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Trends, Analysis Green Products, Green Books, Entrepreneurship

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

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Image Courtesy - The Good Planet

Air Pollution Costs India 50% of Its Annual Tax Collections

It's well known that Indians are paying a mindboggling price for polluted air with their health. And the Indian economy and businesses too are suffering massive losses. For the first time, there's data to show the extent of such losses.

Dalberg Advisors, in partnership with Clean Air Fund and Confederation of Indian Industry, has estimated a colossal loss of $ 95 billion or Rs. 7 lakh crores, which is 3% of India's GDP, 50% of tax collected annually.

At least now, will policy makers, business leaders and civil society wake up to take radical measures? Time for incrementalism and green washing is over. The same advisory firm, CII and Clean Air Fund should do another report on the outcome of measures taken in the last five years.

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Dalberg estimates that India's workers take 1.3 billion days off work annually because of the adverse effects of air pollution on their health, amounting to USD 6 billion in lost revenue. Air pollution has also been shown to have significant effects on workers' cognitive and physical performance, lowering their on-the-job productivity and thereby decreasing business revenues by up to USD 24 billion.

Further impacting the national economy, the report found that lower air quality also reduces consumers' willingness to venture out of their homes, leading to lower footfall and ultimately USD 22 billion less revenue for consumer-facing businesses.

India had 1.7 million premature deaths from air pollution in 2019, 18% of all deaths in India, a figure that is projected to increase by 2030, making India a major contributor to the global economic cost of premature mortality. In economic terms the lost working years cost the Indian economy USD 44 billion in 2019.

The report further reveals that India's IT sector, the source of 9% of the country's GDP and a magnet for foreign investment, is disproportionately affected, losing USD 1.3 billion due to pollution-induced productivity loss per year. If air pollution continues to increase at currently projected rates, this figure could nearly double by 2030.

India has grown to become the world's fifth most polluted country in the last decade and has 21 of the world's 30 most polluted cities. As India's median age rises from 27 in 2019 to 32 in 2030, vulnerability to air pollution will increase as mortality due to air pollution-linked pulmonary problems and lung cancer will grow at an accelerated pace, as these illnesses tend to affect the elderly harder.

Says **Gaurav Gupta**, Partner, Asia Director, Dalberg, "It has now become important for Indian business to include air emissions in their profit and loss statements. Clean air is a precondition for businesses to thrive – and for India to realise its vision of becoming a USD 5 trillion economy by 2025. Achieving this goal would require industry leaders to take more ownership and become advocates in the movement for cleaner air."

Dalberg is an impact advisory group that combines strategy consulting, design thinking, data analytics, and research to address complex social, economic, and environmental challenges. It works collaboratively with communities, institutions, governments, and corporations to develop solutions that create impact at scale. It has offices in 30 locations worldwide. www.dalberg.com

To **Seema Arora**, Deputy Director General, CII, "Business solutions to this crisis as per our findings include ''greening" business operations and supply chains, adopting renewable energy technology, mitigating emissions through CSR activities, and campaigning for more ambitious pollution policies. We believe that through active and sustained collaboration between the public and private sectors, bluer skies and a healthier economy can soon become India's reality."

CII is part of the 'India CEO Forum for Clean Air'. It's a platform to galvanize industry efforts to find lasting solutions to deteriorating air quality. The forum was formed in July 2019 and currently 50 industry members are active.

The report notes that air pollution has a substantial impact on India's economy, alongside the health and environmental impact and that by improving its air quality, India will not just be healthier but also wealthier.

The Clean Air Fund is a philanthropic initiative with a mission to tackle air pollution around the world. It brings together funders, researchers, policy makers and campaigners to find and scale solutions for clean air for all. **www.cleanairfund.org**

Full report – **http://bit.ly/airpollutioncosts**

IIT Madras, Bombay Jayashri Launch Rivers of India

The International Centre for Clean Water and IIT Madras have teamed up with popular classical singer Bombay Jayashri to launch Rivers of India. The video is to promote awareness and a sense of wonder towards Indian rivers.

This music video is based on the names of 51 rivers of India to bring awareness of water conservation and importance of this valuable resource. The video was released in April 2021.

Rivers Of India is a global collaboration featuring Bombay Jayashri and her family. It was composed and conceptualized by IIT alumni, Kanniks Kannikeswaran.

Pandemic Boosts Eco eMarket's Impact

S R Pejavar, CEO and founder of Eco eMarket

By SN Staff Writer

The Corona pandemic is forcing businesses, governments and the civil society to raise the bar on waste management practices. **Eco eMarket**, a four-year old Bengaluru-based start-up, is gearing itself up to capitalize on the growing demand for safe, contactless and profitable waste management practices across India.

Eco eMarket's pioneering digital solution has brought sellers, aggregators and recyclers on the same platform. It enables efficient exchange of waste anywhere, anytime with transparency. The platform ensures that all stakeholders get the best value for their material and services. Waste is gold, is its mantra.

It's a one-stop cloud-based smart digital service to dispose waste material responsibly and profitably in India aligning to E**SG (Environment, Social and Governance) and MOEF guidelines**. Eco eMarket's one stop solution covering disposal of e-waste, metal scraps, packaging materials, textile etc is now used by more than 70 clients which include Fortune 100 firms. In 2020, the firm was active in 24 states covering more than 150 cities and serving 19 industry sectors.

The firm was listed as part of top HOT 50 start-ups in 2017 by The Economic Times.

Eco eMarket is banking on major transformation opportunity in the waste sector to propel its growth. Digital transformation of waste business is the new big opportunity in India. Eco eMarket is a pioneer and is gearing itself up to be a leader at the right time. To expand its capacity and network the firm is readying itself to raise risk capital.

The pandemic has changed the way organizations – manufacturing and services function. They are in a hurry to outsource non-core functions like waste management. To capitalize on the big demand Eco eMarket is expanding its footprint through automated workflow.

S R Pejavar, CEO and founder of Eco eMarket says, "Organizations are keen on adhering to compliance, ESG reporting. They are more eager to outsource non-core activities like waste management. Outsourcing to professional firms is known to improve transparency and accountability of processes. It also helps in better adherence to Ministry of Environment and Forests (MOEF) norms. What's more, it helps in fair price discovery, achieves greater circularity for closing the asset loop to the final destination."

Strengthening Circular Economy

India's $14 billion waste sector is fragmented, complex and inefficient. India is yet to seriously start its work in addressing waste management as a sustainable circular economy opportunity. India

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needs to reduce informal recycling and move quickly to a formal system through smart technology solutions.

Eco eMarket serves businesses of all sizes. Waste aggregators and waste recyclers and processors use this platform to earn better returns. It also provides much-needed reporting, traceability, status of disposals on real-time basis. "We constantly improve our technology and operations to achieve circular economy objectives and zero waste to land-fill, Chidambaram, Director Product & Customer Experience notes.

Eco eMarket has done more than 800 disposals across 150 locations in 2020. This marks a 400 % growth. It expects to double its operations and income this year.

Facility Disposition

The pandemic has forced a majority of employees in the services sector to work from home. This has led to massive redundancy in office space in all the cities.

Eco eMarket is being sought to manage the transition. Its project management and vendor contract management services are speeding up the release of office space by dismantling or/ and renovating to avoid penalties from builders. "They are being done with best sustainability practices to minimize environmental impact while ensuring better commercial returns and within agreed timeline," Mr. Pejavar adds.

As of March 2021, Eco eMarket has managed more than 30 facility release projects covering around 2.5 million square feet across 18 cities in India. Eco eMarket is set to transform India's waste management sector by moving the needle from compliance and disposal to helping the industry discover and obtain fair value. It is today India's only digital aggregator or aggregators in the waste space.

Image Credit – Pinterest.ca

How Retrofitting Motors is Equal to Planting 33 Million Trees in India

By Omer Basith, Director and CEO of Virtual Forest

We intend to create a Virtual Forest the size of the Sunderbans National Park. A claim that no doubt needs some explaining.

There is a triangular equivalence that is now at the heart of the energy transition. "A rupee saved is a rupee earned" is interchangeable with "a watt saved is a watt generated" and also "CO_2 avoided is CO_2 sequestered"

Money, Carbon and Energy have become perfectly convertible.

Well, almost perfectly convertible. In practice, saving a watt of power is always cheaper than generating a watt of power, emissions prevented are considerably better for our planet than emissions sequestered, and this equivalence is often true in the case of money as well, not getting Starbucks is easier than generating a few hundred rupees. However, for the purpose of illustrating my thesis let's say that the monetary value attached to savings and generation is the same.

The other concept I'd like to unpack is the notion of "Net Zero emissions". A situation where greenhouse gas emissions equal greenhouse gas removal. Most climate models agree that net zero emissions by 2050 are an absolute must in order for us to avoid catastrophic global temperature increase.

In practice this would have to mean that the release of all the carbon that has been locked up for millions of years underground (through the burning of fossil fuels) plus all carbon emissions from deforestation, agriculture and other activities is completely removed from the atmosphere by natural or manmade "Carbon Sinks".

Achieving Net Zero is Far-fetched

Despite the recent feel-good stories about net zero pledges, carbon capture and storage and green hydrogen the reality is humanity is very far from net zero emissions. As it stands, human activity releases approximately 9.4 gigatons of Carbon per year (GtC/year) into the atmosphere, the ocean (the largest carbon sink) absorbs 2.5 GtC/year land uptake which includes vegetation accounts for approximately 1.8 GtC/year.

Humanity is currently adding an excess 5.1 GtC/year into the atmosphere, in order for us to reach net zero we will have to remove more than half our current emissions on a yearly basis.

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This leads back to our thesis and ultimately our claim we will create a virtual forest the size of the Sunderbands National Park. To put that in context this corresponds to 1332 Km2of forest cover or 33 million fully grown trees (older than 20 years).

I would like to pause here to admit that we are clearly making broad approximations, we don't actually have any way of knowing the exact number of trees in the Sunderbands but our logic is based on scientific best estimates.

A fully grown tree (older than 20 years) sequesters approximately 22 Kgs of CO_2 a year so hundred trees sequester 1.8 tons of CO_2/year a million trees 2.2 kilo tons of CO_2/year and our target 33 million trees sequester 6.16 mega tons of CO_2/year.

Carbon, energy and money have become interchangeable. So, we may assume preventing emissions from entering the atmosphere has the same net effect as removing emissions from the atmosphere (in reality, emission prevented have a considerably more positive impact than emission sequestered)

A Watt saved = CO_2 avoided = Rupees saved

The existing installed base of home appliances with motors like fans, AC's, refrigerators, washing machines, water pumps are responsible for 65% of Indian residential energy demand. This demand will rise in step with increasing technology penetration and rising temperatures.

It is our ambition to help mitigate 6.16 mega tons of CO2/year and help enable annual residential energy savings of approximately 52.5 Billion INR in 5 years. Through the installation of motor control retrofits on the existing connected base of motor run appliances. This will have a mitigation impact equal to carbon sequestration by 33 million trees or a "Virtual Forest" as big as the Sunderbans National Park.

We at Virtual Forest are technology leaders in motor control solutions and support the Indian appliance ecosystem through the supply of electronics for inverter AC's, BLDC ceiling fans, fluid movement pump controllers and inverter washing machines.

We are addressing energy inefficient motor applications like fixed speed air conditioners and residential fluid movement pumps through the installation of motor control electronics. These retrofits present a low carbon pathway with a demonstrated ROI, that have the potential to deliver real world energy savings of up to 40%. We are addressing energy inefficient motor applications like fixed speed air conditioners and residential fluid movement pumps through the installation of motor control electronics.These retrofits present a low carbon pathway with a demonstrated ROI, that have the potential to deliver real world energy savings of up to 40%.

Biomimicry Frontiers Helps Set Up Net Positive Eco-Building in Bengaluru

Biomimicry Frontiers is helping several firms around the world to apply biomimicry principles to solve business challenges. In this article, the authors discuss a few case studies of their work with a few of their clients. They show how biomimicry is the best approach to mitigate climate crisis, help businesses earn profits and improve quality of people's lives

By Jamie Miller and Asha Singhal

Biomimicry offers endless opportunities and possibilities in sustainable business strategies because it invites us to draw on the world's oldest and most sustainable teacher: Mother Nature. Biomimicry is a practical approach for learning to harness ideas, processes, and system strategies for how to thrive on a dynamic planet. It recognizes that Nature has been refining the best solutions for how to thrive on this planet for billions of years. And that when we can shift our collective perception from human exceptionalism and truly see the genius of Nature, then we can start to create designs, communities, and businesses that are truly sustainable.

The most popular examples of biomimicry is Velcro, which was inspired by the hooking of a burr, or Interface Carpets, which, among many things, made carpet tiles inspired by the entropy of a forest that dramatically reduced carpet waste, and infused circular economics in their factories to drive profit margins significantly higher.

JAMIE MILLER, PhD,
Founder, President

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Executive Design Lead, Germany

The key to biomimicry is that it represents a shift in our perspective, recognizing that Nature may hold some of the most efficient, sustainable and beautiful solutions to our biggest challenges. The problem is, most companies don't recognize this, or more importantly, know how to effectively do it.

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At Biomimicry Frontiers, our mission is to make it better, naturally. From years of experience learning, teaching and practicing biomimicry, we have found practical ways to draw on nature's genius and that often, the biggest barrier to success in biomimicry is creativity – the ability to release preconceptions, silos, and biases in order to creatively abstract bold ideas from nature and then harness existing assets to make those incredible ideas real.

Biomimicry is a concept that pushes the status quo of design thinking and as a result, a lot of our work is about engaging with contrasting ideas both within different levels of organizations and within our team. We welcome diverse thinking, challenging ideas and unique visions for the future. And it is through our unique approach that Fast Company named us a "World Changing Idea" in 2019.

Biomimicry and Business

We truly believe that biomimicry is the most effective way to mitigate climate change. First, it can show us the technologies for how to create more stable and sustainable ecosystems. But it can also highlight the true value of intact ecosystems.

a) When we think about cooling our buildings, air conditioning is often the first solution that comes to mind. However, nature has managed to cool for billions of years without using any fossil fuels. An elephant for example has cracks in its skin that look like wrinkles. These micrometer-wide cracks retain 10 times more moisture than a smooth surface, helping the animal regulate its body temperature through evaporative cooling. We emulated this strategy to create a wall for a residential project in India that cools the house, eliminating the need for any additional energy input.

b) Our relationship with nature transforms, once we see the value, recognizing that nature is the ultimate model and mentor for how to thrive on the planet. When we truly see its genius, it becomes harder to see it only as a resource to extract from and instead, also something to learn from.

The ecological services that nature provides are the most undervalued tool for mitigating climate change. For example, ecosystems offer unprecedented carbon sink technologies. Destroying these productive systems not only reduce our ability to learn from and emulate them, they also destroy significant allies in our fight against climate change.

By 2050, the loss of key ecosystem services could cost the world $479 billion per year, and this is a **conservative estimate**. A **recent study** argues that nature-based solutions represent "over one-third of the cost effective climate mitigation needed between now and 2030 to stabilize warming to below 2 degrees Celsius", which can reduce the need for less proven technologies like bio-engineering and other techno-centric approaches.

What we learn from biomimicry is that nature may already hold the secret to our species survival and that all we need to do is look. However, when we elevate and obsess about our own species' ingenuity, it can be easy to ignore, or forget, the 3.8 billion year old ideas that exist outside. Nature already knows engineering, chemistry, and manufacturing. It knows agriculture, community

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organization, art and communications. It has been refining these ideas long before our species has arrived (and effectively decimated these elders).

Using nature as a model and mentor, Biomimicry Frontiers has been fortunate to work on harnessing and practically applying nature's genius to the built environment.

Net Positive Eco-Building

In India, Biomimicry Frontiers helped a landowner push the boundaries of habitat design. Partnering with B+H Architects, we successfully applied biomimicry and biophilia to a house design. The process included an in-depth four-stage investigation and design; researching the local conditions and organisms, biological abstraction and problem disruption, biomimetic and biophilic design scenarios and finally, multiple iterations towards a final concept. We used a unique metric for determining design success in that we measured the ecological performance of the site based on two scenarios:

- As if we did nothing and let the land naturally evolve
- As if there were no was no human settlement in the area and the land was left to its original state (i.e. old growth forest)

We then measured the success of our building to these two scenarios in terms of how much carbon it could sequester, or how much air and noise pollution it could reduce, rain it could store and manage, and how much oxygen and soil it contributed to the site. We wanted to see if the house could function as efficiently as a forest. The goal, to shift the lens of human built environments as disruptions that are a contribution to place.

Canada's first Circular Food Economy

In Canada, Biomimicry Frontiers successfully partnered with the City of Guelph in their bid for $10M from Industry Canada to lead Canada's first Circular Food Economy. We wanted to help the community realize that a circular economy is a natural economy. In nature, "waste" streams are opportunities for reinvention and redistribution.

In our project, we took the metaphor of nature a step further and learned from ecological "patch dynamics" that seeks to eliminate waste streams and inspire local, circular businesses in the unique neighbourhoods throughout the city. We call the project a "City of Villages" and are attempting to highlight the local assets, flows, and opportunities, nested within a larger system.

Indoor Agriculture Technology Integration

Nature's proven efficiency is best seen through biomimicry-based technologies. Especially, at the form level. In 2018, Biomimicry Frontiers was hired by **Thrive Cannabis** to incorporate biomimicry into its practices. This included developing a sustainable land-use strategy and incorporating multiple sustainable technologies into its processes and systems.

We partnered with **Pax Scientific** to include custom-made impellers, inspired by seashells and lilies, that more efficiently mixed the irrigation tanks. These shell-like mixers can move 10 million gallons

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of water with the electricity of only two light bulbs. They do this because they work with the fluid and its natural movement rather than trying to push it, like traditional propellers.

Nature moves in spirals and the Pax impeller highlights this. We also designed a Living System wastewater treatment system with **John Todd Ecological,** which functions as a complex wetland. As a result of this project, cost savings resulted from reduced water usage and the environmental impact on groundwater recharge was reduced.

The most important thing we can do is recognize that in times of disruption there are opportunities to **plant seeds for a new evolution, a new ecosystem**. Despite the collective trauma, financial disruptions and overwhelming tragedy the world is currently facing, biomimicry shows us that we can reframe how we solve problems. It inspires hope. And it allows us to recognize that the problems we face today may already have a solution in nature; that they will not be solved by the same thinking that created them. Biomimicry in business is about reflection, contemplation, and realizing that we are not alone. That we are just a very young species and that the call to action is now.

Why India Needs Genetically-Modified Natural Dyes Soon

India can achieve a big portion of its sustainable development goals by taking up natural dye cultivation even in waste and arid lands. This will also help generate employment and prevent dumping of effluents into water bodies, argues Dr. Mazahir Raza, Chartered Scientist Technical Director, R&D Centre, AMA Herbal Laboratories

Since natural dyes are almost 100% biodegradable and sustainable leading textile brands are developing their products dyed in natural dyes. To meet the growing demand and to become price competitive against harmful synthetic dyes there is big need to increase production of natural dyes.

The huge demand can be met either by hybrid or Genetically-Modified Natural Dyes. When land availability is a major limiting factor the needs of the hour is to create crops that require less space to grow. **According to VIB, a Belgian research institute, cultivation of GM crops over the last 18 years has delivered substantial benefits for the environment.**

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Insect-resistant crops have resulted in a 230 million kg decrease in the use of insecticides. Herbicide-tolerant crops have led to reductions in fuel use and CO2 emissions of 6.3 billion liters and 16.8 million metric tons respectively, by supporting no-till farming. **Overall, GM crops have produced an environmental benefit of 37%.**

Crossbreeding hybrids, which is a centuries-old method, the coloring molecule in the plant can be increased. This will reduce the consumption of raw material in the manufacturing of natural dyes.

Availability of all types of dye-bearing plants can also be increased by working on wild variety growing on wastelands and marginal lands. If we focus on increasing production of natural dyes in a sustainable manner from agri-waste or byproduct of any industry where vegetable matter is used as raw material, for example, food, pharmaceuticals, leather, furniture and lacquer industry demand of dye houses can be met.

Testing Challenges – Tag Separately

There is a myth that reproducibility of shade is not possible in dyeing with natural dyes. If dyeing with natural dyes is compared with synthetic dyes, dyer can see in dyeing with whether natural or synthetic the challenges are same but since synthetic dyes are highly purified the problems are overcome relatively easily than natural dyes.

Synthetic dyes molecule is made incompatible with the substrate for cotton there are reactive dyes, wool acid dyes, polyester disperse dyes and so on but in case of natural dyes cotton, silk, wool, jute whatever substrate is dyed with same dye. For example, Mallow the natural dye from pomegranate gives yellow on cotton and khaki on wool. Even single natural dye gives different shades of different tones on the same substrate by using different pre and post treatments of the substrate.

Quality control of synthetic dyes is done in compliance with international standards mainly AATCC and ISO. The dyed substance has to meet required good fastness rating as per standards. When checked on existing colorfastness testing methods almost all-natural dyes fail especially for wash and light fastness. Chromophores of natural dyes are weak which make fastness poor but natural dyes if processed properly, can match color fastness properties as good as synthetic dyes. **There is a demand for sustainable textile with natural dyes but brands are not showing any aggression for promoting their natural dyed products.**

Actually, the problem is in the testing methods of existing standards not in natural dye. Most of the natural dyes are pH sensitive. It is observed that when the naturally-dyed textile sample is tested as per AATCC and ISO for fastness shades not became lighter but tonal change appeared.

Separate standards must be made for natural dyes. This is the need of the hour. Without delay, AATCC and ISO must establish testing standard keeping in mind the properties of natural dyes. May the world think it is ridiculous but the only solution is that naturally-dyed products should be tagged properly with special washing and drying instructions.

By application of biotechnological tools including cell and tissue cultures, genetic engineering produces quantity and quality of raw material for natural dyes can be regulated.

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What the Fashion Industry can Do

The fashion designers are the ringmasters for a consumer. Textile to apparel designer plays a vital role. Colors make the design attractive. Fashion designers can play an important role by making sure that their products are dyed or printed with natural dyes in the most environmentally friendly way possible. With the realization of the unsustainable and hugely exploitative nature of the fashion industry, designers want 'sustainable fashion' for the world. Here too natural dyes are facing challenges. Limited shade range puts designers in a challenging position. They hesitate to step into eco-fashion but colors on textile dyed with natural dyes have their own beauty hue is soft and earthy.

Today designers make their designs with shades available and achievable from synthetic dyes. Any intensity of color can be gained by synthetic dyes which are so far not possible with natural dyes. Making the dyeing process of their garments is indeed one of the hardest nuts to crack for eco-conscious brands. Many of them dive into natural dyes nowadays: a good reason to take a closer look at this process.

If the fashion world really wants to produce sustainable textile and other product dyed with natural dyes designers should try to find more colors. A good range of shades can be produced by intermixing and overdyeing different dyestuff such as Bio Indigo, Kareel, Rubia, Mallow, etc.

There is a need for a separate regulatory body for natural dyes. Natural dyes manufacturers should be forced to follow the guidelines.

Today when people need clothing with antibacterial /antiviral effect to protect us from Covid 19. Copper is the best natural antibacterial /antiviral agent available.

A majority of dyeing houses are in developing countries. So the use of natural dyes will definitely give momentum to the economy of such nations. Natural Dyes can provide sustainable livelihoods for the agriculturists, it can make textile industries more competitive and healthier, by reducing production costs by eliminating the huge expenses of effluent treatment.

The expanding premium market for goods that carry 'natural' or 'eco-safe' or 'green' or similar labels is providing an excellent focal point for the textile industry. Highly biodegradable and nontoxic properties of natural dyes offer textile coloration the maximum scope for capitalizing on the eco-conservation. Sustainable textile products can be produced only by returning of natural dyes on a commercial scale.

Dye manufacturing companies are now focusing on production as well as novel technologies for making natural dyes as a compatible and eco-safe alternative to synthetic dyes. This will help in sustainable development of the textile world and make this earth greener.

How Natural Dyes are Sustainable

Unlike petroleum resources, natural dyes are obtained from natural resource are completely renewable as well as biodegradable. Natural dyes are prepared from dried plant material such as fruits, leaves, flowers, seeds, and rhizomes. Most of the time these dried plant materials. Some natural dyes such as Bio Indigo or Natural Indigo are obtained from annual crops.

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Some natural dyes are obtained from bark and wood. These are not considered as sustainable sources because it is difficult to remove these without harming trees. This issue can be addressed by procuring bark and wood as a by-product from the timber industry. There are several agro-processing wastes such as pomegranate rind, onion peel is used to color textile and flowers offered in temples are the source of natural dyes.

Lac mud which is an industrial waste of the shellac-manufacturing industries is a cheap source of lac dye. When we use these resources for procuring raw material for natural dyes, we follow Triple Bottom Line (TBL) which is also known 3Ps: people, planet, and profits. It is the essence of sustainability.

In comparison with synthetic dyes, natural dyes are found eco-friendlier on the basis of Life Cycle Analysis (LCA). For example, LCA of Bio Indigo (Natural Indigo)

Impact Categories	Natural Indigo/ BioIndigo Dye	Synthetic Indigo Dye	% Difference
Acidification Potential (AP)[kg SO_2 eq.]	3.56E-02	4.21E-02	15.55
Eutrophication Potential (EP) [kg Phosphate eq.	3.35E-02	3.14E-02	1.93
Global Warming Potential (GWP100 years) [kg CO_2 eq]	8.09	9.03	9.28
Photochem Ozone Creation Potential (POCP) [kg ethane eq]	1.80E-03	2.26E-03	20.08
Primary energy demand (net cal.value) [MJ]	209.39	227.69	8.04
Eco toxicity Potential [CTUe]	0.73	0.95	22.62
Human toxicity Potential [CTUh]	3.08E-11	3.60E-11	14.39
Blue water consumption [kg]	2984.8	2973.40	-0.38

Table 1 – Comparison of LCIA results of dyeing with Natural indigo/Bio Indigo vs Synthetic Indigo Dye

Impact Categories	Natural Indigo/ BioIndigo Dye	Synthetic Indigo Dye	% Difference
Acidification Potential (AP)[kg SO_2 eq.]	0.12	0.25	51.88
Eutrophication Potential (EP) [kg Phosphate eq.	0.02	0.05	61.30
Global Warming Potential (GWP100 years) [kg CO_2 eq]	-0.69	10.38	>100
Photochem Ozone Creation Potential (POCP) [kg ethane eq]	-3.79E-03	2.90E-03	>100
Primary energy demand (net cal.value) [MJ]	78.61	200.25	60.74
Eco toxicity Potential [CTUe]	4.00E-03	1.78E-02	77.53
Human toxicity Potential [CTUh]	1.69E-11	1.88E-11	10.26
Blue water consumption [kg]	706.16	44.06	>100

Table 2 – Cradle to gate LCIA results of 1 kg of Natural indigo/Bio Indigo vs Synthetic Indigo Dye manufactured

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When a comparison was made between Cradle to gate of 1 kg of Natural Indigo dye and 1 kg of Synthetic it was observed that Natural Indigo had more than 50% lesser impact. This reinforces the statement that better utilization of Natural Indigo in the textile sector will have more savings potential.

Easy-to-Treat Effluent

Natural dyes are derived from natural materials are susceptible to microbial action. This makes it 100 % biodegradable. In comparison to synthetic dyes, the dye molecule of natural dye has low tinctorial value. Thus, natural dyes are more susceptible to the action of light and water than a synthetic one. Effluent produced during its dying is easily treatable and less expensive than received form synthetic dyes

Natural dyes are available in nature with various hues and tones. Natural dyes are basically extracts of plant materials, mainly from fruit, flower, bark, and leaves. The phytochemicals present in natural dyes impart antioxidant, antibacterial, antimicrobial, antifungal properties. This makes the textile dyed with natural dyes skin friendly for consumers. **The modern trend of Ayur Vastra claims that the clothing dyed with natural dye can cure skin ailments over a period of time.**

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Crypto Currencies are Going Green

The green bug is biting crypto currencies in a big way. Elon Musk's recent tweet that Tesla would not accept payment for its cars in Bitcoin because it uses non-renewable energy to mine, has given others who use renewable energy a boost. The anxiety levels are high among various crypto currencies as the ones that are greener are beginning to command a small premium, as much as 10% in some cases.

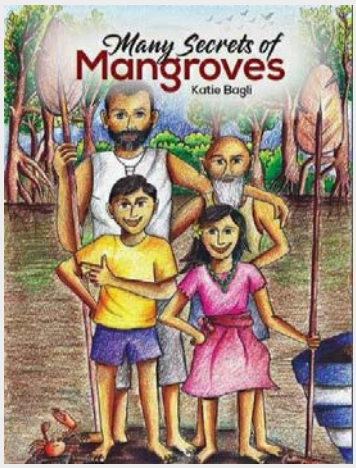
Green coins are those whose transactions are verified on the blockchain by computers powered only by renewable energy.

Bloomberg quoted Sheldon Bennett, CEO at crypto miner DMG Blockchain Solutions Inc saying, "There's a market that doesn't know it yet." He said his firm has had discussions with "multiple banks and financial institutions" that want to buy Bitcoins that can fulfill increasing demand for environmental, social and corporate governance compliance.

Interestingly, the cryptos are taking their impact on environment very seriously. Many joined together to form **Crypto Climate Accord**, a private-sector initiative to decarbonize the crypto industry by 2030. They were inspired by the Paris Climate Agreement of 2015.

The article stated that only between 55% to 65% of total Bitcoin mining is done using renewable energy. About 50% of all Bitcoin is being mined in China, which still relies on cheap coal to fuel its economy.

BOOKSHELF



Many Secrets of Mangroves

Author Katie Bagli, translated to Marathi as 'करामती खारफुटी'

Godrej & Boyce, the flagship company of the Godrej Group, announced the launch of the Marathi version of the story book "Many Secrets of Mangroves". **This is the first ever story book on mangroves** and was first published in English in 2019 in collaboration with celebrated children's author Katie Bagli. The Marathi e-version, named 'करामती खारफुटी' is also the first time a Marathi story book has been dedicated to the marvelous and delicate mangroves ecosystem.

This book is just one of the many initiatives by Godrej & Boyce to spread awareness about the significance of the mangroves ecosystem. The goal of translating the book into Marathi is to educate more children on the vital role that the mangroves play in conserving and maintaining the ecological balance.

The e-version of the book is accessible, both in English and Marathi, on the Godrej Mangroves website, the only website of its kind dedicated to the mangroves.

Dr. Pheroza Godrej,
Art-historian,
environmentalist and writer

Speaking about the Marathi book launch **Dr. Pheroza Godrej**, Art-historian, environmentalist and writer said, *"At Godrej, our goal is to educate the community on the role of mangroves as an indispensable asset to the environment. We are confident that this new release will aid our efforts of spreading the message of conservation about this delicate yet important ecosystem."*

Over the last few decades, Godrej & Boyce has been actively managing and conserving one of the largest mangroves in Mumbai at Vikhroli. The company launched the Mangroves Mobile App available in 11 languages, opened a dedicated mangroves website in Marathi, organizes exhibitions across educational institutions in Mumbai. Along with WWF India, the company launched the Magical Mangroves Campaign in 8 states.

Godrej Mangroves

The Godrej mangroves at Vikhroli extend their silent ecosystem services much beyond their boundaries to the entire Mumbai Metropolitan Region. A two-year research study revealed that the standing stock, with its biomass and sediments, holds 6 lakh tonnes equivalent of carbon dioxide – a key greenhouse gas responsible for global warming and climate change.

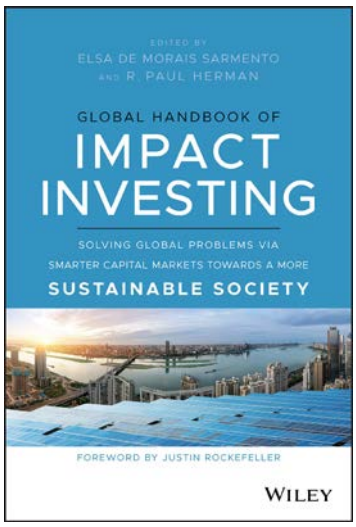
Additionally, around 60,000 equivalent tonnes of carbon dioxide is sequestered every year. Besides land stabilisation, the mangrove ecosystem plays a vital role in natural cycles and nutrient recycling thereby maintaining the environment balance.

Godrej & Boyce ('G&B'), a Godrej Group company, was founded in 1897, and has contributed to India's journey of self-reliance through manufacturing. G&B patented the world's first springless lock and since then, has diversified into 14 businesses across various sectors.

To read the Marathi e-version, click
https://mangroves.godrej.com/Resources/pdf/Mangroves_marathi_book.pdf

To read the English e-version, click
https://mangroves.godrej.com/resources/pdf/TwoPageBook.pdf

To know more about Godrej's conservation efforts, visit
www.mangroves.godrej.com



Global Handbook of Impact Investing: Solving Global Problems Via Smarter Capital Markets Towards A More Sustainable Society

R. Paul Herman, Elsa De Morais Sarmento Published by Wiley

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While other resources may take a local or limited approach to the subject, this Handbook gathers global knowledge and results from public and private institutions spanning five continents.

Meri Ek Kahani

Planet Earth houses countless species of living beings including fauna and flora. Their complex interactions make our planet what it is today. Nature is a great provider of natural resources. However, a growing utilitarian way of life and the pressure of anthropocentric development have placed an undeniable pressure on the natural system. It is of vital importance to be aware of the responsibility of every human being for the preservation of nature, and for the maintenance and restoration of natural relations between man and the living world. The role of children in inculcating a more environment-friendly attitude will determine our collective destiny. Experience tells us that there is no substitute for education as an instrument of attitudinal change. Hence the relevance of 'The Green School' project is undeniable.

The Green School is a prestigious initiative supported by Tata Steel. It is being implemented at several operational sites of the company in the states of Odisha and Jharkhand, by The Energy and Resources Institute. In the process of conducting this Environment Education initiative, we understood that there is a lot to learn from the children. The states of Odisha and Jharkhand are blessed with major concentrations of indigenous population. Nature has also bestowed richness of resources to these areas. Hence an idea was conceptualized to compile stories based on the knowledge levels of students about the environment around them. The initial focus was on indigenous knowledge, but this was extended to include nature and natural resources.

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