Pathways to Green Cities

Innovative Ideas from Urban India

Volume II

EARTH DAY NETWORK

EARTH DAY NETWORK

Green Cities

22 April, 2015

Dear Reader

Growing out of the first Earth Day (22 April, 1970), Earth Day Network engages with over 50,000 partners in 192 countries to broaden, diversify and mobilize the environmental movement. More than one billion people participate in Earth Day activities, making it the largest civic observance in the world.

It is our great pleasure to release Volume II of our eBook, ‘Pathways to Green Cities: Innovative Ideas from Urban India’ on the 45th anniversary of Earth Day. We are proud to announce that many of the case studies from Volume I have been successfully replicated. The account of how ragpickers turned into entrepreneurs, featured in Volume I, has also been recognized by the UN Framework Convention on Climate Change with the ‘Lighthouse Activity Award’.

Volume II exemplifies the theme for Earth Day 2015, “It’s Our Turn to Lead,” by showcasing innovative ways 26 organizations have developed strategies to lead green movements in their cities. The volume has several accounts that focus on waste management, a problem faced by many cities in India. There are case studies that focus on ‘upcycling’–a method to refashion discarded items into useful ones thus prolonging their use, and reducing demand on fresh, raw materials. Read how old tyres are turned into sandals, discarded bags into high fashion accessories, musical instruments created out of junk, and more. Solar energy is another focus area. There is a fascinating account of how solar cookers installed at community kitchens at popular religious sites have proven to be effective alternatives to using Liquid Petroleum Gas for cooking. Volume II found that bicycling was the top green alternative for transportation. We have studies of cycles fashioned out of natural products such as bamboo, and of ways cycles can be used to provide that first and last mile connect to public transport that often only operates along arterial routes.

The collection of case studies in Volume II ‘Pathways to Green Cities: Innovative Ideas from Urban India,’ offer inspiration, and we hope that you find ways to implement the green practices in your city. Earth Day Network is very grateful to the many organizations that sent in material. We are also grateful to those who volunteered their services to help edit Volume II, in particular, Khushi Khanna and Lee-Alison Sibley.

Denis Hayes
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President

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INDEX

Accessorize Your Waste

Accessorize Your Waste

Did you know that some of the high fashion handbags, footwear, belts, funky jewelry, hair clips and home decor accessories sold in upscale boutiques across the world are made out of upcycled plastic waste? Delhi alone produces around 8,000 tons of waste every day, but the local authorities are able to collect just half that amount. It is left to ragpickers to perform the valuable work of collecting, sorting, and where possible, selling for reuse or recycling, the remaining waste.

Born out of a desire to reduce India's rubbish mountain, improve energy efficiency, and empower some of India's poorest, my husband Shalabh and I started Conserve India. We combined his expertise in engineering with my creative talents to produce high fashion items from discards. With it, our enterprise also empowers the ragpicker-community that performs the important task of waste management, yet is unrepresented, voiceless, faceless, and lives on the fringes of society.

The venture started in 1998 as a fledgling recycling project but quickly adapted to confront the biggest challenge it was facing—what to do with the thousands of plastic bags that could not be composted or recycled locally. After much experimentation, the Conserve India team hit upon the idea of not recycling, but upcycling by washing, drying, and pressing the bags into sheets. Handmade Recycled Plastic (HRP) was born. High fashion was going to support better lives for the poorest and a cleaner environment for all. "It was a new dawn" as I remarked then. A seed was sown. Today, it has blossomed into a huge Tree of Life that provides shade to 300 people. The Tree of Life also harvested two fruits—intelligent waste management and empowerment of the most vulnerable.

Beginning with 28 ragpickers, Conserve India today employs and trains hundreds of people from Delhi's most disadvantaged communities to clear their streets of the plague of plastic bag waste. Once the waste bags are turned into HRP products these are sold for profit that is then spent on education and welfare programs in those same communities. As the plastic is kept in its original form and color, Conserve India's upcycling technique uses much less energy than traditional recycling. No dyes are needed for this green way of creating fashion from waste. No wonder that I refer to HRP as "a material of the future."

This environmental-friendly process does face challenges. Collecting the right material is the first. Conserve India caters to the fashion industry where colors and shades are very important. The ragpickers therefore need to focus on specific colors. How do you explain "mauve" or "coral",

for example, to those who don't speak English? There is no word for these shades in Hindi. Add to this the fact that employees come from different states and villages and speak varied dialects or languages. Constantly finding words to pinpoint a shade becomes an impossible task. Conserve India found a brilliant solution. They use Bollywood stars! Yes, they name every shade of color after a Bollywood star. After all, these names are known across India. For example, if solid black is the color needed, the instructions that go out are "Get Shah Rukh Khan."

Once the right shade of scraps is collected, the next step is getting the items to be squeaky clean, as that is what HRP needs. It is obvious that what the ragpickers collect is likely to be dirty, so a thorough wash is essential. This was initially done on roadsides, but the sheer magnitude of orders makes for massive amounts of plastic bags needing to be washed. To ease the problem, the management of Conserve India requested residents to share their rooftops for the purpose. Many generously obliged. Now a washing unit is in place.

In the final stages, our team uses its knowledge about the needs of the fashion industry and utilizes its artistic creativity to produce eye-catching products that are sold at high-end stores in India and overseas. The designs have been recognized with many awards. These include: Best Eco Design, Hong Kong Trade Show (2006), Best Green Designer, Qatar (2010), Most Innovative Green Fashion by School of Fashion Technology, Pune (2012).

In the social sector Conserve India provides adult literacy programs in which knowledge of Hindi and basic arithmetic and writing skills are taught. To further empower the workers, they are taught how to open bank accounts, factory protocols, and hygiene. Conserve India's Mobile Health Clinic visits every ragpicker's home to conduct basic medical checkups and diagnostic services. Skills development is also offered, which includes training on the use of sewing machines, die-cutting machines, quality control and packaging. This training shapes workers into skilled craftspersons and hence employable in factories. Those identified as having an entrepreneurial bent of mind are provided with soft loans to help them set up their own businesses.

We stand today as a proven and viable model of environmental conservation, eco entrepreneurship and social enterprise.

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Back to the Wild

Back to the Wild

A burgeoning population inevitably competes for dwindling resources, for which pristine natural surroundings in the vicinity often have to bear the brunt. Verdant forests turn into desolate stretches of bad land, marauded by excavators, ruthlessly concretized, or even converted into garbage dumps. IamGurgaon, a Non Governmental Organization, achieved the opposite.

We at IamGurgaon are working towards restoring a defunct mining site to its original state as an Aravalli forest that serves as a repository for flora and fauna and a recreational space for citizens to connect with nature. We proudly present to you the Aravalli Biodiversity Park.

A 350 acre derelict mining site that once was a forest, was lost due to mining. IamGurgaon, with the help of the Municipal Corporation of Gurgaon, paved the way for the ecological restoration of the area into the Aravalli Biodiversity Park. We approached the Corporation with a well-thought-out plan to reforest the wasteland with native flora of the Northern Aravalli range. It was hoped that recreating the wild would encourage birds and animals to return. Aravalli Biodiversity Park is also envisioned as an urban forest garden where people can connect with nature, and enjoy outdoor activities such as leisure walks, jogging, cycling and trekking.

Today, a fledgling Aravalli Forest stands at the very spot where five years ago one could only see exposed rock and invasive weeds.

How did this miracle happen? On getting the “go ahead” from the Corporation, work began in earnest to weed out plant species such as the Vilayati Keekar—Prospis juliflora, Parthenium, Argemone and others that colonize land and impede the growth of native plants. In the initial stages we gave the responsibility of plantation to experts from the Haryana Forest Development Corporation. However, they began to treat the Park as a garden with aesthetic value, planting exotic species, beautiful to look at, but not native, and hence ecologically inapt. After the first year, the Corporation asked us to take over the plantation work and afforest the area in keeping with scientific principles for the development of a proper forest. That was easier said than done. Mining, grazing, encroachment and quarrying of stone for building projects had badly affected the soil quality. Also, just a few specimens of Aravalli Forest species still stood. Not enough for developing a forest. We had to source native seedlings from as far away as Rajasthan and Madhya Pradesh. Many of these saplings didn’t survive the rigors of transportation in the severe heat. It thus became necessary to establish our own in situ nurseries, an ambitious project which proved to be difficult, as hardly any documentation on the propagation of Aravalli species was available.

To deal with this issue, we have set up two nurseries that house over 60,000 saplings of around 130 species.

We have incorporated several sustainable environmental practices in the Park to implement our objective of optimal utilization of natural resources. These include setting up drip irrigation which works on the principle of gravity, using sewage-treated water to water the trees and preparing compost from dead leaves collected in the city to serve as manure. This solves the city's garbage problem as well.

To restore the natural wetlands that were also lost in this area, we have begun the development of seasonal ponds. These are lined with Bentonite (Fuller's Earth) to create a perennial water source, thus restoring the hydrological drainage pattern of the land. Plans are being discussed to utilize the nullahs in the vicinity of the Park for water drainage. Other features of the Park include an amphitheater for cultural events, a parking space for cars and a gabion stone compound wall.

A major contributor to the success of the Aravalli Biodiversity Park is the participation of people. The members of IamGurgaon are actively engaged in the maintenance and upkeep of the Park. Each year, at the plantation time, the Aravalli Biodiversity Park sees over 15,000 people participating. Students from over 30 schools, residents of Gurgaon and wandering nature enthusiasts from all over the country come to do their bit for the Park. Many corporate enterprises in and around Gurgaon are contributing to the development of the Park. Currently, more than 40 corporates are enthusiastically aiding in the development of the Park.

Today the Aravalli Biodiversity Park witnesses a daily footfall of more than 500 people, who come here to get respite, away from the maddening cacophony of city life. The area is bursting with animal life. It is a bird watcher's paradise; 120 species of birds, many of them migratory and exotic, were spotted last year. Mammal and reptile populations have also increased. Jackals, nilgai, hares, monitor lizards, and snakes are regularly sighted.

The park continues to be a "work in progress." There is so much more to plant and maintain. Though it is far from being a complete success, it is an example for others to know where and how to begin, should they want to grow their own urban forest.

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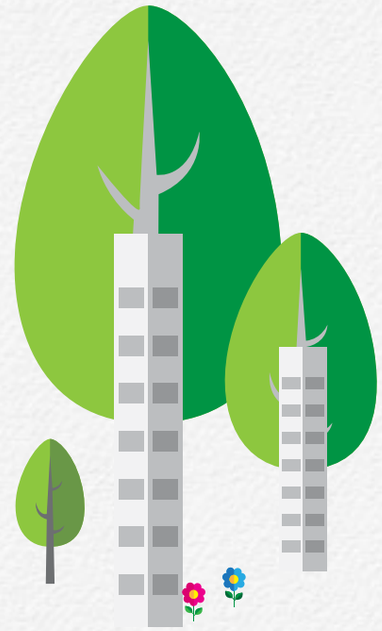
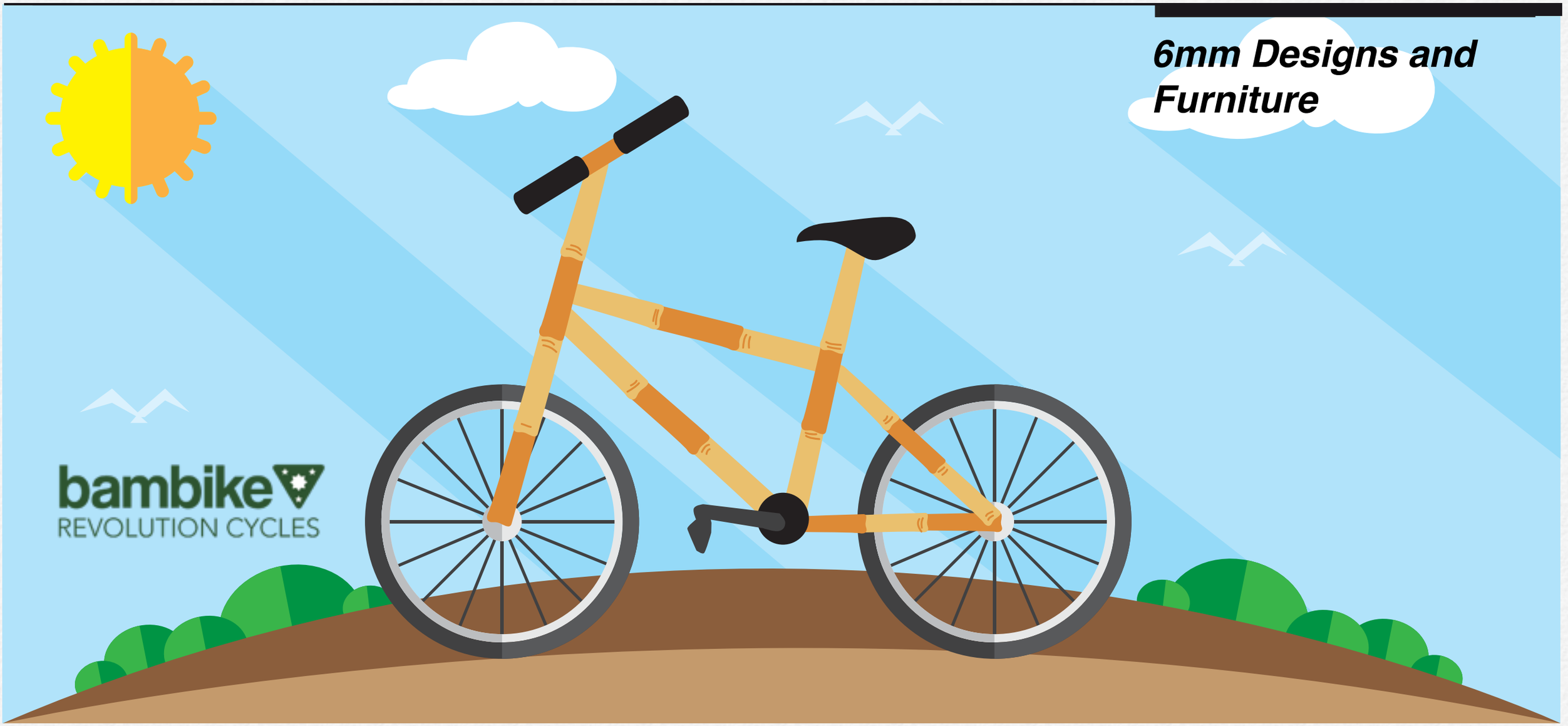


Bambikes



Bambikes

Have you ever ridden a bicycle made of bamboo? Is that even possible, you may wonder. What if I told you that it is? I have a “Bambike” and its frame is fashioned out of bamboo, hemp and natural resin fibers. Did you know that bamboo is in fact as strong as steel and is known for its superior elasticity? For these reasons, many communities in North Eastern India and other parts of the world use it for housing construction. In my case, bamboo’s tensile strength and tubular structure made it ideal for building bicycle frames. Its excellent shock-absorption properties also made it the perfect choice for a vehicle intended for rough Indian roads.

Let me tell you how I, the son of a carpenter, and a furniture designer by profession, made the eco-friendly Bambike. It all started when my wife Niyati bought herself a bicycle for her daily commute to work in Bengaluru. I wanted one too and began examining all the choices available in the market. The designer in me was also intrigued by the mechanics of bicycle design and I spent hours on the internet studying this. “Why don’t you make your own out of bamboo?” some of my friends suggested. What began as just a suggestion eventually turned into an all-consuming green-technological project.

While I had accepted the challenge to make my own bicycle, the work involved was far from easy. After months of research and experimentation the first prototype of my Bambike was ready. It comprised a bamboo and fiberglass frame with metal inserts for joints. I was alarmed to discover, however, that at high speeds, the rear wheel would wobble dangerously. This indicated that the bicycle joints were too flexible and needed to be firmer to avoid swaying. I realized I needed a jig—a metal frame that joins disparate parts of an object and ensures consistency between all the pieces. It is commonly used as a point of reference in mass production. With this in mind, my second design featured hollow bamboo of slightly larger diameters. I also replaced the fiberglass of the earlier model with hemp fibers as hemp is more conducive to the gluing of the multiple bicycle joints with resin. Voila! This time around, the bike offered a zero-wobble ride.

So here I was with a basic structure. Now I needed to procure the right gears, derailleurs, brakes, etc. for my bike. This proved a challenge as factories manufacture these parts to certain standardized specifications only. I had to figure out how to integrate these mass-produced mechanical pieces onto my bamboo bike. After a great deal of research and experimentation, I eventually managed to incorporate these into my model’s design and unveil a Bambike.

To test the endurance of my prototype and also generate publicity, I approached the Bengaluru-based Ride-A-Cycle Foundation that promotes cycling for environmental and health benefits. On their suggestion, I joined the Tour of Nilgiris for their eight-day 900 km cyclathon. I am glad to report that I was among the tour's top contenders. This first-hand testimony to the viability of my idea, along with the widespread social and media interest in the product, acted as an added incentive to continue developing the Bambike.

Further inputs from cycling enthusiasts and experts around Bengaluru helped me test, improve and publicize the Bambike. I now modified the prototype to create a version that was finally ready for mass-production testing. This superior model underwent vigorous testing at the Japanese Industrial Standards facilities of the Tube Investments of India Ltd. in Chennai. Here, the performance of the bamboo frame exceeded prescribed safety standards set for conventional steel frames. I was ecstatic!

My Bambike weighs just 12 kg, almost 2–3 kg less than a conventional bicycle of identical specifications. It is environmentally friendly, but yes, at present, despite bamboo being cheaply available, it costs more than a commercial bicycle. This is because each Bambike is painstakingly handcrafted rather than assembled from mass-produced parts. A single frame takes eight days to construct.

While I am working now on ideas to reduce the end-user cost of Bambikes, I must highlight that, if you consider the reduced environmental costs of using all natural materials, my Bambike stands significantly cheaper than a regular bicycle.

I hope the environment-friendly appeal of the Bambike will attract more buyers. At present the majority of our customers are overseas with only a handful based in India. An increase in sales in the local Indian market would definitely be a plus.

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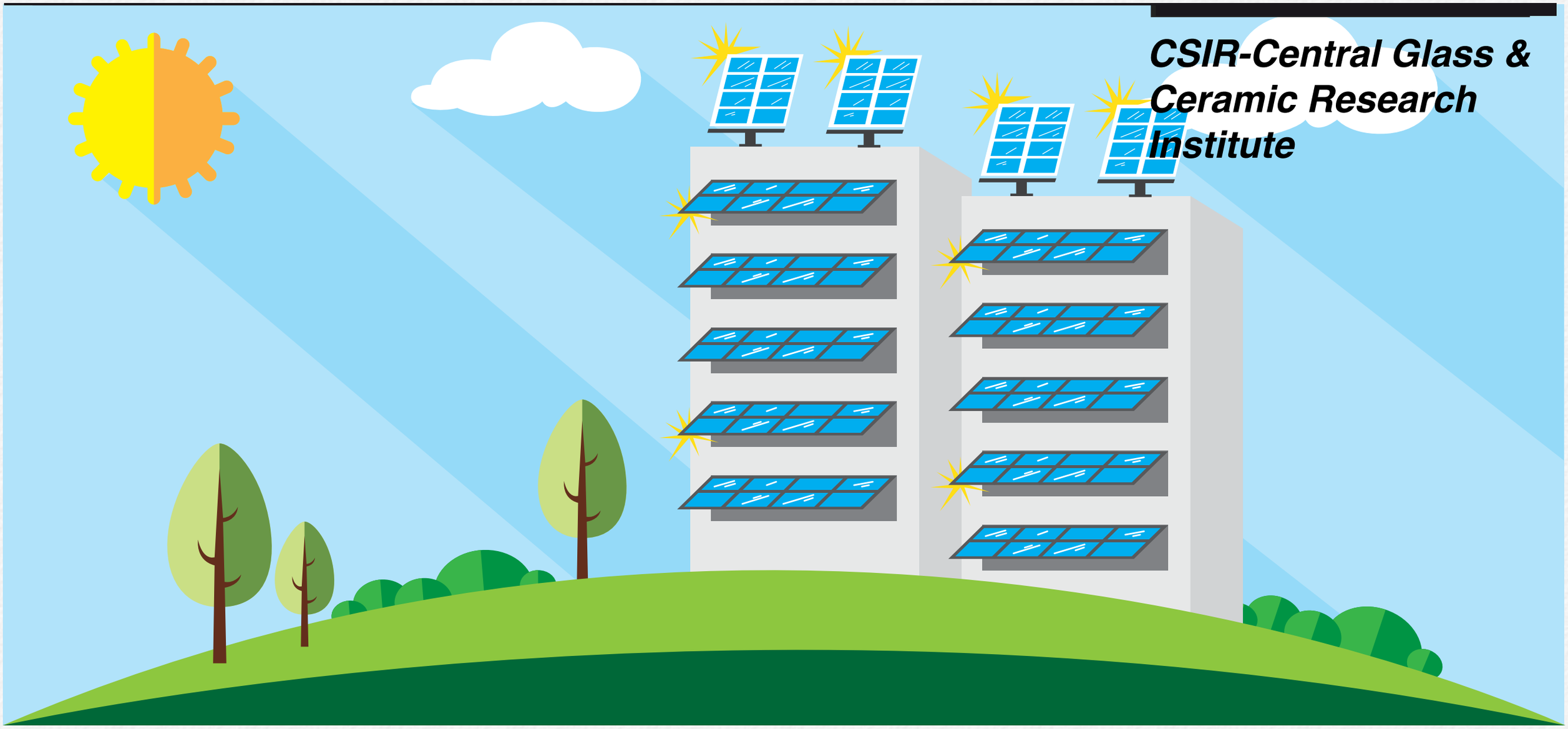
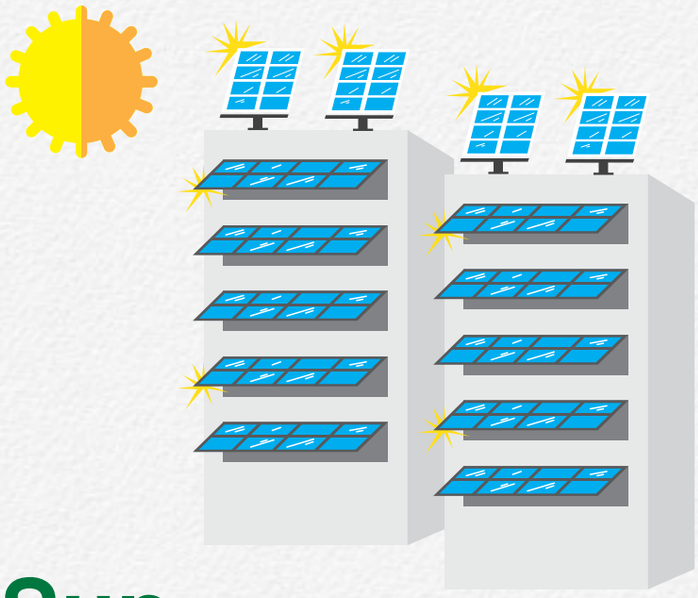
Catch the Sun



CSIR-Central Glass & Ceramic Research Institute



Catch the Sun

In the heart of Kolkata is SIRSA, a 10-storey residential complex for officers and scientists of the Government of India's Council of Scientific and Industrial Research (CSIR). The buildings here are unique as they use power generated within the complex. In fact, often SIRSA even has surplus to feed into the power grid.

The SIRSA complex needs a lot of power for its nearly 100 apartments and large guesthouse that are almost fully occupied. The common areas such as playgrounds have to be lit, elevators operated, and water pumps run. Its guesthouse is fully air-conditioned, and yet no power is taken from the grid; it is all generated within.

Earlier the monthly energy bill hovered around ₹1.60 lakhs. This was a concern. What was even more worrying was the indication that tariffs were likely to rise. As scientists, we knew that coal and water, two sources of power in India, were becoming scarcer year-by-year and that the CO_2 emissions from thermal power plants were creating havoc for the environment.

A solution had to be found that was both economical and environment-friendly. We had to take the lead and demonstrate to others that this was possible. The obvious indication was to look for alternate sources of energy. But which one? Being an energy professional and also the Principal Technical Officer of CSIR's Central Glass and Ceramic Research Institute, I was asked to explore the choices available. After much deliberation, my team and I zeroed in on solar power as the best method to offset the effect of incremental power tariff and at the same time to minimize the environmental impact. A grid-connected solar photo-voltaic power plant was setup on the roof of SIRSA in 2014. This was commissioned at an initial cost of ₹37.35 lakhs. 30 percent of the cost was subsidized by the Ministry of New and Renewable Energy. With the available roof space (minus shadow zone and maintenance space), an initial area of 5,500 square feet was earmarked in the first phase.

There are successes. In the last year total green energy generated was 52,269 kWh, while 2,166 kWh was exported to the grid after captive use. ₹4.13 lakhs has been saved and 85.72 metric tons of CO_2 emissions avoided as a result. It has also eliminated the usage of 575 kiloliters of water by the thermal power plant.

We also have a solar water heater of 200 liters capacity for use at our guesthouse and a sun ray heated water storage system that uses discarded 20 liter containers. The experimental results are quite encouraging and indicate a potential of saving Liquid Petroleum Gas to the tune of 33 percent. The next plan is to develop community biogas by using household kitchen waste produced in flats at SIRSA.

We have succeeded in making this huge residential complex energy-efficient by taking small steps. I would recommend that every highrise, anywhere in the world, think seriously about installing alternative energy units. For Indians who are keen to do so, MnRE (Ministry of New & Renewable Energy, Govt. of India) schemes and guidelines for availing Accelerated Depreciation in Tax rebates etc. are available.

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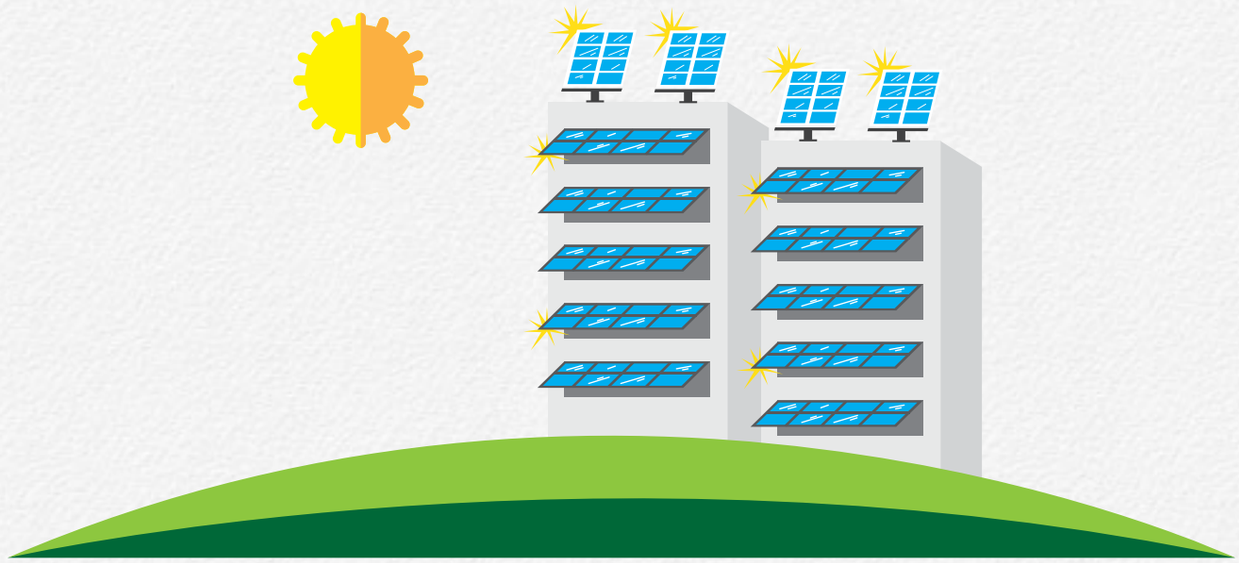
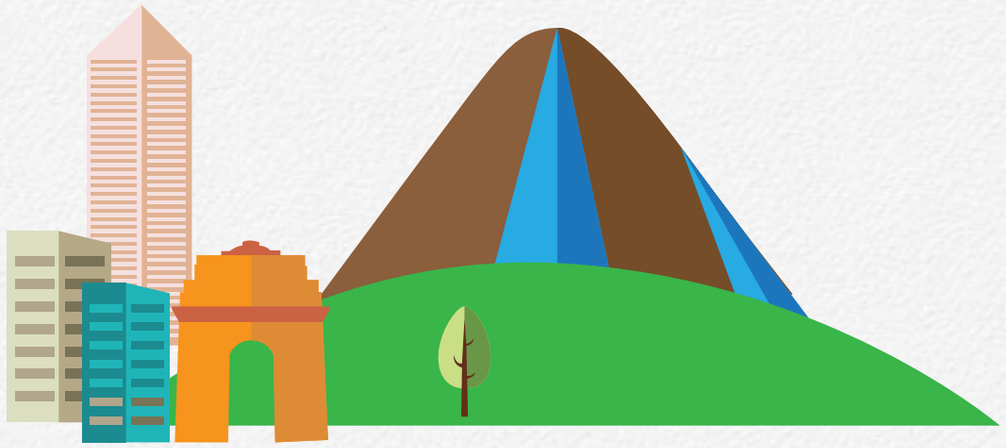


Come Greenery, Come Flowers



Come Greenery, Come Flowers

In Delhi there is a hilly spur known as the Delhi Ridge. This once occupied almost 15 percent of the city's land. Alas, today, the majority of it is lost. The deciduous arid scrub forest of the Ridge that still remains is a unique ecosystem in the heart of the modern city, and is critical for its ecological health. It is not an exaggeration to say that it acts as a green lung for the city's polluted air. It allows the flourishing of rich biodiversity, lowers the ambient temperature and acts as a noise buffer. It also protects Delhi's southern reaches from the heat and blowing desert sands of its neighboring state, Rajasthan. Foxes, porcupines, chinkaras and blackbucks were once abundant in the Ridge. Today, it is mainly nilgai and smaller animals such as hares that remain. Fortunately, bird life still abounds. 150 native species inhabit it and migratory birds visit it.

The Ridge also plays a vital role in groundwater recharge. Its fractured and porous quartzite rocks are important rainwater conductors for an aquifer recharge zone that lies beneath. Delhi's current water woes are in fact due in part to the disappearance of large patches of the forest on the Ridge and its associated River Yamuna channels.

The Ridge was God's gift to Delhi you will agree, but we humans are unappreciative of this precious resource. Today the Ridge is battling against being diverted for "development" and we at Toxics Links are fighting for its survival.

Our fight for the Ridge Forest has been ongoing for over two decades. Our campaign began in 1993. Informative articles were written, street protests and citizen walks organized, speeches made, students educated, court cases filed. It was an intense time of not holding back, but fighting for the dwindling Ridge. With support from the people of Delhi and other like-minded organizations, we succeeded in having 7,777 hectares of the Delhi Ridge declared a "Reserve Forest" in 1996. These protected forest areas are scattered in four distinct patches across the city. We have also succeeded in saving the Ridge's Asola Bhatti Wildlife Sanctuary from being converted into a landfill.

All this has been possible with a blitzkrieg of awareness building and litigations. We speak to young and old alike about the importance of the Ridge and the need for all to join hands in its preservation. We offer nature walks for school children so that they may build a personal connection with the forest. We also regularly post innovative and engaging activities on our Facebook page in order to attract a youth audience. Additionally, articles for the print media and for reports and books are written for publication.

Artistic tools such as films are among our favorite mediums for outreach. In 2014 we commissioned film director Krishnendu Bose to make “Three Characters in Search of a Forest.” The script is about the Delhi Ridge Forest and its struggle for survival as manifested in the lives of three residents of Delhi. As part of the Microsoft Create to Inspire Fellowship, we also worked with young artists and researchers from the city to design campaigns to draw attention to the need to protect the Delhi Ridge. Our cameras captured the struggle for survival of the Oud Community that for generations has known the Ridge to be their home. Ravi Agarwal, our Director at Toxics Links, is now an inductee of the Ridge Management Board, and this also helps.

While we have enjoyed some victories in our battle for the Ridge, our work is fraught with challenges. Most people in Delhi have never seen the Ridge Forest. Garbage is what they have seen in its place. It appears inconceivable to many that such a large area outside a “development zone” can be designated a protected forest in a city where land demand is astronomically high. Ironically, the Metro Rail, which travels over the fabulous forested canopy, provides a spectacular bird’s eye view of the forest. We hope that as more and more people learn about this ecological wonder in the midst of their dense, urbanized and endlessly growing city, they will realize that it is a blessing that can hardly be taken for granted! The ecological functions served by the forest are in fact more needed today than ever before.

At Toxics Link, we believe that if only the people of Delhi understood the importance of the forest on the Ridge, they would join the movement to save it. Their efforts would certainly be worthwhile, as life in the city would improve dramatically. Less pollution, reduced water scarcity, and an ability to enjoy nature, even in a busy and crowded city will be their reward.

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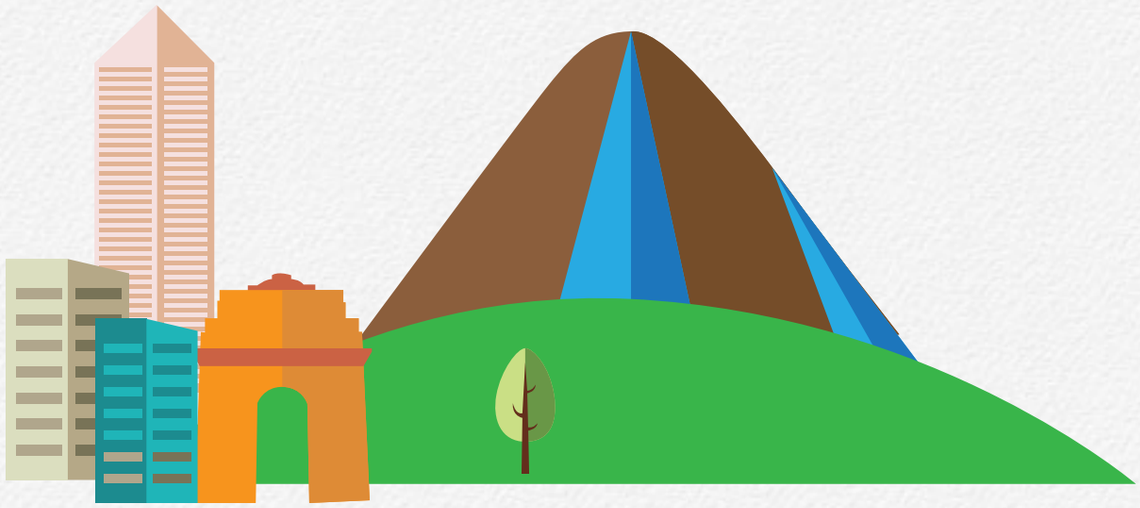
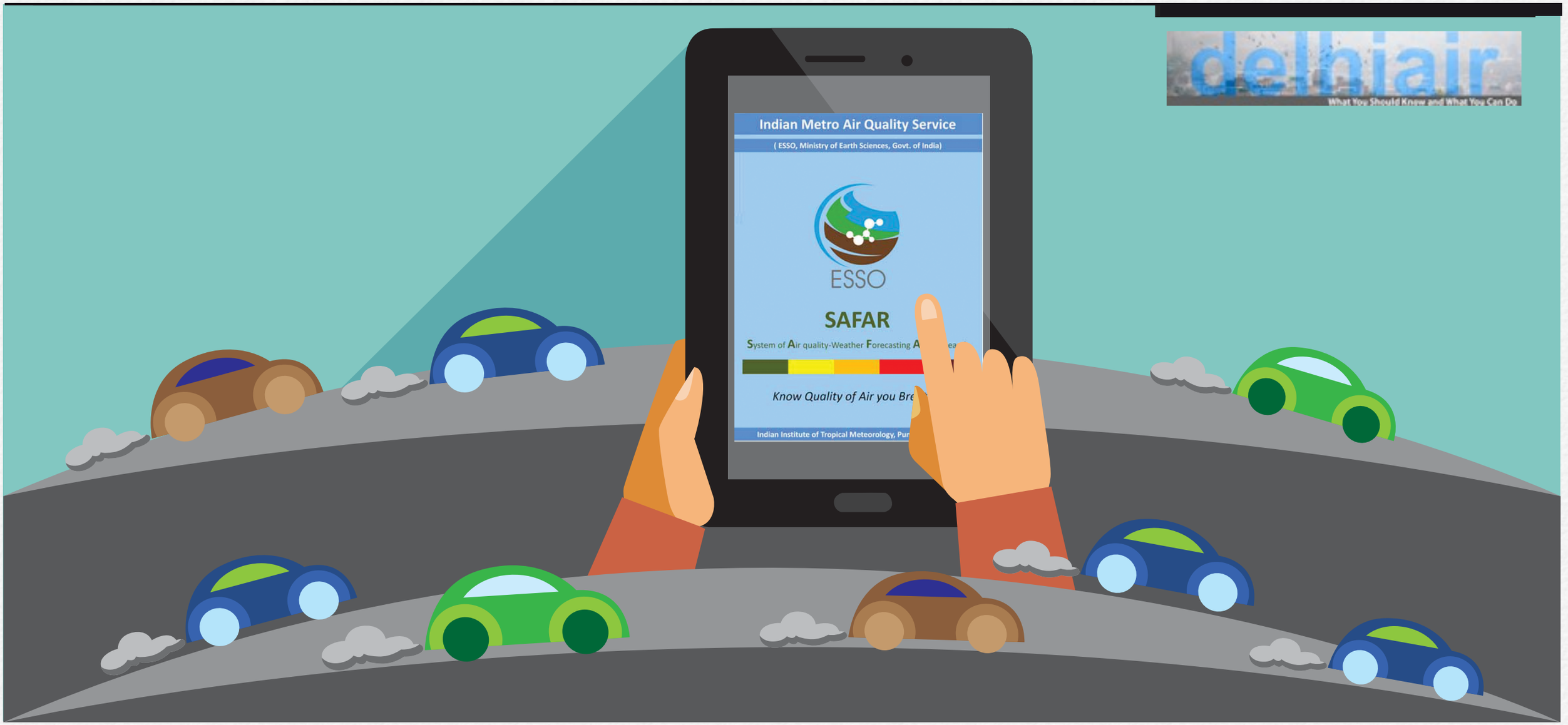


Daily Gasps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What You Should Know and What You Can Do
Indian Metro Air Quality Service
(ESSO, Ministry of Earth Sciences, Govt. of India)
ESSO
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System of Air quality-Weather Forecasting A
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Daily Gasps

As recently as two years ago, when I first arrived in Delhi, few people I knew were talking about air pollution. In fact, the pollution that gets trapped close to the ground in the winter was considered “fog” and winter was still seen by many as lovely and misty and beautiful because of it. However, as a newly arrived resident and public health professional, it looked and felt like something different, something that was making my eyes tear, my throat and chest tighten, and my energy levels wane—it was making me sick. Rather than fall into a state of fatalistic acceptance,

I began to investigate Delhi’s air quality. Sure enough, the Air Quality Index numbers (or AQI) published daily by the Delhi Pollution Control Board illustrated the severity of the air pollution problem here. With the evidence so clear and alarming, I was puzzled why was there such little discussion on how “fog” is really smog and on the serious impact it has on the lives of the close to 25 million people living here. Did people see the numbers and not understand them? Why were my friends still attributing symptoms of air pollution exposure to viruses and not to the harmful effects of the pollution in the air? Clearly, there was a disconnect, or more likely, I thought, a lack of information and understanding.

Casual conversations with friends on the topic alarmed people, and they wanted to know where to go for more information about air pollution and health. I found myself jotting down notes for people, sending them to the trusted primary resource information they needed from organizations such as the UN World Health Organization (WHO), the US Environmental Protection Agency, the Public Health Foundation of India and the Center for Science and the Environment. The conversation was gaining traction, especially after the recent WHO air quality announcement naming Delhi as the world’s most polluted city.

As people began to ask where to go to learn more, it became clear my mode of communicating this information was inefficient. Something bigger, more effective and able to reach a wider audience needed to be done. Social media was the obvious answer, whereby there would be a “one-stop shop” online for interested people to learn about Delhi’s air pollution, its implications on health, and what people could do to protect themselves. From there it didn’t take long to pull together a team to help—I knew I needed someone with the technical and graphic design expertise who could build a website, and a partner to help with the research and editing as well as managing the site. Our small team came together and Delhiair.org was born.

The site focuses on the big picture of what air pollution is, what causes it, what is being done, the science behind the air quality numbers, the health effects on adults and children, and what people can do to mitigate their exposure. In addition, it includes scientific research and studies for both the general public and professionals who want a deeper understanding of some of the data, research and studies that have been conducted on air pollution and its impact on health.

The aim of getting as much information as possible onto a platform that was easily accessible to my friends who asked for it, and to the general public, was a success. Still, surprises and challenges revealed themselves almost immediately after the launch, with one outstanding issue being how to get people to find the website, become loyal followers, and spread the word.

Our first two months indicated that we were on the road to becoming relevant. People liked the site—lots of people. In October 2014 (the month we launched), we had 902 visitors to the website. The next month, November, saw an uptick to 1,120 guests. And then the momentum stopped, with December's numbers shrunk to 581 visitors. At that point, it became clear that even though we were in the midst of the worst of the air pollution season in Delhi, our outreach had plateaued.

Perhaps the number one rule to social media outreach is to make sure you are relevant and your website or status on Facebook or elsewhere is updated often to include the most recent news and information. With that in mind, our strategy changed to focusing on finding important news and media stories, research, YouTube videos, presentations and quickly uploading onto DelhiAir.org. We opened Facebook and Twitter accounts for people to "friend" and follow us more easily. Almost immediately, the number of visitors to our site multiplied, far surpassing the October and December figures.

The goal now is to continue to think of new ways to attract not only residents of Delhi and India, but visitors from around the world. The next steps in doing so will include redesigning the website to make it easier to read and access.

The DelhiAir.org website has led to some amazing new public outreach and other activities around air pollution awareness building, advocacy and networking for professionals working in this field. We are proud that Delhiair.org is part of the growing movement to tackle the issue of air pollution in Delhi.

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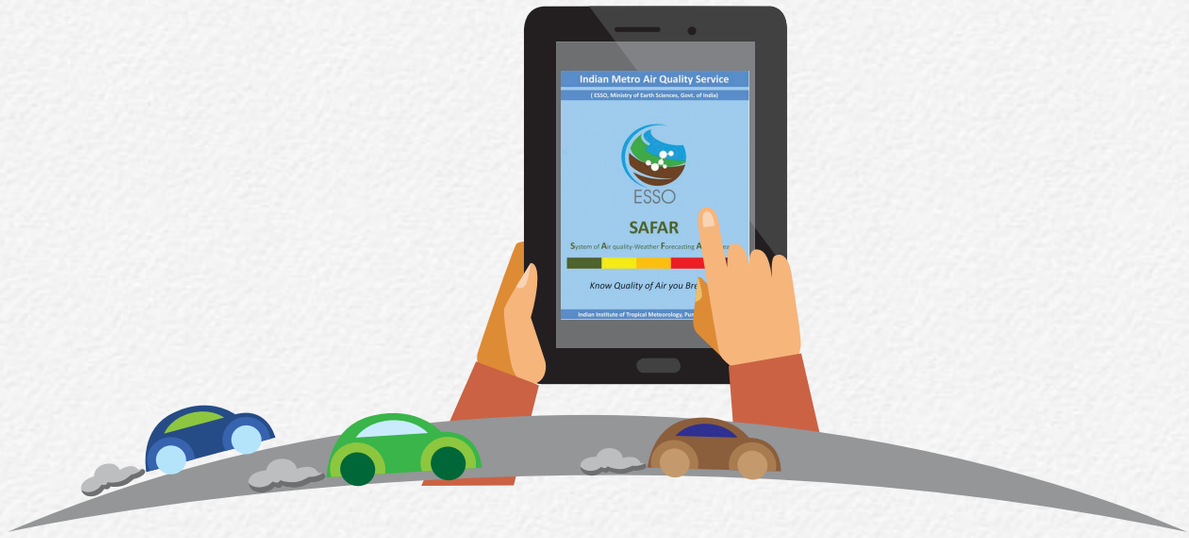

Earthworms Re-soil

Green Cross Society Foundation

Earthworms Re-soil

My name is Shantaram Umanath Shenai. I live in Mumbai where I am popularly referred to as the “Garbage Guru.”

You will agree that in cities such as mine, garbage is visible almost wherever you look. Municipalities and local bodies struggle to remove it and attempt to maintain a semblance of cleanliness. Despite the enormous financial and human resources used to crush and to truck garbage to dump sites several meters high (that often self-ignite and create hazardous air pollution), the city is still not clean. I came to live in Mumbai at the age of 10 and was deeply disturbed by the squalor around. Growing up, I resolved that some day I would do something about this. So here I am doing my bit for a cleaner city.

The solution I identified came from observing how nature works. Earthworms gave me an idea that matured from a mere waste disposal program based on the recycling of organic waste into vermi-compost, to a pioneering rejuvenation program that literally recreates soil. Perhaps many don’t know that earthworms are capable of replacing soil in one year, something that could take 200 years to regenerate naturally. Could these earthworms be used to convert all forms of organic waste matter into soil conditioners was my thought. I would not only relieve cities of the threat of epidemics and the high costs of waste management, but also help revitalize fallow and denuded land, and supply organic fertilizer for use to rural areas so that village economies are insulated from market instabilities.

But let me start from the beginning. Our NGO, Green Cross Society Foundation, was commissioned by the Municipal Corporation of Greater Mumbai and encouraged by the Government of Maharashtra to study the garbage crisis after the Surat Plague of 1994. The lessons from the study were intended to be constructively applied in Mumbai. We examined every aspect of the journey of garbage, from its moment of creation, its path of transportation, to its final resting spot. We also studied the consequences of filth on public health. Engineering equations known as “Material and Energy Balance” and the use of Nature Chemistry reactions were applied creatively and logically to study all aspects relating to the make-up of the constituents that went to creating garbage.

Once the journey had been mapped, we examined innovative ways to manage this garbage, as the traditional ones were really not effective enough for the huge amounts of waste generated in Mumbai. The unique method we hit upon was the “Deep Burrowing Earthworm Eco Technology.” Many algorithms were arrived at that enabled emulating

nature's designs. As the Deep Burrowing Earthworm Eco Technology evolved and began to incorporate plant chemistry in a simple way, it became possible to address any kind of organic waste locally, without the nuisance of stench, threat to health, or pollution of the surroundings. A soil conditioner was created to repair degraded land with saline soil. The knowledge was then applied to sewage (which is anyway just liquid garbage) to confirm that it could be treated without the use of aeration machinery and external energy. New possibilities of how organic waste and sewage could be looked at as a misplaced resource to create natural materials and products useful to society became possible. Decentralized garbage and sewage treatment became a reality with the latest Eco Technology.

Today, I have understood that the natural reactions in plants and animals can be imitated to transform poison to medicine, pollution to resources and waste to wealth. Think about the equation we learned in school that describes photosynthesis—$NOx+CO_2$+Light = Food, Fuel, Fiber+ Oxygen. Dr Uday Bhawalkar, whose knowledge greatly helped us, described the complete reaction as $NOx+CO_2$+Light/Heat = Food, Fuel, Fiber+Nascent Oxygen+Cooling. This understanding of nature's processes and creating a new technology based on it to address waste and pollution, was the solution I was looking for.

The documentation we have is being put to use to create websites that can inspire stakeholders and governments to change their thinking and methods in addressing waste, pollution, sanitation, health, farming and even climate change issues. Nature has plenty of answers. We have to just seek and we will find useful equations that describe processes of use, much in the same way as we have employed earthworm technology to manage garbage.

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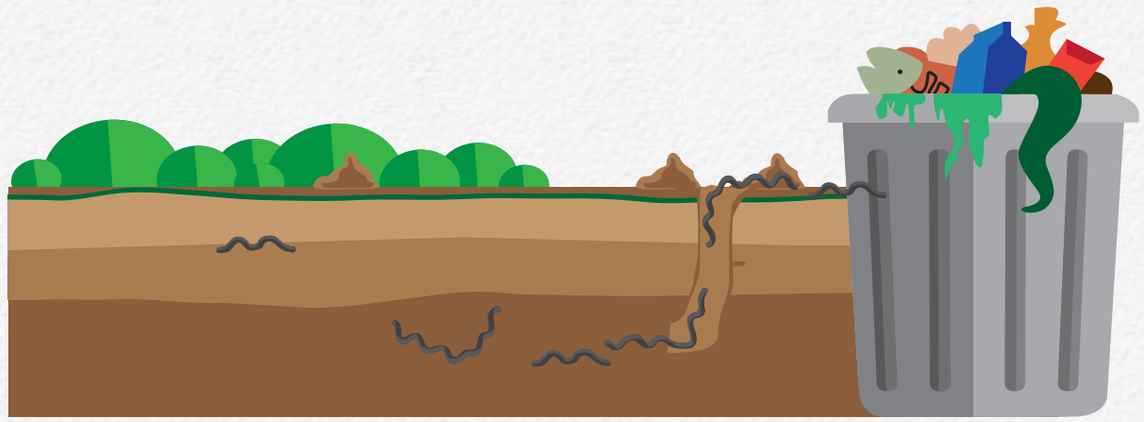
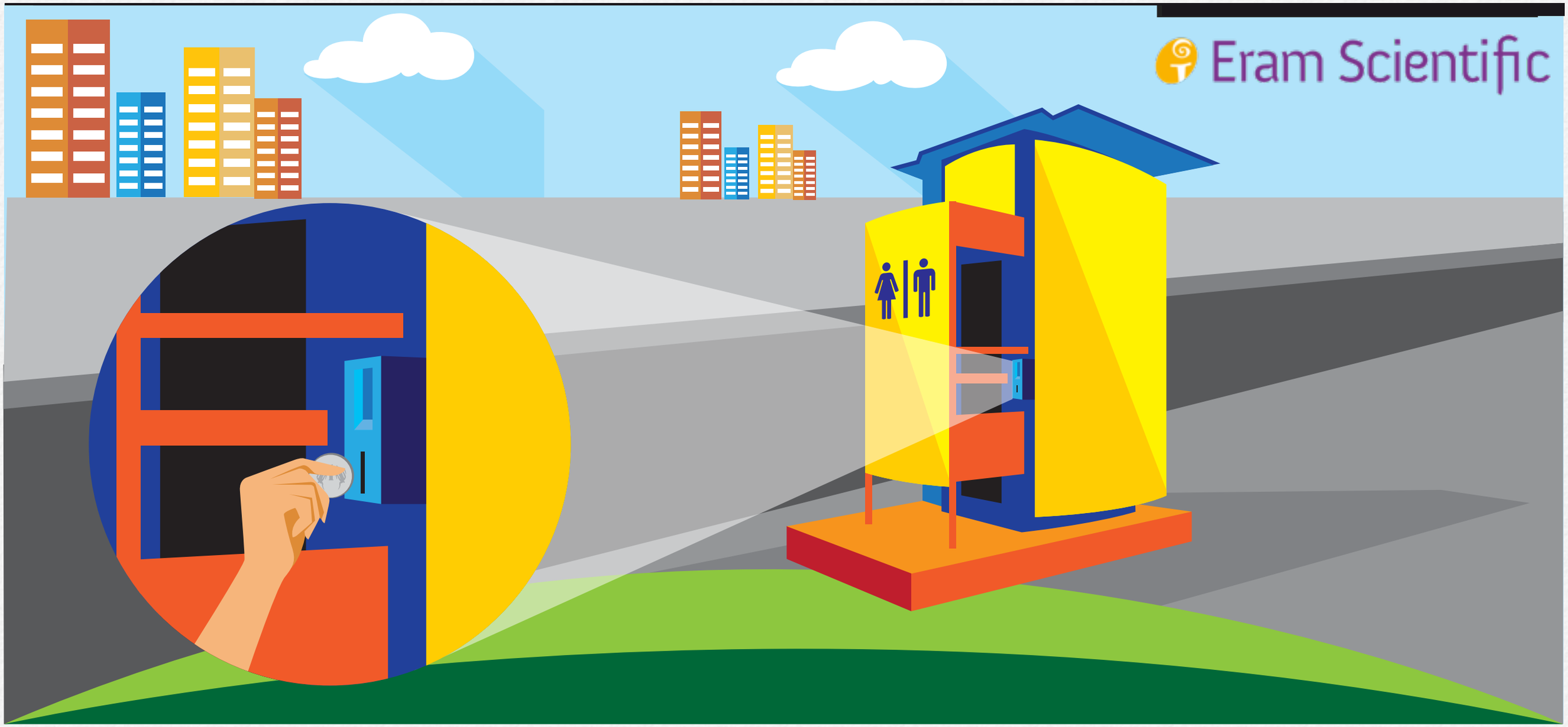
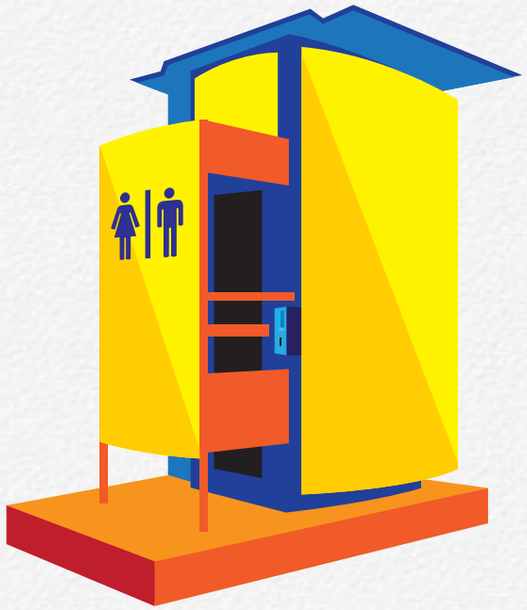


eToilets





eToilets

A coin is dropped into the slot and you don't even have to utter "Khul Ja Sim Sim"—the door to the eToilet slides open. Lights and exhaust fans come on without your having to grope for switches. In case you forget to flush, the automated flush turns on and sterilizes the commode too. These are unmanned electronic public toilets that are making their presence felt in India thanks to Eram Scientific Solutions Pvt. Ltd.

Dr Siddeek Ahmed, Chairman and Managing Director of Eram/ITL Group is a visionary. He is amazed by the fact that around 626 million people in India—the highest number in the world—continue to defecate in the open, as they don't have access to toilet facilities. Statistics from the NGO CRY indicate that 38 percent of schools in India do not have basic sanitation facilities. Of the built toilets, 34 percent are so filthy and unhygienic that no one can use them. Only 18 percent of schools have separate toilets for girls. It is no wonder then that many girls absent themselves from school during their menstruation.

While the world is finding innovative strategies for cleaner sanitation, India appears to be stuck in the Dark Ages. Sanitation continues to be a taboo subject, something Indians totally avoid. "And then I thought about the potential of IT to circumvent this unspeakable issue. I knew that if technology is used in a smart way, it could resolve the problem and provide a fundamental necessity to hundreds of people," Dr Ahmed says.

With this in mind, Dr Ahmed forayed into the highly nascent and neglected Indian public sanitation sector. He founded Eram Scientific Solutions Pvt. Ltd. (ESS) to work on innovative solutions for improved public sanitation. Despite the lack of an enabling framework, focused industrial activities, infrastructure or competent manpower, ESS ventured into developing sanitation solutions using convergence of modern technologies.

The result was India's first unmanned Electronic Public Toilet that is portable, hygienically maintained, and eco-friendly—the eToilet. The eToilet works on a sensor-based technology. The self-cleaning and water conservation mechanism in the toilet makes it unique. An instruction note pasted outside the toilet helps a potential user get familiarized with the functioning of the toilet. Once a user puts a coin in the slot, the eToilet door opens and a sensor-based light system is automatically turned on. Audio commands direct the user. To conserve water, the eToilets are programmed to flush 1.5 liters of water after three minutes of usage and 4.5 liters if the usage is longer. This smart toilet also washes the platform after every 5 or 10 usages.

Although the eToilet is self-cleaning and automatic, people sometimes litter the place, or use the eToilet incorrectly. To deal with this, Eram has a

service team that conducts periodic maintenance and repair visits to the toilets. All the eToilets are connected over a GPRS network. The web interface at Eram's control center keeps track of the performance of the eToilets and collects data regarding usage, downtime, usage charges collected, etc. "This provides accountability of the for-public-use infrastructure and provides the opportunity to municipalities to check usage patterns in real time," says Dr Ahmed.

The basic model of the eToilet designed for educational institutions costs ₹1 lakh. The version made of stainless steel that is better for public use comes for ₹4.5–5 lakhs. Many of the eToilets are funded by legislators or by governance bodies such as panchayats (Local Self Governments) or municipalities.

"Of course there are challenges," Dr Ahmed says. "The foremost was getting people to understand the eToilet. They are so used to the idea of a mop and a cleaning lady, that they find it difficult to believe the eToilet could actually work." Another challenge was finding appropriate sites. The eToilet needed to be easily accessible but also not too close to a crowded area, difficult in a crowded city! Disruptions in power supply tended to affect the smooth functioning of eToilets, although some backup power is available through solar power.

To sustain this innovative idea, regular research and development was a necessity. This is when Marico Innovation Foundation's (MIF) Social Innovation Acceleration Foundation Program came in with a helping hand. "We were facing a challenge in scaling up and getting a hold of the private market. MIF gave us interesting ideas and the support to do so," Dr Ahmed says.

MIF mobilized students of XLRI Jamshedpur to prepare documentation for the sanitation project and brainstorm on how it could be improved. The most important part played by MIF was to provide value engineering and to help Eram come up with improved versions of the eToilets. MIF's intervention in Eram's case has helped not only market the technology but also develop the product as per the needs of the users.

To date, 600+ eToilet units and over 200 Sewage Treatments Plants have been set up across 14 states in India. The concept of eToilets has been recognized with over 35 awards, both national and international. The eToilet concept proves that the intelligent use of technology can solve many of our problems.

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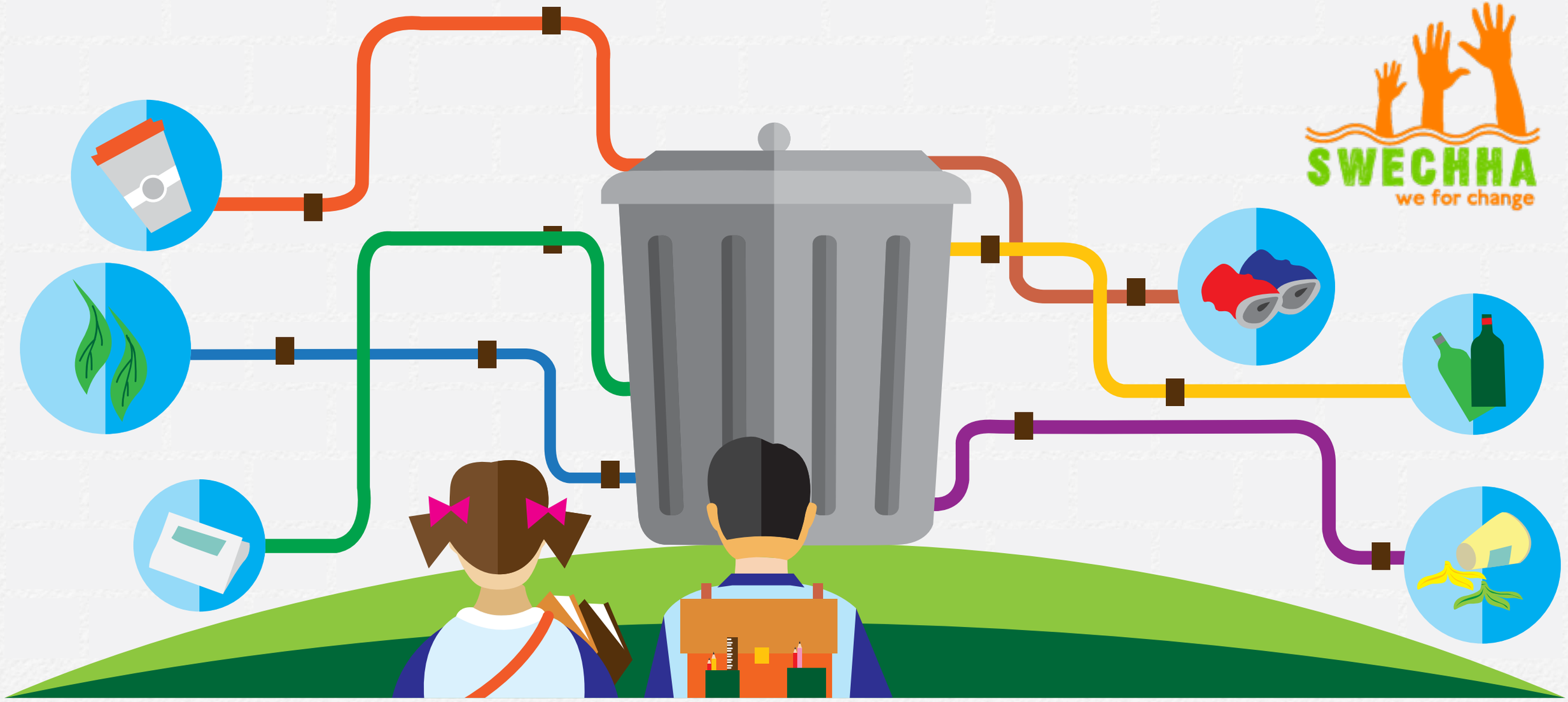
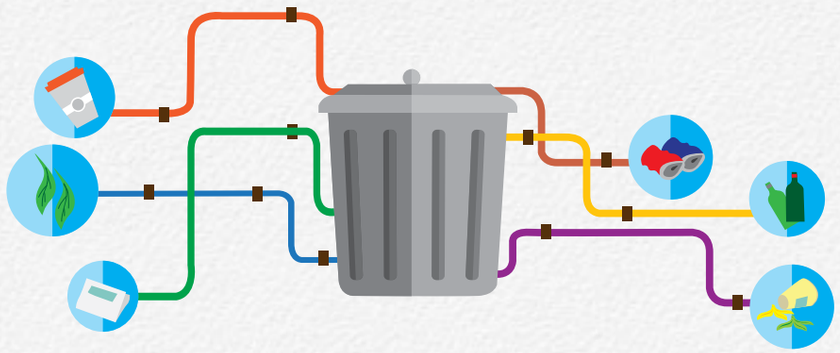
Garbage Analysis





Garbage Analysis

Walk into the office of our NGO Swechha in Delhi and you will be amazed. It is fashioned entirely out of waste materials and is perhaps India's first upcycled office. Look around you. There are so many discarded objects that are now transformed into things of beauty. The chandelier that hangs is made of discarded coke cans, and the book shelves are made out of cartons. The office is an example of how "upcycling" is not just a design exercise or theoretical wisdom; it's a practice and is achievable.

Our work reflects the spirit of the Sanskrit word "swechha"—one's free will. Awareness is really the first step to exercising swecha. Our work started over a decade ago as a young people's campaign to raise awareness about pollution in the River Yamuna. We used innovative means to help build active citizenship among youth. We organized street plays, photo exhibitions, film screenings, workshops and public meetings in various schools and colleges, and other institutions.

Let me tell you about one of our recent campaigns. Recognizing that children need to see before they can believe and be motivated to take action, we achieved what some thought was the impossible. We got children to sift through the garbage they had generated, analyze what they found, and understand where the garbage ultimately lands up. The campaign was developed keeping in mind my strong belief that Environment Education needs to be experiential, personal and demonstrable.

On a regular basis, I visit some of the leading schools in Delhi to interact with students, many of whom come from affluent families and live a life where words such as dirt, garbage, and poor, don't form part of their regular vocabulary. It is no easy task to motivate these children to open up dustbins and analyze and witness the world of waste "hands on". Not remotely via a video clip, but with their olfactory, tactile and visual senses. The sweet wrappers thrown, those banana peels, all the plastic from packets of food, chewing gum, paper, even discarded electronic items...as someone observed, I give these children a cradle-to-grave analysis of their trash.

We discuss where the garbage came from. How will it decompose? Where will it ultimately land up? Who could imagine these children taking interest in putrefying waste! Truly amazing isn't it! However, it doesn't end there. I complete the loop by introducing the children to the people who dispose of the waste the children have generated. The affluent meet

those lesser privileged! The creators of the garbage meet those who manage it. With patience, by making friends with the children, and by communicating with them in a language they understand, this is achieved.

This model to widen awareness is a self-sustaining one. The funds generated by charging the richer private schools a sizeable amount for providing their students this educational experience is used to cover healthcare for children from lesser privileged sections of society. It is also used to conduct similar awareness programs at reduced rates in these latter schools. Here again we loop in the privileged schools with others.

I am convinced that imparting environmental education to some of the richest kids in the country is very beneficial. We all know that almost 70 to 80 percent of the leadership of our country in every walk of life, whether media, business or politics, comes from the elite. It makes sense to engage with this group at an early stage, rather than later when they are in college.

I sincerely believe that lessons about the environment are best delivered young. The younger generation must be provided a platform to enable them to develop a sense of stewardship and citizenship toward the environment. We must help children to understand that environmental concerns are not distant happening somewhere in somebody else's life, but right here, happening in mine. This, I think, is today the most critical need for our planet.

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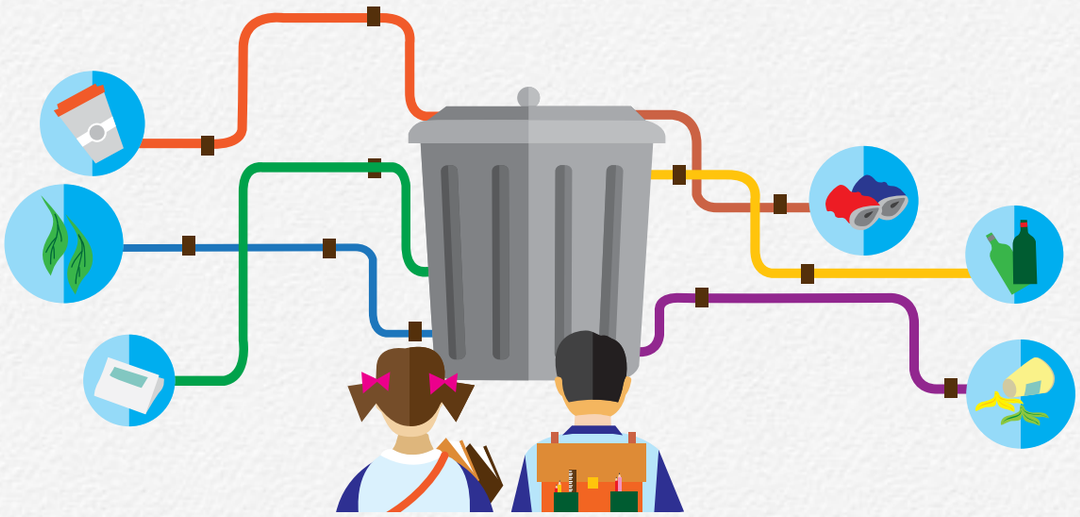
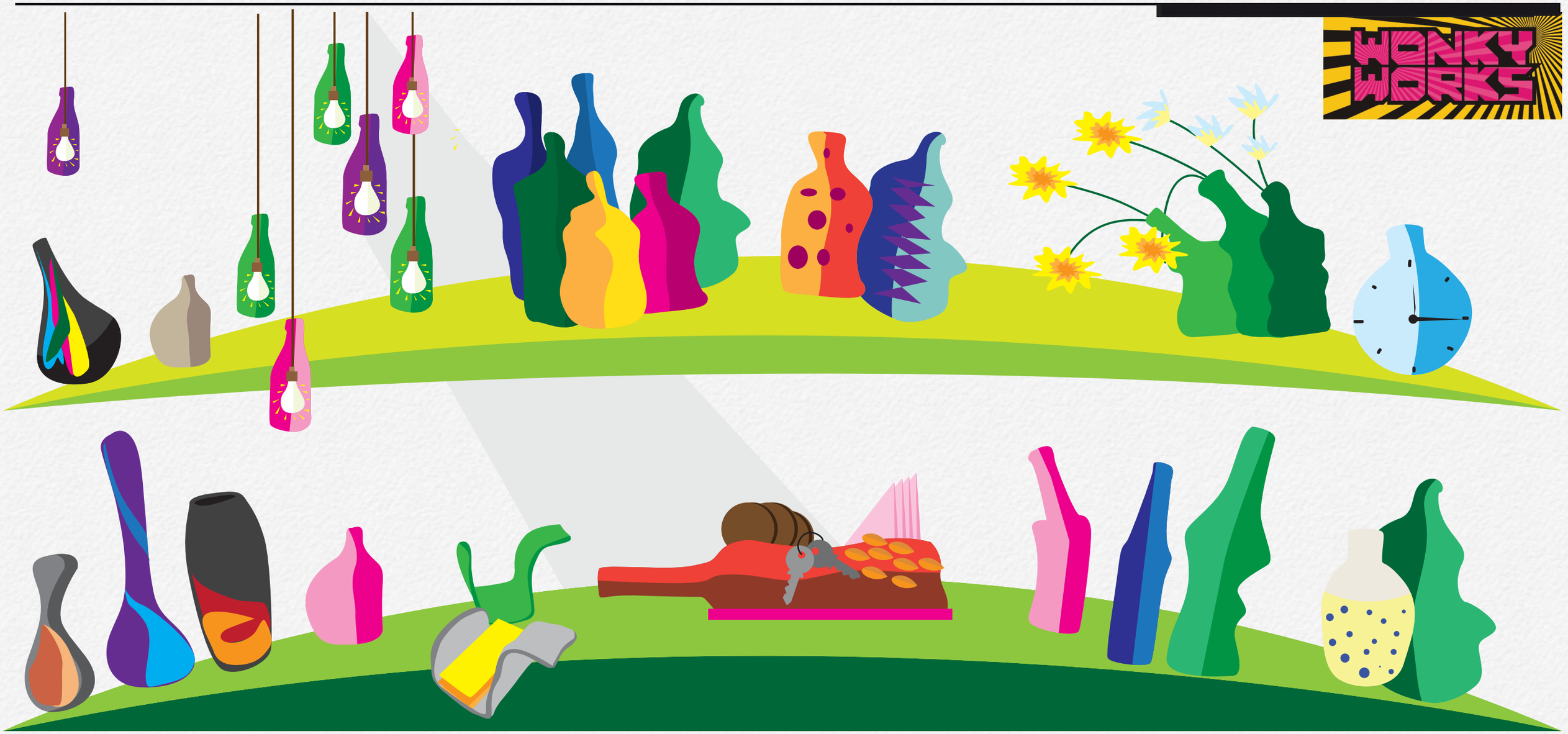


Glass Art



Glass Art

Hello! I am Ekta, head of WonkyWorks, a small, independent, glass art studio that has an eclectic collection of upcycled glass products. Each handmade piece is created with the utmost care and artistic discretion tapping into years of glass art experience. All our pieces are made using techniques, colors and materials that are permanently fired, etched or fused into the glass at high temperatures, making them peel-free, fade proof, food-safe, and long lasting, using best known techniques from across the globe.

Hmmm, let's see how this started. I had a furnace. I knew how to melt glass in it. All I needed was glass. And then I melted my first used bottle! And then I melted more, and more, and hundreds more! Have you ever thought of what happens to the used glass bottle you chucked out—be it one that earlier had sauce, beer, or oil in it? The answer is nothing. It will not compost, rot, erode or rust. It will most probably lie in landfills, breaking down into smaller and smaller pieces of glass. Not breaking down into its main constituent—silica (sand), one of the hardest minerals on Earth, for a long, long, time. Maybe even a few million years. Maybe forever. Think about that.

The thought got me worked up, and I must admit, a bit excited as well. I looked into glass recycling and upcycling. I researched glass waste and disposal methods. I collected all the possible waste glass from my home—broken, discarded, unused—and started experimenting to make things out of melted glass. The heat needed to melt our upcycled glass pieces is very high. However, that is still about 40–50 percent less than what would be needed to make fresh glass. Not to mention the reduction in consumption of more raw material. Thus, less energy usage, less air pollution and water pollution, less water usage, and even less greenhouse gas emissions. Apart from this, it eliminates an entire tier or two of the recycling process that includes, collecting, sorting, processing and breaking down, converting, and finally, new manufacture.

One of my earliest challenges was to create products that would have the finesse and design to appeal to mainstream customers, rather than just people who were aware and conscious of Green Design and thus specifically interested in sustainable products. The growing awareness in India of the Green Culture helped to a certain degree, as did the innate sense Indians have to turn waste into something useful. It also helps that I make many versions of the products and test their user-friendliness on myself and with a close group before placing the objects on display. This sometimes takes months and even years, but knowing that the usability, design and functionality of each product is appreciated, is worth all the time. Another challenge is pricing. Most people find it absurd that

they are asked to pay ₹600 for example, for a piece of glass art, when come to think about it, a three rupee, almost worthless bottle was melted to make it. Also, as most of my pieces are created at an independent studio level, my prices can never compete with factory manufactured products that use labour-intensive techniques and are known to pay low wages. Another aspect important to me is the health and safety precaution, in terms of equipment and information. Ethically working with and disposing of glass and glass related waste does take up a chunk of our studio time and budget! But not doing that is never an option for us.

I am hooked to upcycling glass into well-designed products that please the eye and are different—wonky as some label these. Our items not only help keep glass out of landfills, but are also pieces of art. In the age of mass-produced uniformity, we celebrate the glitzy, the skewed, the piece that is absolutely unique.

Ekta Doctor
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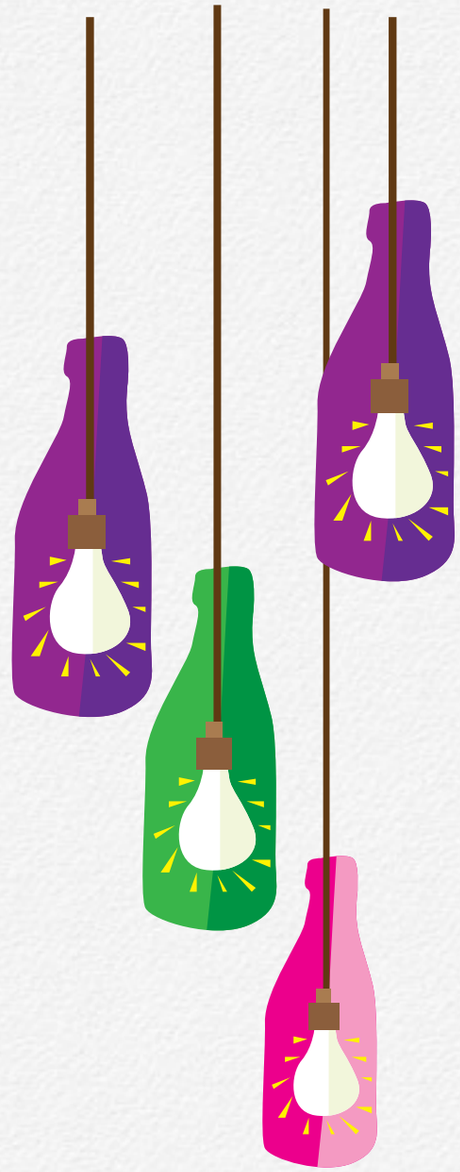
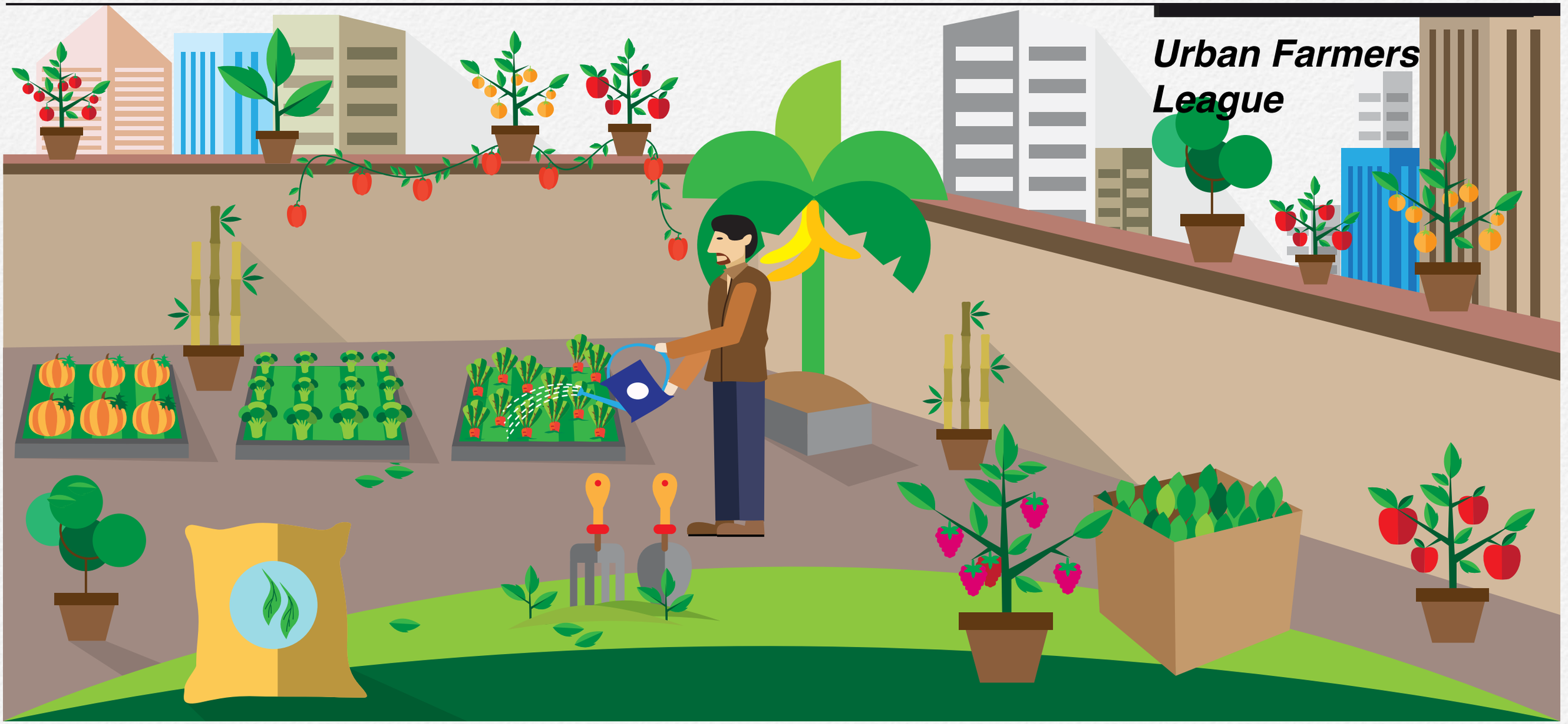


Home Grown



Home Grown

Urban Farmers League is a first-of-its-kind venture that seeks to motivate and empower urban dwellers to grow their own food.
All seasonal produce suitable for that particular agro climactic zone can be grown: exotics, herbs and even fruit!

I head Urban Farmers League. To describe myself, I would say I am a designer, a technocrat turned activist and a social entrepreneur. I grew up in a city eating stodgy, junk food, rich in masalas and oil. Perhaps laced with pesticides! There was nothing fresh, as even the produce sold by street vendors had traveled over several miles to reach the city. Consuming such unhealthy food had to be disastrous.

I reasoned that the only way for me to stay healthy was to leave the city and move to a village. I was all set to do this, and had even bought a piece of land in a village when I stopped to think. Was there a way to bring the village to the city? Can urban dwellers get healthy food on their plates by growing produce themselves? A difficult proposition, as urban space is really limited. I was still convinced that there had to be a way.
I started looking at what other cities did and came across a very popular practice in Europe of growing crops—even in a square foot of land. If this could be replicated in my city, so many people could grow their own food. We needed to build a technology-enabled gardening ecosystem that would inform, motivate and handhold urban dwellers to grow their own organic food.

The idea of urban farms translated into the Modular Gardening Units we developed. While units can be built to customized sizes, our Standard Start Up sizes are 3’x3’, 2’x4’. An hour or two is all that is required to set up. The unit costs ₹7,000. Tools, equipment and planting material are provided to encourage patrons to “Do it Yourself.” The package includes a Farm in a Box Ecoplanter with a ten year lifespan and an advanced drainage system, a soilless growing medium to last for a minimum of five years and saplings and organic pesticide for the first season. Our experienced gardeners and other experts are also on hand to provide patrons continuous support. Installation costs are waived within a geographical periphery.

By eliminating the problem of land availability, the modular gardening units provide the opportunity to have a farm at home. Urban Farmers League has already installed these modular farms in several home terraces, rooftops and balconies. Imagine sitting at home and reaching out to grab a fresh, organic fruit or vegetable—items that are expensive to buy in a store as they are labelled “organic.” We have set up Nakshatra Vatikas for those who wanted. Wheatgrass parlours are developed for the health conscious.

Other facilities available to our patrons include our “Farm to Platter” home delivery service of fresh food in a subscription-based model. Members also have access to a web base for additional information as well as a subscription based web platform with multiple support features.

In our brief existence of just a few months, we have set up some demo sites and also started to work with about ten families in the National Capital Region. Our organization has been featured on All India Radio as well.

It is a wonderful experience to see people enjoy farm life in a city. With modern technology and determination, almost anything is possible.

Pankaj Arora
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iBus

AiCTSL

iBus

Indore is the largest city in Madhya Pradesh. The increase in the purchasing power of its residents has translated into a rapid growth of vehicle ownership. More traffic jams, slower speeds of travel and accidents resulted. With greater economic empowerment, the entry of women into the work force, and rise in the number of school-going students who have to be ferried to school and back, the “Per Capita Trip Rate”, i.e. the average number of trips made by a person in one day has also increased. More vehicles and more trips per vehicle. The result, more chaos.

With a view to addressing the rapidly deteriorating traffic situation, a Bus-Rapid Transport System (BRT) was developed. In August of 2012, an open competition was held to name the BRT. We wanted a recognizable symbol with which the people of Indore could identify. From over 800 entries received, “iBus” was chosen where the “i” stands for “Indore” and “intelligent”. It is also stands for ‘I’, giving a sense of ownership to citizens.

At present, 13 buses run on an 11.45 kilometer stretch of the city’s arterial AB Road. There are 21 bus stops on the corridor, and buses run from 7:00 am to 11:00 pm. The iBus is an affordable public transport service with a simple fee structure. Travel up to 2 kilometers costs ₹5, up to 8 kilometers ₹10, and above 8 kilometers, ₹15.

However this innovative solution to Indore’s transportation woes was achieved only after crossing several hurdles. To start with, challenges arose in the form of land acquisition negotiations, negative media coverage, illegal land encroachments on the bus route corridor, and public interest litigations. The project was further complicated by parallel government-led projects, such as the Narmada Water Supply System Project and sewerage installation projects along the same land corridor. It didn’t help that there was a lack of awareness among the general public about the iBus project details. During a public workshop, reactions from attendees ranged from strong opposition to enthusiastic support. It was quickly clear that more awareness outreach was needed to garner public support. In addition to the above issues, the construction process of the intended iBus route experienced numerous delays.

It became apparent to us that involving the media in outreach efforts would be critical to winning the much needed public buy-in. The iBus team also determined that a better understanding among potential users would boost use, justifying the need for higher service frequency and route expansion. With this clarity, the iBus team, with the support of EMBARQ India, developed a structured, multi-layered plan to widely disseminate information that would help boost public faith in the project.

Social media proved very successful, especially with the younger generation.

As the BRTS system extends its network, it will continue to improve traffic conditions in the city and enhance the overall quality of life for the residents of Indore. The current 11.45 km stretch marks the first phase of the project. It has demonstrated that affordable, high quality public transportation is possible and is a necessity for rapidly growing cities. But this is not the end of the project. The complete plan is for an 88.4 km Bus Rapid Transit Network, to be completed in two further phases. At full fleet strength, the iBus will have 50 buses in total, and is expected to serve over 50,000 passengers per day.

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It’s A Good Word

chindi

It’s A Good Word

If you’ve grown up in Mumbai like I have, chances are, you have heard the word Chindi being used in a derogatory context. A “Chindi Chor” is someone who penny pinches and to be “Chindi” is to be cheap or small minded.

I grew up hearing the word Chindi used in a different context altogether. My mother runs a small tailoring unit where I heard the tailors use Chindi to describe the scraps of fabric left over after they had stitched something. My mother often saved the nicer pieces of Chindi in a steel cupboard for no reason except that she didn’t have the heart to throw these away. The rest would periodically get tipped over in the garbage dump across the street, where I’d often see ragpickers picking bits out. Who knows where the Chindis eventually ended up.

Cut to 2013. I had just moved back to India after a three-year stint in London. Perhaps my time away had given me a fresh perspective on India. I was trying to live a little less wasteful, a little more mindful. One day, hanging out with my mum at her unit, I wandered over to look inside the cupboard. It was still full of neatly tied bundles of pretty fabric pieces: too small to make anything with, too nice to just throw away. “You still have your Chindi cupboard,” I smiled. And then added as an afterthought, “You should do something with all this fabric. Start a brand called Chindi.”

While in London, I had also spent some time learning how to knit. One of my good friends got interested in learning how to crochet. We were struck by how common it was to see young people and hipsters knitting and crocheting, while in India these were only crafts your grandmother did. Why did knitting and crochet die out in India? How could we make them relevant again? These were questions we asked ourselves.

Seeing me knitting away a friend almost absent-mindedly asked one day, “What if we knit with all this Chindi you have? What if this is what we did under the brand name Chindi?”

And then began a journey into getting to know Chindi like I never thought I would. I discovered that Chindi is a flourishing industry in Mumbai. It was exciting to find huge storehouses full of used clothes, old bed sheets, and “side cuts” or the leftovers from tailoring units and garment manufacturing units such as my mother’s. When we followed the Chindi trail, however, we discovered that most of it was sold to factories for use as rags to wipe oil spills and machine parts. Tons of these rags end up in landfills.

That's when I knew we were on to something with Chindi. The chance to upcycle and reuse these scraps and give these a new life. I scoured the Internet and discovered a world of fabric knitters abroad who bought fresh fabric to knit and crochet into things such as bags and baskets. I learned techniques to cut large pieces of fabric into a single long strip of cloth that could be wound up into a ball and used instead of conventional yarn. I found thicker knitting needles and crochet hooks and worked with my tailors to figure out how to sew on the thick, cushy fabric it produced so we could make polished, lined pieces for mats, etc.

All this while, I had no idea the Chindi movement was flourishing and thriving closer home, in fact right around the corner. A seamstress in my mother's shop had been watching my experiments and one day absently said to me, "I know how to knit too, you know. I made a rug with an old sari. And my sister made one with old plastic bags. All my neighbors do something like this at home." It was a light bulb moment. Rajkumari, the seamstress, took me to her congested little basti in the slum of Mankhurd, Mumbai. This is a no-man's land with some of the poorest people in the city totally overlooked and ignored by NGOs and social enterprises who tend to flock to the safer bet, Dharavi. Chindi started in the homes of these women who shyly showed me the torans, TV covers and blankets they knit and crochet with their old clothes. They didn't think of it as upcycling—to them it was just about saving some money and using something as long as they could. To them being "Chindi" was not a derogatory thing but a simple way of life. I began to realize how much we would all benefit if we lived this way too.

In the last six months, Chindi has established a centre for women in the midst of this slum. Together, we have designed a range of products we sell online, and at exhibitions. People are amazed that "waste" can look so beautiful and be so functional. The women have taught us their traditional upcycling methods and we have helped showcase these to a wider audience. Together, we have so far prevented nearly 1 ton of Chindi from ending up in a landfill.

As the concept of a "social enterprise" is so alien to these women, we have helped create not just a production unit but a whole new culture of independence and gainful employment. We have shown them a way of life where they are not exploited or considered inferior to men.

For the future, we're looking to forge creative collaborations with artists and designers specializing in different mediums to work with our community of women to create Chindi jewellery, furniture, and lots more. We are also seeking experts from the world of social enterprise to help us establish the Chindi women as a Self Help Group so that we may create a more sustainable organization.

So Chindi is really a good word. We have helped change its definition from "miserly" to "mindful" and from "stingy" to "careful". Who knew that one day Chindi would become such an important part of my life. For, here I am, knee deep in it, and so excited about all the possibilities!

Tanushri Shukla
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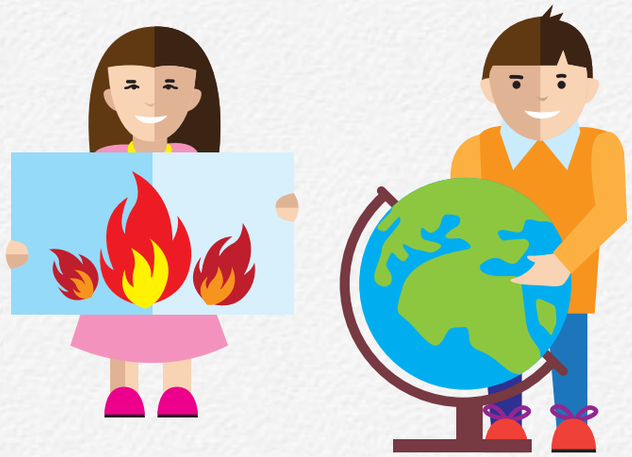
Learn, Enact, Empower

Earth Day Network (India)



Learn, Enact, Empower

Earth Day Network-India developed a theater-based program for school students to better understand the concepts of climate change and global warming. In addition, we wanted to instill in them a sense of responsibility toward our common heritage—Earth. The project was funded by the US Department of State, and implemented by Contact Base, an organization that works to empower communities. The program reached 700 children in 40 schools. The cities we worked in were Delhi, Jaipur and Kolkata.

With a clear plan in hand, we first met with principals of schools. It took some time to assure them that our innovative approach was not a mere extra-curricular activity, but an effective teaching method. As the schools chosen were generally for the lesser privileged sections of society, there was also the issue of which staff member could take time out from his/her busy schedules to work with us. Most of the teachers were already overburdened.

On getting the green signal, teams of communicators from Contact Base began working in the schools. The mantra for the entire project was "fun, interactive, educative." Games were organized to break the ice and ensure that even the shyest of students came forward to participate. Storytelling helped build bonds with the students, as did humor. Once we had a captive audience, colorful books, films, and posters, became the tools to enlighten the students about climate change and global warming. At all times, the approach was an all-encompassing, hands-on one. "No question is too silly," the students were told. "We are all Earthlings. Each connected to the other. Every Act Counts."

Now that enthusiasm had been generated, we had "aware kids" who better understood the causes of global warming and the resultant climate change, the necessity to reduce it, and the role they could play to mitigate it. Everyone wanted to play his/her part and be a "Green Champion" out on a mission to save Earth. Unlike Superheroes who can do just about everything, the kids had to understand clearly what was doable within their time limits, and other constraints.

The young minds began exploring their environs with fresh vision to identify problem areas. The garbage heaps ignored earlier when they walked to school now were "poisonous dumps" to be eliminated. "Switch off lights and fans" was an often repeated phrase, as was "Water is precious." "This birthday please give me a potted plant to care for, Mummy." "Aare! Again you have thrown your sweet wrapper on the floor!" Conversations had changed.

Many hours of discussion later, each school team chose one particular issue that most impacted them. A framework for a script was outlined, and Contact Base experts helped the teams develop it for stage

production. You can imagine the excitement as rehearsals started, costumes made, lines learned, and acting begun. “He cuts the trees that clean the air I breathe,” said a little boy when he was asked why the woodcutter in the play was depicted as a bad man. In all three cities, students identified waste management as a critical issue. Other common concerns included increasing the green cover, minimizing the use of plastics, and stopping the wastage of water and electricity. In Delhi, students also focused on the growing vehicular emissions, while in Jaipur, water took top spot.

The testing of the waters happened first in the school itself as students put up their productions before peers and teachers. They learned how to draw in audiences to participate by intermingling with the spectators, and by asking questions from the stage, or even adding a personal comment. Confidence was built by this exercise and parents were invited to witness their brilliant wards. Many parents were amazed. “I live in this area and didn’t notice the filth. I’m going to take it up with our Councilor,” said one of the parents. To widen the circle of awareness, performances took place at other venues such as street corners, auditoriums at the American Centers, and museums.

We kept the momentum of interest in climate change and global warming going with creative activities—film and poster making, slogan and essay writing, jingle composing, creating logos, and turning discarded PET bottles into hanging gardens. Quiz competitions and debates generated healthy competition.

To close the loop, the students were introduced to prominent stakeholders who could help them take their messages to those in positions of authority. We provided students opportunities to interact with editors, corporate officials, political leaders, NGO heads, and others.

Theater as a tool worked. Many teachers told us that the theater workshops program really helped their students understand the benefits and importance of sustainable living. “They see themselves as green champions now, with responsibility to take action for a better Earth,” said another. Schools that weren’t a part of the program have heard about it and request something similar for their students as well. UNESCO India has exemplified the methodology for use in toolkits to teach biodiversity.

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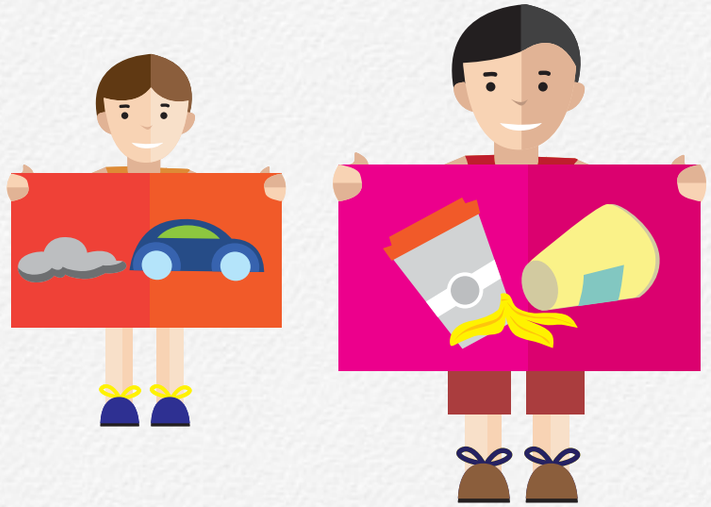
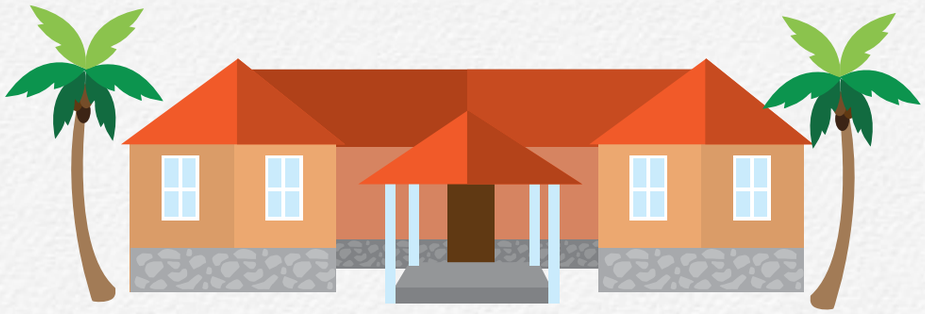


Mud, Brick and Stone



Mud, Brick and Stone

What is the first thing that comes to your mind if I ask you to take a tree-covered plot of land and construct a home on it? Chances are, you think about cutting down the trees and making the surface plain and barren in preparation for building. This might be a majority answer, but I, G Shankar, the Founder and Chief Architect of our organization Habitat Technology Group (HTG) would beg to differ. I believe in green or sustainable architecture that builds around nature rather than on it. Architecture that minimizes the negative impact of buildings through moderation and efficiency in the use of construction materials, energy and development space. Simply put, I believe in ecological design that ensures that our actions and decisions today do not inhibit the opportunities and resources available to future generations. My vision is for a world where the greatest architectural works are those that stand closest to nature and yet fulfill all the essential requirements and comforts. I have not allowed my thoughts to remain mere philosophy, but have translated these into actions.

My work began as a lone crusade when I observed the massive and largely indiscriminate real-estate development in my home state of Kerala as a result of the Gulf Boom of the 1980s and 90s. I realized the need to act quickly if I wanted to divert the tremendous expatriate resources flowing into the state towards green buildings. This was the genesis of our group HTG that began in 1987.

I believe in taking lessons from our rich architectural tradition to create aesthetic spaces using locally available materials such as mud, bamboo, bricks, or stone. No cement, nor plastic for my constructions. No futuristic edifices of concrete and steel either. India has an amazing range of locally available building materials. We have got the best mud and lime in the entire world. The perception that mud is a poor man's material has to change. I am amazed that while over three quarters of the Indian population lives in mud houses, there are no standard specifications for earth materials in India.

A good example of the traditional methods in Kerala's architecture used by HTG is the concept of the *nadumuttam* or the central open courtyard. Almost all old houses in Kerala had a *nadumuttam* that allowed the women of the house a glimpse of the blue sky above. Besides its social significance, this was also a device that allowed hot air to escape and cool the house. I try my best to incorporate this concept into the houses I build. Keeping in mind transportation costs, all construction should use resources from within a 5 km radius only. Why bring in marble from way out quarries?

Very few people today value eco-friendly buildings. Perhaps that is why building a house has become such a strain. This was not the case with our ancestors for whom building a house was a pleasurable exercise.

Today, the yardstick for most people is the neighbor's house. It is in such situations that the architect has to take on the role of a teacher, and educate people on the feasibility of the materials used and resources that are locally available.

The going hasn’t been smooth. Many didn’t think that my ideas would be successful. However, we have proved them wrong and today our team has over 400 architects, engineers and social workers and a support base of over 30,000 trained workers functioning from 34 regional offices of ten states of India and four overseas offices. We have built more than 40,000 buildings all over the country including residences, commercial complexes, tourist resorts, public offices, schools, hospitals and so on, all using green technology. HTG has had many firsts to its credit.
Our firm has built the country's first eco-township with over 600 homes in Sirumugai, near Coimbatore; the first senior citizens’ village for Life Insurance Corporation of India in Bengaluru, the world’s largest earth building in Bangladesh of about 600,000 square feet, to name just a few.

Next time you plan a construction, think about it and choose a design that comes under the genre of “Sustainable Architecture”—no harm to Earth today, and safe for the future as well.

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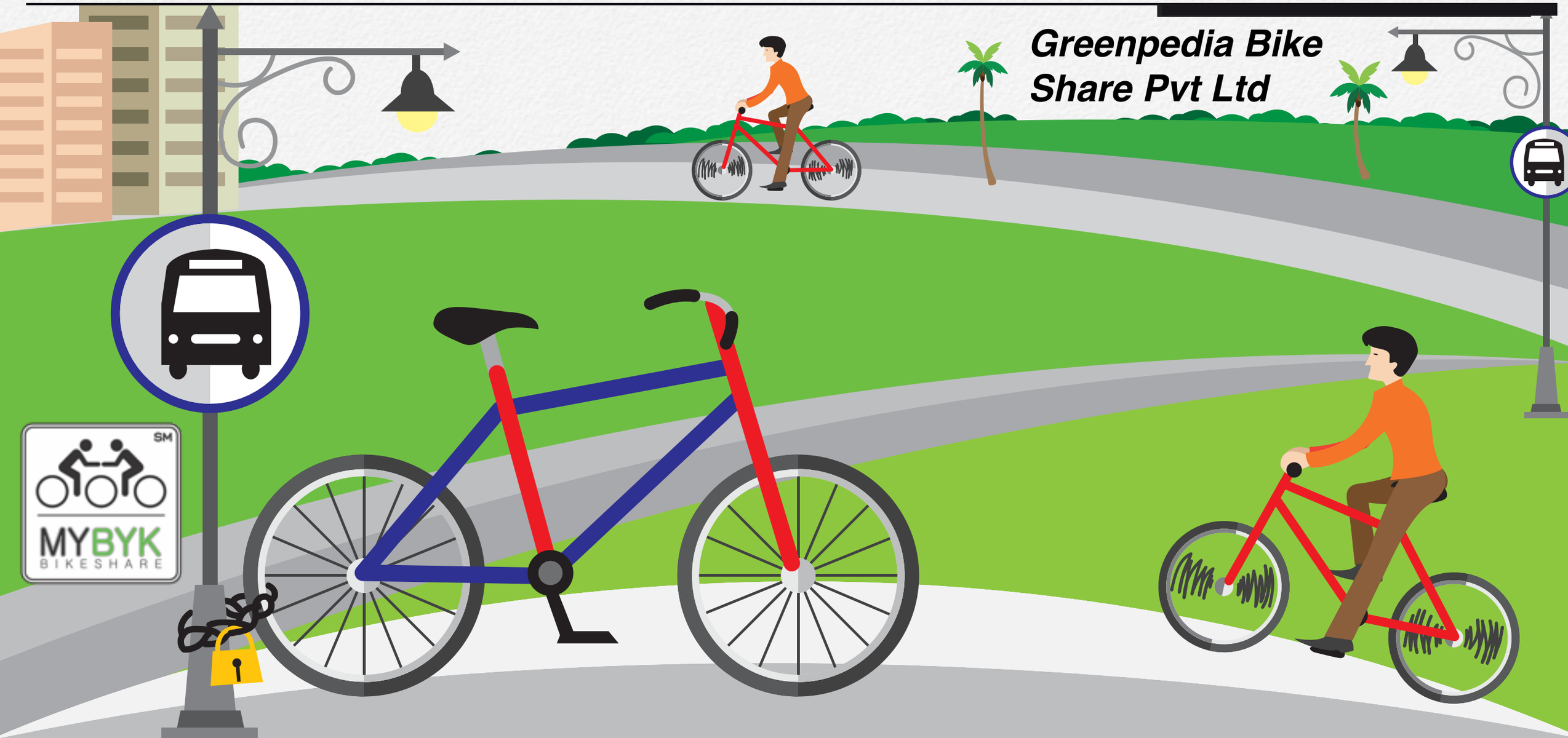
MyByk



MyByk

We constantly complain about the rising prices of petrol and diesel. Experts warn us that these resources are fast dwindling. But, has anyone wondered about a still scarcer commodity? I'm talking about parking space. What would happen if everyone was to use a car for their daily commute? This stark realization made me, a Chartered Accountant by profession, conclude that, if not today, definitely tomorrow, people will have to opt for public transport. I started thinking about ways that could make public transportation more accessible, economic, time-efficient and most importantly, convenient.

Remembering the difficulties I had faced while commuting in Mumbai, I realized that the biggest problem with public transport was in the first and last mile connectivity. How do you get from your place to the station, bus-stop, etc.? After continual brainstorming over a period of three years, I zeroed in on the concept of Bike Sharing. It was my Eureka moment. But on surfing the net, I found that there were over 555 such systems already in use in several countries. I started studying these to understand the modalities of how these operate. I also looked at user reviews and feedback. Most of the systems appeared unnecessarily complex and exorbitantly expensive. These would not work in India where we need something simple and economical to use. I finally froze on a business model that not only met these two criteria, but, was in fact more convenient as well.

The next step was to share my idea with concerned government authorities so that they could implement the idea. I soon realized that leaving it to them alone wouldn't work. I had to do something as well. In 2013, I met our present Prime Minister Mr Narendra Modi (who was at that time the Chief Minister of the state of Gujarat). He gave me a patient hearing. He was actually aware of the concept and cited some examples of "Bicycle Feeder Service" in China that he had seen during one of his visits there. He promised help to start this in India.

In 2014, we launched MyByk. Our membership costs the user ₹300 per month. This amount entitles the user to unlimited usage of a bicycle. The uniqueness of our venture is that we provide anywhere drop and pickup. The program is simple. On registration, MyByk delivers a bicycle to the member at his/her home/office. Along with the bicycle, we provide the member a Smart Card and a bicycle lock. The member can now cycle away to destinations without having to look for a taxi or an auto rickshaw, or wait for a bus. If the member encounters a mechanical problem with the bicycle, all the member needs to do is drop the malfunctioning bicycle at the nearest terminal and take a replacement. Or, the member can call us and we will arrange for another bicycle to reach his/her destination. The membership covers the maintenance cost. To ensure that there is

responsible usage of the bicycle, MyByk asks for a refundable deposit of ₹3,000 per bicycle.

The real challenge was to get a large number of people to see the advantages of MyByk and start using it. In addition, getting funds to sustain the project was a big issue. Our team is working to create awareness about MyByks and how environment-friendly this non-motorized means of transport is. Hero Cycles has provided exclusive design support, while funds have begun to come in from investors.

Currently, the pilot project runs in Ahmedabad. Our fleet of 1,000 bicycles feeds nine Bus Rapid Transport Systems (BRTS) stations. The pilot project was set up with the intention of introducing the concept to the end-users, investors and government authorities, and to gauge user responses, understand operational challenges, and evaluate operational viability and financial feasibility.

In less than 11 months, the start-up already has an active base of 1,000+ members and is adding 50–75 members each month. The true potential of the project will be realized only once we expand our service to all the 1.5 lakh daily commuters of the BRTS and to the potential non-BRTS users who are looking to make a shift from private vehicles.

In order to scale up, MyByk is negotiating with local municipal corporations for allocating requisite space near each and every BRTS station. The company is also looking to introduce hybrid bikes in the future.

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Never Wasted Bags

Happy Creative Services (India) Pvt Ltd

Lee NEVER WASTED

Never Wasted Bags

What will you leave behind?

This is perhaps the central question of our time, a question especially faced by brands and corporations that are committed to reducing their carbon footprint and promoting a sustainable eco-friendly vision. It becomes all the more important for companies with a large global reach, that face the problem of implementation and manageability.

Lee, the international denim brand, was well aware of the importance and need for a suitable eco-friendly initiative and was looking for an innovative solution that would not only display their commitment to a greener planet, but would also spread the message among their thousands of customers across India. They approached Happy Creative Services, an advertising agency in Bengaluru, and their brand partner of many years.

The solution, as is often the case, was derived from a pressing problem: shopping bags. People tend to use shopping bags only once, after which they are usually thrown away or left to gather dust on shelves. We hit upon a unique idea: a shopping bag that could be used and reused in a variety of different ways—some for fun, others for functionality. Either way, the bag would never go waste.

And so the “Never Wasted” bag was created. A shopping bag that could be reused by cutting along guided lines to get various pieces and objects. By following a set of simple visual instructions, the bag transforms into a board game, bookmarks, a calendar, pencil holder, “Do not disturb” signs and much more. Each piece has Lee’s brand name etched alongside, so as to remind customers about the company behind the initiative. This makes the idea long-lasting and interactive, while also conveying the message at the heart of the program in an engaging manner.

The response was both immediate and immense as people spread the word. Within 48 hours of its release, the bag went viral on many major social networks. People across the country were pleasantly surprised to find such a remarkable innovation in an ordinary object, one they often took for granted. Soon, many websites caught on and passed on the message, attracting a lot of attention along the way. The “Never Wasted” bag was featured as the pick of the day on 25 leading design and advertising websites. Consequently, footfall increased at Lee stores and the initial production order of 3,000 bags was extended to another 10,000 bags.

Some of the laurels the “Never Wasted” bag has received include the Young Guns 2011 in Australia for Packaging Design, a Silver Abby at Goafest 2011 for OOH and Ambient Media, a Bronze Abby at Goafest

2011 for packaging, a Bronze Abby at Goafest 2011 for Print Craft, an Award for Excellence at Communication Arts 2011 for packaging and a prestigious design shortlist at Cannes in 2011.

The message still continues to spread from the Lee stores even today. The bags have served a larger purpose of preventing large volumes of unnecessary paper wastage.

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Co-founder

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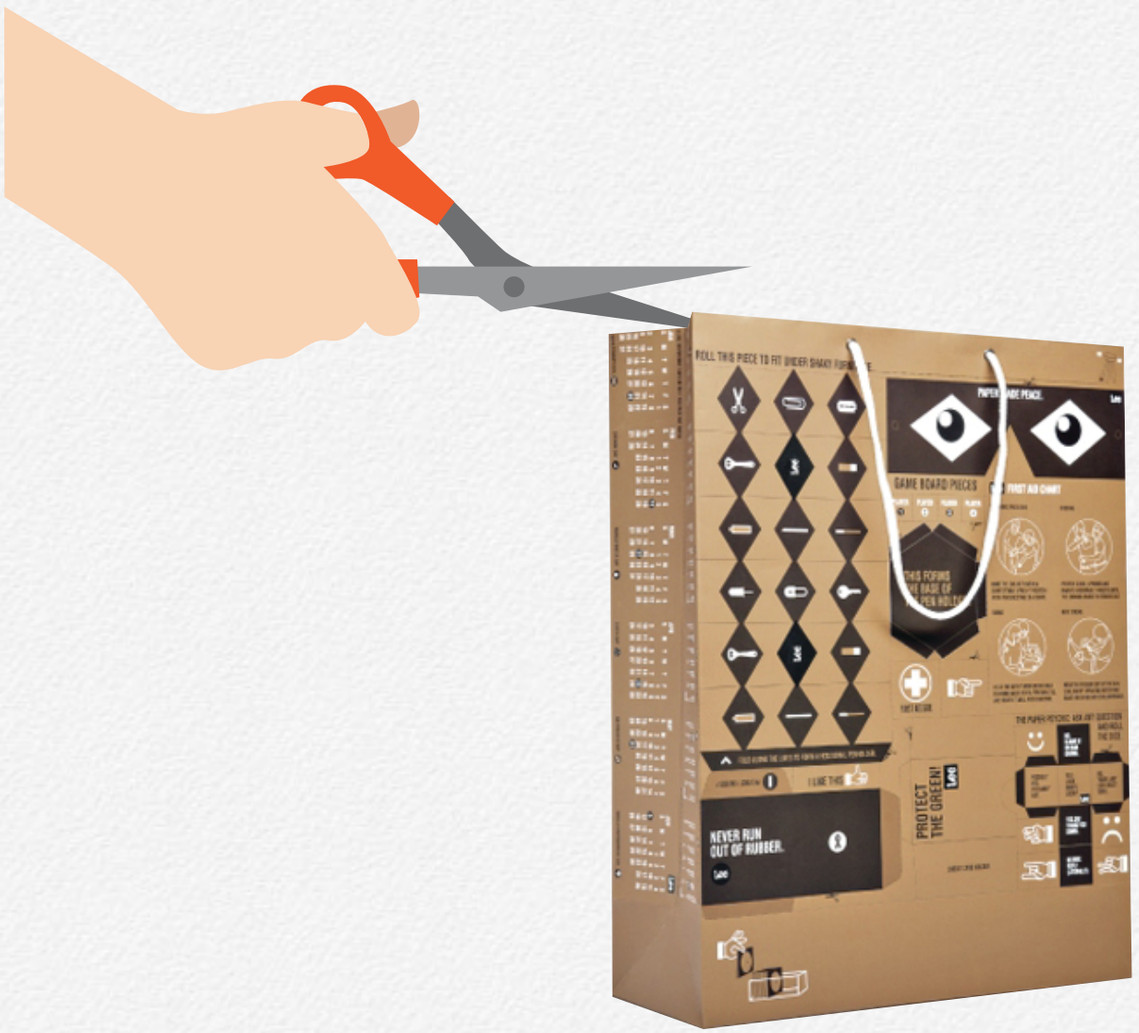
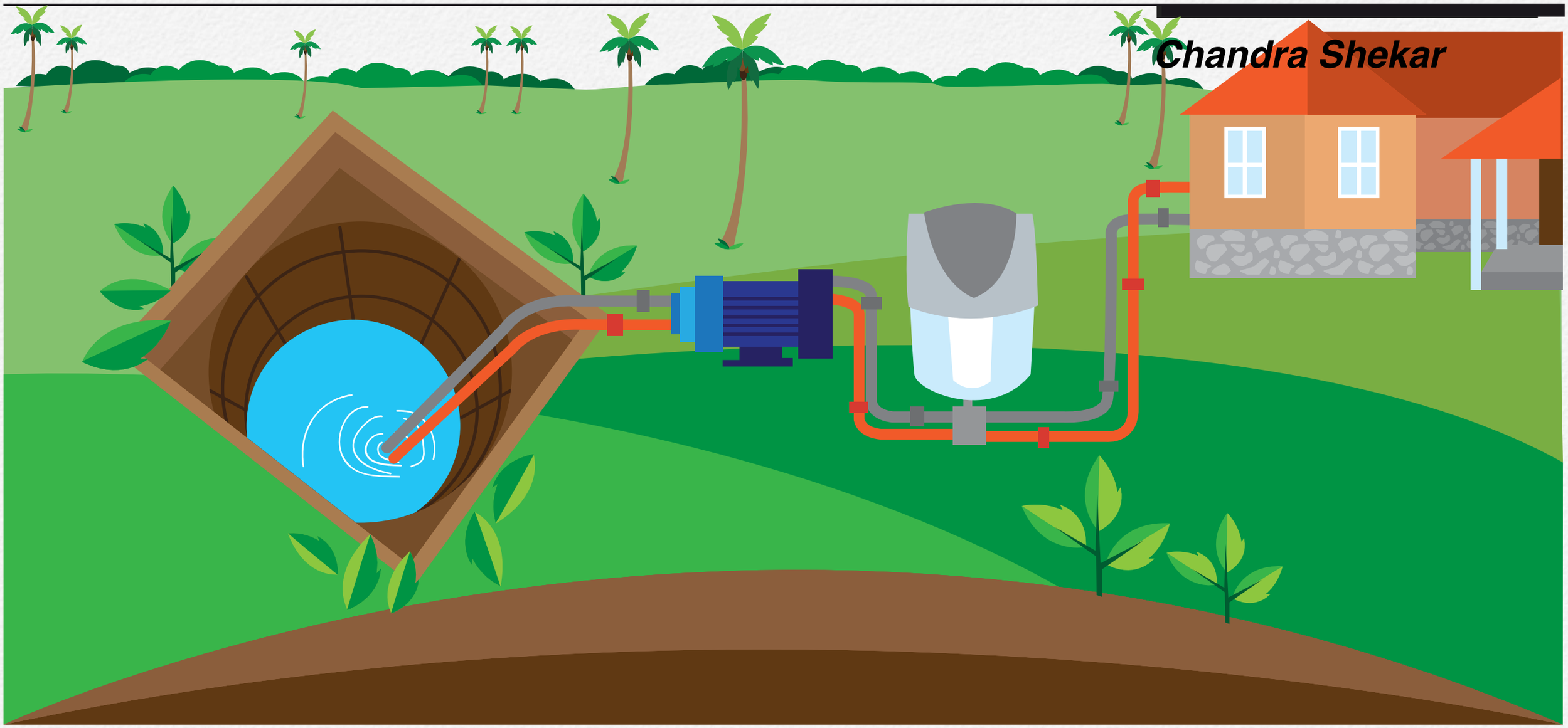
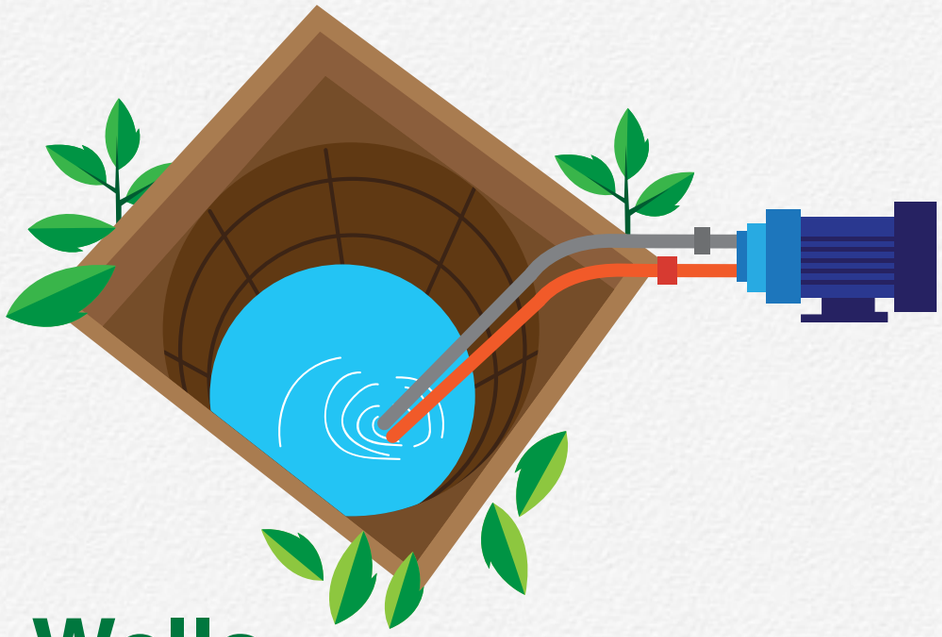


Open Wells





Open Wells

In 1962, when we built our house in Bengaluru, there was no water supply provided by the City Corporation. We dug our own well and lo and behold we struck good water at a depth of 35 feet. This well water helped us to construct our house and for many years, until the Water Department laid pipelines and supplied piped water to our area, was our only source of water.

Once piped water came, many houses in our area abandoned their wells and turned these instead into garbage pits. But my family had a deep affection for our well in the garden. We always kept the area clean and free from rubbish.

The growth of the city and the burgeoning population's demand for water was enormous. At one time Bengaluru had over 1,000 lakes and surface water bodies, but over the years development and construction activities killed the lakes and dried them up. Catchment areas and supply routes were encroached upon and no rainwater could reach the water bodies.

In 1993, Bengaluru faced a severe water shortage. I sensed that trouble was around the corner. As both my father and I were engineers, we used our training and made percolation pits near and around the well. I ran pipes around the house rooftop and collected all the rooftop rainwater and directed that to the percolation pits. What a glorious sight it used to be when it rained and the percolation pits filled up and even overflowed! Just 20 minutes after the rain stopped, the percolation pits would feed the water into the ground. In 24 hours the water level in the well would rise by 10 feet. That is how I experimented and discovered an effective method of harvesting rainwater.

Over the years I have improved the system and introduced a filter to clean the rain water. I have now decommissioned the percolation pits from the system and have pipes from the filter taking the water directly to the well. During the monsoon season the well is flush with water.

I started writing about my initiative in letters to the newspapers to encourage the general public to do the same if they too had a well. If not, water could be collected in underground tanks for use later. Many people have asked for my advice to develop rainwater harvesting for their spaces. I'm glad to report that several projects have been implemented. Old and defunct borewells, open wells and lakes have sprung back to life.

We did face some challenges. The most difficult to overcome was people's apathy and inertia. Many people are aware and are interested in rainwater harvesting, but very few are ready to implement it. I assure them that the costs are not as high as they think. The only expense is for

the filter and the tank. Plumbing and labor charges are minimal too, but still, there is a mental block when it comes to implementing the idea. Piped water has spoiled us. The ease of getting water from a running tap and shower has made us lazy. We don't want to make any individual efforts or take the lead to bring about change.

I have tried to build awareness by writing and speaking to and motivating people. I have conducted many field surveys and developed project plans. I have implemented simple projects for others personally.
By doing the plumbing myself, I have shown people how easy it is to install and how effective the system is. I have also encouraged people to motivate others to do the same.

In the recent past, I have seen the idea grow, but the numbers are small in comparison to the opportunities available. Every building or construction has the potential for rainwater harvesting and rainwater harvesting should be implemented.

My message is to catch the water where it falls and feed it to the ground or into a tank. Water is life and where there is water there is hope for humanity.

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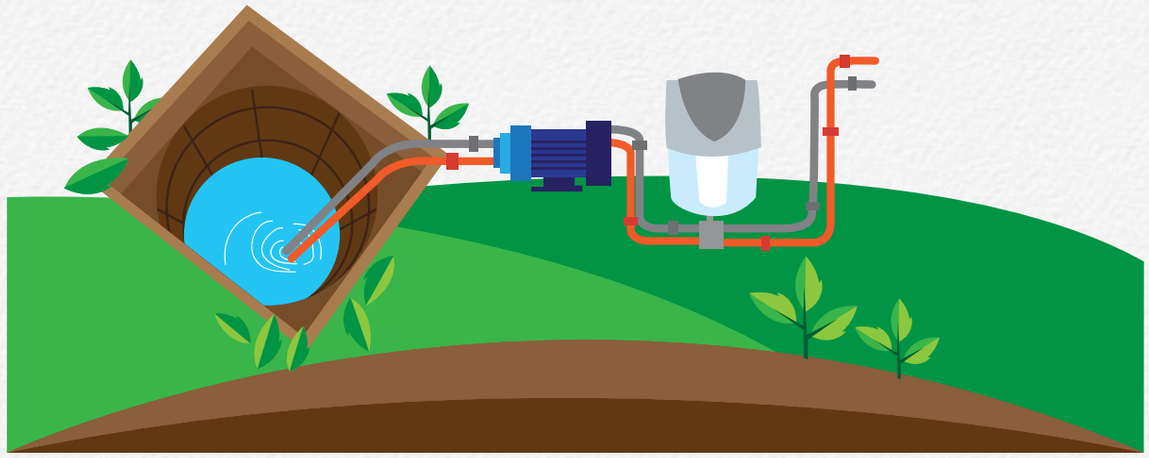
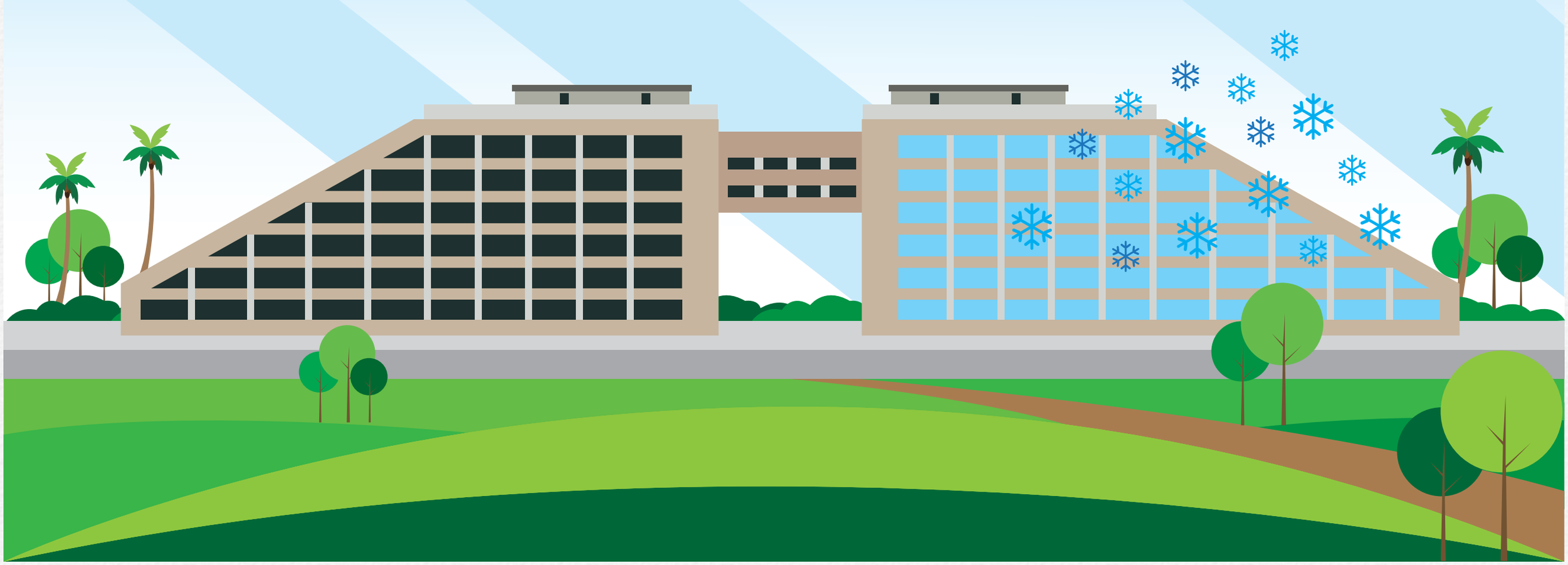
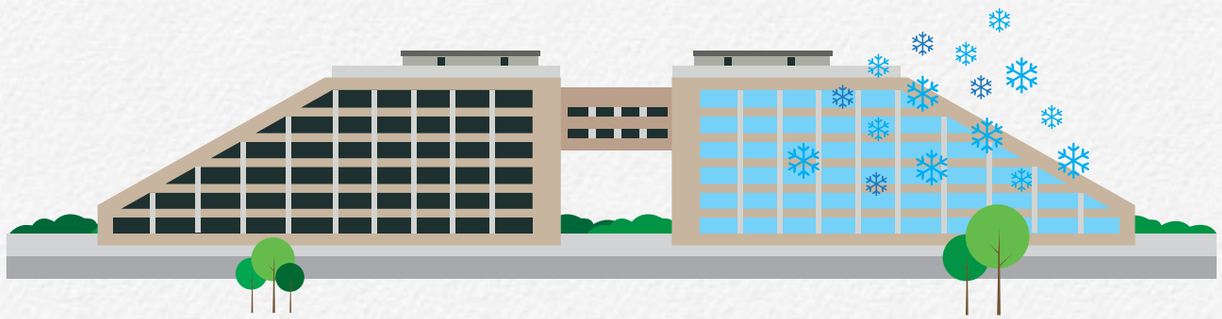


Radiant Cooling

Infosys Limited





Radiant Cooling

For Infosys, sustainability is not an option but a business imperative. It is embedded in our core business strategy and is the cornerstone of activities that drive innovations. Our top management is actively involved in initiating sustainable practices and has set goals such as becoming carbon neutral, achieving 50 percent reduction in per capita energy consumption by 2018 (against the baseline year 2008), and meeting our entire electricity consumption from renewable sources. We are constantly pushing boundaries and trying out innovative technologies to improve our Triple Bottom Line.

The building sector is one of the largest energy intensive sectors, accounting for over 30 per cent of the total energy consumed in India. Heating and cooling systems take up over 40 percent of the energy consumed in buildings. We recognized that energy consumption could be lowered with improved Heating, Ventilation and Air Conditioning (HVAC) systems. With this in mind, we focused on bringing efficiency from the design stage itself—starting from right sizing of equipment, correct orientation, efficient building envelope, and most importantly innovative technologies to optimize our building operations and eliminate inefficiencies.

We implemented Radiant Cooling Technology in Infosys SDB1, Hyderabad. As the building is the first radiant cooled commercial building in India, we made the decision to enable a clear comparison of radiant cooling and conventional air conditioning systems to demonstrate its viability with accurate data. Thus, we turned our building into a live laboratory. We split the building into two symmetric halves, one half with conventional air conditioning and the other with radiant cooling. Both sides of the building have the same orientation, thus the solar loads are the same. All other parameters, including the type of lighting, number of occupants and building envelope are also the same for both the halves. The building management system (BMS) continuously monitors, manages, and optimizes building operations to ensure efficient energy use. This project is one of the biggest HVAC systems in the world.

After detailed monitoring and evaluations, the side with Radiant Cooling Technology emerged the winner. What are the reasons that the technology worked out the best in the winning half? There were many. Moving water is more efficient than moving air due to its inherent physical and thermal properties. Water has the ability to carry 3,400 times the energy that can be carried by air of the same volume. This simple property of water has been used in the radiant cooling system to achieve the highest levels of efficiency. Cold water flows through the pipes embedded in the concrete slab and cools the entire slab surface, maintaining slab surface temperature at about 20°C. Cooling is achieved when the cold slab absorbs the heat radiated from human bodies,

computers, lighting, and equipment. Fresh air is supplied through an air system that maintains adequate and comfortable indoor air quality for employees. The building is also designed with a highly efficient envelope that minimizes heat ingress into the building, but at the same time allows maximum amount of natural light into the office space, giving the workstations full daylight.

A major challenge we faced while implementing the Radiant Cooling Technology was to change the mindset of our various stakeholders. Though radiation is an established way of heat transfer since ancient times, (it has been used in the famous Taj Mahal, for example). Radiant Cooling Technology had never been implemented in modern India. There were apprehensions from many stakeholders including HVAC and engineering consultants who were of the opinion that radiant cooling could never work in tropical climates. Our building breaks this myth and proves that radiant cooling is the most efficient technology that can work in tropical conditions.

So here we have a building that has naturally lit workstations, thus eliminating the requirement to turn on artificial lights during the entire day. There is no recirculation of air in the system, hence, the system inherently provides healthier indoor air quality. Treated fresh air is provided to the occupants to maintain a healthy indoor environment. There is constant monitoring and controlling of the building's comfort parameters, including CO_2 levels, temperature, and Relative Humidity (RH). The Radiant Cooling system is easier to build, as it requires less equipment and also the overall capital cost is slightly lower than that for conventional cooling systems. Apart from maintaining high indoor air quality levels, the space required by this system is only one third of the conventional one.

The lower capital cost of the Radiant Cooling System, as compared to conventional cooling is expected to be a major factor driving Radiant Cooling Technology in the future buildings of India.

Radiant Cooling Technology can thus be the technology of the future and may redefine the way cooling is done in India. The building serves as a global case study for others, demonstrating the viability of the Radiant Cooling System in India. Word is getting out, and others are following the example. We were excited when a large software company from the Silicon Valley visited the building to see our large-scale radiant building. Based on the visit and some other research, they have decided to proceed with radiant cooling in their own building as well.

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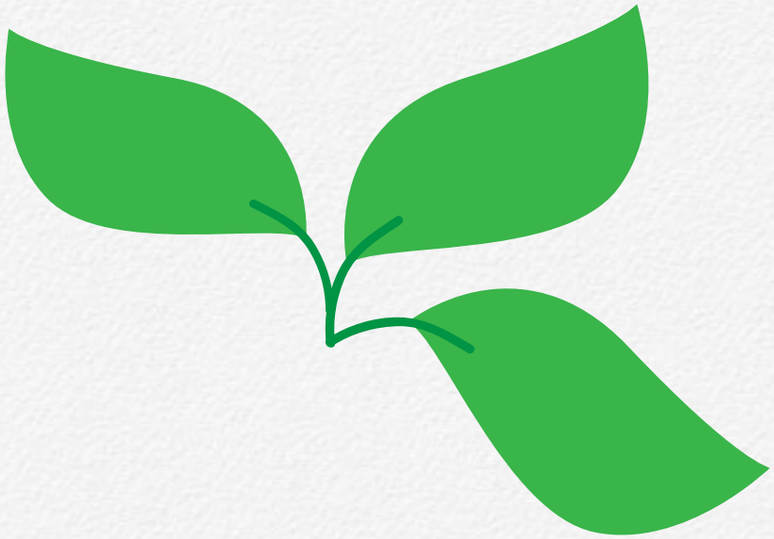
Responsible Luxury

ITC Ltd



Responsible Luxury

All of ITC's super premium luxury hotels offer "responsible luxury" and are LEED® (Leadership in Energy and Environmental Design) Platinum certified, making ITC the "Greenest Luxury Hotel Chain in the World." All the premium luxury hotels use 18–29 percent less energy than the USEPA national average for large-sized luxury hotels. Efficient fixtures reduce the building water use by 35 percent compared to internationally benchmarked luxury hotel standards. Almost 100 percent of the hotel's waste is recycled. Innovation, cutting edge technology and design integration have enabled the hotel to set benchmarks in energy efficiency, water efficiency, sustainable site planning, indoor environment quality and sustainable material sourcing.

This ethos is exemplified by the ITC Grand Chola, the 600 room luxury hotel in Chennai, certified as the World's Largest LEED® Platinum Hotel in the "New Construction" category. It has a 5 Star GRIHA (Green Rating for Integrated Habitat Assessment), the highest national rating for Green Buildings in India. ITC Grand Chola also saves over 40 percent of energy, when compared to a conventional hotel, through state-of-the-art energy efficiency features including its self-owned wind farms of 12.6 MW capacity that cater to 100 percent of the electrical energy demand of the hotel. The envelope materials comprise of composite wall assembly, multi-glazed windows, and rooftop insulation, that well exceed the fenestration standards of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) and the Energy Conservation Building Code (ECBC) of the Government of India.

For the first time in India, a programmable AC Plant control system called the "Hartmann Loop" has been installed to increase the efficiency of the system by 20 percent. CO_2 Sensor-based fresh air handling units operated by IBMS (Integrated Building Management System) lead to optimum guest comfort and save energy. An iPad-based Room Control System ensures customized room climate controls and prevents wastage of energy. Fully automated energy efficient boilers with O_2 trimming enhance efficiency and lower fuel consumption. 20 percent of the domestic hot water requirement is met by Solar Collectors. Electrical energy is saved through programmable computerized lighting controls that provide for mood lighting in the public areas and restaurants. Water-cooled condensers in kitchen refrigeration equipment save more energy than conventional air-cooled equipment. Energy savings are also enhanced through the CO monitoring-based jet fan ventilation system of the basements, which conserve more energy as compared to a conventional duct system.

ITC Grand Chola has also set several standards in water efficiency. 100 percent of the irrigation, flushing, and cooling tower requirements is met through treated effluent. Water efficient fixtures reduce the building water use by 35 percent compared to conventional benchmarks. Rainwater harvesting systems have been installed to maximize catchment and percolation. The landscape area consists of carefully chosen native, adaptive and low maintenance vegetation species to minimize water requirements. Shading of ground cover by trees helps conserve water by reducing evaporation losses. Drip irrigation and timer-based controls for operating the irrigation valves further eliminate water wastage. The hotel's laundry uses the water from the last wash for the prewash of the subsequent cycle. In addition, the use of low alkaline, environment-friendly washing liquids helps reduce run time and saves water.

100 percent of the car parking space is covered, thereby reducing paved areas onsite to eliminate "Heat Island Effect." The roof is a combination of a green roof, reflective paints and high SRI finish on domes to reduce thermal gradient differences after sunlight hours. The hotel also ensures 100 percent recycling of waste generated by its operations through waste segregation at source and subsequent utilization for useful purposes. An onsite organic system converts organic waste into manure. A comprehensive virtual training program and green education is also conducted to create awareness among all stakeholders.

The hotel also ensures that all material that is sourced and purchased is environment-friendly. Green housekeeping materials are used that are Greenseal certified. Over 10 percent of the building material of the project is from recycled sources. Around 17 percent of Portland cement by weight was replaced by fly-ash during construction. Over 40 percent of the building material value of the project is comprised of materials manufactured and extracted within 800 km. Over 5 percent of the building material value of the project is made of plant products that are typically harvested within a 10 year span or shorter. Over 50 percent of the wood products used in the project are from FSC (Forest Stewardship Council) certified forests.

As a result of the adoption of green building mechanisms, and a host of other interventions, ITC is today a model of sustainability practices. This is manifest in its status of being the only company in the world of comparable size to have remained "water positive" for 11 years in a row, "carbon positive" for eight consecutive years, and "solid waste recycling positive" for the last six years.

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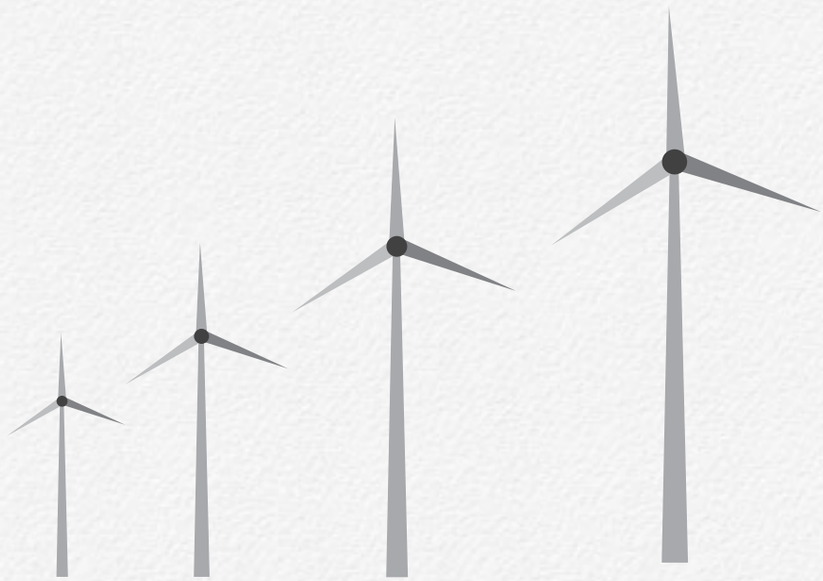

Slowly Trickles a River

Slowly Trickles a River

Mithi is one of Mumbai's bigger rivers. 17 km long, it originates from the Vihar Powai hills, and meanders along Marol, Saki Naka, Airport, Kurla, Kalina and Bandra-Kurla complex, before discharging into the sea at Mahim. Once upon a time, thick mangroves flourished on both its banks. The lush forests were nesting grounds for many avian species, some exotic, some rare. Dr Salim Ali, the renowned ornithologist spent many a day here birdwatching. A special variety of crabs from the Mithi were internationally sought as a delicacy and folklore has it that fishermen would catch fish by just hauling them up in baskets from the river.

Over the last several decades, human encroachment has made inroads into the mangroves and the river itself, leading to large-scale damage to this riverine system and to biodiversity. The banks and flood plains of the Mithi have been physically encroached by commercial structures and slums. Retaining walls have come up over long stretches along the banks, terminating the age-old relationship between the river and its hinterland. Tidal waters that nourished the mangroves have been impeded, impairing the ecology sustaining the biodiversity. Unchecked pollution from small and big sources, many unauthorized, pollute the river. Explosives have been used to blast the riverbed in some places. Concrete and paved roads have cut through mangroves and concrete walkways have been paved and beautified with non-native trees.

So what do we have today? A river transformed into a stinking, toxic sewer, and over constructed banks. People recall swimming in the river, and fisherfolk would eke out their living from her bounties. Now it is dangerous to even dip one's hands in the waters for fear of getting infected. The abuse of the river has far-reaching effects. Consider the many lives lost and the millions in damage to property the cloudburst of 2005, caused Mumbai. The city's most significant rainwater drainage system, the Mithi was just not able to absorb the excess water. The flow of the Mithi used to be 40,000 to 50,000 cusecs, equivalent to the volume of water carried by the Narmada Canal, which is the world's largest. Perhaps rivers don't create floods; floods are a creation of humans.

Despite its odious smell, and the sore sight of over-exploited banks where greenery once stood, I don't avoid the river. I continue my regular ritual of ambling along its banks and thinking of ways to awaken attention to the need to bring the river back to its past avatar of a flowing body of pristine water with flora along its banks. I am constantly trying to persuade people to look at it in its present form as they pass by, and not to avert their eyes. In 2001, my friends and I joined other like-minded individuals and organizations with a deep interest in water issues to form Rashtriya Jal Biradari—a national water community. The organization

aims to restore catchment areas around the hills, and treat all effluents discharged into the river.

Our members visit schools and colleges to sensitize students and teachers about the river, as well as organize cleanup campaigns on the riverbanks. The removal of garbage and debris will greatly facilitate floodwaters percolating the floodplains and thus preventing excess waters from collecting downstream. Public Interest Litigations have been filed to bring attention to the condition of the Mithi. Chalking out ways to build support for our cases continue over endless cups of tea, multiple meetings and innumerable visits to the river to photograph violations and illegalities. Sometimes we think that it is easier to explain a river estuary and sea delta to the judges ourselves, rather than through lawyers, so we often represent ourselves in court to defend the cases.

Our efforts have met with some success. In 2014, the National Green Tribunal, on a petition filed by Jal Biradari, directed the Mumbai Metro Region Development Agency and the Mithi River Development Authority to stop blasting within the riverbed until an Environment Impact Assessment is undertaken and vetted by the Maharashtra Coastal Zone Managements Authority. The Tribunal has also passed an order to stop industrial units from polluting the river. A directive by the Bombay High Court on the removal of illegal structures and encroachments along the riverbank, and the demolition of the 300 meter wall built along the river, is expected.

The Jal Biradari is set to launch the Plastic Lao, Nadi Bachao (Bring Plastic, Save the River) campaign in Mumbai. The initiative is aimed to have plastic collected from around 50,000 homes of students for recycling, thus preventing it from getting dumped in the river. We will also engage students from over 300 schools and colleges to participate in riverside activities such as yatras, clean-ups and cultural events. We hope to instill in them a connect with the river so that they take pride in protecting the Mithi, or for that matter, any waterbody in their environs.

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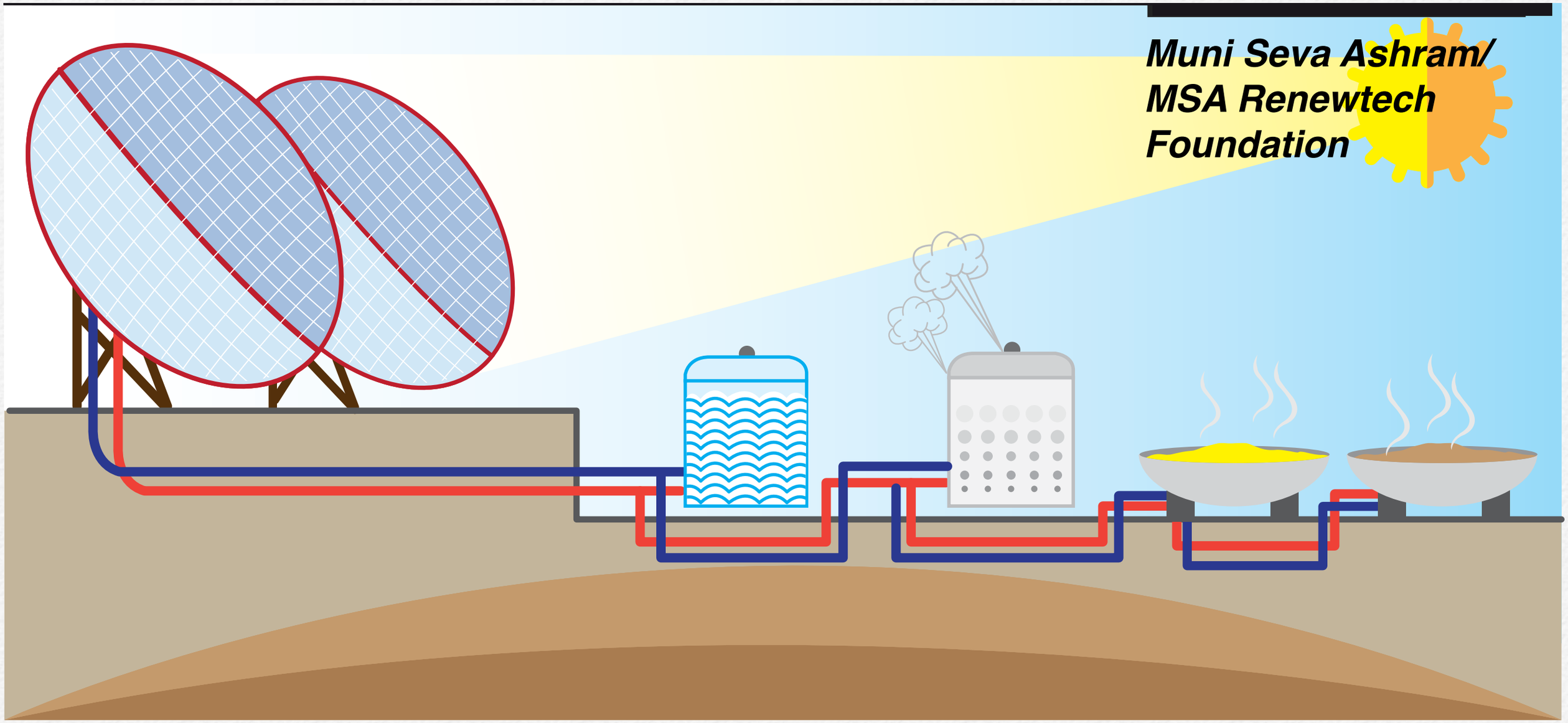
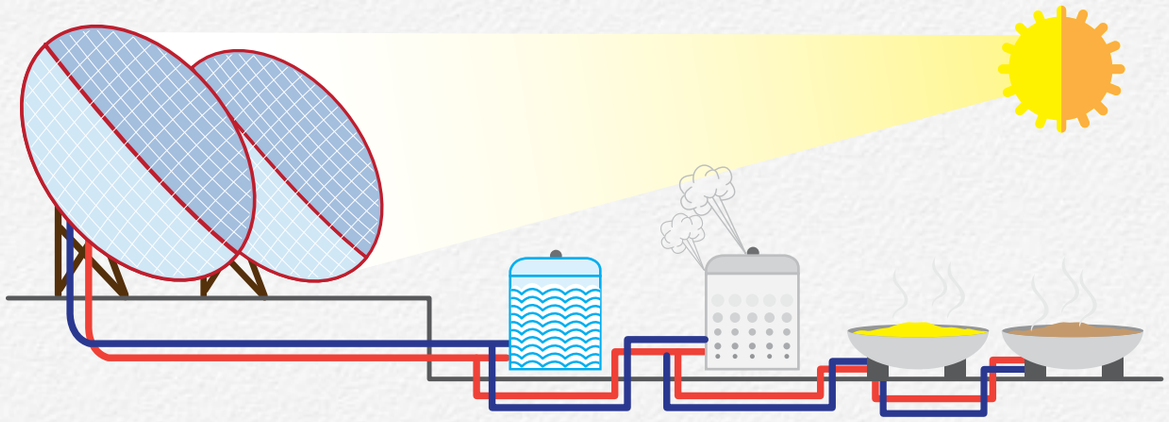
Surya Prasadam





Surya Prasadam

India is a land of immense spiritual diversity. Holy sites and places of worship dot the length and breadth of the country. At many pilgrimage sites, ‘prasad’ or ‘prasadam’ is cooked and provided free-of-cost to devotees. One can imagine the several metric tons of fuel energy invested across India in this cooking process.

In this niche arena of temple energy usage, my company Gadhia Solar Energy Systems Pvt Ltd (later renamed Flareum Technologies by new owners) identified a tremendous opportunity to institute energy savings through solar technology. Our Shirdi Solar City Project at the vast temple complex of India’s revered saint, Sri Sai Baba of Shirdi, has been widely acclaimed as a pioneering effort. At this pilgrimage site, 25 to 30 thousand visitors arrive daily to seek blessings. On holidays and special occasions the numbers of Sai devotees can swell to as many as 55 thousand a day.

At Shirdi, our company has installed cutting-edge green technology to better utilize the abundantly available solar energy. 73 Parabolic Concentrators resembling dish-antennas of 16 square meters each have been mounted atop the kitchen complex of the Sri Sai Baba Sansthan. These comprise the world’s largest Solar Steam Cooking System and allow for the cooking of food for an estimated 55 thousand devotees daily.

The System harnesses sunlight to heat water and generates 3,500 kg of steam daily for cooking. Steam cooking is clean, efficient and hygienic, especially when food is cooked for large numbers of people. The Shirdi system has been designed in a way that allows it to run even in the absence of electricity. Our solar dish antennas concentrate solar rays on receivers or “Heat-Exchangers” to create steam at 180 degree centigrade and 10 kg/cm^2 pressure. The temperatures of the steam generated can range from 550 to 600^{o}C. With an automated tracking system, the dishes rotate in tandem with the movement of the sun, always concentrating solar rays on the receivers. The solar-based prasadam production for thousands of devotees at Shirdi, saves an estimated 100,000 kg of Liquid Petroleum Gas consumption per day.

In terms of manual input, the antennas require alignment with the position of the sun only once every morning, after which an automatic tracking process takes over. As the solar system is hooked up with boilers, it can take care of a few non-sunshine hours. However, a backup is required for prolonged spells of rainy and cloudy days.

The excellent energy-saving efforts of the Shirdi temple complex have earned Shirdi City the prestigious Solar City Status designation from the Government of India. It has also been recognized by the Ministry of New

and Renewable Energy, which awarded the city ₹58 crore for further solar technology development.

Inspired by the resounding success of the Shirdi Solar City Project, spiritual and religious shrines around India have sought our help in their quest to become more eco-friendly and energy efficient. For example, the Brahma Kumari Movement has adopted Solar Steam Cooking Systems at their multiple campuses across the country. Their center at Mount Abu has installed 24 solar energy antennas of 7.4 m^2 each. These cover the meals that are cooked every day for their approximately 2,000 visitors. The Brahma Kumari campus located at Taleti has taken their energy-saving commitment a step further. Through a technology-transfer arrangement with us, they manufactured their own Solar Steam Cooking Systems. The Taleti campus now has 84 solar dish antennas that support cooking of meals for anywhere between 20 to 38 thousand devotees per day.

The colossal Tirumala Tirupati Devasthanam Temple Complex located at Tirupati is another adopter of our Solar Steam Cooking Technology. Here, with the help of 110 solar energy dish antennas of 10 m^2, meals for 30,000 visitors are prepared on a daily basis. With the reduction in its former diesel consumption, the Tirumala Shrine saves ₹17 lakhs per year on energy costs. This translates to a decrease of CO_2 emissions by 1.2 tons per day.

Through their exemplary efforts in adopting solar energy technologies for communal cooking, the temple complexes of Shirdi, Tirupati and the Brahma Kumari Movement, to name but a few, have demonstrated the tremendous energy-saving potential by using green technologies. They have also highlighted how renewable energy can be a feasible source of power in our country.

If so much energy efficiency can be achieved by only a handful of religious complexes across India switching to renewable energy technologies, just imagine how much more would be saved if more places did the same.

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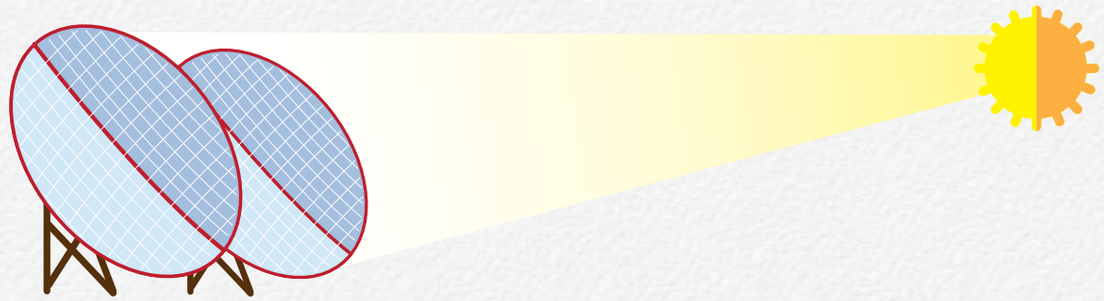
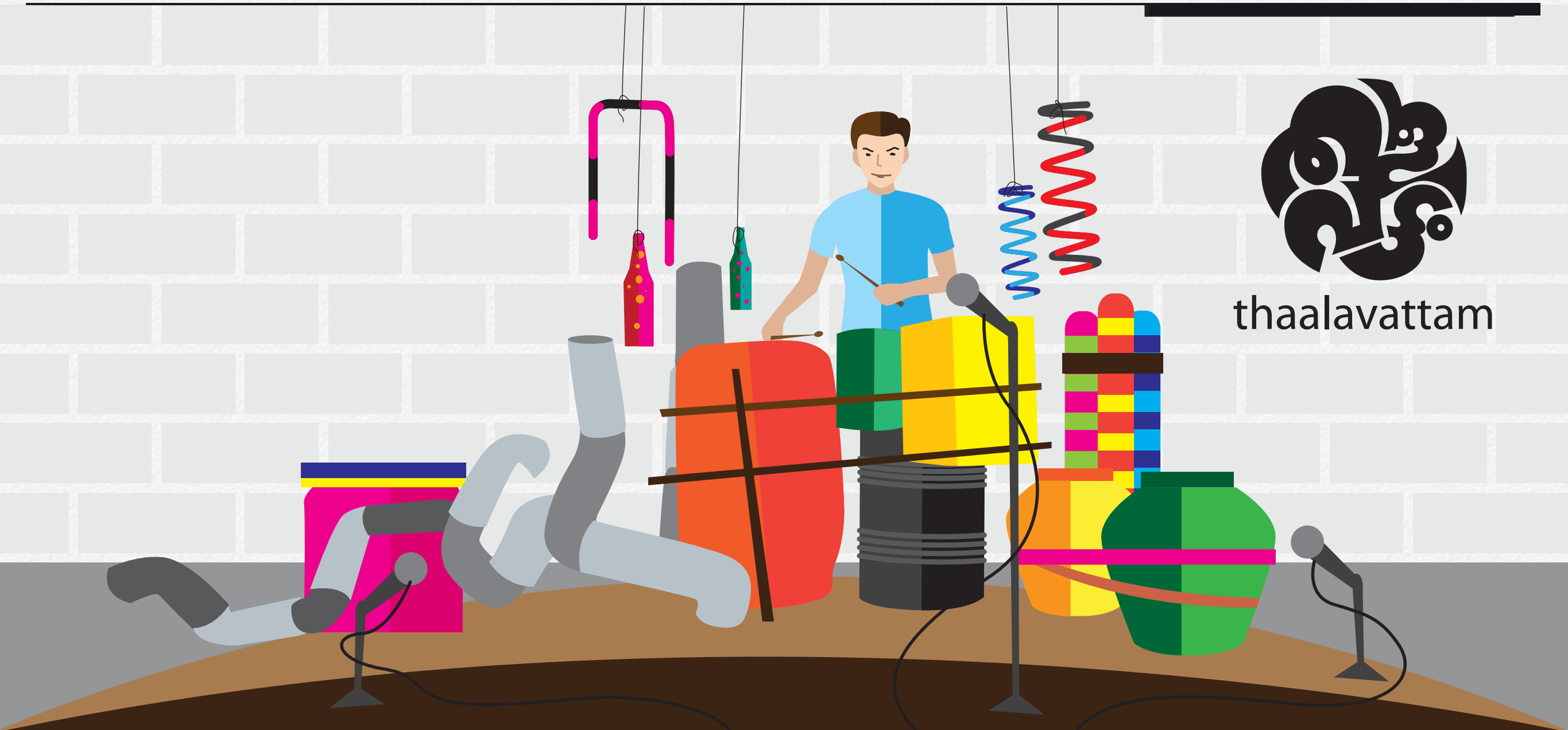


The Circle of Rhythm



The Circle of Rhythm

Have you ever thought of creating music out of trash? Well this is exactly what I do. As a musician, designer and artist, I discover potential in the all-too-ubiquitous plastic and metal waste that blights the Indian landscape. In what most of us typically label “junk”, I see an opportunity. I envision discarded soda cans, PET bottles, crown caps and PVC pipes as instruments for creating music. This is also an innovative way to save the environment from an overload of trash. The instruments (read discarded items) come together to be played in Thaalavattam—a percussion-based project.

The word Thaalavattam means “The Circle of Rhythm” in Malayalam. For this unique initiative, I put to good use old cycle sprockets, steel water jugs and PET bottles, turning these into drum high hats, hand drums, percussion shakers, special-effects generators and more. This is a result of my belief that since music is really a universal language, there is creative potential and reusability inherent in discarded items as well.

I started this project in 2011 as a way for people to express their creativity. Street plays, music, designs, art, we have it all. The discarded bottles lying around, I noticed were clean and strong. My background in art helped me see this waste as raw material from which to fashion musical instruments. Even junk can be used artistically to carry a message, and mine was “reuse”.

Thaalavattam performances have taken place across India. Its series of concerts are titled “Rhythm Rush”. At each performance, entrancing tribal and electronic sounds are generated, not using traditional percussion instruments such as tablas, mridangams, and bongos, but several salvaged materials. The show begins with a short percussion performance that sets the tone. The concerts are unique experiences as audience members are presented handmade recycled items to co-create music on the spot. The collaborative jam sessions have the audience jamming with the band. Dancers, painters and digital artists are also present. I facilitate the drum circle that ends on a great rhythmic energy. “Engaging with waste is awesome,” is what a lot of attendees have said to me.

The fashioning of instruments from scrap, plastics and metal, takes much thought and time. Once I have identified a discarded item for its unique sound and musical potential, I redesign the salvaged waste articles into stage-ready instruments. On an average, the process takes 15–20 days. Portability is the next consideration. We have to ensure that all our musical kits are convenient to use and easy to transport and store. Take for example my latest find—discarded steel water jugs,

accompanied by upcycled paint cans which have to be banded together for each performance. Once dismantled, these have to be kept together ready at hand. Placing one inside the other was the best way I discovered to facilitate transportation and easy accessibility.

I have had to cross several hurdles. Some people wonder about my frequent junkyard forays, while others, observing my interest, jack up prices of what is really just junk. Yet despite these challenges, Thaalavattam has forged creatively and sanguinely ahead. I'm told my music and unique medium of artistic expression has inspired fellow-artists and music lovers across India to also take the pledge to "reduce, reuse and recycle" as well as rethink before writing off items as waste.

I have been fortunate to establish numerous environmentally-conscious partnerships. Non-profits, businesses, artisan groups, as well as neighbors, friends and local junkyards now regularly supply us with the raw materials we need. For example, Saahas, a Bengaluru-based waste-management non-profit, supplies us discarded items from which so many instruments have emerged.

Thaalavattam clearly demonstrates how simple and creative strategies can benefit both people and the planet. To take our collaborative, inclusive and community-oriented approach forward, we are planning to launch a new initiative titled "Call for Love" that will see street jamming. We look forward to having you participate in our circle of rhythm when we perform in your city.

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Transmigrated Soles

Transmigrated Soles

Paaduks is a business venture that I started in 2013. The name comes from “Paaduk”—India’s oldest and most quintessential footwear. We create handcrafted sandals and shoes. So what is so special you might ask? There are so many people who do the same. Let me assure you, there is a difference. The soles of every pair of footwear we produce come from the upcycled (already used) rubber of automobile or airplane tires. These are different from the “normal” synthetic rubber, plastic, or PVC soles that most mass-produced products have. To be eco-friendly and ethical is our core philosophy and using existing tires supports this as it does away with the need to produce more rubber. This zero demand for new rubber helps reduce the carbon footprint of our products. Even the materials used for the upper parts of the footwear don’t come from animal products—only vegan leather, jute, cotton fabric with vegetable prints and canvas materials are used. All materials are sourced from markets in Mumbai itself and not from afar, so here again we save on the carbon footprint.

Some years ago, I read about an enterprise that turned scrap tires from Indonesia into slippers to be sold in the US. This innovative way of upcycling scrap into useful commercial items really caught my interest, and I thought it was worth trying myself. That was the genesis of Paaduks.

Eco-friendly shoes are just one half of Paaduks’ story. The other half is about the cobblers that make these shoes. Nagraj Singhadia is our chief cobbler. He leads a team of shoe artists that operate in the narrow lanes of Thakkar Bappa colony in Chembur. They work on tire pieces sourced from scrap dealers in Kurla and Taloja. So what is so special about cobblers working? The difference is that these cobblers are partners in the enterprise, not mere wage earners. Earlier, individual cobblers at the colony always remained in penury because they were forced to sell their talents to local wholesalers or traders at very low prices and were often bullied into doing so due to their poor economic status. We have been working to change these terms of trade to fairer ones. Paaduks pays Nagraj and the other cobblers three times the market rate per pair. We realize that it’s the cobblers that are the backbone of the business and deserve to be remunerated fairly for their work. The Paaduks team also provides financial assistance to the cobblers’ families for their healthcare, education and emergency needs.

Currently my wife Jothsna and I jointly manage Paaduks. Jidnyasa Butley who has volunteered with us since November 2014 and has recently come on board as a full-time staff member is also an invaluable member of our team. The three of us handle everything—marketing, sales,

sourcing, production and distribution. So far, around a thousand shoes have been sold.

I won't say it has been smooth sailing right through. There are challenges. Getting customers to appreciate the true value of the product is one. Most buyers really don't bother about what soles are used, or how the profits are shared. The reality is that aesthetics typically scores higher than social causes when competing for the customer's wallet. High-end stores are reluctant to retail our products as they think that their customers might not want upcycled items. We also have to compete with mass-produced, commercially available sandals or, constantly come up with unique designs so that our products stand out from the rest.

Of course we need to expand. We need to produce more, sell more, find a bigger place for our team of cobblers to work and offer avant-garde product choices to our customers. We also need professional designers to partner with us and develop the Paaduks collection further. Our plans are to tap into international markets, in particular where there are bulk buyers.

We have the will and the determination, and we can see growth ahead, without giving up on our values of being eco-friendly and socially conscious. After all, Paaduks is not about making money per se, but also making a difference in someone's life. It is the feeling of having a positive impact in the life of others that keeps us going. Hopefully, Paaduks' durable, upcycled soles will meet more and more appreciative souls.

Jay Rege
Co-founder

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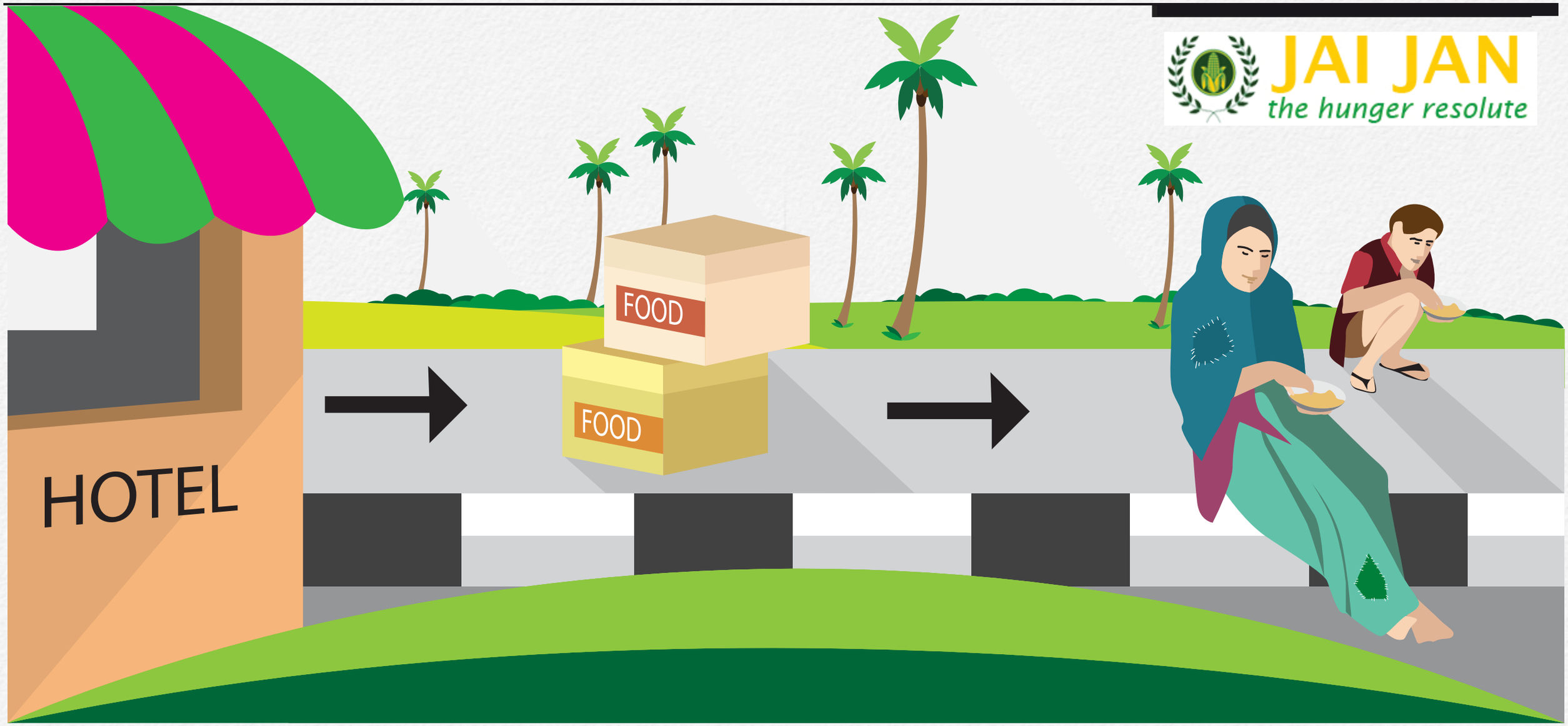
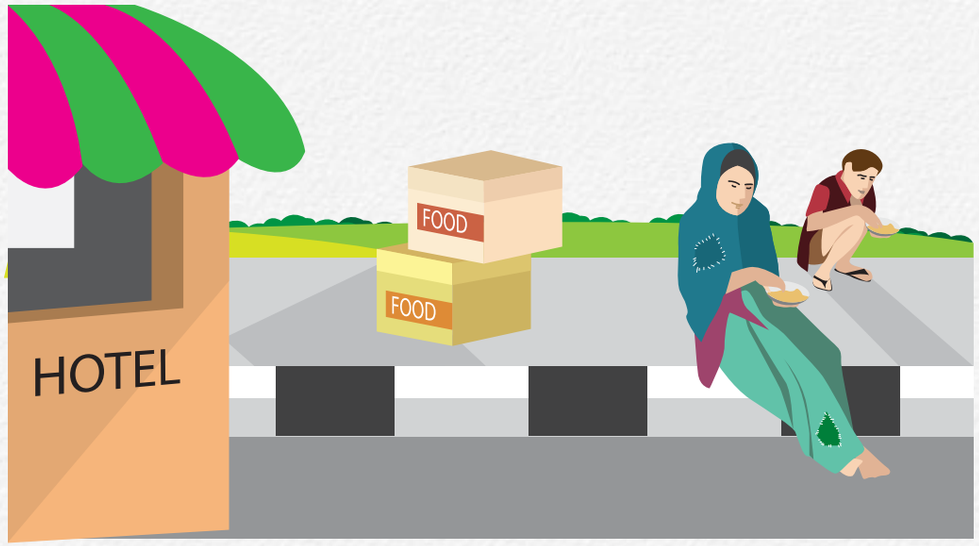
Waste Not, Want Not





Waste Not, Want Not

My story begins on a summer night in 2012. At a dinner I attended with my parents, the host had a restaurant cater the meal. Like any other teenager, feeling out of place in a room full of adults, I was in my own world, and as the event started to wind up, I decided to take a different route toward my car. I had no idea about the profound impact this diversion would have on my life. As I walked through the back alley, I witnessed a waiter dump a perfectly good plate of bruschetta into the trash. This was the start of my NGO, Jai Jan.

Before then, I had never really put much thought into what happens to food in restaurants when the day is over; most of us who enjoy a good meal don't really think about the leftovers. Restaurants throw away copious amounts of good food each night in the interests of hygiene, legalities about its distribution amongst employees, and lack of cold storage facilities.

My parents and grandparents have taught me not to waste food. My grandparents, who were refugees from Pakistan during the 1947 partition of India have witnessed hunger and poverty first-hand. This was one of my inspirations to help those facing hunger. Constantly being tutored as a child that waste was wrong is what slowly and gradually pushed me into doing my part, and that is why the sight and even thought of the bruschetta going into the trash had such a profound impact.

NGOs estimate that around 140,000 people are homeless in Delhi. Apart from unhygienic living conditions, scarcity of food and malnutrition, are the biggest challenges. Sadly, parallel to these large numbers of homeless citizens, there is 15–20 percent food wastage at restaurants. What a sad situation! So many could eat, but instead, the food goes into dumps. An outlet was needed to utilize this unused food, and this is what Jai Jan strives to do. Our goal is to combat hunger. By collecting food that would otherwise go in the trash, we not only combat hunger, but also help the environment. Did you know that the city of Seattle has just recently made it illegal to throw food away? If only we did the same in Delhi!

Jai Jan takes untouched, vegetarian food from as many restaurants as it can, and distributes it among hundreds of people on the streets of Delhi. Our team is divided into units. Each is responsible for collecting and distributing in a particular area. For example, those that collect from Ambience Mall, Gurgaon, distribute in Munirka. Each unit has a driver, a helper, and a manager. Food is collected at around 11 pm and distributed the next morning at 7 am, before people start their day. Many restaurants have come forward to supply us with food. Even private parties call us in advance to let us know that there would be food to collect at the end of the night. It is amazing how many people feel for

the cause and join us as volunteers. Even more amazing is the number of students, from schools such as the American School, British School, Shri Ram and Vasant Valley, who help.

Our efforts in the last year have resulted in feeding around 500 to 800 people a day. Imagine the numbers when I am able to take this cause nationwide. I would like Jai Jan to expand to every corner of this country. We strive to get more people and restaurants involved, more resources, and build greater awareness.

I have been introduced to so many whom I now consider to be my friends and family. For example, I was going to school and happened to stop by a red light next to the flyover that Jai Jan delivers to. A bunch of kids recognized me and came up to my car asking for what they call Chocolate Wali Malai. Chocolate Mousse really does sound better expressed that way!

I am in the process of making an App to connect those with surplus food and those in need of food. In this way Jai Jan hopes to source and implement innovative ideas using technology to reduce wastage of food .

At times we face challenges. The police ask us for bribes, local henchmen have tried to scare us away, some even bullied us, but nothing deterred us from our goal. We do not fuel negative thoughts, and consider challenges insignificant. The more mouths my team and I feed, the more motivated we get. Each of us is driven to work harder to put to good use the food that goes to waste and ethically distribute it among those who might otherwise go hungry.

If you went to bed last night on a full stomach, you are among the lucky ones. Close to a billion people around the world this evening will not be doing the same. In India alone, 3,000 children will die from hunger-related issues today and over 35 million Indians will sleep on an empty stomach. Hunger by far, is the biggest killer in the world. And look at the irony. In India, about 30 percent of agricultural produce goes waste. Even if it gets saved, it is turned into food that is not only wasted in households, but in restaurants, hotels and cafes. This same food could bring a smile to so many hungry faces. The monetary loss is tremendous when we go across the entire food chain starting from cost of food procurement, labor, transportation, fossil fuel-based gas to the cooking oil and packaging. Do think about it the next time you waste even a morsel of precious food!

Bani Kohli and Vrinda Sharma
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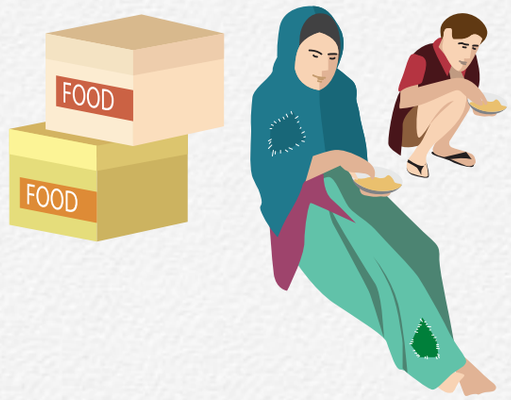

Watt Counts

LIGHTING

SAVINGS / MONTH

ENERGY SAVINGS (UNITS):	COST SAVINGS (INR):

APPLIANCES

SAVINGS / MONTH

ENERGY SAVINGS (UNITS):	COST SAVINGS (INR):

HEATING

SAVINGS / MONTH

ENERGY SAVINGS (UNITS):	COST SAVINGS (INR):

STANDBY

SAVINGS / MONTH

ENERGY SAVINGS (UNITS):	COST SAVINGS (INR):

COOLING

SAVINGS / MONTH

ENERGY SAVINGS (UNITS):	COST SAVINGS (INR):

WATT GURU

Watt Counts

“What if someone turned you on…and left?!!” Watt Guru provocatively asks visitors to its website against the backdrop of an extravagantly illuminated urban skyline. An initiative of the Bengal Chamber of Commerce and Industry (BCCI), in association with technology partner Enfragy Solutions India, Watt Guru is an Energy Conservation e-Portal. Its goal is to spread awareness about energy issues and drive behavioral change in power saving across India.

With its interactive approach, Watt Guru serves as a knowledge platform and citizen-engagement forum with a difference. Its innovative design and deployment of creative content, transforms energy saving from a technical and dry subject, into an accessible and lively conversation. The three pillars that comprise the superstructure and inform Watt Guru’s priorities are: “Engagement”, “Information” and “Assistance”. Material on a wide range of energy-efficient products as well as expert-compiled videos, articles and blogs are available on the portal. Creative stories and articles outlining the importance of standardization and labeling of products as per Bureau of Energy Efficiency (BEE) norms, tips for energy conservation and other energy conservation fun facts, are also included. Simulations, comics and games are another distinct appeal of the Watt Guru portal. For example, the platform includes an online Energy Calculator that enables consumers to make energy-efficient choices by comparing their electricity consumption against those of the best green technologies in the industry. All Watt Guru’s multimedia tools are widely available as downloadable “Applications” from the Google Play Store and target a broad audience: from teenagers and students to professionals and senior citizens.

Through Facebook, Twitter, YouTube and other social media platforms, Watt Guru engages regularly with its target audience, particularly youth, as this group comprises the “change agents and change makers of the future.” Watt Guru devotes significant attention to promoting environmentally-conscious thinking and behaviors within this demographic. Various online competitions, social media campaigns and marketing collaterals such as taglines, slogans and communications are designed to reach out to the “next generation” and position energy efficiency as the responsible and as “cool” new thing to do.

In addition to its e-Portal, Watt Guru also partners with schools and institutes of higher learning to expand its outreach to young people. With Watt Guru as an “Energy Efficiency Partner”, collaborating institutions are not only supported in implementing energy savings practices at their locations, but also recognized as “Responsible Schools” on the Watt Guru portal. Students are instrumental to these partnerships with “Student Ambassadors” providing weekly updates on the progress of energy conservation initiatives at their respective campuses. At present,

nine “Responsible Schools” have their logos featured on the Watt Guru portal, with ambassadors at each of these institutes carrying out energy awareness and conservation events on a regular basis.

Watt Guru has won the “Microsoft Youth Spark Competition” for its youth initiatives.

Watt Guru’s efforts with its registered “end clients” have also been encouraging. End-clients particularly active on the Portal reported greater energy savings than those less engaged. Through Watt Guru, a large number of people have also been educated about energy conservation issues and solutions as evidenced by the over 6,723 fans and 484 likes (at last count) on the Portal’s Facebook page. Watt Guru’s website has had 4,181 unique visitors with 1,500 returning for further engagement.

Yet even with the excitement surrounding the initiative, Watt Guru is not immune to the growing pains familiar to most startups. The initiative is presently grappling with the quandary of attracting new audiences while sustaining the interest of its existing users. Simultaneously, through continual innovation it is attempting to retain its competitive edge as a pioneer within the Indian Behavioral Proficiency and Client-Engagement space and distinguish its work from new contenders. Finally, Watt Guru has to perennially adapt and surmount the barriers presented by an Indian business environment that may be resistant or unprepared for consistent energy conservation.

Despite these challenges, Watt Guru is optimistic. Calcutta Electric Supply Corporation (CESC) has recently joined hands with Watt Guru as a Knowledge Partner and the Portal is doubly committed to championing the cause of power saving in fun and easy ways. One unit of energy saved at the consumption level reduces the need for fresh energy creation by 2.5 times to 3 times. Furthermore, such power saving through efficient usage can be achieved at one-fifth the cost of fresh energy creation. With these facts in view, Watt Guru is determined to change energy conservation from a “can do” alternative to a “must do” one.

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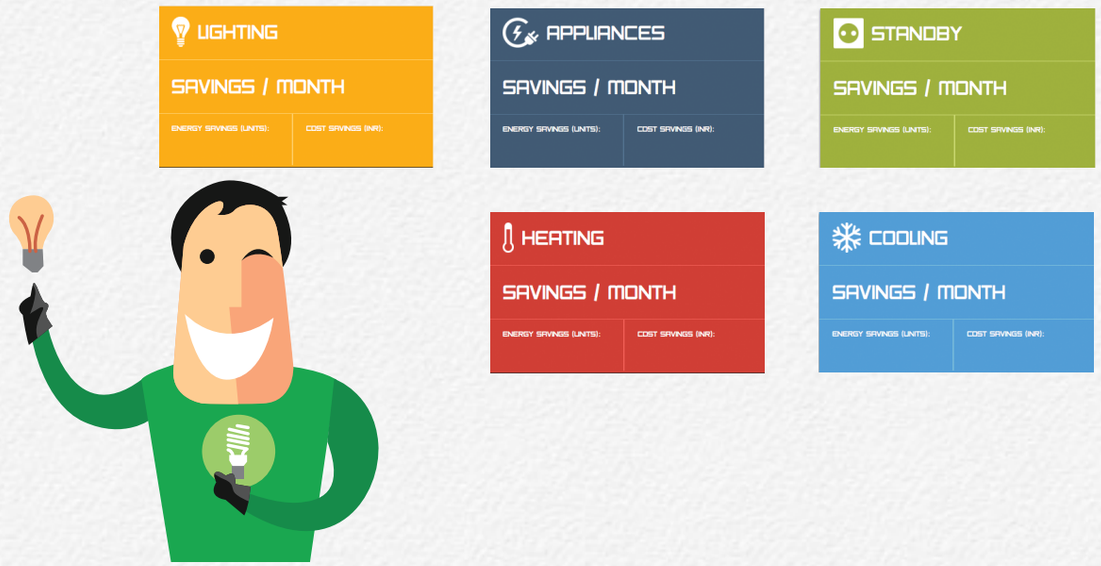

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We would like to specially thank Wysiwyg Communications who brought the stories to life through their imaginative illustrations and innovative designs. Feel free to visit them at www.wysiwyg.co.in.

It is our aim to publish further volumes of this e-book in order for more people to benefit from tried and tested techniques that help cities gain sustainability.

Do write to us with ideas you may have of other pathways to green cities at greencitiesindia@earthday.org.

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