuality and ability to change, design and fabricate this world through development. But this so-called development should not be at the cost of all of us.

The current issue of this magazine compiles the thoughts and views of both students and staff of GSFC University on this particular topic. I believe that you all will appreciate the efforts and enjoy it.

Happy Reading

Dr. Manish Gupta

Dean – Students Affairs & Editor in Chief- Science View

Effective actions to address climate changes need attention – Act smart!!

The rains in Diwali, the unbelievable hikes of vegetable costs, rising sea levels and water loggings and floods in and around the metropolitan cities (including our Vadodara), the onset of pulmonary acute and chronic disorders in very young age of Delhi children, and the list goes on and on!.. Do we need any explanation to understand the climate change after experiencing such catastrophic events?

Greenhouse gas emissions and global warming are the talk-of-the-world and it fuelled up widely after the protest and speech of the Swiss teen, Greta Thunberg at United Nation (UN) gathering this year. According to a U.N. report, global temperatures could rise by 1.5°C, a threshold that scientists say will bring dire consequences to the planet, by as early as 2030 if greenhouse gas emissions continue at the current rate. Many movements have been initiated all over the world including India for the steps to reduce global warming and greenhouse gas emissions. A majority of awakened minds along with social activists, politicians, celebrities, students, youths and adults got engaged in activities like 'No plastics', 'grow more trees', 'odd/even vehicles on road', 'use of renewable resources like solar panels in homes and street lights', 'save electricity and water' and so on. But are our actions smart enough to see a considerable difference or valuable change in reduction of global warming?

However, the world needs a drastic action to combat the damage by understanding the root causes and target the major contributors of climate change. A group of environmental scientists in Sweden have carried out a study to identify the major contributors of greenhouse emissions and most effective ways to cut carbon emissions. Interestingly, the high impact actions to reduce climate changes revealed in this research are rarely mentioned in government advisory and school textbooks worldwide. The few high impact actions are discussed here forth.

Small families: The research identifies population control as the best action that can help in fighting climate change. Having one fewer child will save 58.6 tonnes of Co_2 equivalent per year. Government needs to take proper action on population control not only for the growing unemployment and poor economy, but also for the drastic climate change. However, overpopulation has been a controversial factor in the climate change debate, with some pointing out that an American is responsible for 40 times the emissions produced by a Bangladeshi and that overconsumption is a crucial issue.

Encourage use of public transport over private cars: Transportation accounts 14% greenhouse gas emissions. Almost all (95%) of the world's transportation energy comes from petroleum-based fuels, largely gasoline and diesel. Our personal vehicles are a major cause of global warming. Collectively, cars and trucks account for nearly one-fifth of all developed countries greenhouse gas emissions, and the percentages are almost similar in developing nation like India with a constant growing traffic. Use of fuel efficient vehicles is the best option. However, even if we try to reduce our travel by private cars by 50% and use public transport, at will be the most appropriate and efficient first step towards slowing down climate change.

Avoiding airplane travel: A new study published in the journal Atmospheric Chemistry and Physics suggests that the global warming effect will triple by 2050 as air travel grows in popularity and new technology enables planes to reach the higher cruising altitudes where contrails tend to form. Contrails are the white plums seen trailing from high flying airplanes predominantly in jets. Scientists say that they contribute in climate change by trapping heat that radiates upward from earth's surface. The gas emissions in air traffic and the warming effects due to contrails are the largest contributors for global warming and climate change next to fossil fuel emissions on land. At personal level, we can pre-plan our trips well and avoid atleast round trips in flights by managing the time efficiently.

Reduce livestock and dairy cultivation: The second most significant source of greenhouse gases emissions is animal agriculture. For example, ruminant animals like cattle produce methane, which is a greenhouse gas about 20 times more potent than CO_2. According to UN report, livestock sector (eggs, meat and dairy products) is responsible for about 37% of human-caused methane emissions and about 65% of human nitrous oxide emissions (mainly from manure) globally. Eating a plant based diet can save 0.8 tonnes of Co_2 equivalent a year which is 4 times higher than use of recycled products and 8 times higher than changing low energy consumable household light bulbs. Encourage vegetarian and vegan foods.

Table: Comparison of the CO_2 emission reduction from various individual actions

Behaviours	Approximate CO_2 per kg reduction per year
High Impact Action	
Encouraging small families	23700 - 11700
Often use of public transport	1000 – 5300
Avoid one flight (depending on length)	700 – 2800
Eat plant based diet	300 – 1600
Moderate Impact Action	
Use of heaters/coolers	180
Install solar panels	180
Conserve energy (unplug cables if not use)	210
Reduce food waste	370
Eat less meat	230
Reusable bags	5
Recycle	210
Eat local	0-360
Low Impact Actions	
Conserve water Plant a tree De compost Eco tourism Minimize waste	6-60

(Source: Wynes and Nicholas, Environment Research Letters, 2017)

It is very crucial to rethink and take smart actions against climate change. There is simply no time to waste, and 2020 is a key turning point for our planet. We need urgent and ambitious action at every level, from government heads of states and countries, to private sector leaders addressing climate change at every step of the supply chain, finance heads committing to divest from fossil fuels and green their investments and individual citizens using their unique influence to drive change and make an impact.

It's time to act smart!

Dr. Nishith Parikh
Associate Dean, School of Technology

Ecological Moss Amendments: The newest trend in biophilic habitat

Biophilic design is an innovative way to harness this affinity in order to create natural environments for us to live, work and learn. Studies show that moss is highly effective at purifying the air.

Abundance

Among several types of moss, there are species which can be easily cultivated in a shady, sometimes humid and dry environment. There are 2 general types of moss: pleurocarpous and acrocarpous. Pleurocarpous moss grows low to the ground and spreads out horizontally very quickly.

Advantage of moss:

Over higher plants in green roofs helps to reduced weight loads, increases water absorption, no fertilizer requirements and high drought tolerance. Since mosses do not have true roots, they require less planting medium than higher plants with extensive roots system.

Notion of Biophilia

It is a concept used within the building industry to increase occupant connectivity to the natural environment. By consciously including nature in interior or architectural design, one of the convenient natural components are general species of Moss which are easy to grow in dry and humid habitat.

Biophilic design can reduce stress, enhance creativity and clarity of thought, improving our well-being and accelerate healing; as the world population continues to urbanize, these qualities are even more important.

"Humans are constantly worried about the consequences of climate change and less about the nature"

Scrutiny

Apart from design oriented facts, many species of moss were used to identify amount of chemicals such as oxides of nitrogen to some extent, as to tackle the conflicts of pollution within the urban and rural area. Below noted few states are responsible for the contamination in various sources like air, water, land etc. whereas regular conservation and cultivation of moss can reduce air contamination up to 40% per hectare.

According to the creators, each CityTree (moss culture) is able to absorb around 250 grams of particulate matter a day (nearly 90 kgs in a year) and removes about 240 metric tons of CO_2 annually. The plant-based air filter also cools the surrounding air by water evaporation (up to 17 degrees Celsius within a five-meter radius) and is thus a space-saving way of combating urban heat islands.

Place	State	%
Allahabad	UP	59
Indore	MP	50
Ludhiana	Punjab	63
New Delhi	Delhi	54
Average Annual Humidity		

Umang Jagani Shaileshbhai,
B.Sc. chemistry, School of Science

Climate Change and crop productivity in India

Climate change and agriculture are interrelated processes, which take place on a global scale. Global food security relies on both sufficient food production and food access and is defined as a state when: "All people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

Climate change, as stated in many research reports, is likely to contribute substantially to food insecurity in the future due to changes in average temperatures, rainfall, heatwaves, changes in pests and diseases, drought, changes in carbon atmospheric dioxide and changes in sea level. There are chances climate change may lead to a severe loss of production or even abandonment of certain crops.

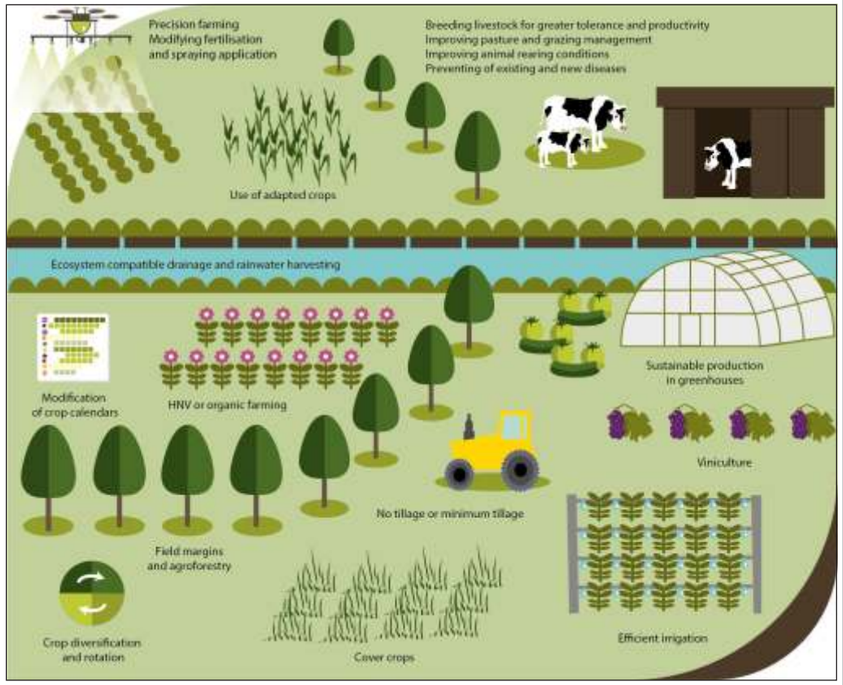
In developing countries like India, climate change is an additional burden since ecological and socioeconomic systems already face pressures from rapid population, industrialization and economic development.

Research suggests that the effects of climate change could force crop production down by 50% in coming years. Food may become more expensive as climate change mitigation efforts increase energy prices. Additionally, extreme weather events, associated with climate change may cause sudden reductions in agricultural productivity, leading to increase in price.

Rainfall patterns have already begun shifting across the country, and such changes are expected to intensify over the coming years. This is likely to mean more intense periods of heavy rain and longer dry periods even within the same regions. In India, growing population is a major concern and will increase the vulnerability of the landless and the poor.

Knowledge about the impact of climate change on current water and crop production is limited. At the same time mitigating and bringing halt to climate change is not within the capability of one country alone. Thus, adaptation strategies seem to be the most immediate needs to ensure food security. Concrete steps need to be taken to prepare for climate impacts on agriculture and to reduce both their severity and vulnerability.

At the outset, few measures which can be implemented at farm level to lower down the risks, as depicted in the image given here:



India has to maintain the sustainability of its ecosystems to meet the food and non-food needs of a growing population. The main thrust of all programs to combat the impact of climate change on food security should be on activities relating to rainwater harvesting and soil conservation.

Additionally, administrative capacities need to be built for designing climate proof investments, such as conservation of wetlands, waste water reclamation, equitable access and regulatory structures for basin level management.

Moreover, Biotechnology can also be one of the answers to help slow the serious and urgent issue of climate change. Biotechnology may not be able to solve climate change by itself but productivity gains through it are increasingly important. Biotechnology can develop plants that store more carbon dioxide in their roots. If this is done on a massive scale across the world with major agricultural crops—such as corn, soybeans, wheat, and cotton— it could help slow down climate change.

Also, through biotechnology, crops can yield more per acre as they naturally resist insect pests and diseases and can naturally fight diseases and adapt to environmental stress. A very good example of same are a number of Kiwi biotech companies, developing fast, and providing leading solutions to help combat climate change.

Mint Innovation is another biotech start-up that is using chemistry and microbiology to recover valuable metals from electronic waste. Avertana produces a range of valuable mineral and chemical raw materials by extracting them from industrial waste, using innovative chemistry but with a much lower environmental footprint. Lanzatech is also turning global carbon crisis into a feedstock opportunity, by taking emissions and converting them to fuels and chemicals, and thus, cleaning air and giving carbon a second chance.

Of course, the planting of billions of trees across the world is the biggest and cheapest way to tackle the climate crisis, according to scientists, who have made the first calculation of how many more trees could be planted without encroaching on crop or urban areas.

Dr. K. S. Kumar
Associate Dean, School of Science

Island of plastic....??

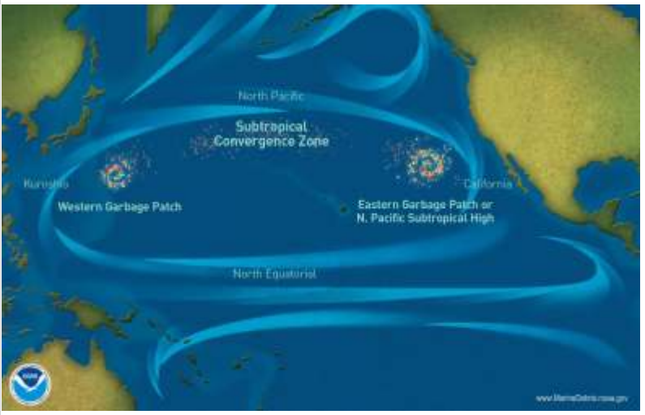
Is there a plastic island in the ocean?

What is the island of plastic? Have you heard about it, is a new continent discovered on earth in the pacific ocean? 2 million plastic bags a minute are thrown away. As for bubble wrap, the amount produced in just one year would be enough to cover our planet around the equator. 500 billion plastic cups are used and disposed of annually. You will be thinking that why are you reading the data of plastic used in the world. Here's the answer to this mystery. This new island consists solely of garbage and plastic waste .-There are 3 huge garbage islands in the world: in the central North Pacific Ocean, in the Indian Ocean, and in the Atlantic Ocean. Amongst these the largest is the Great Pacific Garbage Patch.

Great Pacific Garbage Patch

The Great Pacific Garbage Patch is a collection of marine debris in the North Pacific Ocean. Marine debris is litter that ends up in oceans, seas, and other large bodies of water. The Great Pacific Garbage Patch, also known as the Pacific trash vortex, spans waters from the West Coast of North America to Japan. The patch is actually comprised of the Western Garbage Patch, located near Japan, and the Eastern Garbage Patch, located between the U.S. states of Hawaii and California. It is located roughly from 135°W to 155°W and 35°N to 42°N. An ocean current about 6,000 miles long, referred to as the Subtropical Convergence Zone, connects the two patches, which extend over an indeterminate area of widely varying range, depending on the degree of plastic concentration used to define the affected area. The vortex is characterized by exceptionally high relative pelagic concentrations of plastic, chemical sludge, wood pulp, and other debris trapped by the currents of the North Pacific Gyre.

Researchers from The Ocean Cleanup project claimed that the patch covers 1.6 million square kilometers. The plastic concentration is estimated to be up to 100 kilograms per square kilometer in the center, going down to 10 kilograms per square kilometer in the outer parts of the patch. An estimated 80,000 metric tons of plastic inhabit the patch, totaling 1.8 trillion pieces. 92% of the mass in the patch comes from objects larger than 0.5 centimeters, while 94% of the total objects are represented by microplastics. Some of the plastic in the patch has been found to be over 50 years old, and includes fragments of and items such as "plastic lighters, toothbrushes, water bottles, pens, baby's bottles, cell phones, plastic bags, and nurdles". It is estimated that approximately "100 million tons of plastic are generated [globally] each year", and about 10% of that plastic ends up in the oceans. The United Nations Environmental Program recently



estimated that "for every square mile of ocean", there are about "46,000 pieces of plastic". The small fibers of wood pulp found throughout the patch are "believed to originate from the thousands of tons of toilet paper flushed into the oceans daily". The patch is believed to have increased "10-fold each decade" since 1945.

Is it thrice the size of FRANCE?

The size of the Great Pacific Garbage Patch is currently more than 600,000 square miles. According to the journal Scientific Reports, there are more than 1.8 trillion pieces of plastic that have accumulated in this area. Great Pacific Garbage Patch would lead you to believe that this marine mass of plastic is bigger than Texas—maybe twice as big as Texas and thrice as big as France. The new research estimates the accumulation is 79,000 metric tons – 1.8 trillion pieces – of plastic. Most of those pieces are tiny microplastics, it said.

In another way of describing its size, Joost said it is made up of enough trash to fill 500 jumbo jets.

The plastic has accumulated into a mass due to currents, scientists say. The research studied a patch of more than 600,000 sq m (1.6 m sq km) of the ocean.

Aneri Nailesh Nagrashna
Bsc Chemistry (Sem-3), SOT

How did we end up here?

It wasn't only greed,
But also a matter of choices.
We let them burn us,
Not bothered to raise our voices.

Sky is already bleeding,
And we celebrate more than fear.
Hollow drums as leaders spitting on land,
No wonder we end up here.

All the voiceless tails cry,
As they watch their mother in pain
If this was civilization
Better we were without the brain.

Plants to compensate forest,
That's nature being dealt.
'Development' was the brand,
The price was lives and health.

Another iceberg falls
Whilst we discriminate,
Who named us humans?
Where's the word 'hate'?

Yet I intend to preserve
And a situation to tackle.
Again I plea
If agreed no less than a miracle.

"Death serves all the same
Pointless is earning by exploitation.
Life can be less tragic
Just by a will of contribution.
Or else we're already losing
Just because of your hesitation."

-Joban
B.Sc. 2nd Yr, School of Science

How to fight climate change by going vegan

Climate change has been called humankind's greatest challenge and the world's gravest environmental threat.According to the United Nations (U.N.) report Climate Change 2014: Impacts, Adaptation, and Vulnerability, climate change is having an impact on every continent, affecting agriculture, human health, ecosystems, water supplies, and even people's livelihoods.If you're serious about protecting the environment, the most important thing that you can do is stop eating meat, eggs, and dairy "products".

How Animal Agriculture Contributes to Climate Change

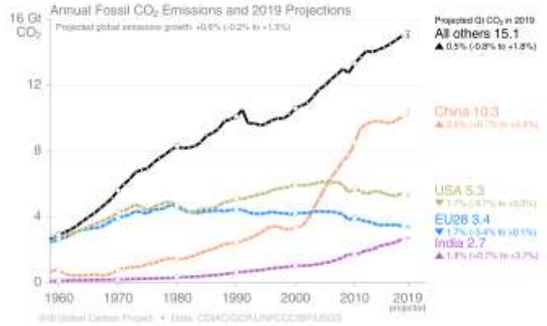
Feeding massive amount of grain and water to farmed animals and then killing them and processing, transporting, and storing their flesh is extremely energy-intensive. And forests—which absorb greenhouse gases—are cut down in order to supply pastureland and grow crops for farmed animals. Finally, the animals themselves and all the manure that they produce release even more greenhouse gases into our atmosphere.

Green House Gas Emissions produce carbon dioxide, methane and nitrous oxide that are harmful and cause majority of climate change.

Globally, animal agriculture is responsible to green house gases more than after leads the worlds transportation systems. And here is where the whole world lacks the knowledge of this fact. Everybody thinks that only the other main factor including this transportation ruins the climate but they don't know about the animal sluttery and such factors related to it.

So, I feel spreading the awareness for this in today's time is the most important thing to do, making people realise the veganism concept is important but yet a hard task to accomplish.

Being vegan doesn't only helps the climate and our surrounding but also plays an major role inside our body. Firstly, I would like to introduce you to the main staple and raw essentials of vegan- what you can intake in as its form is- mostly available in our houses too- that is- Legumes, Nuts, Seeds and in substitute of dairy product like milk, one can go for Soy or almond milk (I think which is pretty good in taste enough and healthy too than normal milk). It regulates your body digestion way faster and improves too as it has all that needs to fill enough nutrients inside your body. It may protect you against certain cancers, especially in women. And lowers the risk of heart diseases too and I guess list may continue longer.



Concluding my theory of veganism for A FIGHT AGAINST CLIMATE CHANGE, raising animals for food is the most serious environmental problem at every scale, from local to global. And every meat eater contributes to it. So, stop using animals as your own product for food and replace them to plants!

Zeel Nitin Joshi
Biotechnology, School of Science

Why 96 million plastic 'shade balls' dumped into the LA Reservoir?

LA is the first city to use this type of innovation for water quality control. Shade balls are also useful for staving off algae growth and preventing harmful chemical reactions between sunlight and chlorine. In a press release, the city claims shade balls are a "cost-effective way to reduce evaporation each year by nearly 300 million gallons, enough to provide drinking water for 8,100 people for a full year.

The city says the balls will shade and cool the water, reducing evaporation from the reservoir and making it less susceptible to algae, bacterial growth, and chemical reactions that can produce harmful substances.

The balls cost 36 cents each, for a total of $34.5 million. The utility has been testing the concept since 2008, reporting that shade balls reduce evaporation by 85 to 90 percent.

That should equate to saving nearly 300 million gallons a year, enough to provide drinking water for 8,100 people.

Yet despite their reputation for saving water, these balls were not put here just to reduce evaporation. The problem actually started with bromide, a natural substance found in salt water.

Bromide on its own is harmless to humans, but if some of this salty water creeps into the reservoir and undergoes ozone treatment with the rest of LA's drinking water, it can form the compound bromate. And bromate is a carcinogen.

The LA Department of Water and Power thought they were keeping to manage these bromate levels, but for some reason, the carcinogen kept spiking when the water entered the reservoir. It turns out, when bromide and chlorine interact with sunlight, the reaction produces even more bromate than when the former interacts with ozone.

The shade balls used in the Los Angeles project are made of high density polyethylene (HDPE) with carbon black additive to protect the plastic from ultra violet radiation. Adding carbon black also prevents the formation of bromate, a suspected human carcinogen.

They are about 4 inches (10 cm) in diameter, and are partially filled with water to avoid being blown by wind. HDPE plastic is commonly used for food and beverage containers as well as water distribution pipes.

The shade balls have a lifespan of 10 years (they were deployed for about 15 percent of that time), and are made of recyclable plastic, so they can go on to be reused for other purposes.

Shade balls have also been deployed in other reservoirs, most notably the Silver Lake Reservoirs in Los Angeles in 2008, to help prevent carcinogenic pollution.

They are also used by mining operations to prevent birds from landing on toxic tailing ponds, and by airports to deter birds from landing on drainage ponds, and risking collisions with planes.

Priyanka Gopal Shivnani

B.Sc Biotechnology/Sem – 3rd, School of Science

Solution To The damage

1. IT IS GOOD TO BE SMART, BUT WE ARE NOT TOO SMART

FOR OUR OWN GOOD.

Yes, we split the atom, we built clever machines that navigate the universe and searching for new home. But at the same time those atom we split up created a nuclear war.

The main problem behind this is increasing rate of population which demands for pure water, food, place to live, education, job, entertainment. And for this we need more land to plant vegetables, industry. We are killing animals for our own taste. Cutting trees for our own need.

We all know, one day population will destroy earth with the increasing demands. And there is nothing we can do. (that is what we think)

Here is what we can do.

i. Just get aware about what is happening and contribute to decrease the rate

of population. ii. People around us won't understand, so don't try it. iii. And please don't hate Thanos. Because he gave people what they deserved.

2. RIGHT NOW WHAT WE CAN DO TO REDUCE THE POLLUTION ?

I heard somewhere that, " If you want to change the world, start with yourself "

Why just we (students of GSFC University) take the initiative!. I know no one's going to start. But here is the solution to that.

We just have to apply the government's strategy as they provide mid day meal to attract poor children, so by that they get some primary education. Just like that why can't we students get some marks in the CEC component to plant one tree every semester!

If GSFC takes initiative, other universities also have to think about that.

The damage has done and we still have time. Stop criticising it, and start to take

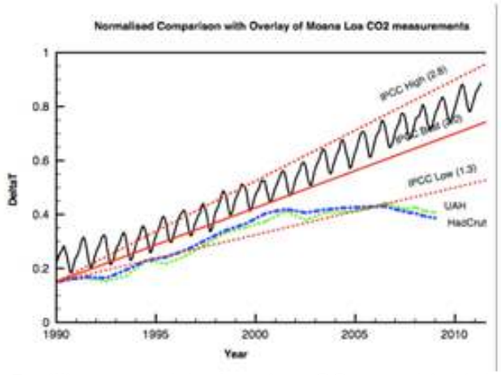
Mudra Pandya

M.Sc, Chemistry, School of Science

Tracking Climate Change

A Timeline Of Events That Ma Dheadlines In 2019

- Polar beer invasion witnessed in Russian towns !a mass invasion of polar beer witnessed in residential areas . polar bear increasingly coming into contact with humans as climate change reduces their sea ice habitats.
- "We are in the midst of the sixth mass extinction ", teen climate activist greta Thunberg told the European union leaders ,urging them to take action on climate change.
- Climate change can "half & reverse" progress made in human health over the last century, according to a study published in the new England journal of medicine .the report suggests that climate change could lead to the death of over 250000 people a year from 2030 to 2050



- More CO_2 in our atmosphere today than in the past 3 million years,' the last time CO_2 was this high Greenland was still green ,sea levels were up to 20 meters higher and trees grew in America.
- For the first time ,"climate change"gets designated as the top international priority for the 28 leading global tanks contributing to a report card on international cooperation .
- World's second largest emperor penguin colony nearly disappeared.
- Hundreds of thousands of students walked out of classes to raise the alarm over climate change protests were planned in more than 125 countries with about 1.6 million participantans.
- 20 days lethal heat per year. Collapsed eco systems .more than 1 billion people displaced . These are all probable scenarios that could devaste soc by 2050 according to an Australian think tank report.
- Chennai; Millions of people are running out of water as nearby reservoirs almost completely dry.
- June 2019 breaks the record for the hottest june ever recorded.
- "OK" becomes the first Icelandic glacier in recorded history lost to climate change .
- Speed of glacier melt in the Himalayas double since 2000.
- 30 July 2019:humans completely use up the planet's natural resources allotted for the entire year.

Virag & Anmol Shah

B.Sc – 2nd yr, School of Science

Thorium - The future of energy

We, humans, need the energy to sustain in the world and if we talk about the energy then what pops in our head is "Electricity", imagine yourself in a situation where there is no electricity for an entire week, freaked out, right? Yes, it is quite obvious in this generation to imagining yourself without energy, but it is a fact that more than a billion people don't have access to electricity and clean cooking and heating fuel.

All developing countries depend upon the coal to create energy for its people, it is not that they don't know the alternatives, it is because rich countries can do what they choose, poor countries do what they must.

Burning coal and fossil fuel will eventually generate CO_2, so what is the problem if it generates CO_2? Why everyone relates it with climate change and global warming?

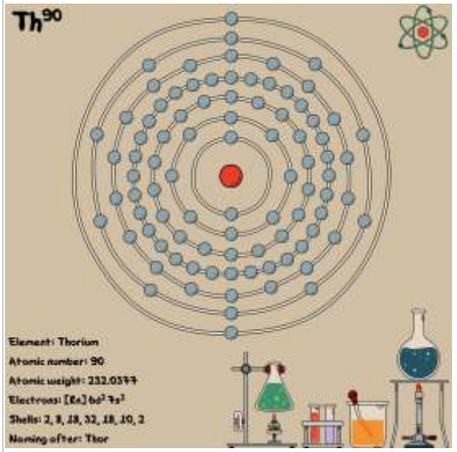
Firstly, global warming refers to the rise in global temperature and climate change occurs when changes in Earth's climate system result in new weather patterns that remain in place for an extended period.

Now, CO_2 has an interesting property to hold heat energy with it which is commonly referred as "Greenhouse effect", as 37 billion tonnes of carbon was added to the earth atmosphere in previous year as it creates a blanket in the atmosphere and that probably goes a long way towards locking in a 2-4^0 C increase in global mean surface temperatures, locking in ocean acidification and locking in sea level rise.

To overcome these problems the Kyoto protocol was introduced, to maintain the global temperature.

From today to 2040, around 800 to 1,600 new coal plants are going to be built around the world. At the end of this week, between one to four coal plants capacity one-gigawatt are being turned on. And every hundred of those plants will use up between 1% to 3% of the Earth's climate budget.

If we talk about the energy consumption China is the largest consumer of energy while India is the third-largest both of them uses coal for energy which jointly makes them the highest consumer of coal, if you need to get China and India off of fossil fuels, you have to create a technology that could pass the "Chindia test" first, It has to be viable, meaning that technically, they could implement it in their country and that it would be accepted by the people in the country.



Every time you wish to do something about global warming, at the end of the week someone had already fired a new coal plant.

We need to move towards alternatives like solar, thermal, hydro, wind and nuclear. Everyone is afraid of nuclear energy after events such as Chernobyl, Fukushima, three-mile island.

But it must be noted it has the least carbon emission in its entire process than any other.

A uranium fuel pellet (1/2 in. height and diameter) contains the energy equivalent of one ton of coal or 3 barrels of oil, which is way high in comparison in terms of energy density.

Nevertheless, with upcoming innovations of thorium nuclear reactor which has more compatibility than an enriched uranium-based nuclear reactor and the waste generated by thorium can be recycled within few hundred years and the waste can be reused as fuel again. India is the leading researcher in thorium it has published more than anyone in the world about thorium, which can be seen in India's 3-stage nuclear power programme.

STAGE 1: PRESSURISED HEAVY WATER REACTOR

In the first stage of the programme, the natural uranium fueled pressurised heavy water reactors (PHWR) produce electricity along with plutonium-239 as a by-product.

STAGE 2: FAST BREED REACTORS

In the second stage, fast breeder reactors (FBRs) would use a mixed oxide (MOX) fuel made up of plutonium-239, which was recovered by reprocessing spent fuel from the first stage, and uranium. In FBRs, plutonium-239 undergoes fission to energy, while the uranium-238 present in the mixed oxide fuel transmutes to additional plutonium-239. Thus, the Stage II reactors are designed to "breed" more fuel than they are feed. Once the spent fuel of plutonium-239 is built up thorium can be added as a blanket material in the reactor and transformed to uranium-233 for use in the third stage.

STAGE 3: THORIUM BASED REACTORS

In the Stage III reactor involves a self-sustaining series of thorium-232–uranium-233 fuelled reactors. This would be a thermal breeder reactor, which in principle can be refuelled – after its initial fuel charge – using only naturally occurring thorium, only thorium as fuel at last!

In upcoming research, we have built up liquid fluoride thorium reactors which have the maximum potential to replace existing reactors.

Although, in the world of never-ending demand for energy, we humans always have been in search of new ways to generated heat and electricity.

Siddharth Notani
B.Sc. 2nd Yr Student

Great Green Wall to combat climate change

India's target to restore 26 million hectares of its Land by building Green Belt.

The plan is to create 1400 kms long and 5 kms wide green belt from Gujarat to Delhi-Haryana border on the line of the "Great Green wall".

India seeks to replicate the idea as national priority under its goal to restore 26 million hectares of degraded land by 2030. This belt covers the entire degraded Aravalli range through a massive afforestation exercise. India has, at present 96.4 million hectares of degraded land which is 29.3% of the total geographical area (328.7 million hectares). Aravalli has been identified as one of the most key degraded zone to be taken up for greening process.

Forest belt likely to run from Porbandar to Panipat covering entire Aravalli range and beyond. It will not only help in restoring degraded land through afforestation along Aravalli hill range that spans across Gujarat, Rajasthan, Haryana and Delhi, but also act as barrier for dust coming from the desert in western India.

The idea of creating a huge green wall was a part of the agenda of recently held conference, (COP14) at the United Nations Convention to Combat Desertification (UNCCD) in India.

The idea of creating a green wall was accepted after successful growth of Africa's green wall. The desertification and land degradation atlas of India, brought by ISRO in 2016, revealed that Gujarat, Rajasthan and Delhi were among the states where more than 50% land was degraded and is under the threat of desertification.

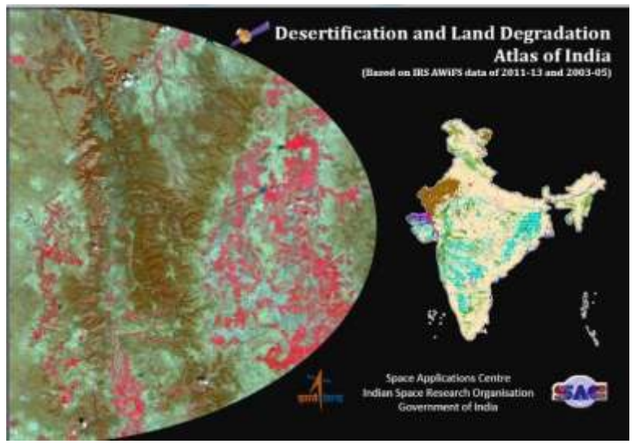
Gujarat is the state with third highest area under desertification/ land degradation in country and fourth highest with respect to other states. The state is observed with 52.29% of the total geographical area under desertification/ land degradation (period of 2011-13). Main aim to tackle the desert by green wall and make the green corridor for rivers and future.

The Aravallis, is the oldest fold mountain range on earth. It spans over 800 kms from Gujarat to Delhi through Rajasthan and Haryana. The Aravalli range, which separates western India's Thar desert and act as a natural barrier against the heat and dust that blows from the west.

Rajasthan is the state with highest area under desertification/ land degradation in country and second highest area under desertification/ land degradation with respect to other states. The state is observed with 62.90% of the total geographical area under desertification/ land degradation (period of 2011-13). The most significant process of desertification/ land degradation in the state is Wind Erosion.

Challenges in this project:

- The planting of economically interesting species and plants must be native.
- Integrated development of agricultural production system.
- Planting of drought-tolerant species.
- Income generating activities for farmers.
- Basic social infrastructure.



Desertification and land degradation are one of the major threats to agricultural productivity in India. Combating desertification and land degradation is one of the area identified by the Ministry of Environment, Forest & Climate Change (MoEF & CC), Government of India, New Delhi. Space Applications Centre (SAC), ISRO, Ahmedabad along with 19 partner institutes have carried out an inventory and monitoring of desertification of the entire country using Indian Remote Sensing Satellites (IRS) data in Geographical Information System (GIS) environment.

The maps and data describing desertification was released on the occasion of "World Day of Combat Desertification", on 17th June, 2016.

"A legacy programme like converting such huge tract of land as a green belt in high intensive land degraded states will be great boost towards meeting India's target." –said by officials. However no official was willing to speak about the plan on record. Once approved, its implementation will start with degraded forest land and the stretches, coming in, for restoration.

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