An Eco Club initiative by TERI SAS

ReEnergize

Vasundhara

Issue 4 | December 2020

EXCLUSIVE

"...necessary for the people to be the monitoring force."

An insightful Interview with

MEDHA PATKAR

INSIGHTS

- Green India Initiative sheds light on a holistic, community-driven approach towards solar energy

- Mapping India's Renewable Energy Movement: The challenges and triumphs

teri school of advanced studies

ECO CLUB

Eco Club TERI SAS brings to you *ReENERGIZE*, the fourth issue of Vasundhara magazine, aiming at the general public and especially for pupils interested in information related to the Renewable Energy sector. This is a free and creative initiative to educate young minds about the ongoing events in the sector. The information in the magazine is for general use only and has been compiled from various research papers/articles/government databases. Some personal experiences and anecdotes have also been shared for which we extend our sincere gratitude to the contributors. The information given in this edition is accurate to the best of our knowledge as of 21 December 2020 and we apologize for any inadvertent errors that may exist.

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IN THIS ISSUE

Vasundhara

Editor's Note

For over 150 years our offices, homes, and factories have depended on fossil fuels as the major source of energy and as a result, we are now facing environmental degradation and climate change on a global scale. Our energy should not come at the cost of the environment. As of now, we are in a transition, renewable energy is the alternative, the cleanest and cheapest form of energy.

The renewable energy sector has shown remarkable resilience in these pandemic times of 2020 and is expected to contribute the most by 2021 and would double the green energy capacity. Wind, solar, and hydro energy accounts for 95 percent of the increase in the electricity generating capacity over the next five years. Renewable energy is estimated to provide a direct economic gain of 26 trillion USD by 2030 as compared to conventional methods. The energy use is changing fast. The shift to renewable energy sources needs to be fast not only in power generation but also in transport and building so as to help in mitigating climate change.

There's a lot more to discuss on this topic and we are eager to present a perfect blend of our perspectives combined with the experiences of the experts in this field, through this magazine. This issue of Vasundhara is dedicated to discovering the various aspects of renewable energy and its impacts including the exclusive interview with Medha Patkar, which is followed by a graphical map overview of the state of renewable energy in India. Besides the informative articles and infographics that our content and design team have curated for you, we have also introduced a brand-new leisure section for our readers.

- Jaya Gupta
Editor, Vasundhara Issue 4

Renewable Energy land use in India

For the expansion of renewable energy in India, upto the targeted capacity of 175 GW (approximately 100 GW of solar and 60GW of wind) by 2022, India needs a total land footprint between 55,000 to 125,000 sq. km, more or less the size of Himachal Pradesh and Chhattisgarh respectively.

Challenges:

- Acquiring land for establishing infrastructure for power plants and grid projects.
- Expansion in ecologically sensitive regions and grasslands.
- Approximately 6700–11,900 sq. km of forestland and 24,100–55,700 sq. km of agricultural land could be impacted
- Environmental and social conflicts

Advantage:

India's location on solar belt makes it one of the best recipients of solar energy courtesy.

Government Initiatives:

- Gujarat's Wind Power Policy of 2013
- PM-KUSUM
- Solar Rooftop Phase-2
- Ultra Mega Renewable Energy
- Power Parks (UMREPPs)

According to research findings, India's wasteland has the potential to generate more than 10 times the 2022 renewable energy target.

SOLUTIONS:

- Developing energy on wastelands rather than placing new infrastructure within natural habitats, would minimise land use conflicts and reduce cumulative impacts.
- establishing multiple decentralised small-scale biomass plants would require relatively lower investment in both land and fuel.
- By retaining most of the land for its original use, easing of land for wind could also provide a stream of income.
- Offshore wind, if implemented, would eliminate this remaining land footprint as well.
- Solar PV installations on building rooftops and Agrivoltaics could provide better productivity and water savings, specially for horticulture.
- creating subsidies and incentive programs aimed at promoting low-impact renewable energy deployment and establishing mitigation obligations, could escalate public support for renewable energy.
- Funds allocated by MNRE to encourage research and development to boost innovation could go a long way.

Rethinking Hydropower as Renewable Energy

Natel Energy

This system possesses a blunt edged curved thick turbine blade. This blade acts as an airbag for the fish ensuring minimal impact. This design also removes the need for a "trash rack" – a fine screen traditionally used to capture debris at the entrance to the turbine, often installed to keep small fish out of the machinery.

Bio-Diversity

Small dams unlike large dams can be economical and sustainable. These dams can help retain food sources, fisheries and the potential livelihoods, and may preserve thousands of species in these biodiversity hotspots.

Climate Resilient

This Hydropower can withstand the unpredictable change in rainfall and extreme weather conditions (droughts and floods). To achieve this, turbine is paired with satellite technology using which real-time models of the surrounding landscape is created, which in turn enables more accurate water forecasts of the water flow.

High Water Level

This model uses biomimicry* wherein cascades that mimic beaver structures are created which cause water to slow down, creating small ponds and wetlands which give sufficient time for water to seep into the ground, which in turn raises the water table. This can help overcome droughts.

*Biomimicry

Before human intervention and the creation of aqueducts and canals, most rivers were clogged with woody debris and beaver dams. The cascades that mimic beaver structures cause water to slow down, creating small ponds and wetlands which give sufficient time for water to seep into the ground, which in turn raises the water table. A higher water table means more groundwater storage, which helps watersheds ride out long stretches of drought.
Beavers create dams that make rivers spill and pool, helping to rewet the wider area.

Rebuilding the economy post Covid-19

The role of Renewable Energy

A stable economy for a country and a reliable source of income for individuals are imperative to survive in any situations. And the lockdowns that ensued due to COVID-19 delivered a hit to the economy like never before. While there were far-reaching implications in every sector of the economy, we will touch upon the energy sector's threats and opportunities

Renewable Energy: A pertinent need

If you have noticed the skies and air quality during the lockdown, you will see just how much carbon emissions impact our environment. Many people have fawned over clean skies and been determined to keep them that way. Investing in and supporting renewable energy is one of the primary ways for us to achieve that. In a nutshell, it is no longer an attractive option, but a necessary change that needs to be worked upon at all costs. Renewable energy is also referred to as sustainable energy by many professionals as it the best way to ensure the fulfillment of the four pillars of energy- access, efficiency, sustainability andsecurity.

The Energy Sector today:

A mere glance at the energy section of your newspaper will show you that energy and consequently, demand for oil has been lower than ever. Naturally, with everyone cooped inside their homes, industries and businesses made an overnight change in the energy demand within the country. That being said, the need for uninterrupted supply in the healthcare sector has never been more urgent. Furthermore, on a micro level, individual needs have also increased with a major chunk of the population working from home and relying on readily available resources for their next pay-check..

Boosting growth and GDP:

According to a recent report by the International Renewable Energy Agency (IRENA), if we double renewable energy's current share in the global energy mix, global gross domestic product (GDP) would increase by as much as 1.1 percent, or approximately $1.3 trillion, by 2030. That's right, not only is it the more ethical choice in terms of meeting emission standards and protecting public health, it can also help drive up our GDP equitably as it will open up opportunities for skilled, semi-skilled and unskilled workers!
In fact, according to a report by the International Renewable Energy Agency (IRENA), the renewable energy industry in India accounted for almost 7,19,000 jobs in the year 2018.

There are many myths surrounding the viability of renewable energy projects yet, it has been proved time and again that sustainable funds provide just as many returns, if not more than traditionally invested funds. So, let's gear up to join the ranks of other nations that have accrued the benefits of this technology and together we can help achieve the nation's goal of becoming a $5 trillion economy by 2024-25.

Biomass and Bagasse:

The Promising Renewable Resource for Electricity Generation in India

Many studies have showcased that the byproducts of the energy generated from coal is responsible for climate change. So, to tackle this problem mankind should reduce its dependency on coal by taking options of renewable energy resources. Therefore, energy generated from biomass and bagasse can have a significant contribution to various sectors.

Government Schemes

- A scheme has been launched by The Ministry of New Renewable Energy(MNRE) to support biomass-based cogeneration in sugar mills and other industries up to March 2020.
- In this scheme central finance assistance is providing biomass cogeneration projects at the rate of Rs 25 lakh per MW of surplus exportable capacity and Rs 50 lakh per MW of installed capacity depending on the type of fuel used.
- The Ministry of New Renewable Energy(MNRE) invited bids for conducting an independent evaluation of the implementation of the 'New National Biogas and Organic Manure Programme' (NNBOMP) which is to be implemented across 13 states of the country.
- Implementation of this programme encourages deployment of small biogas plants in the remote rural, semi-urban areas of the country facilitating the beneficiaries to convert cattle dung, organic wastes into clean gaseous fuel for cooking and lighting.

Indian Scenario

- According to the Power and Renewable Energy Minister Mr. R.K Singh India is capable of generating around 18,000 Megawatt of renewable energy using biomass and an additional 7000-8000 MW from bagasse cogeneration in sugar mills.
- In the year 2010, the cumulative installed capacity of grid-interactive biomass and Bagasse cogeneration power was 2313.33 Megawatt.
- So, setting up of new sugar mills have been initiated and the modernization of existing ones are done in order to achieve the estimated target of 21000 MW and 5,000 MW respectively.

Advantages

- One of the major contributing factors is the climatic conditions of India which provide an ideal environment for biomass production.
- About 540 million tons of biomass is available per year ranging from residues from agriculture, forestry and plantations and the surplus residues can be used to generate more than 16,000 MW power.
- The main advantage of using biomass is that it does not add carbon dioxide to the atmosphere as it absorbs the same amount of carbon in growing as it releases when consumed as a fuel.
- Thus, it's very advantageous to generate electricity with the same equipment or power plants that are now burning fossil fuels.

Thus, if this sector is given due attention, it can be a major turning point for the renewable energy sector by strengthening industrial development, economy and providing job opportunities.

oorjan

FOUNDERS: GAUTAM DAS, ROLI GUPTA
FOUNDED IN: 2014
COVERED: 14 STATES
LOCATION: MUMBAI

Das belongs to a family of agricultural workers. Hailing from West Bengal his family had no access to electricity and this drew him towards his goal of working for sustainable living in India. Today, he has carved his way through the power industry through the solar energy space. Gautam has key interests in agriculture and Environment. Such a combination of experience and interests yielded Oorjan.The company started operations in 2016. It provides turn-key solutions including easy financing to consumers for Solar projects across residential and corporate spaces.They faced many roadblocks including lack of exposure, awareness and viable financing options. But the resilience helped the team sail through, and Oorjan took the help of technology to tackle the issues, to reach out to people in order to spread awareness. It developed softwares like Greenstitute and I Smart Solar where people can obtain knowledge on solar power for free. ***The I-Smart Solar platform is being run by The Energy and Resources Institute (TERI).*** The company is focused on expanding geographically in the near future. It is also trying to come up with solutions to recycle the downstream solar panel waste.

uron

FOUNDER: KUSH CHOKSI, URVISH DAVE, RAAJ PATEL
FOUNDED IN: 2019
LOCATION: AHMEDABAD

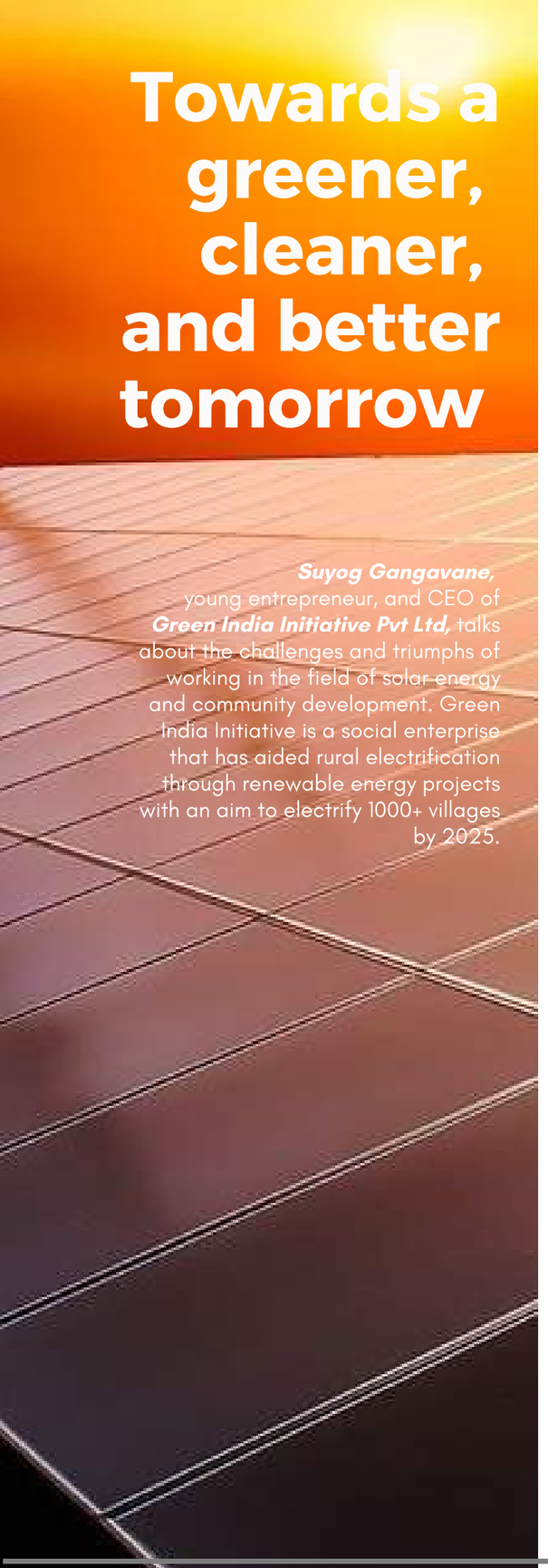
URON Energy offers end-to-end solar solutions from the concept to commissioning to all types of clients. It aims to be a quality player in the solar energy segment and provide the utmost transparency to customers.
"Since my father was working with the wind energy sector, I was able to track and regularly update myself on the latest developments taking place in the renewable energy sector. This got me more interested and prompted me to become a part of this exciting & ever-changing space. Thus, going over through extensive brainstorming sessions and gaining immense knowledge under the mentorship of Deepak Gadhia, known as the father of Solar Thermal Energy in India, I ventured into the solar space," speaks Urvish Dave.
Urvish Dave's company blog has been recently recognized as one of the most read blogs among readers in 150 countries.
"Our services differ from others in the way that we are acting purely as a solar project consultant and advisers to the clients with a process constituted with ethics, professionalism & credibility," avers Dave.
Institutionalized as a small firm that is rapidly scaling in terms of service offerings & business expansion, Uron has marked its presence in countries like Mauritius, Tanzania, Ghana, Kenya, Uganda, Nepal and is planning to enter 5 more nations.

MYSUN

FOUNDER: GAGAN VERMANI
FOUNDED IN: 2015
LOCATION: NOIDA

MYSUN incorporated about three years ago, to make an impact in the distributed solar segment. Vermani explains, "The country has made significant progress in the deployment of large-scale solar but rooftop solar lags behind even with hundreds of companies operating in the segment. The idea behind MYSUN was to develop a platform that simplifies rooftop solar installation for end-consumers – be it industries or individual homes."
Vermani expects the impact of Covid-19 on the rooftop solar segment to last a couple of quarters. He feels that the current business models do not cater to the medium and small enterprise segment, which constitutes 95 percent of the Indian industry.
"We were working to develop a business plan and trying to gauge the financial returns from solarisation in just one city. During the process, we got so excited that we ended up doing that exercise for each pin code in India for every customer category."
Vermani follows a collaborative management style and believes that each employee is important in building the organization. He values new ideas and technologies.

Towards a greener, cleaner, and better tomorrow



Suyog Gangavane, young entrepreneur, and CEO of ***Green India Initiative Pvt Ltd,*** talks about the challenges and triumphs of working in the field of solar energy and community development. Green India Initiative is a social enterprise that has aided rural electrification through renewable energy projects with an aim to electrify 1000+ villages by 2025.

GREEN INDIA INITIATIVE Pvt. Ltd.

Q: What is your experience of working on solar electrification in villages and what are some of the challenges and struggles you have faced so far?

The journey has been good so far and at times, the experience has been rough and raw. Villages in the rural parts of India have still not been developed in terms of transport, infrastructure, electricity connections, or even water. One is connected to the other, and if one development takes place, it connects to all different aspects of development and the village succeeds in elevating its infrastructural development as well as development as a whole. The ground reality is harsh, so when you reach the village, in some parts there was no transportation and we had to walk 3-4 km to just reach the place.

So, we took this into our own hands that if something is not happening, why don't we take the initiative to develop the villages. The basic thing that we need today is electricity. Hence, it was considered a keypoint by us which could lead to a push in development for other factors too. Our company came as an idea in 2009 but it was only registered in 2014. Before that, we were only doing some small projects such as the distribution of lamps or solar lanterns, but after 2014 we started actual projects on the grassroots level. There were a variety of problems we faced such as communication which was the most important. To overcome that, we took a translator with us who would explain our thoughts to them in their language. Another thing we practiced in every village was documentation as once you do that, everything is on paper and details about training, past experiences, what more can be done, etc are always handy.. It also gave us a superficial image of the village and how our work and the people's expectations should align.

They have a lot of expectations because of how deprived they are. Keeping their struggles in mind, we also try to innovate our technology in a way that can help. For example, if the project is the electrification of a school and someone comes to us with subsidiary problems of accessing water, we managed to innovate and develop a solar dual-pump project to help the women and children who had to devote 3-4 hours a day to get water. Now, it was just a matter of 10 minutes.

Thus, we have overcome a lot of struggles and helped develop 165+ villages. However, the pandemic has forced us to take a step back this year.

Q: What happens after the initial installation of these projects? Are the communities able to sustain these on their own or do you still lend a helping hand?

Two things come into place in this aspect. First of all, wherever and whenever we do a project, along with the documentation, we also select a few individuals from the village itself. For instance, we have often experienced that school teachers are a big help and often selflessly work to help people survive. So, we select these kinds of villagers to create a team for the maintenance of these systems.
We also make sure to give the funding party an idea of how long the equipment will last and other needs. If it stops working even 7-8 years after the warranty period, we make it a point to look into the issue. But this is based on the village maintaining the system as we make it a point to check on these projects quarterly every six months to see how the villagers are maintaining it. Our idea is that these technical systems and if the people are not up to maintaining these projects after training, they can't receive long term and increased benefits.
Another way is that if the village saves money due to our projects, they can save some of their annual government funds and these can be utilized if the project stops working down the line. If they even save INR 500 of these funds, then over the years we have a proper fund to help repair and replace what is necessary. If this model becomes successful, it catches the eyes of many corporates and NGO's which makes them want to invest in similar things.

Q: What are the policy and social related issues affecting the implementation and achievement of your 2020 goals?

Government policies are often unable to reach the grass-root level and help people. Policies don't affect us anyway because we are not connected with the grid which is implemented by the government. But before installation of the solar panel, there is documentation done where we take permissions from Gram Panchayat or the concerned landowner before starting with the new project on their land or property. There are many social factors such as demographic, geographical terrain, the behavior of people, climatic conditions that need to be taken care of before initiating any work. Also, we are totally against cutting trees. There was a school in a high rainfall area that was planning to install solar panels that were surrounded by trees and installing solar panels would decrease their efficiency as they will be able to capture the UV rays less. So instead of cutting down the trees, we decided to increase the efficiency. We established a 370W panel so that even if the panel gets sunlight for 2 to 3 hours of what in the general condition is 4 to 5 hours then the whole school will get electrified and the trees will be saved. Also sometimes the donor and the corporates try to do the project with implementing agencies that give them better rates I.e. lesser prices. But often the higher price due to some economic conditions and social factors are neglected which is a common thing in villages. After overcoming all these challenges we try to benefit the villages by doing what we can for them.

Q: What are the challenges faced by corporations and individuals in adopting solar and what are the affordable ways of bringing it home?

Solar panel cost for the homes is not that much. The cost of batteries goes off as it is mostly on-grid so there is only a panel and inverter which is connected and the electricity goes to the grid itself that is measured and calculated by a net meter which is installed by a utility bill company. So your production and consumption daily are calculated by the net meter and by the end of the year if you have produced electricity in surplus then the government would pay you back at a rate of 3 rupees per unit on these on-grid projects. Also, some financing companies are helping individuals by giving EMI which can be paid back within a few years. It is also true that the initial cost is high but the rate of investment is paid back within 3.5 to 4 years and can be beneficial in a long run for up to 20 years or even more.

"Government policies are often unable to reach the grass-root level and help people."

Q: How has the Covid-19 pandemic affected your plans?

This pandemic has indeed impacted the plans to a great extent. The funds which were allocated for the community projects had to be shifted to the PM relief care funds to fight this pandemic. Our scheduled visits to some villages especially near Mumbai were shelved because of this as there was a sense of fear amongst the local people. Apart from this, various economic and strategic problems were also encountered but as nobody had foreseen this situation we had to deal with it in the best way possible.
On the other hand, this pandemic even helped us get prepared for future situations similar to this by having a proper strategy management plan and backup plans. Our target of 1000 villages till 2020, we were not able to achieve it due to various reasons but that didn't bog us down because the satisfaction that one gets to work selflessly for a cause can't be described in words and that is what we are working for. So, amid this crisis, our organization also worked on various school projects and other community development works because if we have to survive in this competitive world, one has to keep working with the mantra of self-motivation and belief.

Interviewed by: Anshita Jindal, Ashwini Ashok Huggi, Divija Kumari, and Pramada Sharan

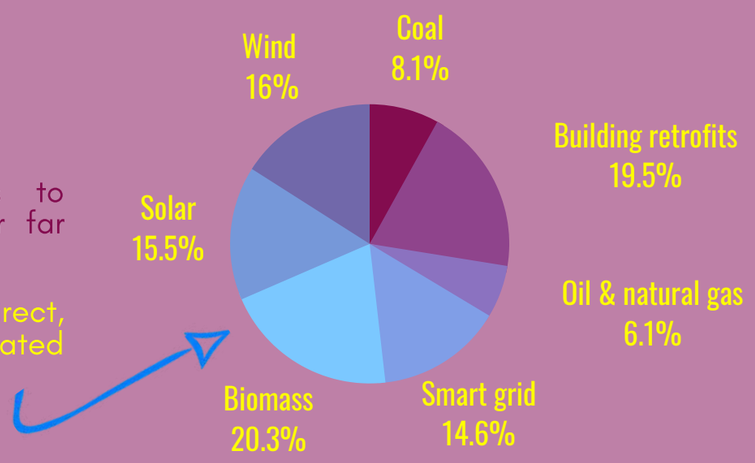
Let's Talk About Renewable Energy!

Types of Renewable Energy

Renewable Energy creates Jobs

From infrastructure changes to supply lines, renewables offer far more jobs than fossil fuels.

Total jobs percent including direct, indirect and induced jobs created by different Energy resources



Renewables improve Health

Human losses due to fossil fuel-based polluting grid

Human lives saved with just one wind plant

Enough sunlight falls on the earth in just one hour to meet world energy demand for a whole year!

Source: Times of India, 31 October 2020

MYTHS VS. FACTS:

The truth about Renewable Energy

1

MYTH: *Renewables cannot replace fossil fuels in keeping up with the growing demand for energy*

FACT: There is a growing consensus among experts and researchers that renewables can, in fact, be relied on as a global source of energy as it is both technologically and economically possible. Further, there is still massive potential to reach energy efficiency primarily through wind, solar, wave and geothermal energy sources. Countries like Iceland and Paraguay have already switched their full needs to renewable and are successful models to take inspiration from.

2

MYTH: *The energy delivered is not reliable and accessible*

FACT: Many people assume that renewable energy is merely a supplement to fossil fuels but not a permanent solution or a replacement. The arguments include how solar can't deliver when it's dark or how wind energy is not constant. However, it's vital to note here that there are a host of sources available today which may be applicable for different areas based on geographical factors. Renewables are also more reliable in the sense that they aren't easily exhausted as fossil fuels.

3

MYTH: *It's only for the rich and the cost is not justified in the long run*

FACT: While the initial cost of set-up for renewable energy projects is high, the cost ends up justifying itself in the long run. After all, we need to factor in additional factors such as environmental externalities or high subsidies. If that didn't make a case for renewables, it's also worth noting that biomass, solar thermal energy, solar PV's are already cost-competitive with conventional energy sources

4

MYTH: *Renewable projects require too much land*

FACT: Land use for renewable is only a one-time investment and the benefits easily justify the same. Furthermore, while renewables don't need to expand on land use in the future, the exhaustion of fossil fuels makes the latter a more draining choice for land. If planned in advance, countries can even make use of degraded and abandoned land for renewable projects to minimise any concerns on land use.

5

MYTH: *Switching to renewable energy will take away more jobs than can be replaced*

FACT: The primary economic argument against a switch to renewables is the jobs that will be lost. However, this fails to factor in the amount of jobs that the renewable sector will create. From operations to assembly, India itself is expected to generate 330,000 new jobs in the sector. The IEA has also predicted that by 2030, more than half the people working in the energy sector will be associated with renewables.

6

MYTH: *Renewables and especially wind energy causes global warming*

FACT: Wind energy causes localized increase in temperature due to the mixing of air layers. This redistribution of heat may lead to increased temperatures during night in surrounding areas. But this temporary surface temperature leading to global warming is not proven till now. It is also important to remember that when compared to fossil fuels, renewables don't come even close in terms of toxic emissions.

"Lok Sabha se unchi Gram Sabha hai"

In conversation with MEDHA PATKAR

Ms. Medha Patkar is a renowned Indian social activist known for her work with people displaced by the Narmada Valley Development Project, an advocate of human rights, fighting against economic and political injustice.

Q: What was your motivation behind a movement like Narmada Bachao Andolan? What kept you going and how did you tackle the criticisms posed?

While working I realized, people were displaced from their original rural habitats and hence I decided to work in the interiors. When I chose Sabarkatha, Banaskantha, and Daan districts of Gujarat, I found advocate Vasudha Tayi and together, we saw how the communities were deprived of their basic resources and livelihood and forced to live under a tree in the Paldi area. This could link the micro-level scenario with the macro-level issues related to the development paradigm. Since my thesis at the Ph.D. level was also to be on the development paradigm, and this was the replica of the paradigm which one could see at the ground level. We raised questions, had dialogues not only before the government but also the World Bank. And when we went through all this, we realized that there was no planning done for the project of this size, a gigantic project, and there was no clearance granted by the concerned ministry. That's when we decided to oppose it fully by conducting rallies. And obviously, the criticisms came forward as anti-development to anti-national, and many were put behind the bars like Father Stan Swamy from Jharkhand because he took a stand in favor of Adivasi rights challenging the corporates who were encroaching and impinging upon their rights. So we shouldn't bother about these criticisms coming our way because they're ignorant and innocent, we must forgive them and move on.

Q: What are the on-ground impacts of development projects on local communities and their livelihood? What is the power of people in stopping the wrong and provoking government authorities to do what is right?

Impacts are very serious. The local people understand the agricultural impacts of these big dams and the impact on the river itself. The impact is not only on submerging and the upstream but also on the downstream; the people in the districts of Narmada and Bharuch rallied because they faced the downstream impacts of drought and flood.
We saw that the farmers or fish workers faced different impacts, and the fish and fisheries were affected. The contractors made them sell their fish for very cheap values as were asked to leave or become 'gulaam'. They also faced waterlogging and salinization in the command area – the so-called beneficiary areas.
We see that the impact of displacement could be dealt with through rehabilitation at least, but still, there are many people yet to get their plots for building houses; there are hundreds in Maharashtra and thousands in MP. Money cannot bring back the land which is affected and the sufferings of people cannot be compensated. We have to ensure that people first get space in the planning at the initial stage itself; that would bring out the truth – how far is the flora and fauna important as the forest resources, as the sources of livelihood, and for the protection of the river basin itself – this is something that people know themselves better than any environmentalist or ecologist but they don't get the space.

The Narmada Tribunal heard the case for 10 years, but no person of authority visited the affected area even once. This is what happens in the Development project planning process and this is what I find to be undemocratic and unjustifiable. People ought to get the right to participate and the right to question the cost and benefits. People must be monitoring forces. This can happen only when the people are organized and do not work as a mere part of any NGO. The affected people should have the first right to the benefits. This had to be provided to the people affected by the Sardar Sarovar Project but did not happen in reality. The involvement of various stakeholders and authorities sabotage the implementation of laws and policies from their end.
I would only say that we have to choose technology very carefully. The hydropower projects for example are generally considered clean and cheap, but having studied a whole lot of dams across the world as a member of the World Commission of Dams, I can tell you that we are following the wrong paradigm. We still have not been able to take care of the environmental impact on the command area of Bengal and have not been able to rehabilitate the people affected by this project. In India, the majority of our rivers are not flowing freely. We cannot miscalculate the benefits and overestimate them while underestimating the harms incurred. We have to, through you youngsters, go into deep research and analysis of the government statistics and data. This is essential to understand which technology is more beneficial than the other. Hydro-power according to me is neither a clean nor a cheap form of energy. Here the environmental and social costs are not taken into consideration, the benefits are overestimated. The people of Kutch and Saurashtra are in misery because although the canals reach there, the micro-canal network is not in place. Thousands of km of canals have not yet been built. The water is diverted to the industrial areas and big cities instead of the places where the people need it the most. Until we as people are not aware and do not ask questions and compel the authorities to execute the project in the legal framework, we will not achieve the benefits as claimed and cannot mitigate the harms and losses.

Q: Could you share a few of your inspiring stories with us?

Lack of alternatives is a false concept that has come along with the Globalization, Liberalization paradigm. This needs to be questioned and challenged. Political power is always compromisable. Hence the power of people is where the power is realized, that is the place where we can compel the authorities to change their position. To do that we have to bring out the data, question it. This is a very in-depth exercise and we need the younger generation to do that.
When we visited the Satpura Range area of Maharashtra we realized that if these people face displacement ever they cannot deal with the situation. There was no school running in the village communities with 100% Adivasis. There was not one person who could help us in the survey related to Land Rights. There were no proper institutions or even roads.
We got many young volunteers who came forward, spent days and weeks with us in the remote areas. They took up the tasks and activities with children and this turned into a school. Soon they built their first Pathshala, which we collectively decided to name Jeevanshala. Our intention was not only to provide formal education but to also have a value-based education. We have 6,000 children who have passed from the Jeevanshala, some are successful athletes and others are social workers.
Jeevanshalas is only up to standard 4th. Older children came to us and asked if they can sit in school. So we talked to the authorities about the situation and thankfully the collector agreed to this. So, in the lockdown, we could manage to start the Nirmalshalas, where the passed out students from Jeevanshalas came and taught the students from class 5th to 10th. This has created a huge youth force which gives us hope for a better future.

Q: How did people perceive displacement and the environment before and after the Narmada Bachao Aandolan?

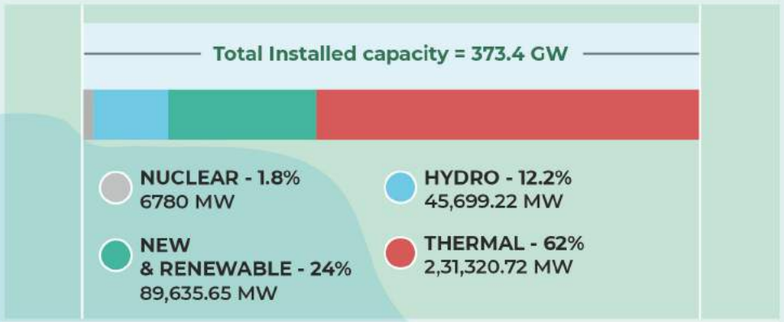
I don't think society will change with the efforts of just a single person. However, it had an immense impact resulting in 'Ghar Bachao Ghar Banao Andolan', the National Alliance of People's movement. Now when there's a project that is imposed on people, they have started asserting their rights because our constitution has granted those via the 11th schedule. Most of the development planning should be left to the village community, whether it is water management or agriculture but that doesn't happen, the omnipotent state controls the decisions. This is where you need to stand and state "Loksabha se upar gram sabha". The gram sabha should be strengthened. Youngsters can play a great role. After Narmada Bachao Andolan, the world bank has established an inspection panel which has helped people in the Sardar Sarovar Project and Tata Mundhra Thermal project. Even now a lot has to be changed and we need to fight injustice the way Mahatma Gandhi did through Satyagraha.

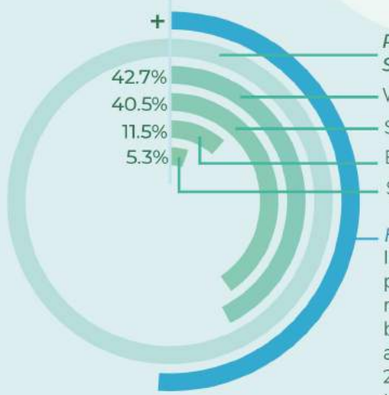
Q: How do you think the youth can better understand the plight of the indigenous people and help the people's movements to become more effective?

I think each one of you must feel determined to give one year at least after your career to any movement that you choose. Sustainable development, cannot come only through webinars, you have to be contributing and implementing it in more or less manner in your community and maybe join others who're paving a path towards sustainability and sustainable development. And who else than Adivasis can teach us, how to live simply and become self-reliant, their slogan of "swayam nirbhar jivan", instead of atmanirbhar jivan teach us a lot. First take a closer look at our pros and cons, our drawbacks, our strengths, and then decide if you are willing to take up this work which is much more challenging than any career in the corporate sector.

Interviewed by: Anshita Jindal, Divija Kumari and Rajesh Kumar

MAPPING INDIA'S Renewable Energy Movement





Hydro
In 2019, large Hydro-power was reclassified as renewable energy to boost the sector as well as to add towards the 2022 renewable energy target of 175 GW.

KEY

STATE LABELS - TOTAL INSTALLED CAPACITY OF RENEWABLE ENERGY IN MW (****)

COLORS DEPICT MAJOR CONTRIBUTING SOURCE TO THE TOTAL RENEWABLE ENERGY IN THE STATE

State | **** — Wind, Solar, Hydro

PERCENTAGE OF TOTAL RENEWABLE ENERGY (INCLUDING HYDRO) OUT OF TOTAL INSTALLED CAPACITY (ALL SOURCES) IN EACH STATE

0-10	50-60
10-20	60-70
20-30	70-80
30-40	80-90
40-50	90-100

Out of its estimated hydro power potential of 20GW, about 16% is utilized in Jammu & Kashmir. The region faces severe power shortages.

Himachal Pradesh has 5 perennial river basins. It has the second highest small hydro power potential after Karnataka.

Jammu & Kashmir and Ladakh | 3654.4

Himachal Pradesh | 10,772.1

As per the Punjab Energy Development Authority (PEDA) for capacity addition of renewable energy, the state is to add 4,774.8MW through renewable sources till 2022.

In Haryana, by the year 2020-21, the installed capacity of solar energy was expected to be 3200 MW.
The state government also offers a 90% subsidy to farmers who use solar water pumps. In Uttar Pradesh as well, a state subsidy of Rs 15000 per kW was announced for rooftop solar projects ranging between 1 kW and 10 kW.

Haryana is known for its production of wheat, paddy, mustard and cotton generating 8.4 million tonnes of biomass annually. The power generation from paddy waste was estimated at 612 MW while wheat straws could be used to generate around 157 MW of power.

Punjab | 2701.1

Uttarakhand | 4418.8

Haryana | 538.5

Uttar Pradesh | 3852.1

Delhi | 228.5

Rajasthan | 10,245.1

Solar is the major source of renewable energy in Rajasthan.

18, 770 MW of wind energy potential has also been estimated.

13 biomass power generation plants of capacity 120.45MW have been established.

Hydro power in the North East provides 34.5% energy out of the total energy consumption.

Sikkim | 2221.8

Arunachal Pradesh | 951.7

Assam | 428.5

Nagaland | 106.7

Meghalaya | 368.4

Manipur | 116.8

Tripura | 25.4

Mizoram | 98

34% of India's total water wealth lies in the surface water resource of the region, nearly 652.3 billion cubic meters along the Brahmaputa-Barak basin.

98% of total hydro-potential is still untapped.

Gujarat | 13,461.8

3530 MW of wind energy projects implemented, dwarfing the solar power generation in the state.

Maharashtra | 12918.6

Goa | 5.2

Madhya Pradesh | 7400

World's largest solar powerplant to be set up in Madhya Pradesh with an expected annual generation of 1.25 billion units of electricity - offsetting 1 million tonnes of CO_2 emissions.

West Bengal | 1908.2

Bihar | 348.7

Jharkhand | 257.4

Odisha | 2689.1

Jharkhand is the leading coal producing state followed by Odisha.

Odisha has a strong base for hydro power due to the Odisha Hydro Power Corporation set up by the state governement.

Chhattisgarh | 680.8

Telangana | 6655.6

Andhra Pradesh | 10,006

Karnataka | 18906

Tamil Nadu | 16,954.3

Wind Energy is the predominant renewable energy in Andhra Pradesh , Telangana , Karnataka and Tamil Nadu because wind generation peaks during the southwest and northeast monsoon months, followed by average generation for the remaining months.

Kerala | 2290.1

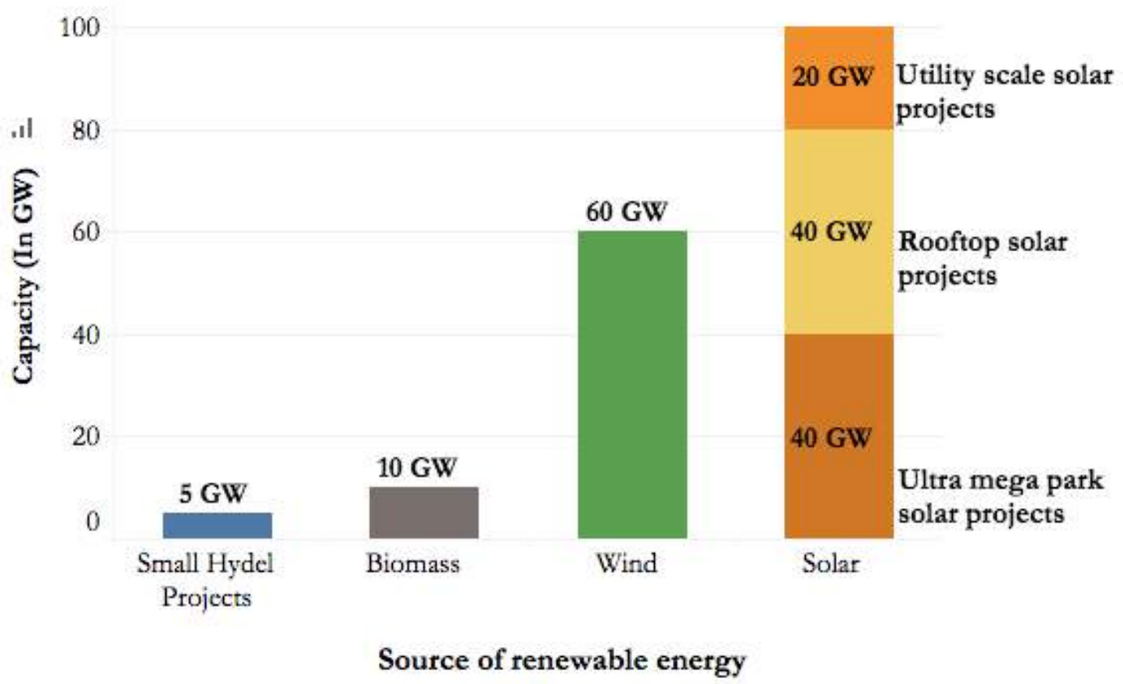
Kerala is bestowed with huge hydro power potential by the way of plentiful of rain and many rivers.

Based on data of all India installed capacity (IN MW) of power stations as on 31/10/2020. (National Power Portal)

Everything you need to know about: Renewable Energy finances in India

India is the world's third-largest emitter of greenhouse gases and is likely to continue being a significant emitter in the near future. According to estimations, nearly 15 percent of India's population of 1.3 billion does not have access to electricity. Hence, it becomes imperative to ensure energy security while keeping emissions low. Every practice and department in India is progressing its way towards a cleaner environment and the story of the energy sector is no different. In fact, we have even set a target of installing 175GW renewable energy capacity by the year 2022. This has been bifurcated sector-wise, i.e. 100GW from Solar energy, 60 GW from wind energy, 10GW from biopower and 5GW from hydropower. What adds to these amazing figures, is the 3.2 billion dollars investment from the FDI sector. The cost characteristics of renewable energy are that the energy projects have zero fuel cost as compared to conventional energy systems and that they are highly capital intensive in nature. According to data, an investment of around $189 billion is required to meet the ambitious target.

India's 2022 Renewable Energy Target



In 2020, out of the total installed renewable energy capacity of 88.79 GW, solar and wind comprise 35.73 GW and 37.99 GW, respectively. The remaining 10.14 GW and 4.73 GW goes to biomass and small hydro power. India's total clean energy generation has now reached 127.01 billion units in FY20. After establishing an installed capacity of 7.3 GW of solar, India achieved its position as the third-largest solar market in the world. However, there still exists reluctance among the banking community to finance renewable energy projects primarily due to associated risks.

Instruments for financing Renewable Energy Vision in India

GREEN BANKS

These financial institutions have proved to be a successful mechanism to mobilize funds into the sector. The Indian renewable energy development agency also plans to become the first green bank in the country. Several other banks in India have also started to take initiative by converting into green banks. For instance- the State Bank of India has been providing loans to renewable energy projects at concessional rates.

GREEN BONDS

Green bonds are fixed income financial instruments for raising funds for projects that are environmentally beneficial. Although these bonds are yet to show benefits, they are used in the Indian financial market in huge amounts. India is one of the top 10 global green bond issuers, and has issued $10.3 billion worth of bonds up until the first half of 2019. The Indian banking system has also implemented many regulations to drive up the green bonds market.

NCEF

NCEEF (National Clean Energy and Environmental Fund) is a fund which supports entrepreneurial ventures and analysis within the clean energy technologies by mobilizing funds through a cess on the coal of INR 400 per ton known as Clean Environment Cess. Part of it is used by IREDA to lend to banks at a 2% rate of interest.

This money can also be used by the banks to provide loans to support renewable energy projects at concessional rates. The budgeted estimates for the year 2020-21 show that about 19.479.74 crore INR has been allocated to the Ministry of New and Renewable Energy (MNRE) under various heads to support renewable energy development in the country.

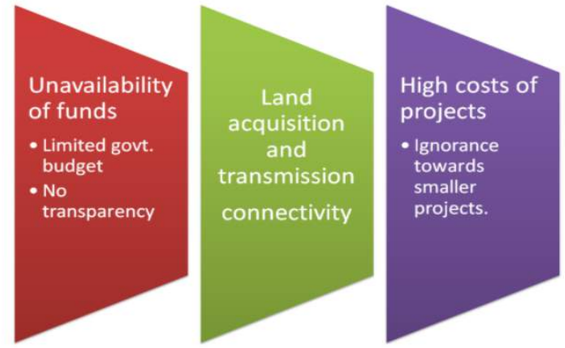
INFRASTRUCTURE DEBT FUND

The Infrastructure debt fund is an innovative financial instrument in India. These funds are created to accelerate and further the long-term debt in infrastructure projects. Such funds are present in the market by L&T IDF, India infra debt. The impact of these funds is yet to come because of lack of availability of well performing projects.

PRIORITY SECTOR LENDING

The renewable energy sector has been categorised by RBI as a priority sector lending in April 2015. The guidelines presented by RBI suggest that 40% of the net credit of banks should be lent out to the priority sectors. The revised guidelines issued by the Reserve Bank of India (RBI) on 4th September 2020 stated that the limit of bank loans has been increased to rupees 300 million to the people who are responsible for generating solar, biomass, wind and micro-hydel power.

Challenges



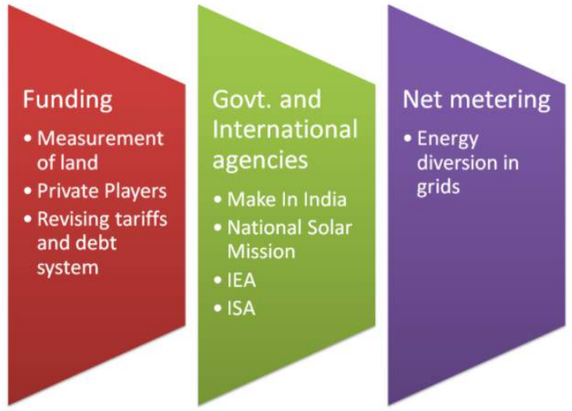
There are three major challenges when it comes to renewable energy. Unavailability of funds tops the list. Unfortunately, solar resource additions in India in Q1 2020 were the lowest since as far back as 2016. And this isn't just pandemic-related as these additions had been slowing down since 2016-17 and came as low as just 30% in 2018-19. Apart from this, there is no transparency in this sector when it comes to funds and implementation of policies.

The second challenge is of land acquisition. Projects end up taking a lot of time when it comes to land and transmission connectivity approval. Many developers struggle with tight deadlines that affect feasibility of the project.

Our Govt's USP is inconsistent implementation of policies and lack of enforcement of regulations. Hence, the investors stay limited and this leads to sole dependence on government support.

High financing costs of projects constitutes the third challenge. Investors hesitate to invest in the first place and leads to the delay in finalising anything. This also creates an issue of investing in smaller projects as the initial costs involved makes many wonder whether it will be justified or not.

The Government has taken initiatives to promote solar by implementing subsidies and schemes such as Make in India, National Solar Mission etc. India is also a member of international associations such as International Solar Alliance, International Energy Agency etc. Additionally, the work on Research and Development through these projects contributes to employment, skilling, capability building as well as women empowerment.



Solutions

India is currently struggling with providing adequate land to fund solar projects due to lesser availability of land per capita. Measures such as allocating converted lands or wastelands for such projects can ease the pressure for developers. Bringing more private players to invest will also help the sector grow exponentially. A more efficient model for revising tariffs, debt-systems, etc. to attract investments can also be worked on.

Use of Net metering is another plausible solution. When the energy generated by the system is more than the amount of energy consumed, it is diverted to the grids where it is stored automatically and can be utilized when the need arises. Also, when the energy is diverted to the grids, extra credits and revenue get produced which leads to more money savings.

Conclusion

Currently, we are halfway through in achieving the target for the country. 85 GW renewable energy installations have already been produced until now. However, the bar has been raised from achieving 175 GW by 2022 to 450 GW by 2030 making the challenge even bigger. The "new normal" too took a toll on our growth but the target is still achievable as India had already seen a good percent of 25-30% of reduction in demand for power.

Rapid urbanisation, hiked prices of fossil fuels and ever-increasing population challenge the ministry and our people to make the most out of the available time and resources. The most critical issue facing India's renewable energy financing framework is the lack of innovative financing options that will offer larger sums at lower interest rates and for longer durations.

Overall, sound financing will boost the number and size of the projects, ultimately translating to accelerated renewable energy growth. These measures will also have a positive impact on the country's economic growth and energy security; and help fight against climate change in congruence with the Paris Climate Agreement.

Wildlife Photography Contest: TOP 5 ENTRIES

An initiative by Eco Club of TERI SAS

1

WINNER

Anubhuti Shekhar

(MSc Water Science and Governance, TERI SAS)

2

Abijeeth Satheesh

(10th grade, Kendriya Vidyalaya, Kanjikode, Palakkad, Kerala)

3

Ananya Pandey

(MSc. Economics, TERI SAS)

4

Vibhuti Bhat

(M.Sc. Environmental studies, University of Delhi)

5

Abijeeth Satheesh

(10th grade, Kendriya Vidyalaya, Kanjikode, Palakkad, Kerala)

KNOWLEDGE UPGRADE

ENVIRONMENT - MARINE

MARINE PLASTIC POLLUTION

A report titled "Breaking the Plastic Wave"- 'A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution' pointed that the annual flow of plastic into the ocean could triple by 2040 to 29 million metric tonnes per year, without immediate and sustained action. Over 300 million tons of plastic are produced every year, half of which is used to design single-use items such as shopping bags, cups, and straws. Out of this, at least 8 million tons of plastic end up in our oceans every year.

Impacts:

- Ingestion, suffocation, and entanglement of hundreds of marine species such as seabirds, whales, fishes, and turtles, and most die of starvation as their stomachs are filled with plastic debris. They also suffer from lacerations, infections, reduced ability to swim, and internal injuries.
- Floating plastics also contribute to the spread of invasive marine organisms and bacteria, which disrupt ecosystems.
- Carcinogenic chemicals present in the plastic materials interfere with the body's endocrine system, causing developmental, reproductive, neurological, and immune disorders in both humans and wildlife.
- Under linear plastic systems, 95 percent of the aggregate value of plastic packaging is lost to the economy after a single use cycle, and that many plastic products are placed in markets that cannot collect and treat them economically after use. Globally, only 71 percent of plastic produced is formally collected, and less than 15 percent is recycled.
- Consistent definitions and conventions for plastic waste data and metrics are lacking, and there is insufficient transparency regarding the plastic being placed on the global market (type, chemical additives, etc.), trade flows, waste production, consumption, and post-use patterns.

Stemming the tide of plastics entering the ocean will require a combination of approaches, including limiting plastic use, improving waste collection, infrastructure, and management, and expanding recycling, particularly in the countries where most of the plastic originates. Additionally, strengthening Collaborations between Governments, research institutions, and industries to find appropriate technological, behavioral, and policy solutions to plastic usage and their disposal. The transition from linear to a circular economy is crucial; where resources, such as plastics, are used, recovered, and reused over and over again, instead of heading directly to the landfill or the Ocean.

WHY HAS LONAR LAKE TURNED PINK?

Maharashtra's Lonar Lake turned Pink in June this year. Lakhs of people including the scientists were curious about this color-change. Lonar Lake is an ancient circular lake created by a meteorite strike in Maharashtra. It lies within the only known extraterrestrial impact crater found within the great Deccan Traps, a huge basaltic formation in India.

The pink color was due to a salt-loving bacteria (red-colored archaeal strains classified as halophilic archaea or haloarchaea). It is associated with high salinity and alkalinity (pH). Absence of rain, less human interference and high temperature resulted in the evaporation of water which increased its salinity and pH. The increased salinity and pH facilitated the growth of halophilic microbes, mainly Haloarchae. During an investigation, researchers also came across an interesting incidental finding related to flamingos that visit the lake. The plumage of the bird is pink or reddish in colour because of ingestion of carotenoids-rich food. This bacteria, which produces a pink pigment, is ingested by these birds and they get carotenoid-rich food, because of that their plumage is pink in colour.

Experts are suggesting virtual water trade as one of the alternatives to ensure sustainable water consumption. Virtual water (VW) is the water 'embodied' in a product, not in real sense, but in virtual sense. It refers to the water needed to produce a product. Every product has a unique water footprint defined as the total volume of fresh water used to produce the goods and services consumed by the individual or community or produced by the business. For eg. on an average, 3000 liters of water are required for producing 1 kg of rice. Virtual water trade (VWT) refers to the import and export of hidden water in the form of products such as crop products, textiles, machinery and livestock — all of which require water for their production.

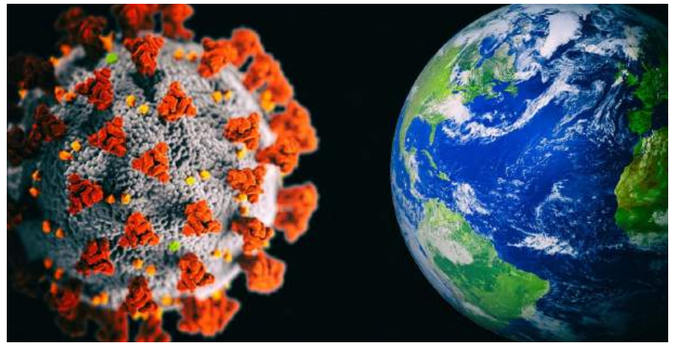
Source: Times of India

Significance of Virtual Water Trade Concept:

- Conservation of water resource: Knowing the virtual water content of products creates awareness of the water volumes needed to produce the various goods, thus providing an idea of which goods impact most on the water system and where water savings could be achieved.
- Optimizing domestic water use: through imports of water intensive agriculture products, water stressed regions can optimize the use of their already scarce water resources. o As in India where the agriculture sector accounts for 78 percent of freshwater usage. The water 'saved' through VWT can be used towards other ends such as for drinking, sanitation purposes, among others.
- To achieve water security: It would direct virtual water flows from relatively wet to relatively dry regions. Net import of virtual water in a water-scarce nation can relieve the pressure on the nation's own water resources. Virtual water can be seen as an alternative source of water.
- Alternate to mega project: It will act as an alternative to mega projects such as Interlinking of Rivers (ILR) in India to alleviate regional water scarcity.

CLIMATE CHANGE

COVID-19: IMPACT ON THE ENVIRONMENT AND CLIMATE CHANGE EFFORTS



The COVID-19 crisis could mark a turning point in progress on climate change. The Lockdown had a mixed impact on the environment-

- Reduced Pollution: There was a marked decline in air pollution (decreased concentrations of NO2 and PM 2.5), clean beaches due to lack of tourists, and reduced noise pollution.
- A decline in Carbon Emissions: Huge decreases in transportation and industrial activity due to COVID-19 lockdown resulted in a drop in daily global carbon emissions of 17% in April.
- However, CO2 levels in the atmosphere reached their highest monthly average ever recorded in May - 417.1 parts per million. This is because the carbon dioxide already emitted can remain in the atmosphere for longer times.
- Increased waste and More plastic: COVID-19 has vastly increased our use of plastic: gloves and masks and PPE kits, and disposable shopping bags, etc. E-commerce has also resulted in more packaging materials, increasing the carbon footprint of e-commerce.
- There has also been a reduction in waste recycling as authorities have been concerned about the risk of COVID-19 spreading in recycling centers.
- Public support for action on climate change increased to a peak before the pandemic; government and corporate action was also gathering momentum. COVID-19 has slowed this momentum.

How can we ensure recovery?

Put science and scientists first: In the case of COVID-19, collaborative networks of scientists beyond political lines and national borders have increased the efficiency and speed in research to find a cure.

Mobilizing financial resources: To avoid a climate catastrophe, climate finance must overcome difficult negotiations and political conflicts. The climate investments also make great economic sense. For example, it is estimated that for every dollar invested in climate-resilient infrastructure six dollars are saved.

Protect and improve common goods: Cases of response to the current pandemic show that previous investments by countries in public health and welfare systems have produced better results. Equally important are investments to restore clean air and water, healthy ecosystems, and other environmental and climate goods, which contribute to planetary health.

Fix and make food systems sustainable: Many policy options have been proposed and already implemented including ecological rotation of crops, robust estimation of the true cost of food, reducing food waste, fair trade, drastically reducing pesticides, decarbonizing food production, and distribution systems.

The pandemic has made it clear that failing to act on issues such as climate change and public health cuts into any development gains made in other sectors. Given the growing number of COVID-19 cases, and how communities have been affected along with their ability to cope with climate shocks, the government must factor in climate change in every decision related to the pandemic including devising the green economic recovery plans.

COOLING EMISSIONS AND POLYSYNTHESIS REPORT

The United Nations Environment Program and International Energy Agency jointly released the Cooling Emissions and Polysynthesis Report. It is based on the assessment of development and climate benefits of efficient and climate friendly cooling. It also lays out actions that can be taken to deliver efficient and climate-friendly cooling for all.

Key findings-

- Energy efficiency improvements along with the transition away from super-polluting refrigerants could avoid greenhouse gas (GHGs) emissions of up to 210-460 gigatons over the next four decades.
- Coordinated international action on energy-efficient, climate-friendly cooling could avoid as much as 460 billion tonnes of GHGs emissions.
- Development and implementation of Minimum Energy Performance Standards (MEPS) and energy efficiency labeling to improve equipment efficiency as part of the transition to low-GWP cooling.
- Anti-environmental dumping campaigns to transform markets and avoid the burden of obsolete and inefficient cooling technologies.
- Promotion of building codes and system-wide considerations to reduce demand for refrigerants and mechanical cooling, including the integration of district and community cooling into urban planning, and measures such as improved building design, green roofs, and tree shading.
- Programs to reduce peak demand, including incentives to purchase efficient cooling equipment and use thermal energy storage.
- Sustainable cold-chains to both reduce food loss – a major contributor to greenhouse gas emissions – and reduce emissions from cold chains.
- Increase public and private financing to accelerate the HFC phase-down, promote leapfrogging, and enhance energy-efficiency.

- Increase public and private financing to accelerate the HFC phase-down, promote leapfrogging, and enhance energy-efficiency.

India Cooling Action Plan (ICAP)

ICAP provides a 20-year perspective and outlines actions needed to provide access to sustainable cooling. It has a long-term vision to address the cooling requirement across sectors and lists out actions that can help reduce the cooling demand. It was launched in 2019. The plan seeks to o Reduce cooling demand across sectors by 20% to 25% by 2037- 38, reduce refrigerant demand by 25% to 30% by 2037-38, reduce cooling energy requirements by 25% to 40% by 2037- 38, recognize "cooling and related areas" as a thrust area of research under the National Science and Technology Program, training and certification of 100,000 servicing sector technicians by 2022-23, synergizing with Skill India Mission.

ENVIRONMENT - FOREST

'NO-GO' FORESTS CLEARED FOR COAL MINING

As per the Centre for Science and Environment (CSE), since 2015, of the 49 blocks cleared for coal mining, 9 were in 'No-Go' areas, or regions that were once classified by the Ministry of Environment and Forests and Climate Change as containing very dense forests and hence closed to coal mining.In 2020, of the 41 blocks put up for auction, 21 feature in the original No-Go list. Currently, India is not utilizing its existing capacity fully: 67% of the mines auctioned since 2015 are were not operational yet.

Source: The Guardian

The environment ministry's ban on mining in areas of thick forest cover has locked away millions of tonnes of coal reserves. According to the power ministry, coal shortage is likely to hold up new power projects of over 17,000 MW aggregate capacity. This has triggered debate among the ministries of coal, power, and steel on the 'Go, No-Go' concept's merits.

What are 'No Go' areas in coal mining?
In 2009, the environment and coal ministries had jointly placed the country's forested areas under two categories - Go and No-Go - and imposed a ban on mining in the 'No-Go' zones on environmental grounds.' No, Go' areas are those having either more than 10 percent weighted forest cover (WFC) or more than 30 percent gross forest cover (GFC).
The exercise is aimed at prioritizing forest areas under the Forest Conservation Act, 1980. Besides, the Diversion of forest land for coal mining in these areas, which are rich in flora and fauna, will have "avoidable serious adverse impact on forests and wildlife". If mining were to continue, even with afforestation and reclamation, it would not be possible to restore the region's biodiversity.

Criticisms of this policy: The concept has no legal standing- They are mandated neither under Forest Conservation Rules, 2003 nor under any circular issued by the ministry of environment and forests.

AGRICULTURE

AERIAL SEEDING

The Haryana Forest Department has started aerial seeding across the state on a pilot basis. This technique will allow plantation in sections of the Aravallis that are either difficult to access or inaccessible altogether. The pilot project will help determine the effectiveness of the technology and the dispersal mechanism. What is aerial seeding? It is a technique of plantation wherein seed balls – seeds covered with a mixture of clay, compost, char, and other components – are sprayed on the ground using aerial devices, including planes, helicopters, or drones.

How does this technique work?
Seeds balls or seed pellets are dispersed in a targeted area by the low-flying drones. They fall to the ground with the help of the coating of clay, compost, char, and other material, that provides the required weight for seeds to drop on a predetermined location rather than disperse in the wind. These pellets will then sprout when there is enough rain, with the nutrients present within them helping in the initial growth.
Inaccessible areas have steep slopes, are fragmented or disconnected with no forest routes, making conventional plantation difficult, can be targeted with aerial seeding. The process of the seed's germination and growth is such that it requires no attention after it is dispersed – the reason why seed pellets are known as the "fire and forget" way of the plantation. They eliminate the need for plowing and digging holes in the soil and the seeds do not need to be planted since they are already surrounded by soil, nutrients, and microorganisms. The clay shell of these pellets along with the other items in the mixture also protects them from birds, ants, and rats.

WILDLIFE

GLOBAL TIGER DAY

Global Tiger Day is observed on July 29 and was created in 2010 at the Saint Petersburg Tiger Summit. On this occasion, the Union Environment Ministry has released an updated report on India's Tiger Survey from 2018.

Key highlights:
- Country's tiger population: 2,967 — unchanged from the government's estimate last year
- India has nearly 70% of the world's tigers
- Madhya Pradesh has the highest number of tigers at 526, closely followed by Karnataka (524) and Uttarakhand (442).
- Chhattisgarh and Mizoram saw a decline in tiger population and all other States saw a "positive" increase.
- While Pench Tiger Reserve in Madhya Pradesh recorded the highest number of tigers, Sathyamangalam Tiger Reserve in Tamil Nadu registered the "maximum improvement" since 2014.
- Guinness Record: The fourth cycle of the All India Tiger Estimation 2018 recently entered the Guinness World Record for being the world's largest camera trap wildlife survey.

Conservation efforts (National and Global):
The National Tiger Conservation Authority (NTCA) has launched the M-STrIPES (Monitoring System for Tigers – Intensive Protection and Ecological Status), a mobile monitoring system for forest guards.
At the Petersburg Tiger Summit in 2010, leaders of 13 tiger range countries resolved to do more for the tiger and embarked on efforts to double its number in the wild, with a popular slogan 'T X 2'.
The Global Tiger Initiative (GTI) program of the World Bank, using its presence and convening ability, brought global partners together to strengthen the tiger agenda.
Over the years, the initiative has institutionalized itself as a separate entity in the form of the Global Tiger Initiative Council (GTIC), with its two arms – the Global Tiger Forum and the Global Snow Leopard Ecosystem Protection Program.
The Project Tiger, launched way back in 1973, has grown to more than 50 reserves amounting to almost 2.2% of the country's geographical area.

HYDROPOWER

HYDROPOWER PROJECTS IN THE NORTHEAST

The Forest Advisory Committee (FAC) has recently deferred its decision on the controversial Etalin Hydropower project located in Arunachal Pradesh. 3097 MW Etalin Hydropower Project is proposed to be constructed over Dri and Tango Rivers, situated inside the Dibang catchment zone in Arunachal Pradesh.
In terms of hydropower, the North Eastern (N.E.) region has the potential of about 58971 MW i.e. almost 40% of the country's total hydro potential. Out of which, only 1.727 MW (about 2.92%) has been harnessed as of 1st July 2020. In the financial year 2019- 20, the northeastern region recorded the highest power supply deficit (shortfall in supply of power as compared to demand) of 3.7%, while the national average was 0.5%. Thus, Hydropower projects can help in a steady and decentralized supply of electricity. Intense monsoon rains cause devastating seasonal floods in the N.E. region every year. Dams can be used to mitigate damage by controlled release of floodwater. Difficult terrain and geographical location of the N.E. region pose a challenge to the development of road and rail connectivity. Inland waterways can help enhance the connectivity of the region to the rest of the nation. Storage reservoirs play a role in maintaining sufficient channel flow downstream, to make the streams navigable in all seasons. Water stored in reservoirs can be channelized to agricultural fields in the area to meet high demands when rainfall is low. It will help in the utilization of fertile tracts of land to spur agricultural activity in the region. It is a renewable source of energy, is cheaper as compared to electricity generated from coal and gas-fired plants.

RENEWABLE ENERGY

WORLD BIOFUEL DAY

World Biofuel Day is observed every year on 10th August to raise awareness about the importance of non-fossil fuels as an alternative to conventional fossil fuels.
The day honors the research experiments by Sir Rudolf Christian Karl Diesel (inventor of the diesel engine) who ran an engine with peanut oil in 1893.
In India, the day has been celebrated by the Ministry of Petroleum and Natural Gas since 2015. The theme for 2020 World Biofuel Day in India is *'Biofuels Towards Atmanirbhar Bharat'.*

What are Biofuels?
Any hydrocarbon fuel that is produced from an organic matter (living or once-living material) in a short period (days, weeks, or even months) is considered a biofuel. Biofuels may be solid, liquid, or gaseous.
· Solid: Wood, dried plant material, and manure
· Liquid: Bioethanol and Biodiesel
· Gaseous: Biogas
1st generation biofuels are also called conventional biofuels. They are made from things like sugar, starch, or vegetable oil. Note that these are all food products. Any biofuel made from a feedstock that can also be consumed as human food is considered a first-generation biofuel.
2nd generation biofuels are produced from sustainable feedstock. The sustainability of a feedstock is defined by its availability, its impact on greenhouse gas emissions, its impact on land use, and its potential to threaten the food supply. No second-generation biofuel is also a food crop, though certain food products can become second-generation fuels when they are no longer useful for consumption. Second-generation biofuels are often called "advanced biofuels."
3rd generation biofuels are biofuel derived from algae. These biofuels are given their separate class because of their unique production mechanism and their potential to mitigate most of the drawbacks of 1st and 2nd generation biofuels.
4th generation biofuels: In the production of these fuels, crops that are genetically engineered to take in high amounts of carbon are grown and harvested as biomass. The crops are then converted into fuel using second-generation techniques.

PROTECTED AGRICULTURAL ZONE

The State government of Tamil Nadu recently notified the Tamil Nadu Protected Agricultural Zone Development Rules, 2020. In February 2020 the State government enacted the Tamil Nadu Protected Agricultural Zone Development (TNPAZD) Act 2020, with objectives to use the available agricultural lands for sustainable development of agriculture and ensure that the agricultural activities were not unduly constrained by non-agricultural use or other development objectives.
Key features of the TNPAZD Act, 2020
- Establishment of Protected Agricultural Zone (PAZ) comprising Thanjavur, Tiruvarur, and Nagapattinam districts and some regions in Cuddalore and Pudukkottai districts.
- Prohibition of certain new industrial and developmental activities in PAZ: such as - Establishment of Zinc, Copper, and Aluminium smelter, Iron and steel plants, Tannery, Shipbreaking Industry; Exploration, drilling, and extraction of oil and natural gas including coal-bed methane, shale gas, and other hydrocarbons.

Significance of PAZ in the Cauvery delta region
- Recognition of farmers' concerns: The delta has seen multiple protests for a decade over methane, hydrocarbon, oil, and natural gas projects which required the acquisition of fertile lands and well drilling.
- Sustainable development of Cauvery delta region: Activities like coal bed methane projects in the region can lead to intrusion of seawater in agricultural lands and threaten sustainable agricultural developments, livelihood, and security of the farmers.
- Food security: The Cauvery delta region is the rice bowl of Tamil Nadu and contributes around 40 percent of the paddy production of the state. Thus, protecting and improving farming activities will improve food security.
- Addressing environmental degradation: The Cauvery delta region is already highly vulnerable to climatic change and sea-level rise. o Certain industrial projects and activities in the region have had adverse effects on the environment including depletion of groundwater and degradation of sanctuaries, wetlands, and other biodiversity-rich and eco-sensitive regions.

The impact of existing projects on the environment and agriculture must be thoroughly assessed. PAZs can be developed on the lines of Special agricultural zones (SAZs) envisioned by M.S. Swaminathan, to include features like- Focus on water security and water use efficiency and climate-smart agriculture; creation of Agro Service Centres including soil testing labs and call center, plant health clinics, weather stations and advisories, bio pharmacy, etc; development of infrastructure facilities such as farm production units, planting materials production units, markets, processing and value addition units, irrigation support, etc; ICT based initiatives related to the procurement system, on-farm technology and training of farmers.

BIODIVERSITY

THE LIVING PLANET REPORT 2020

Recently, World Wildlife Fund (WWF), a leading organization in wildlife conservation and endangered species, released The Living Planet Report 2020 (LPR) along with the Living Planet Index (LPI).

About the Living Planet Report

- LPR, released every two years, is a comprehensive study of trends in global biodiversity and the health of the planet.
- It shows an average 68% decrease in population sizes of mammals, birds, amphibians, reptiles, and fish between 1970 and 2016. o Since the industrial revolution, human activities have increasingly destroyed and degraded forests, grasslands, wetlands, and other important ecosystems, threatening human well-being

75% of Earth's ice-free land surface has been significantly altered.
More than 85% of global wetlands have been lost. India has lost nearly one-third of its natural wetlands.
The 3,741 monitored populations – representing 944 species of mammals, birds, amphibians, reptiles, and fishes – in the Freshwater Living Planet Index have declined by an average of 84%;

- Destruction of ecosystems has led to 1 million species (500,000 animals and plants and 500,000 insects) being threatened with extinction.
- The most important direct driver of biodiversity loss in terrestrial systems has been a land-use change, primarily the conversion of pristine native habitats (forests, grasslands, and mangroves) into agricultural systems; while much of the oceans have been overfished. The largest wildlife population loss has been in Latin America at an alarming rate of 94%.
- Since 1970, our Ecological Footprint has exceeded the Earth's rate of regeneration..

About the Living Planet Index (LPI): LPI is a measure of the state of global biological diversity based on population trends of vertebrate species from around the world. LPI has been adopted by the Convention of Biological Diversity (CBD) as an indicator of progress towards its 2011-2020 target to 'take effective and urgent action to halt the loss of biodiversity'.

GLOBAL BIODIVERSITY OUTLOOK

Recently, the Fifth Global Biodiversity Outlook (GBO-5) report was released. It is a flagship publication of the Convention on Biological Diversity (CBD). It is a periodic report that summarizes the latest data on the status and trends of biodiversity and draws conclusions relevant to the further implementation of the CBD.

How can we achieve the 2050 Vision for Biodiversity?

- Land and forests transition: It involves conserving of intact ecosystems, restoring ecosystems, combating and reversing degradation, and employing landscape-level spatial planning to avoid, reduce and mitigate land-use change.
- Sustainable freshwater transition: An integrated approach guaranteeing the water flows, improving water quality, protecting critical habitats, controlling invasive species, and safeguarding connectivity to allow the recovery of freshwater systems from mountains to coasts.
- Sustainable agriculture transition: Redesigning agricultural systems through agroecological and other innovative approaches to enhance productivity while minimizing negative impacts on biodiversity.
- Sustainable food systems transition: With a greater emphasis on a diversity of foods, mostly plant-based, and more moderate consumption of meat and fish, as well as dramatic cuts in the waste involved in food supply and consumption.
- Sustainable climate action transition: Employing nature-based solutions, alongside a rapid phase-out of fossil fuel use, to reduce the scale and impacts of climate change.

The 2050 Vision for Biodiversity was adopted as part of the Strategic Plan for Biodiversity 2011- 2020. The vision of this Strategic Plan is a world of "Living in harmony with nature" where "By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people."

FOSSIL FUELS

METHANE IN KRISHNA GODAVARI (KG) BASIN

Researchers from Agharkar Research Institute (ARI) have found that the methane hydrate deposits located in the Krishna-Godavari (KG) basin are of biogenic origin.

Significance of the KG Basin

Even the lowest estimate of methane present in the methane hydrates in the KG Basin is twice that of all fossil fuel reserves available worldwide. Researchers have also predicted the rate of biogenic methane generation in KG Basin hydrates to be 0.031 millimoles methane/TOC/Day, resulting in total deposits of methane around 0.56 to 7.68trillion cubic feet (TCF).

Methane is a clean and economical fuel. On Earth, methane (CH_4) is a naturally occurring gas. Most of the methane on Earth is produced in biological processes — some of it by microbes, and some occurring as underground natural gas that had been formed by earlier generations of microbial life. Many of these methane-producing microbes live in the digestive systems of animals, especially cows. However, methane can also be produced by abiotic processes (those that do not involve living organisms). Methane hydrate is formed when hydrogen-bonded water and methane gas come into contact at high pressures and low temperatures in oceans.

CSCAF 2.0

Climate-Smart Cities Assessment Framework (CSCAF) 2.0 was launched recently by the Ministry of Housing and Urban Affairs (MoHUA).
CSCAF initiative intends to inculcate a climate-sensitive approach to urban planning and development in India. The objective of CSCAF is to provide a clear roadmap for cities towards combating Climate Change while planning and implementing their actions, including investments. The Climate Centre for Cities under the National Institute of Urban Affairs (NIUA) is supporting MoHUA in the implementation of CSCAF. The framework has 28 indicators across five categories namely:

1. Energy and Green Buildings.
2. Urban Planning, Green Cover & Biodiversity.
3. Mobility and Air Quality.
4. Water Management.
5. Waste Management.

NATURAL RESOURCES

GROUNDWATER EXTRACTION IN INDIA

The Central Ground Water Authority (CGWA) under the Jal Shakti Ministry recently issued the latest guidelines to regulate the extraction of groundwater. The revised guidelines are an improvement over the 2018 norms, which did not ban granting NOC to industries for extracting groundwater in over-exploited areas, did not levy environmental compensation, and the hefty penalty for violations.

New guidelines:

- No objection certificate (NoC): It is mandatory for new and existing industries, group housing societies, infrastructure projects, mining projects, and bulk water suppliers abstracting groundwater to get a no-objection certificate (NOC) for withdrawal of groundwater.
- Over exploited areas: NoCs in 'over-exploited' areas will only be granted to micro, small and medium enterprises (MSME).
- Over-exploited areas such as those where the groundwater development is more than 100%, that is, the annual groundwater consumption is more than its recharge, according to the Central Ground Water Board (CGWB).
- Abstraction and restoration charges: Under the new conditions, such NOC holders will now have to pay groundwater "abstraction and restoration charges" based on the quantum of extraction, unlike the old provision where they had to just pay a nominal lumpsum amount.
- Annual water audits: It makes annual water audits compulsory for industrial users apart from mandating impact assessment for granting no-objection certificates (NOCs) for groundwater extraction.
- Protection of Wetland Areas: Projects falling within 500 m. from the periphery of demarcated wetland areas shall mandatorily submit a detailed proposal indicating that any groundwater abstraction by the project proponent does not affect the protected wetland areas.
- Environmental Compensation: Extraction of groundwater for commercial use by industries, infrastructure units, and mining projects without a valid NOC will be considered illegal and they will be liable to pay Environmental Compensation for groundwater extracted.

Concerns:

- Exemption of the agriculture sector: As per official data, 90% of groundwater is used for irrigation and 10% by domestic and industrial consumers. Excluding the agriculture sector is a bigger concern.
- Implementation issues: The implementation would be difficult as it will raise a conflict with the single-window clearance of applications for establishing new industries.
- Impact of mining projects: Mining projects are counted in the regulatory bill and are required to pay a nominal groundwater abstraction fee. Negative hydrological impacts of mining are far more serious than industries and should have been categorized separately with detailed guidelines.

Groundwater usage in India:

- India uses the most groundwater in the world, extracting 253 bcm (billion cubic meters) per year. This is approximately 25% of the global groundwater extraction.
- Out of the total 6,881 assessment units, 17% have been categorized as 'over-exploited', 5% as 'critical', 14% as 'semicritical' units, and 63% as 'safe'. o Majority of the over-exploited units are concentrated in parts of Punjab, Haryana, Delhi, western UP, Rajasthan, Gujarat, Karnataka, Andhra Pradesh, Telangana, and Tamil Nadu.
- According to the country's minor irrigation census 2013-14, 87.86% of groundwater wells are owned by marginal, small, and semi-medium farmers having landholding up to four hectares.

Way Forward:

- Incentivize: Incentivise investors to use bulk volumes of rejected groundwater (grey water, black water) available in urban, semi-urban areas for recycling and reuse. An incentive for not pumping groundwater to enhance the intrinsic value of land, improving ecological balance and overall valuation is a distinction that needs serious evaluation.
- Increase water recycling: Water-recycling, especially through the reclamation of waste-water, needs to be done on the front foot. While Israel recycles nearly 90% of its water, India's recycling capacity stands at just 30%. The problem is worse at the household level, where not even 5% of the water used is recycled.
- Real-time data: The groundwater estimates need to be dumped and migrated to real-time modeling.

FLUE GAS DESULFURIZATION (FGD)

Flue Gas Desulfurization (FGD) is a set of technologies used to remove SO_2 from exhaust flue gases of fossil-fuel power plants. This is accomplished through either a wet or a dry process.
Dry FGD: In the process of dry scrubbing injection systems, lime is used as a reagent to react and remove gaseous pollutants. A dry injection process injects dry hydrated lime directly into the flue gas duct. It yields a dry final product, collected in particulate control devices for further treatment.
Wet FGD: A shower of lime slurry is sprayed into a flue gas scrubber, where the SO_2 is absorbed into the spray and becomes a wet calcium sulfite and wastewater. FGD wastewater can be effectively and efficiently treated using large filter presses or large vacuum belt filters for very large sludge production.

Selective catalytic reduction (SCR): Ammonia is used as a reducing agent to convert NO_x to nitrogen in the presence of a catalyst in a converter. The catalyst is usually a mixture of titanium dioxide, vanadium pentoxide, and tungsten trioxide. SCR can remove 60–90% of NO_x from flue gases. The process is very expensive and the associated ammonia injection results in an ammonia slipstream in the exhaust Selective Non-Catalytic Reduction (SNCR). In the SNCR process, a reagent, i.e., urea, ammonium hydroxide, anhydrous ammonia, or aqueous ammonia, is injected into flue gases in the furnace within the appropriate temperature zone. The NO_x and the reagent (urea, etc.) react to form N_2 and H_2O and do not require a catalyst.

Electrostatic precipitator: An electrostatic precipitator is a filtration device that removes fine particles, like dust and smoke, from a flowing gas using the force of an induced electrostatic charge minimally impeding the flow of gases through the unit.

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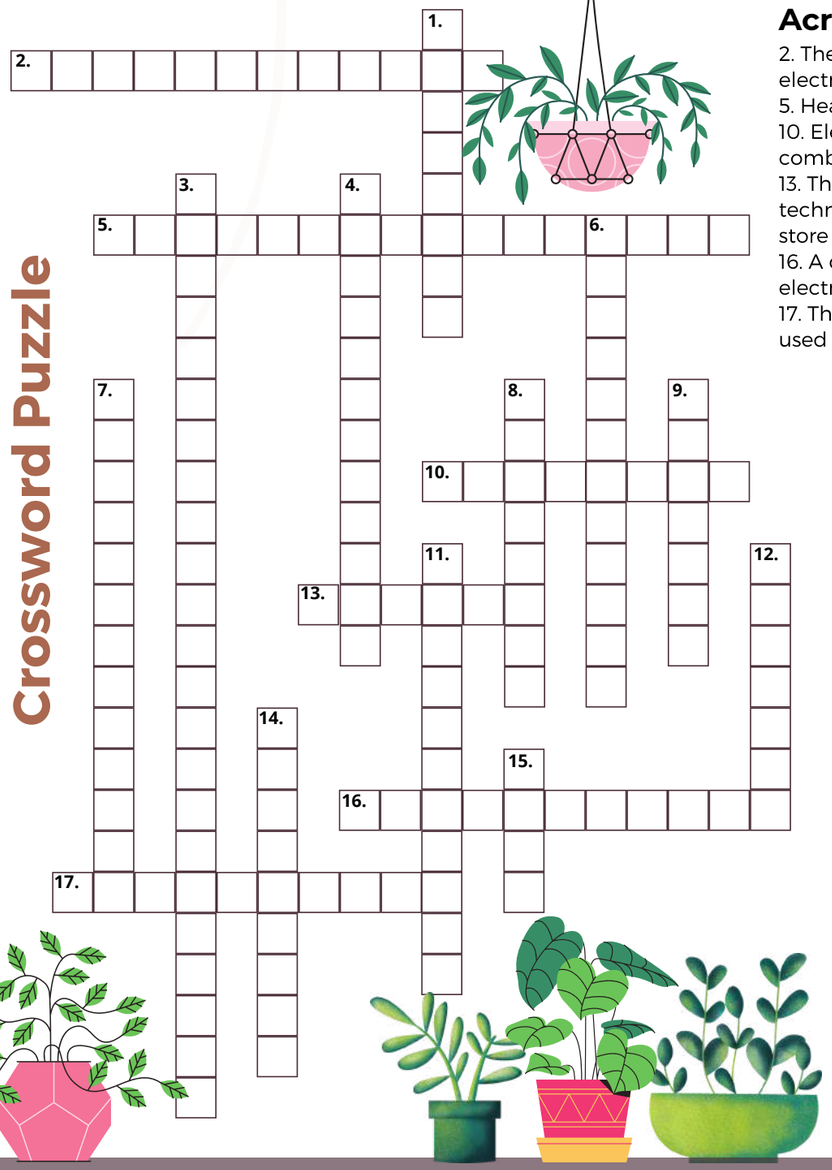
Fun, facts and recommendations

Crossword Puzzle



Across:

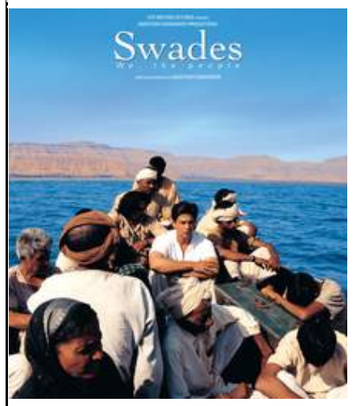
2. These cells convert solar energy to electricity
5. Heat produced below Earth's surface
10. Electricity produced by the combustion of biomass
13. The type of solar energy that uses technology to collect, move ground and store solar heat
16. A device that converts wind energy to electricity
17. The kinetic energy of moving water used to generate electricity

Down:

1. A grouping of wind turbines
3. Using mirrors to focus sunlight to generate electricity
4. This heat pump uses the stable temperature of the soil a few feet under the ground
6. A process where water is broken down into oxygen gas and hydrogen gas
7. Energy produced from material produced by living organisms
8. Liquid fuels from biomass sources
9. These batteries use hydrogen gas to produce electricity
11. Using the movement of the tides to generate electricity
12. The type of solar heating that involves building design that collects and stores solar energy naturally
14. Solar collectors that use heated fluid to heat water or air
15. Abbreviation for the process that changes thermal energy in ocean water into electricity

Solutions: 1. Windfarm; 2. Photovoltaic; 3. ConcentratingSolarPower; 4. GroundSource; 5. GeothermalEnergy; 6. Electrolysis; 7. BiomassEnergy; 8. Biofuels; 9. FuelCell; 10. Biopower; 11. TidalEnergy; 12. Passive; 13. Active; 14. Flatplate; 15. OTEC; 16. WindTurbine; 17. Hydropower

Film recommendations



Swades
(Directed by Asutosh Gowarikar in 2004)

This movie probably wasn't a commercial success but it definitely struck a chord by making the audience realize the importance of renewable energy sources. Mohan bharghava leaving his job at NASA to help a village become self sustained by generating electricity through local water bodies still inspires and ignites a nationalistic spark in the youth. Swades was not just a piece of Gowarikar's imagination, but based on a real life story. Aravinda Pillalamarri and Ravi Kuchimanchi (NRI couple) were the real inspiration behind this masterpiece.

Ratings: 8.2/10 (IMDb)

Streaming Platform: YouTube, Google play movies and TV, Netflix

Catching The Sun
(Directed by Shalini Kantayya in 2015)

This documentary was widely acclaimed by the audience and received a lot of praises for its revolutionary idea on the subject of Solar Energy. There couldn't have been any better visual representation of growth and future of the solar power industry. The film highlights how solar energy can not only help the planet, but the economy as well.

Ratings: 6.7/10 (IMDb)

Streaming Platform: Just Watch, Vimeo

Did you know?

The world's largest solar powered office building is the Sun Dial solar office located in Dezhou, China. It has a marvelous sundial structure and covers an area of 75000 sq m.