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Purpose
To excite entrepreneurs, executives and graduate students about immense opportunities in green business.

Image - https://www.youtube.com/watch?v=nkWMMYS0ucY

Tech Startups Can Make India Water Rich

By Ram Ramprasad

A slew of startups is set to change India's water story in significant ways. They could create millions of jobs and renew urban and rural ecosystems while doing so. New inventions in water technology can propel India to a water rich nation from a water scarce nation. Startups and entrepreneurs can transform a negative narrative on water scarcity to a positive one within 5-10 years.

Experts predict that 21 cities in India will become dry in the next five years. Climate change and rapid depletion of ground water are exacerbating the water problem all over India. The Government of India created the Ministry of Jal Shakti to address

these problems. However, their focus to date has been on macro level solutions such as river waters. This article focuses on micro level solutions by offering practical ideas for entrepreneurs. India can save about 50 plus billion gallons of water per day if all the below ideas are implemented. Ideas require zero sacrifice of existing water consumption for drinking, bathing, and other hygiene needs. The magic lies in how we use water and for what purpose. India's water problem can be turned into a business opportunity in a massive way.

Waterless Washing

Several inventions are occurring in the field of waterless washing. The most promising technology is in the use of liquid CO2. At a very high temperature, CO2 becomes liquid and at a lower temperature it becomes gas. Therefore, a single machine can accomplish both the washing and the drying of clothes. **Tersus Solutions in USA** has accomplished this task. Its liquid CO2 washer cum dryer machine uses significantly less energy compared to a combination of a conventional water-based washer and a gas or electric dryer.

Solvair, USA, and LG, South Korea, have also made some advances in liquid CO2 washer cum dryer machines. Washing clothes with liquid CO2 enhances the life of fabrics, uses no detergent, micro plastics and dirt are not released into the water systems. Plus liquid CO2 is nontoxic, biodegradable, and fully recyclable.

A liquid CO2 laundromat with a drop-off and a pick-up type business serving every 50-100 households all over India could save about 10 billion gallons of water per day while providing employment for several million people. Today, most of the youth of India are underemployed. We have too many greeters, cashiers, bag checkers, waiters, etc., in stores and restaurants than required. Many women choose to be housewives due to lack of jobs. This human power could be more gainfully employed in a new laundromat industry that does not currently exist in India. The water saved for washing could now be diverted to water the trees on our highways that are starved for water. Plus, it allows us to grow more trees. Economic models should study the benefits of such water allocation and their impact on climate change.

There are other inventions in waterless washing. The startup, **80Wash**, in Chandigarh uses its patented ISP steam technology – a low frequency radio-based microwave that uses very minimal water. The Whirlpool arm in India is also launching a low water-based washer. Indian Institutes of Technology (IITs) and other engineering colleges need to address the obvious and urgent problems facing India. Entrepreneurs need to more closely study liquid CO2 washers that are now in use by US Military. Entrepreneurs are providing liquid CO2 washing to hospitals and hotels in major cities such as Chicago, San Francisco, and New York City. **The dense population of India allows for several million liquid CO2 laundromats to flourish and provide employment to millions and in the process the country becomes more water rich.**

Liquid CO2 has many traditional applications whether it relates to refrigeration or cleaning of electronic or other industrial components. **DyeCoo Textile Solutions** in USA offers textile dyeing solutions with liquid CO2 that uses zero water and chemicals. Adoption of such technology will transform the entire textile industry of India and make it greener. India needs to invent liquid CO2 washing machines

for restaurants. All utensils and silverware can be washed in a nontoxic and a safe manner. The wasted food residue can be composted and used as fertilizer instead of its release into the water systems – a new revenue stream for the restaurant industry.

The use of liquid CO2 is clean and green. It will save 10-15 billion gallons of water per day, saved water can grow new trees or invigorate existing water starved trees.

Image – https://newsroom.posco.com/

Innovative Materials to Recharge Groundwater

Startups and researchers are experimenting with permeable type materials that can recharge groundwater levels. If these highways and roads are covered with permeable type materials it would recharge our groundwater levels. Asphalt on roads and highways are non-permeable and exacerbate flood situations during heavy rainfall.

A company such as Tarmac in England makes a permeable type of concrete material called Topmix for roads, highways, and parking lots. It absorbs 880 gallons of water per minute. With climate change and flash floods the new normal, we need such novel permeable materials for our roads and highways to replenish our low groundwater levels. University researchers need to step up and meet this challenge.

Prevent Water Leaks

Several startups have created miniature marble sized robots with GPS technology that can detect water leaks in underground water pipes enabling municipalities to accurately dig and repair the pipes. This technology needs to be complemented with satellite technology that can narrow down the location of where the leaks are prevalent. **Utilis Solutions**, a company based in USA deploys such a type of satellite imaging technology that works well even in densely crowded areas.

Reduce Water Footprint

Several crops such as cotton, coffee, tea have a high water and a land footprint. If these products were made in the lab their water/ land footprint will be low. The freed-up land could be used to grow more diverse species of trees. Such trees would attract more rain. Mono cropping with cash crops on precious hills contributes to deforestation and changes our weather patterns.

GALY in USA is already producing cotton in a lab, they use80 percent less land and water, and the cotton grown in the lab grows much faster than on land. Finland has successfully produced coffee in a lab, people in a blind study could not tell the difference between the lab grown coffee or the real coffee. Many startups are now geared to produce meat in the lab. The global water and land footprint of meat grown as food on land is significantly greater than all plant-based food. UN IPCC states that meat

grown as food on land emits more greenhouse gases than all the vehicles in the world. Meat or coffee when grown in a lab are biologically like the land grown stuff. Lab grown meat can be titrated for lower fat content or be made hundred percent organic. **As a policy, we must shift high resource utilizing items to the lab.**

Fruit bearing trees attract rain, enrich the water table and the environment. Therefore, we should not produce such items in the lab. Interestingly, those which harm the environment seem to lend themselves to being produced in the lab, and those that are beneficial for the environment do not lend themselves to being produced in the lab. Fortunately, our creator has planned everything with perfect intelligence.

Better than Desalination

Dr. Praveen Kumar and his team at the University of Illinois, USA, have invented a process and a structure that **harvests fresh water by absorbing the plentiful water vapor above the oceans.** This technology is cheaper and superior to desalination and cloud seeding. The findings have been reported in Nature, a prestigious scientific journal. India can leapfrog and adopt such technologies.

https://www.inceptivemind.com/newly-proposed-method-harvests-untapped-sources-fresh-water/28962/

Interested entrepreneurs should check out the website, **Imagine H_2O**, an organization that backs the best water entrepreneurs from concept to scale. They have supported 165 startups all over the world. They list interesting case studies on their site. Similarly, the **WASH Innovation Hub** in partnership with the Administrative Staff College of India, Telangana, supports innovative ideas with respect to water, sanitation, and hygiene. **XPV Water Partners** in Canada invests in a variety of water related companies across the world. They list their portfolio companies on their website. Entrepreneurs will greatly benefit by researching the business models of these companies.

Entrepreneurs need to study the business model developed by **Madhukhar Swayambhu** who deploys Vedic technologies to cure dead water bodies. His website, **Vaidic Srijan** describes the scientific methodology he uses. The wastewater treatment plant **ECOSTP in Bengaluru uses zero energy** and mimics the process of what happens in a cow's stomach.

The **Shafdan wastewater treatment facility** in Israel treats and uses 95 percent of the wastewater for agriculture purposes. There are several startups tying up with wastewater treatment plants and turning waste into precious fertilizer using microbes. **Modern Meadow** in USA grows leather in a lab using microbes, therefore, they don't pollute either the rivers or the groundwater unlike traditional leather tanning known for being one of the worst water polluters.

Opportunities in sustainable water innovations are enormous. Even simple innovations can

make a big difference. For example, if a bath towel had a different color on each side, the consumer psychologically will use the towel for a longer time and may save more water. We can transform the bottled water industry by offering water in biodegradable plastic bottles.

Urgent action by Ministry of Jal Shakti, Universities, and entrepreneurs can transform India from a water scarce nation to a water rich nation. The water saved from all the above actions needs to be diverted to grow more trees and attract more rain. All listed actions have a multiplier effect to save water and mitigate the impact of climate change. The negative narrative of water scarcity can be transformed to a positive one. India needs to step up to this challenge.

In fact, growing of trees such as the peepul is known to repair the ozone layer through the release of an organic compound called isoprene. India needs to create greater awareness of the utility of the several sacred trees of India – **our solution to climate change lies in our sacred trees**, the wise use of our sacred water, soil, and animals. Leadership and entrepreneurship will be the enablers.

Ram Ramprasad *worked as a Global Marketing Director for a Fortune 100 company in the USA. He authored two books and published articles in reputed magazines in India. He holds graduate degrees from Yale University, USA, and Madras University.*

Changemaker - 'Yellow to Green' - Govt. Sr. Sec. School Chail, Solan, Himachal Pradesh with CSE Founder Sunita Narain (extreme right)

CSE Picks 106 Greenest Schools

The Centre for Science and Environment (CSE) has picked 106 schools from among the 707 schools as the greenest schools in India for the year 2022-2023. This is part of CSE's annual Green School Program. Of these, 19 schools received the topmost Annual Green School Awards for their exemplary initiatives in making their campuses environment-friendly and eco-conscious students.

Awards were also conferred on the most proactive teachers, the "best state" and "best district." CSE director general Sunita Narain and executive director Jagdeep Gupta handed out the awards to the winners.

The awards are based on an exhaustive and rigorous annual audit of resource management and environment-friendly practices within the school campuses. The audit is conducted by the schools themselves with CSE's help.

Souparno Banerjee, senior director, environment education, CSE said the unique aspect of this program is that it offers the opportunity for schools to measure their progress year on year so that they can improve their ranking."

Over seven hundred schools from 29 states and Union territories vied for the honors; 19 of these received the top awards, and 106 were tagged as 'green'. 436 government schools, 55 government-aided schools and 216 private schools participated in the audit.

Each school which undertook the audit, was assessed by the Green Schools Program on its

resource consumption practices in six areas – water management, solid waste management, energy efficiency, air pollution control, land and biodiversity management, and food systems.

List of THE 2022-23 AWARDS

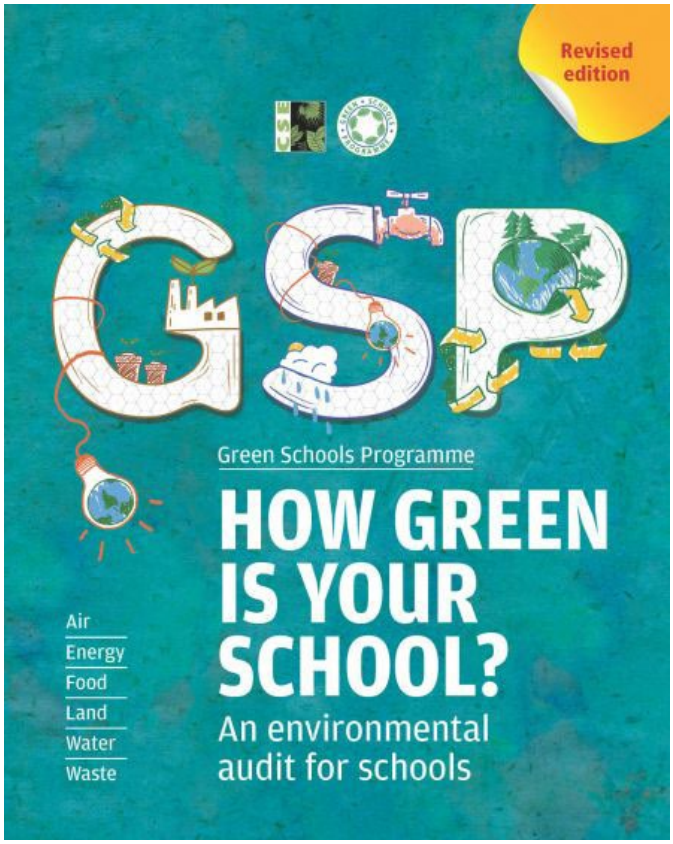


Image – https://www.greenschoolsprogramme.org/

Best State and District: Himachal Pradesh bagged the award for the Best State with the highest audit registrations and report submissions. 114 schools from the state submitted their audit reports – nine were rated 'green'. Solan in Himachal Pradesh bagged the Best District Award with 61 submissions and six schools rated 'green'.

Changemaker Awards: These were schools that have monitored their resource consumption and improved them. The two awardees in this category:

1. Global Public School, Ernakulam, Kerala
2. Noyes Mat. Hr. Sec. School, Madurai, Tamil Nadu

Sterling Schools Awards: Schools rated 'green' for five consecutive years:

1. Motilal Nehru School of Sports, Rai, Sonipat, Haryana
2. Sachdeva Global School, Southwest Delhi, New Delhi
3. Salwan Public School, Ghaziabad, Uttar Pradesh
4. Ashok Memorial Public School, Faridabad, Haryana
5. Bal Bharati Public School, Noida, Gautam Buddh Nagar, Uttar Pradesh
6. Kendriya Vidyalaya WCL, New Majri, Chandrapur, Maharashtra
7. East Point School, New Delhi
8. Indirapuram Public School, Pratap Vihar, Ghaziabad, Uttar Pradesh
9. Bal Bharati Public School, IMT Manesar, Gurugram, Haryana
10. St Edmund's School, Jaipur, Rajasthan
11. Mahindra World School, Kanchipuram, Tamil Nadu

Best Newcomer: Schools that have recently registered to be a part of the program and have demonstrated considerable potential in managing their natural resources.

1. Cambridge School, Indirapuram, Ghaziabad, Uttar Pradesh

Best in Section: Schools that have performed exceptionally in specific sections.

- **GSP Waste Warrior Award:** Christ Academy CBSE School, Bengaluru, Karnataka

- **GSP Land Manager Award:** Government Senior Secondary School Himgiri, Chamba, Himachal Pradesh
- **GSP Good Food Award:** Shiv Nadar School, Gautam Buddh Nagar, Uttar Pradesh
- **GSP Air Action Award:** Subodh Public School Airport, Jaipur, Rajasthan
- **GSP Energy Manager Award:** Dr Rajendra Prasad Kendriya Vidyalaya, Central Delhi, New Delhi

What it means to be a Green School?

A 'green' school may include, but is not limited, to the following:

- A window to floor ratio (WFR) of more than 15 per cent.
- Majority of the population using sustainable and non-polluting modes of transport (public transport, e-rickshaws, cycling, walking).
- Maximum use of energy-efficient lighting to conserve energy and use of alternative sources of energy – the GSP Audit encourages schools to minimize the use of conventional lights without compromising over sufficient lighting for students.
- Maintain a high green cover inside and around the school campus along with greater biodiversity by planting native species of plants.
- Serve only cooked meals (avoid packaged foods) to ensure healthy food consumption.
- Harvest rainwater and treat wastewater.
- Segregate waste at source efficiently and dispose of responsibly — recycling of at least 90 per cent of the waste is recommended
- Wet waste composted; waste should not be burned.

https://www.greenschoolsprogramme.org/

Image - https://www.thehindu.com/

India Needs to Switch to Green Logistics Faster

By Benedict Paramanand

Transition to Green or sustainable logistics in India can be faster with greater focus on rail infrastructure. Traditional FMCG companies need to take the leap. India needs to focus on cutting waste. Excerpts of chat between Benedict Paramanand, Editor of SustainabilityNext with Manish Saigal, Managing Director with consulting firm Alvarez & Marsal, a thought leader on transportation and logistics. He was part of Dr. Rakesh Mohan's national task force on integrated multimodal logistics framework, the steering committee for the CII National Logistics Summit, and the CII national committee for ports.

What are the challenges for India right now in green logistics sector?

In the last decade or so, we notice a couple of key trends. Earlier, a lot of logistical operations were done in-house by companies in pharmaceuticals, FMCG, automotive, among others because they felt it was core to their operation. Now they recognize that they need to focus on their core business, which is to manufacture a great product, to understand customers better and to take the product at the right price in the market. They are now looking to outsource or work with people who can provide good quality infrastructure and put in place all the services right around it. This is a very strong trend that we have seen which has led to growth in capacity creation in this space.

Second trend is the way multinational companies function. They know that they will not be able to manage logistics in India because of complications around the regulatory setup and taxation. Even before GST was launched, our taxation system was very complex and multi-tiered. The other is the increased focus on regulatory and environmental compliance.

In this country if you go to a location like a Bhiwandi, a lot of structures are built on a noncompliant or a no man's land. While there have been companies working out of such facilities, but when incidents of fire or something similar happens, insurance companies to process the claim look for compliance. As a result, there's been a big shift in the mindset of consumers to shift to compliant facilities which meet their standards.

Manish Saigal, *Managing Director with consulting firm Alvarez & Marsal*

The single biggest factor that has driven the way we look at modern logistics of warehousing today is the advent of ecommerce companies and 3PL (third party logistics) companies. Today, two e-commerce companies put together occupy more than half of the total organized warehousing or Grade A warehousing in India. They are also very conscious of tying up with facilities which are greener, more sustainable because they also have very strict focus on sustainable logistics. For example, Amazon has a goal that by 2030 they want to be net carbon zero in their entire supply chain and that's what they need to kind of focus on.

How management consultancy firms like yours are gearing up to aid in this transition from a traditional to sustainable logistics?

Consultants like us play two critical roles – one is of a torchbearer. When there is a transition, and you don't have a playbook on how to manage the transition, you need people who can help you with that.

This whole transition to modern warehousing and to understand the benefits was not easy. One can't simply use the old playbook, so we get involved to help clients. We help them understand the impact, or rather the value of this transition from what they were doing to what they need to do.

We work with a lot of developers and logistics companies like Lodha warehousing park and logistics park and Welspun. We guide them how they should target the opportunity on the ground, the segment they should focus on and what should be their value proposition. So basically, help both the buyers and sellers to transition to this type of product or proposition.

Since green is capital intensive, banks and other local financial institutions do not fully understand the dynamics. So, we work with many global private equity funds who fund these platforms. Because of their global experience they want to use the same approach for a market like India. Then it's a question of how do you help these investors develop confidence and comfort that these projects will generate the right level of financial returns for them to invest in.

For instance, I had advised Bain Capital and Ivanhoe Capital to invest in Lodha's warehousing platform to develop 30 million square feet of large green, sustainable warehousing and logistics parks in this country. This is like a billion dollar of investment. Consultants like us are often hired to help these investors understand the value and the risks involved, and then make a more informed call.

We also do a lot of operational work like helping these guys set up facilities, building teams, decide which locations to go and set up warehouses, look at locations which are not very well discovered and where there could be a lot of infrastructure development potential and a lot of cargo potential. We help them identify and build projects in a different way than what otherwise they would have done.

Who are the top players in India in green warehousing?

Image – Go Green Warehouses Pvt Limited

The largest one will be IndoSpace. This is a platform that was built almost 15 years back and have more than 20 million sq. ft. capacity. The second largest would be Horizon Park. Horizon Park is funded by Blackstone, which is world's largest private equity fund, and they acquired a couple of companies. They acquired a platform called Embassy, part of the Embassy Group. They acquired All Cargo's logistics set up. They also acquired Hiranandani's logistics set-up.

There is a platform called ESR, which is a very large Chinese Fund that actually has set up their platform in India. There's also Welspun, part of the big textile company, Welspun. They also have a logistics park platform. And now even Adani is getting into it. Adani acquired a large 250 acre land parcel in Mumbai at Kalyan, they have developed warehouses there.

We talk about the change in talent profile for logistics in the last few years. Are there enough people available to manage the development of 200,000,000 square feet of grade A+ sustainable warehouses. The answer is no. When the point is that this is one area where we are seeing more and more people entering and I'm hopeful that over a period of time, this will get built as a more exciting career option for younger people.

I think we are in the first phase of professionalizing logistic enterprise in India, isn't it?

I would say it's the second. I think the first phase happened maybe just pre COVID when a lot of foreign capital started flowing into the country. Because when foreign capital starts flowing in, you typically can attract the right type of talent. And sometimes that capital comes with a rider that if you don't have the right team, we will not be able to invest. As a result, a lot of interesting new logistics businesses, tech-enabled logistics businesses got built out. There has already been several success stories of unicorns that got built in logistics in the last few years by young people. And now we are in the second wave, where more businesses are getting built out.

What are the challenges/pain points in transitioning from the second to the third phase?

One is real estate itself. It is very difficult to easily acquire 100-300 acre of land parcel anywhere in this country. Because there are archaic land acquisition laws. To beat this challenge, the government has come up with this whole multimodal logistics park policy where government has identified several locations across the country.

When two large e-commerce companies gobble up most of the new modern spaces, other industries like FMCG, consumer durables, pharmaceutical, automotive companies still operate from legacy facilities. **I guess for a large scale adoption or transformation to happen, we need some of the more traditional industries also to participate in this and they have to show their commitment to operating out of greener, larger, more sustainable kind of facilities.**

How big is the challenge of getting the right talent?

People are obviously training folks in India and a lot of these people are actually a combination of people who have worked in companies like this globally and they want to now come back and therefore they have their experience and we are also seeing the younger folks who want to build their careers in logistics.

Image – https://www.itln.in/

Is sustainability in-built these days in logistics or is it the next phase?

My personal view is that it is not clearly emerged even by developers or logistics companies. There is an additional cost of making it green. Only a handful of companies that are actually deeply committed to building Infrastructure or providing services which are truly green in nature. It is not a default option now for any large developer.

So there are industries like ecommerce, some of the three PL's maybe examples of companies from modern retail like IKEA, I'm seeing clearly a deep commitment and they are actually insisting on it, but the problem also is that look you can insist on such facilities going forward.

Today, if I have to run a certain operation and I need about 10 million square feet of warehouses is in the country, I won't find completely sustainable or green warehouses today. So, Amazon also has kind of swallowed that bitter pill.

And therefore, they are insisting that any new facility that they go to should be of certain specifications, which meets the requirement from a green sustainability perspective. They are still operating out of many facilities in the country, which are far from sustainable and green. That is that the hard reality.

What is the additional price that goes into a product which an end customer has to pay for green logistics?

It's a longer conversation. I would not really put it squarely as incremental cost for a green or sustainable warehousing.

How do you get green, either the use of materials that are more sustainable or you can design the facility in a way that there is a lot more open air and light in order to can reduce the consumption of power or energy. I've seen that the way technology is moving, the cost of such materials and the layouts and design are also coming down.

Are lorry aggregators able to scale and are they making a difference?

For me, aggregators are playing an interesting role. If you really look at the root issue that they are solving for, it is trying to create more demand-supply discovery. There is supply on one hand which is looking for demand and it is not finding it. We have worked on these models quite a bit and not just in India, but also globally hence we've seen the value these aggregators can add.

The problem the aggregators are facing right now is about how to make money. While some of them are actually funded so they can all do this fancy stuff. Yet they are struggling to make money and as a result there has been a challenge in continual focus on profitability

and being selective about the kind of business they pick.

India is not developing the rail and water sufficiently to make it more sustainable and clean. Your thoughts

Rail is a sad story right in India. If you go back 30-40 years, post-independence, rail share in overall freight was as high as 60%. This has come down to less than 20% now. And this is despite India having one of the densest rail networks in the world. Indian Railways loses money on passenger transportation and again it is political.

The Government recognized that there is a problem. To address this, we have two projects under Dedicated Freight Corridor plan – one is the Delhi-Mumbai Industrial Corridor (DMIC) and the Eastern Dedicated Freight Corridor. These are dedicated corridor only for freight. DMIC will be operational fully operational in next maybe three to five years. Here all the trains are double stack trains, so basically you can do 2 containers and you can move this on a superfast speed, non-stop from/to Delhi-Mumbai. This reduces the time that you take and can carry double the amount of cargo. So, it reduces the cost per kilo, and it is a welcome sign. I believe this is going to have a very positive impact on how the freight will transition to rail because as a logistician. Any cargo which has to move beyond 500 kilometer rail is 25% cheaper and more energy efficient than road.

In the next five years, what are the two or three things that we really need to rapidly make it green logistics?

I think big focus has to be on energy transition and fuel transition. I would say the biggest contributor to environmental problems and also fossil fuel dependencies are trucking industry. Government of India is deeply committed to transitioning the overall mobility to greener and cleaner. That's where all the electric vehicle related transition is taking place. While some good progress has been made on the ground in two wheelers, three-wheelers, but still I would say we are scratching the surface as far as commercial vehicles are concerned.

In the next five years, I believe you will see that change. You will see trucks that will run on hydrogen or electric batteries. This is going to be a big change because that'll change literally the way trucking industry or the transportation networks work because you'll need to think about newer types of trucks, charging networks across the country, new economic structure of how to make that happen because the trucks would be expensive. You need some support in the form of subsidies and all of that. It is a big change coming our way and it's already started happening.

The third would be a lot of focus on efficiency and wastage. In my view that also is a very important sustainability topic in the industry. For example, there is a lot of wastage that we have on the ground when it comes to food because of inadequate quality of logistics – storage, transportation temperature control. So, we waste a lot of material in this country.

It is like a circular economy where you wastage more so you end up producing more. You are kind of using the ecosystem a lot more than what you should. This hurts the economy and the environment. I believe there will be a lot of focus on circular economy-oriented businesses **where people will focus on reducing wastage and there is reverse logistics model where damaged products are brought back and recycled/reused.** There is a logistics play there and so the whole circular economy, circular logistics is going to be again a very interesting theme going forward.

Vedanta Aluminium Moves to Second Spot in DJSI

Vedanta Aluminium became the second most sustainable aluminium producer in the world after it moved to the second spot from fourth in the S&P Dow Jones Sustainability Index (DJSI) world rankings for this sector for 2021-2022.

A press note stated that the company scored high on most aspects of Environment, Social and Governance criteria, including Cybersecurity, Environment Reporting, Environmental Policy & Management Systems, Labor Practice Indicators, Human Capital Development, Talent Attraction & Retention, Customer Relationship Management, and Social Impact on Communities.

Rahul Sharma, CEO, Vedanta Limited said the new ranking reflected his company's commitment to structurally integrate the principles of sustainability throughout its value chain – from sourcing to product delivery. He noted that his sustainable development agenda included a laser focus on decarbonisation of operations, increasing quantum of renewables in the energy mix, judicious use of natural resources like water, wellbeing of employees and partners.

The company recently published its Sustainability Report and maiden report on climate change (aligned to the Taskforce for Climate-related Financial Disclosures framework) for FY 2021-22. It is India's largest aluminium producer, with operations in the states of Odisha and Chhattisgarh.

https://vedantaaluminium.com/sustainability/sustainability-report/.

Aluminium is called a green metal as recycling it saves 95% of the energy required for producing the metal. With net zero commitments by almost everyone, aluminium is poised for significant demand.

It is called a green metal also because of its properties like high strength-to-weight ratio, high corrosion resistance, excellent thermal and electrical conductivity, among others. It can be recycled 100%. With solar power emerging big, this metal will play a key role in the green transition of world economies.

Walking the Coast

By JoAnne Saldanha

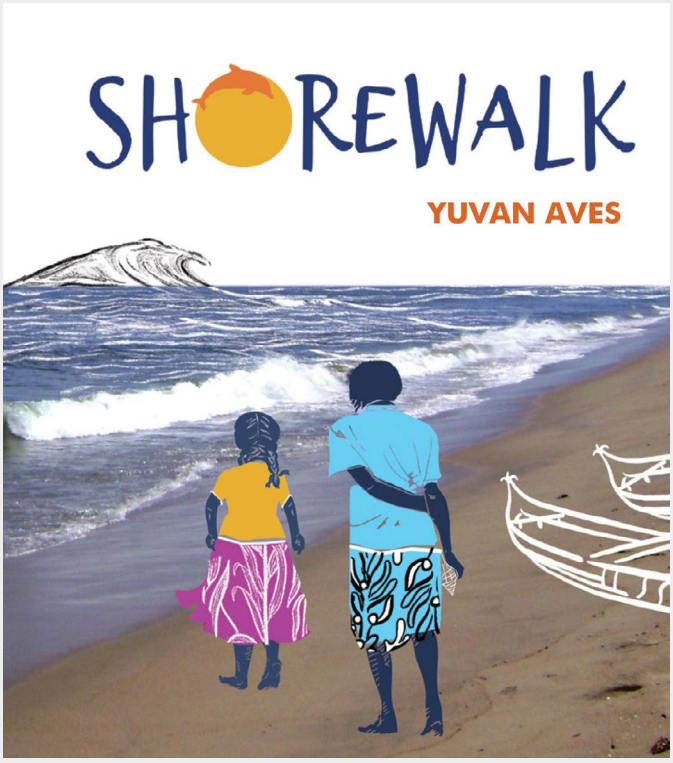
What do you notice when you go to the seashore? If you are like me, you probably dig around in the sand, collect shells, play in the waves, admire the sunrise or sunset and skirt the tiny crabs scurrying around on the sand. If you are a little more observant, you may notice the nature of the waves, the direction of the current, maybe the texture of the sand and the gradient of the shore. You definitely enjoy the cool breeze and hope that no construction of bridges or ports spoil your view.

Shorewalk by Yuvan Aves will completely upend your beach visits, and leave you wondering if you have ever truly observed and experienced the seashore.

A medley of words, pictures and photographs, it takes you into the world of little Kadalamma, named after the 'ocean mother', who loves to walk on the beach with her grandfather Palayam. A former fisherman, Palayam is a keeper of traditional knowledge steeped in experience that stems from living within the coastal ecosystem. Told from his eyes, the book brings to life the drama and intrigue of the seashore.

Have you wondered why your feet sometimes sink into the sand when you walk the shore?

Did you know that ghost crabs are the beach clean-up squad? Or when they chuck sand far away while digging a burrow, the weather will be calm? Or what poses the biggest threat to these little scavengers?



Why were some coastal villages devastated by the 2004 tsunami, while others along the same coast remained largely unaffected?

Do ports and harbors truly mean progress? What is progress if the fallout from their construction threatens our living space?

With its simple storyline laced with facts, Shorewalk deftly guides readers through this mysterious and fascinating world. It encourages them to reflect on the dangers posed by human-induced climate change and how an imbalance in coastal ecosystems can affect other habitats too.

This is a book that you will want to tuck into your beach bag, every time you choose to visit the coast.

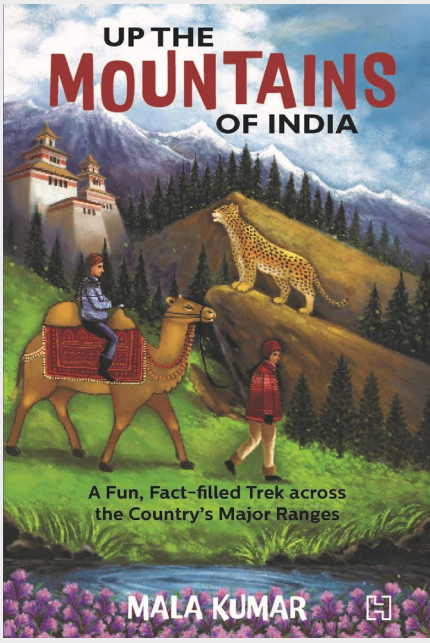
Mountain Mania

By Meghaa Gupta

Although I enjoy reading non-fiction, I may not have voluntarily picked a book on mountains, deeming it too dull. But Up the Mountains of India by Mala Kumar is far from boring.

Written in a light and engaging tone, it is an excellent primer on the geography of mountains in India. The book begins with an introduction on how mountains are formed and then takes readers on a tour through various ranges in the country. When it comes to mountains, the Himalayas and the Western Ghats enjoy so much attention that it's easy overlook the fact that India has several other fascinating ranges with their unique geography and stories. For instance, I was intrigued to learn about the Phuktal monastery in the Zanskar range where the Hungarian historian Alexander Csoma de Koros compiled the first English-Tibetan dictionary.

Each chapter is a geographical narrative, interspersed with black-and-white images, illustrations, boxes and trivia. I found the placement of the trivia text somewhat distracting, as it often came in the middle of an ongoing narrative and broke the flow of reading. I also felt that the heading font could have been better and the front cover, a little less busy and more to the point. The choice of the leopard and Bactrian camel in the foreground is unusual, but it does not convey a comprehensive sense of what this book offers. Indeed, unaware readers might be stumped to find a camel on the cover of a book on mountains!



Mountain ecology has close ties to the environmental history of India. Unsustainable development in fragile mountain ranges has unleashed a plethora of disasters and spurred one of the earliest and most renowned people's movements in independent India – the Chipko Andolan. I felt that the book could have woven this aspect into its narrative to emphasise the pressing need to conserve this geography. However, the focus of the book appears to largely be physical geography with rich accounts of natural history.

Overall, this is a vital supplementary reader for curious young minds learning about and interested in mountain landscapes in India. It is most certainly a book meant for all school libraries keen to build a comprehensive collection of learning resources.

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