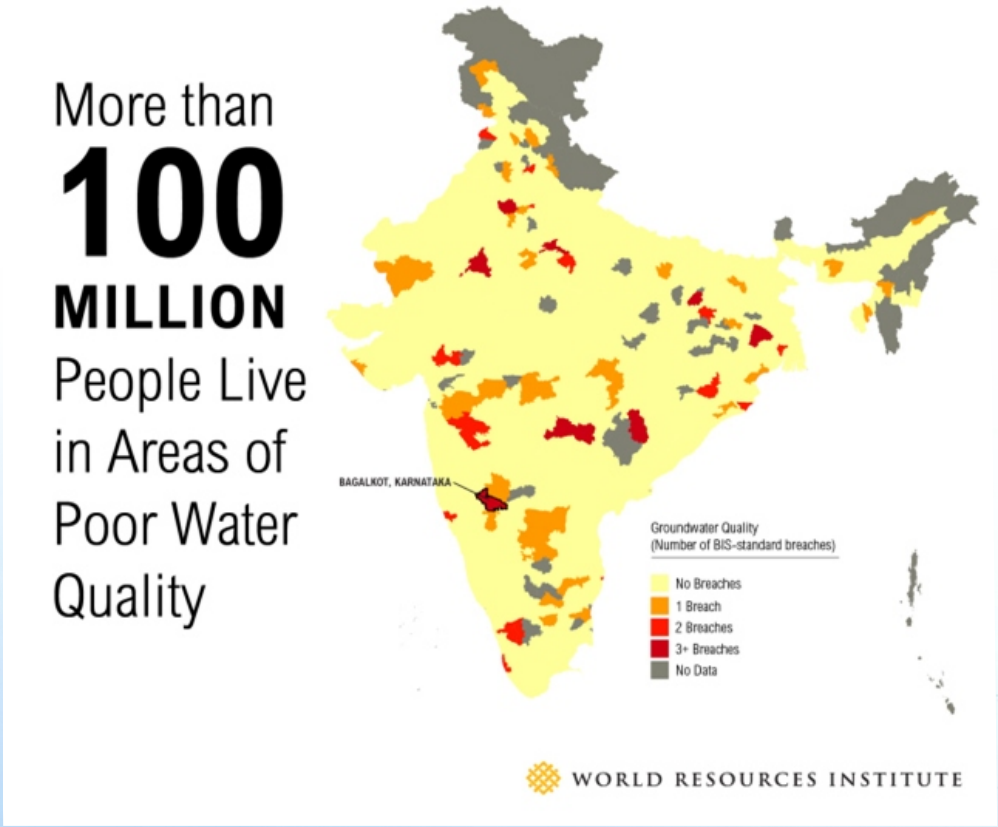

Greenergy
A Green Concern!
Mother's Feelings....
Though a Shoe-Nest!
.....Nature to Nature ....

YO- GREEN JAGATE RAHO !

Mrs. Yogini Jagdale
(Guest Editor)

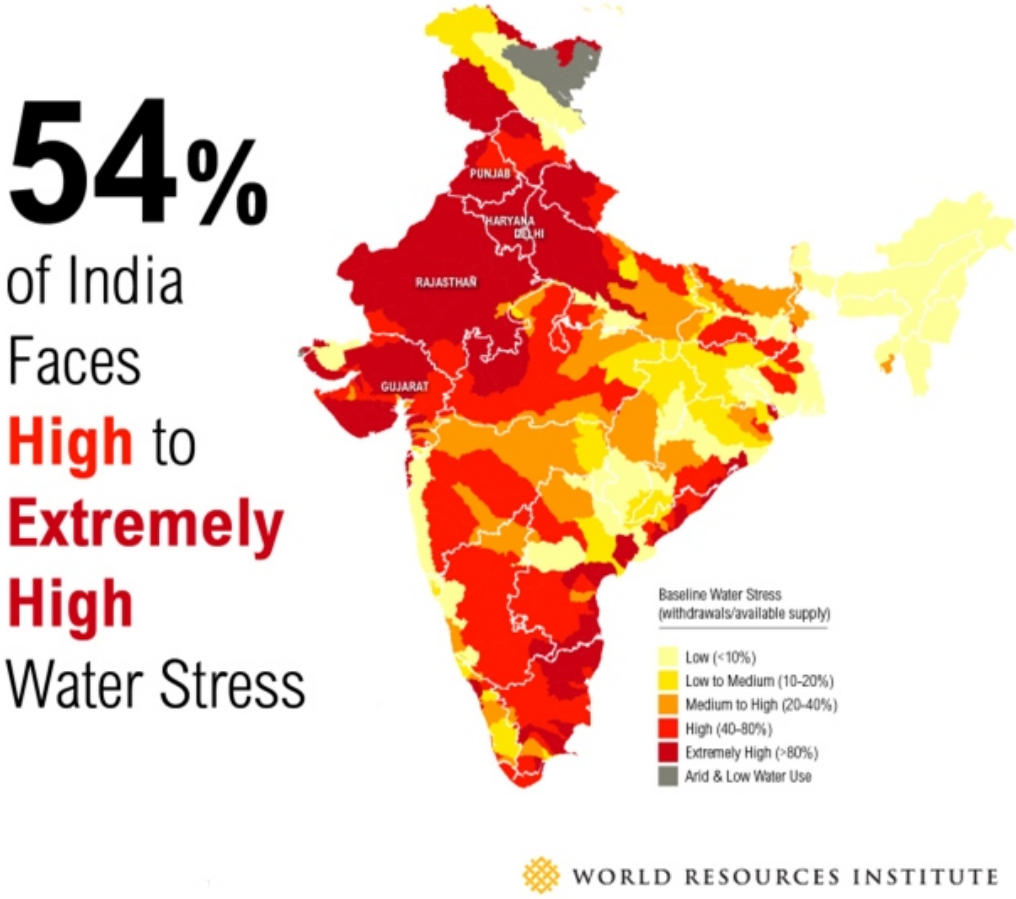
Water scarcity has begun early in India. Corporations and farmers have been guzzling surface water, groundwater levels have been reducing, and the amount of pollutants in water is increasingly rapidly, according to a new report by the World Resources Institute.

More than 100 million people in India are living in places where water is severely polluted. Out of the 632 districts examined to determine the quality of ground water, only 59 districts had water safe enough to drink. The yellow and red areas in the map show the places where concentration of pollutants such as chlorine, fluoride, iron, arsenic, and nitrate exceed national safety limits.



In 2011, some 130 million people lived in the districts where the concentration of at least one pollutant is higher than the levels considered safe. And more than 20 million people lived in the eight districts where at least three pollutants go past the safety standards. Bagalkot in Karnataka has the most unsafe drinking water with five out of the six pollutants exceeding safety limits.

With increasing industrialisation and urbanisation, more than 40% of India's available surface water is being used every year. In the northwestern region,the breadbasket of India, about 80% of the surface water is being used.



Once surface water is exhausted, people dig to find more water. Groundwater levels across 4,000 wells studied by the authors have receded by 54% in the last seven years. Falling groundwater levels mean water is further away from the surface and hence less accessible.

Many farmers depend on groundwater levels and rains to grow crops. About 65% of cultivable land in the country doesn't have irrigation facilities. To make matters worse, the government subsidises electrical pumps for farmers which they use to pump water putting a lot of strain on the electrical grids in India—a power-starved country.

The report states that with more than half of India's total area is facing high to extremely high stress, almost 600 million people are at higher risk of surface-water supply disruptions. Shrinking supply might have serious ramifications for the country's agriculture sector which uses 90% of the available water (pdf). While the current situation looks quite grim, there is a possibility that it can get worse. Water supply is expected to fall 50% below demand by 2030.

What are the root causes of India's water crisis?

India's water crisis is rooted in three causes. The first is insufficient water per person as a result of population growth. The total amount of usable water has been estimated to be between 700 to 1,200 billion cubic meters (bcm). With a population of 1.2 billion according to the 2011 census, India has only 1,000 cubic meters of water per person, even using the higher estimate. A country is considered water-stressed if it has less than 1,700 cubic meters per person per year. For comparison, India had between 3,000 and 4,000 cubic meters per person in 1951, whereas the United States has nearly 8,000 cubic meters per person today.

The second cause is poor water quality resulting from insufficient and delayed investment in urban water-treatment facilities. Water in most rivers in India is largely not fit for drinking, and in many stretches not even fit for bathing. Despite the Ganga Action Plan, which was launched in 1984 to clean up the Ganges River in 25 years, much of the river remains polluted with a high coliform count at many places. The facilities created are also not properly maintained because adequate fees are not charged for the service. Moreover, industrial effluent standards are not enforced because the state pollution control boards have inadequate technical and human resources.

The third problem is dwindling groundwater supplies due to over-extraction by farmers. This is because groundwater is an open-access resource and anyone can pump water from under his or her own land. Given how highly fragmented land ownership is in India, with millions of farmers and an average farm size of less than two hectares, the tragedy of the commons is inevitable. India extracted 251 bcm of groundwater in 2010, whereas the United States extracted only 112 bcm. Further, India's rate of extraction has been steadily growing from a base of 90 bcm in 1980, while this rate in the United States has remained at more or less the same level since 1980.

What are your recommendations to tackle the water crisis in India?

The following recommendations address the most important issues in India's water crisis.

First, the central and state governments should empower local groups with knowledge, understanding, and real-time information on the status of groundwater so as to manage extraction in a cooperative way. Since groundwater is an open resource, farmers extract as much as they can. But when everyone does this, it leads to extraction above a sustainable level. This problem can only be managed by a cooperative agreement among the users of the aquifer, who should know how much can be extracted without depleting the resource. The state can monitor and provide this information.

Second, India needs to promote watershed development and rainwater harvesting.

Third, India must educate people about the need for dams to store water. The environmentalists and other groups who oppose dams should be engaged in a dialogue to work out alternatives and build a consensus.

Should India adopt these recommendations at all levels—federal, state, and local—it will be a great step toward addressing the most critical issues causing the country's water crisis.

Although India has made improvements over the past decades to both the availability and quality of municipal drinking water systems, its large population has stressed planned water resources and rural areas are left out.

Regardless of improvements to drinking water, many other water sources are contaminated with both bio and chemical pollutants, and over 21% of the country's diseases are water-related. Furthermore, only 33% of the country has access to traditional sanitation.

One concern is that India may lack overall long-term availability of replenishable water resources. While India's aquifers are currently associated with replenishing sources, the country is also a major grain producer with a great need for water to support the commodity. As with all countries with large agricultural output, excess water consumption for food production depletes the overall water table.

Many rural communities in India who are situated on the outskirts of urban sprawl also have little choice but to drill wells to access groundwater sources. However, any water system adds to the overall depletion of water. There is no easy answer for India which must tap into water sources for food and human sustenance, but India's overall water availability is running dry.

India's water crisis is often attributed to lack of government planning, increased corporate privatization, industrial and human waste and government corruption.

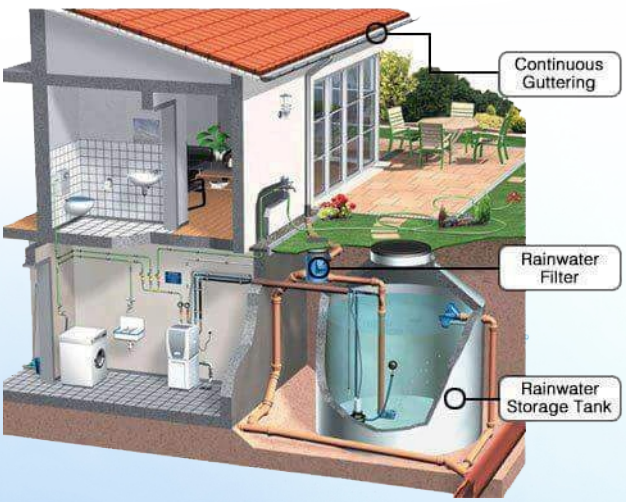
In addition, water scarcity in India is expected to worsen as the overall population is expected to increase to 1.6 billion by year 2050. To that end, global water scarcity is expected to become a leading cause of national political conflict in the future, and the prognosis for India is no different.

On a positive note, some areas of India are fortunate to have a relatively wet climate, even in the most arid regions. However, with no rain catchment programs in place, most of the water is displaced or dried up instead of used. In these areas, rainwater harvesting could be one solution for water collection. Collected water can be immediately used for agriculture, and with improved filtration practices to reduce water-borne pathogens, also quickly available for human consumption.

Whatever the means, India needs solutions now.

Children in 100 million homes in the country lack water, and one out of every two children are malnourished.

Environmental justice needs to be restored to India so that families can raise their children with dignity, and providing water to communities is one such way to best ensure that chance.



" Rain Water Harvesting"

Compiled By Shrikant Patil

Water

Mrs. Yogini Jagdale
(Guest Editor)

Clean and plentiful water provides the foundation for prosperous communities. We rely on clean water to survive, yet right now we are heading towards a water crisis. Changing climate patterns are threatening lakes and rivers, and key sources that we tap for drinking water are being overdrawn or tainted with pollution.

Water and Climate Change

From more severe and frequent droughts to unprecedented flooding, many of the most profound and immediate impacts of climate change will relate to water. More than one-third of all counties in the lower 48 states will face higher risks of water shortages by mid-century as a result of global warming. Other impacts will include sea level rise, saltwater intrusion, harm to fisheries and more frequent and intense storm events.

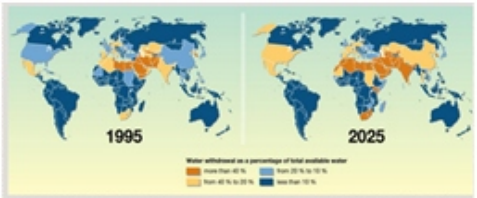
Pollution of surface water is a problem for over half of our planet's population. Each year 250 million documented cases of water-borne diseases are documented, with roughly 5 to 10 million deaths.

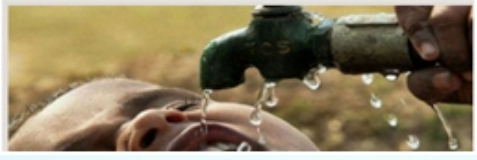
Fifty percent of worldwide groundwater is unsuitable for drinking because of pollution and only about .007% of the water on earth is accessible for human use.

The world water pollution and sanitation crisis claims more lives through disease than any war can claim through the use of weapons.

Every 20 seconds, a child dies from a water-related disease. Children in polluted environments often carry about 1,000 parasitic worms in their bodies at any time.

At any given time, half of the world's hospital beds are occupied by patients with water-borne illnesses.





Close to 85% of the total area of Bangladesh has contaminated groundwater, and the most dangerous contaminant is arsenic. Thus, 1.2 million people in this nation are exposed to the deadly effects of arsenic-contaminated water.

Asian rivers are considered the most polluted in the world. They have three times as many bacteria from human waste as the global average and 20 times more lead than rivers in industrialized countries.

In Ireland, about 30% of the rivers are polluted with fertilizers and sewage, which make them too polluted for swimming, fishing, or aquatic life.

Water and Climate Change\

One of the most polluted rivers in the world is the King River in Australia. Over 1 million sea birds and 100,000 marine mammals and other creatures have died from the toxins and acidity in this river. The U.N. estimates that by 2025, forty-eight nations, with combined populations of 2.8 billion, will face freshwater scarcity. According to the survey done by Food & Water Watch cites that approximately 3.5 billion people in 2025 will face water shortage issues. This will be mainly due to water pollution. This is likely to happen because the world pollution is increasing tremendously with more water sources getting contaminated as a result of water pollution.

Asia has maximum numbers of polluted rivers than anywhere else in the world. Most of it contains bacteria created from human waste. The 2011 Tsunami in Japan created 70 km long island of debris which is floating out into the Pacific Ocean.Rivers in Asian subcontinent re considered to be the most polluted. The bacteria (from human waste) found in these rivers are 3 times as much as that of the global average.

Aquatic animal have faced an estimated extinction rate five times more than that of terrestrial animals. Two million tons of human waste is disposed in water everyday. An estimated 1000 children die every day in India due to polluted water. Cruise ships are also a major source of water pollution. They produce over 200,000 gallons of sewage which is mostly released in the ocean. Apart form that, they are also causing at least 35,000 gallons of water contamination due to oil spill.

Population and the Environment
The Global Challenge

Mrs. Yogini Jagdale
(Guest Editor)

The rapid increase of human population is putting an incredible strain on our environment. While developed countries continue to pollute the environment and deplete its resources, developing countries are under increasing pressure to compete economically and their industrial advancements are damaging as well. The demands that this growth places on our global environment are threatening the future of sustainable life on earth.

One of the largest environmental effects of human population growth is the problem of global warming. The energy production (via power plants and coal burning) that is needed to support human life is increasing the emission of greenhouse gases into the atmosphere, which can lead to rising global temperatures. The more automobiles in use on the planet also contributes to the pollution problem and the injection of carbon dioxide into the atmosphere. Some scientists fear that global warming will lead to rising sea levels and extreme weather conditions in the future. In order to support the growing population, forests are being destroyed at an alarming rate. Many countries are constantly cutting down their forests to clear land for farming and to make room for housing.

Deforestation is harmful to the environment for several reasons. The tropical moist forests that are being lost provide homes for some of the most diverse animal and plant life on the planet. The clearing of these forests results in the extinction of many species, possibly including hundreds that are yet unidentified by scientists. Deforestation also adds to the problem of global warming, because trees naturally absorb carbon dioxide from the atmosphere.

Environment getting worse

In the past decade in every environmental sector, conditions have either failed to improve, or they are worsening:

Public health:

- Unclean water, along with poor sanitation, kills over 12 million people each year, most in developing countries. Air pollution kills nearly 3 million more. Heavy metals and other contaminants also cause widespread health problems.

Food supply:

- Will there be enough food to go around? In 64 of 105 developing countries studied by the UN Food and Agriculture Organization, the population has been growing faster than food supplies. Population pressures have degraded some 2 billion hectares of arable land — an area the size of Canada and the U.S.

- **Freshwater:**

The supply of freshwater is finite, but demand is soaring as population grows and use per capita rises. By 2025, when world population is projected to be 8 billion, 48 countries containing 3 billion people will face shortages.

- **Coastlines and oceans:**

Half of all coastal ecosystems are pressured by high population densities and urban development. A tide of pollution is rising in the world's seas. Ocean fisheries are being over exploited, and fish catches are down.

Forests:

- Nearly half of the world's original forest cover has been lost, and each year another 16 million hectares are cut, bulldozed, or burned. Forests provide over US$400 billion to the world economy annually and are vital to maintaining healthy ecosystems. Yet, current demand for forest products may exceed the limit of sustainable consumption by 25%.

Biodiversity:

- The earth's biological diversity is crucial to the continued vitality of agriculture and medicine and perhaps even to life on earth itself. Yet human activities are pushing many thousands of plant and animal species into extinction. Two of every three species is estimated to be in decline.

Global Climate Change:

· The earth's surface is warming due to greenhouse gas emissions, largely from burning fossil fuels. If the global temperature rises as projected, sea levels would rise by several meters, causing widespread flooding. Global warming also could cause droughts and disrupt agriculture

Conclusion:

If every country made a commitment to population stabilization and resource conservation, the world would be better able to meet the challenges of sustainable development. Practicing sustainable development requires a combination of wise public investment, effective natural resource management, cleaner agricultural and industrial technologies, less pollution, and slower population growth.

A HIGH FLIGHT INTO THE HORIZON
ARCHITECT FRANK GEHRI

Ar. Pramod Chaugule
Editor, Greenergy

Each common man has a heartfelt desire to achieve something extra-ordinary, during lifetime. Each person strives for that! It is not necessary for a common man to actually do something extra-ordinary, it is also a satisfying desire, if something unusual happens on its own, or may be at least see something unusual and out of this world, during the lifetime. But there are some extra-ordinary personalities who do extra-ordinary things every day, with their own hands and that too not for themselves, but for others. Their endeavours too are extra-ordinary and they are meant to be! Such personalities exist amongst common people but they themselves stand out as uncommon identities! On 25th February, I was going through an article describing the twenty four fantastic creations of extra-ordinary artists, on the occasion of Architect Frank Gehri's eighty-fifth birthday! I bow with all my heart to this great architect of a difference, born in Canada, on 28th February, 1929 and wish him a very long life!

Some people are born to be extra-ordinarily talented. This fact keeps peeping in our mind, the moment you see him and his creations. Architects in Canada have no other alternatives than using very special techniques in architecture, as Canada is a very hilly and snowy terrain. Gradually these professionals gain expertise in these techniques and become legends in their own right! Frank Gehri is one such legend! He started his career as a truck driver, switched over to a chemical engineer, till in 1954, when he became an architect. He loved his art and has become a major example in the field of architecture. Armed with a degree in City planning from Harvard University, he started his career in 1962, in California. He created his own special mark in his own field, by starting with very small projects, of a different nature, eye-catching and attractive.

He had a very different style of architecture, stated as the “style of distinct vision”. Even when it is a fact that structural engineers and their science plays a very significant role in all creations of architects, this architect had a hobby of erecting structures, thinking much ahead of times, on his own! His creations depict his style of working and the type of long lasting impact it created in the field of architecture.

We architects always debate on whether “Function follows form” or “Form follows function”. Frank Gehri was always very sure on his stand about “Function follows form”. His science, which started from his own house in Santa Monica, was a difficult one to follow, for the commoners but today it is being established as a different style for the upcoming generations. I don't see anyone who had so many chances in one's career, of building and designing museums and art galleries, than Frank Gehri! He has been applauded with many awards for his outstanding creations which have been great spots of tourist attractions, right from Guggenheim museum; Bilbao, Spain to Walt Disney concert hall, Weisman art museum, Art gallery of Ontario to O'Keefe museum of art. He has received many prestigious awards like “Order of Canada”, to “Pritzker Architecture prize”, at the hands of stalwarts.

He was criticized for his different and eccentric style, but he always stood strong and satisfied. He took all the criticism in his stride and as an essential part of life. He always tried to inculcate new thoughts and ideas from literature, in his creations and buildings for the benefit of the society, but these also invited sarcastic remarks related to extravagant expenditure.

But it is also true that immortal and ever-lasting creativity is not possible unless something is done out of the way! We fall short while giving proper directions to our next generations, if we do not do something outrageous and extraordinary.

Not everyone has the courage to build a dancing house! To present such a creation before public, we have to listen to so many different sarcastic remarks from so many people along with the facing of all types of hurdles and after effects. Frank Gehri always maintained a proper balance of all these issues and could organize various exhibitions of his work. Through these exhibitions, many astounding facts came before the world, along with his creations. It included his various designs specially created for the world famous "Tiffany and Company", designs for the trophy of "2004 World Cup Hockey", designs for the Prada hats in 2009 brought forth by the famous pop star Lady Gaga and the latest software "Digital Project" handed over to all the architects in 2014. It is a dream of all the artists in the field to get an opportunity to work with an artist of such a calibre, which is realized by very few. I could visit one of his creations in my Europe trip but it didn't give the desired complete satisfaction, which I craved for! Probably, next year's visit to his house in Santa Monica would prove to be the pinnacle of satisfaction. Let's see what fate has in store!!!

THE FOREST MAN OF INDIA
A TRUE HERO !

Dr. Jaya Kurhekar
Executive Editor, Greenergy

This is a story of a "Forest man" who transformed a leafless, treeless, barren wasteland island to a blooming forest, by continuously planting trees, for thirty consecutive years. The title of "The Forest Man of India" was conferred upon him by the then president, A.P.J. Abdul Kalam.

Very recently, Padmabhushan Awards, the highest honour in India, were distributed at the hands of the President of India and one unknown recipient was Jadav "Molai" Payeng!

Jadav "Molai" Payeng , aged fifty six, has dedicated his life, since 1979, to the sole duty of planting trees and covering Mother Earth with greenery. His dedication and focus has been so great that he has succeeded in planting each tree with his own hand and erected a jungle called "Molai Kathoni" on a huge, two hundred and fifty acres of wasteland, a barren island, in the basin of river Brahmaputra. "Molai" is his nick name and "kathoni" designates "jungle"!

His jungle is full of one hundred and ten types of useful medicinal trees like Bambu, Saag, Kate Sawar, Subabhul, Kadamba, Ain, Arjun, Kapok and Shewari. Hippopotamus and Rhinos from the nearby Kaziranga sanctuary, elephants from Arunachal, come to stay here for three to four months. Bear, deer, rhinos, striped Royal Bengal Tigers are seen in these jungles. Molai Kathoni has been a home for birds like sparrows to vultures and eagles.No one was aware of this person, till about five years back. Today Jadav "Molai" Payeng has a new identity as "The Forest Man of India".

It took thirty years for this Jadav Payeng's "World of forests on barren island", to be known to the outside world. Very much coincidently, the information about Jadav Payeng's island world came into lime light, because of a Jeetu Kalita, a news reporter and an amateur photographer. Jadav Payeng resides in a typical bamboo house, in Kokilamukh area, about twenty five kilometres from Jorhat, the cultural capital of Assam. The road leading to the house is very bad. Very silently flowing Brahmaputra River bifurcates very close by and then unites again, as it flows further.

Jadav Payeng's surprising and miraculous journey was initiated by a question, "Nature bestows us all resources with both the hands but what do we give, in return"? He had seen the disastrous Brahmaputra floods, in childhood, which did not allow a single tree to be left on the island! Hundreds of snakes died in the scorching heat, because there was neither any shadow nor any burrow to hide! At a young age of sixteen to seventeen years, Jadav Payeng became restless with a worry that even human beings will face this situation, one day, if there were no trees left. Elderly people made fun of him and advised him to plant trees. They also gave him a few Bamboo trees. Taking the advice very much to heart, he started planting trees singlehandedly and his work continues, even today!

For the last thirty years, he has been slogging like a mad person. Getting up at three thirty in the morning, crossing the river in his own boat, he goes to the island, collecting small plants and seeds and planting them after digging trenches. He takes a follow up every day and takes care that the plants grow, despite adverse conditions of rains, heat and winds!

It takes about half an hour, to cross the river by a boat, to Molai Kathoni, followed by island Aruna Sapori after which we reach the cow shed of Jadav Payeng, after about a walk of five to seven kilometres. Tending pigs and about fifty to sixty cows, helps him in getting daily bread. Next to the shed, is a small fencing, inside which, vegetables have been planted. Everything grown here, right from cow milk to rice and vegetables, is organic, free of any chemical poison.

Every tree in the Molai Kathoni forest has its own story.

In the initial stages, the elephants that came to the jungles destroyed the village and the houses in the village. Disturbed villagers came to hit Payeng and cut down the trees in the forest. Payeng took a stance that they would have to first cut him down, before cutting the trees. This pacified them. He had just a simple thought that the elephants should get what they like, from the jungles, so that they would stay in the jungles.

Jadav did not waste even a single plant, during the initial period of erection of the jungle. About ten years back, a small plant came floating to the island with a wooden plank, which he saved delicately and planted it here. Today it is transformed into a great, huge tree supporting life.

Jadav is continuously thinking of just one thought, about planting trees, which will take root early and grow quickly. The island has one tree which protects animals and birds during floods. He had brought big, red ants and left them near the roots of the tree, so that they would eat up the white ants, eating up the tree. This idea worked and the ants now have a huge ant hill, in the huge stem of the tree which protects many important components of the ecosystem during floods.

A complete, self-sustaining ecosystem is visible in Molai Kathoni. Jadav hates human interference in this eco-system. In the initial period, hunters killed rhinos, the fossils and remains of which are still visible in the jungles. Jadav firmly believes that the greatest danger Mother Earth faces is from human beings. He shows the visitors, all those places which are visited by tigers and elephants. Tigers have killed his sixty to seventy cows till today but he doesn't complain about them.

He doesn't take the credit of planting the jungle alone on the one thousand, two hundred and fifty acres of Wasteland Island. According to him, birds, winds and every component of nature is equally responsible.

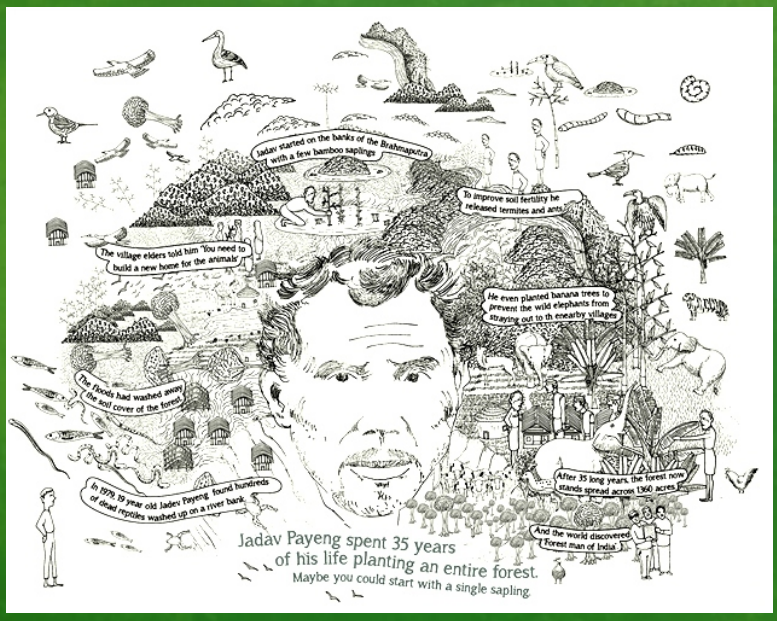
He suggests that if we wish to protect Mother Earth from the drastic weather changes, we should plant trees. He is confident that the younger generation will preserve and protect, what we have planted. He insists that the lessons of environment protection should be included in all school syllabi. He believes that if each student plants just two trees and takes care of them, the Mother Earth will be greener.

Crossing one more stream of Brahmaputra, Jadav has discovered another island "mekahi" beyond Muloi kathoni. He has already started his favourite job of planting trees on the two thousand acres land of Mekahi, since last four years. He has decided that he will grow a jungle on Mekahi, the barren sand island, in the forthcoming years.

Many people visit Molai Kathoni, to see Jadav's work and take inspiration from it. He is happy and satisfied that at least after thirty years, his work has reached people and it is being acclaimed worldwide!

He is being internationally known as "The Forest Man of India". He is being felicitated and awarded by many states and country. But he believes that planting trees is a more important job.

We feel very small when he says that his house is one thousand, two hundred and fifty acres big. The forest man is striving towards establishing real jungles on sand islands and on the other hand, human beings are cutting down trees to erect cement jungles. Jadav Payeng stands out in the crowd, which selfishly thinks only about own family, while he is worried about the birds, animals and Mother Earth. He is our great hero because he dreams of and strives towards carrying forward and gifting the next generation with a greener, lush Mother Earth!



The clouds have floated away,
With the depleting trees and greenery turning grey!
Water has evaporated without the dark and heavy cloud,
Green pastures and agricultural land stand barren without irrigation, screaming loud!
Declining greenery has led to declining prosperity,
There is chaos and stress without prosperity and heavenly charity!
Cutting down of trees has led to such a lot of damage,
Nature is not happy with us; keep in mind and heart, it's a package!
Nature has sent a warning message, to all those who are alive,
To plant more trees and help them survive!

Our breathing is in jeopardy,
Oxygen is depleting,
Plant trees to breathe freely,
Plant trees for our being!!

Dr. Jaya Kurhekar
Executive Editor, Greenergy

Water Supply and Drainage at MACHU PICCHU

Er. Nikita

The city of Machu Picchu, once the royal estate of a powerful Inca emperor, lay hidden in the mountains of Peru until 1911, when Hiram Bingham, a professor of history at Yale, discovered its ruins. Since then, it has become perhaps the most important archeological site in the Americas. Most people know Machu Picchu not for its history, but for its breathtaking beauty (see Photograph 1). For years, few even with the scientific community recognized that it also represents a remarkable achievement of civil engineering.

Photograph 1. Machu Picchu's unique geography presented Inca engineers with a number of challenges

In 1450 the Inca came to [Machu Picchu]–2,440 m. high mountain ridge in the Andes–with one goal in mind: to build an estate for their emperor, Pachacuti. The site was perfect, but its suitability would been apparent only to a trained engineer. The slopes were steep; how would buildings be prevented from sliding downhill in a heavy rain? How would drinking water be made

Water Supply

Wright's research revealed that the Inca must have planned the city carefully before building it. First, the Inca engineers had to determine the exact location of the spring and whether it would meet the needs of the anticipated population. The spring, on the steep mountain slope to the north of Machu Picchu, is fed by a 16.3 ha tributary basin. After conducting an inflow-outflow evaluation, it was concluded that the spring draws on drainage from a much larger hydro-geographic catchment basin.

The Inca enhanced the yield of the spring by building a spring collection system set into the hillside. The system consists of a stone wall about 14.6 m long and up to 1.4 m high. Water from the spring seeps through the wall into a rectangular stone trench about 0.8 m wide. Water from a secondary spring enters the canal about 80 m west of the primary spring. The Inca also built a 1.5 to 2 m wide terrace to allow easy access for operating and maintaining the spring works. The condition of the spring works is surprising. The spring works is still intact and working, after all these centuries of abandonment.

Before the city could be built, however, the Inca engineers had to plan how to convey the water from the spring–at an elevation of 2,458 m–to the proposed site on the ridge below. They decided to build a canal 749 m long with a slope of about 3 percent. With the city walls, the water would be made accessible through a series of 16 fountains, the first of which would be reserved for the emperor. Thus the canal design, determined the location of the emperor's residence and the layout of the entire city of Machu Picchu.

The Inca built the water supply canal on a relatively steady grade, depending on gravity flow to carry the water from the spring to the city center. They used cut stones to construct a channel that typically ranged from 10 to 16 cm deep and 10 to 12 cm wide at the bottom. It was concluded that the nominal design capacity of the channel was about 300 L/min, or more than twice the typical 25 to 150 L/min yield of the primary spring (see Photograph 2).

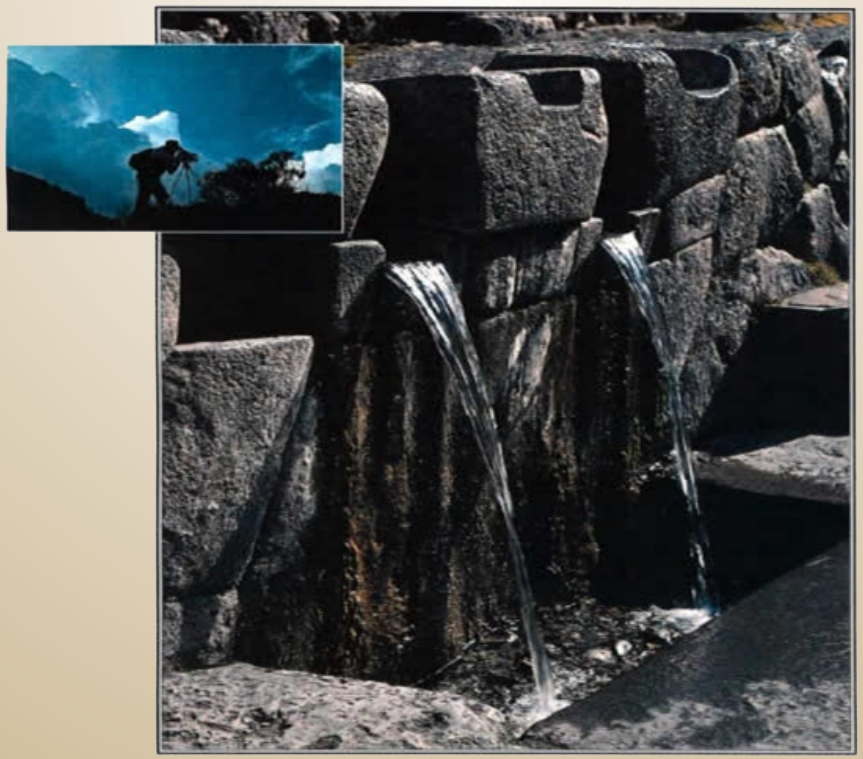
Photograph 2. The Inca supply canal flowed gently into Machu Picchu at an engineered grade on a carefully built terraced right-of-way.

In 1450 the Inca came to [Machu Picchu]–2,440 m. high mountain ridge in the Andes–with one goal in mind: to build an estate for their emperor, Pachacuti. The site was perfect, but its suitability would been apparent only to a trained engineer. The slopes were steep; how would buildings be prevented from sliding downhill in a heavy rain? How would drinking water be made accessible?

Water Supply

The canal descends the mountain slope, enters the city walls, passes through the agricultural sector, then crosses the inner wall into the urban sector, where it feeds a series of 16 fountains known as the stairway of fountains. The fountains are publicly accessible and partially enclosed by walls that are typically about 1.2 m high, except for the lowest fountain, which is a private fountain for the Temple of the Condor and has higher walls. At the head of each fountain, a cut stone conduit carries the water to a rectangular spout, which is shaped to create a jet of water suitable for filling aryballo–a typical Inca clay water jug. The water collects in a stone basin in the floor of the fountain, and then enters a circular drain that delivers it to the approach channel for the next fountain.

Researchers studied the fountains in detail, conducting hydraulic flow tests and measuring the channels and outlets (see Photograph 3). They concluded that the Inca designed the fountains to operate optimally with a flow of about 25 L/min, but the fountains would operate with flows as low as 10 L/min and could handle a maximum flow of 100 L/min. The team found water control points at two places along the canal where excess water would have spilled onto the agricultural terraces or into Machu Picchu's main drain before reaching the fountains.



Photograph 3. The water supply canal ends in a series of 16 semiprivate fountains.

Study of Machu Picchu's hydrology and hydraulic engineering led them to conclude that the Inca understood the importance of pure drinking water. The surface drainage system generally directed agricultural and urban storm water runoff away from the water supply canal. Wright also notes that the Inca apparently did not use the fountains for bathing. The emperor, for example, had a bathing room with a separate drain, so that bathing water did not reenter the water supply.

In 1998, they discovered another, previously unknown series of fountains on the eastern side of the ridge, downhill from Machu Picchu. These fountains received their water not from the canal but from intercepted groundwater drainage. While elaborate spring works were not necessary here, the Inca would have had to identify the dry-weather groundwater flow locations to concentrate the flow for use in the fountains. Adjacent to some of the fountains, an important trail, was also discovered, connected Machu Picchu to the Urubamba River in the valley below. After clearing away the dense forest undergrowth, the team restored the water flow to this second series of fountains for probably the first time in 450 years.

How successful were the Inca in planning their water supply? Observers have advanced several theories to explain why the Inca abandoned Machu Picchu; some suggest that a water shortage forced the Inca to leave. A hydrological analysis showed that the yield of the primary spring was related to rainfall. determine rainfall levels during the time the Inca occupied Machu Picchu–from 1450 to about 1540–Wright analyzed ice core data from a glacier that lies 250 km to the southeast. The analysis suggested that Machu Picchu received nearly 2,000 mm of rainfall annually and that in the final decade of occupancy rainfall actually increased.

It was determined that a flow of 10 L/min to the fountains during the dry months would have been enough to meet the needs of the population–estimated to have varied from 300 to 1,000 when the emperor was in residence. In the winter of a dry year, the Inca may have experienced a temporary water shortage. But the discovery of the trail leading down to the Urubamba River seemed to confirm that the Inca would have used the river as a secondary water source water source. Therefore, it was concluded, a water shortage does not explain the abandonment of Machu Picchu.

Drainage

At Machu Picchu, drainage is a serious problem. The site rests on top of a ridge with a roughly 50 percent slope. The site rested on top of a ridge with a roughly 50 percent slope and received almost 2,000 mm of rainfall. For their city to endure, the Inca had to find a way to keep it from sliding down the mountain.Perhaps the most visually striking features of the drainage system are the agricultural terraces. Machu Picchu includes 4.9 ha of agricultural terraces, which are held in place by stone retaining walls. In addition to maximizing the land available for farming, the terraces also protected the agricultural sector from erosion. Researchers conducted soil analyses that showed that the Inca constructed the terraces with subsurface drainage in mind. They layered each terrace for efficient drainage, with a layer of stones at the bottom, followed by gravel, sandy material, and topsoil.

The terrace structures also promote good surface drainage. The slope of terraces generally directs water toward a system of drainage channels that are integrated with stairways and other structures. These channels direct the drainage water to a large, east-west main drain that runs through the center of Machu Picchu, separating the agricultural and urban sectors. Gravity flow carries runoff into the main drain in both sectors, taking it safely away from the city.

In one instance, the Inca apparently experienced a landslide while a part of the terrace area was under construction. In this area, close to the main drain, the terraces are offset by 1 to 2 m. Team speculates that after the landslide, the Inca stabilized the terraces and continued to build the walls but did not attempt to correct the offset. The Inca engineers realized, however, the importance of controlling surface runoff in this area. Just uphill from the place where the water supply canal crosses the terraces, they built a north-south interceptor drain. This 42 m long channel carries runoff from the land above into the main rain.

In the urban sector, the Inca took equal care to address drainage. Excavations found that the Inca constructed their plazas in the same way as their terraces, with a deep subsurface layer of rock chips. The plazas received runoff from other areas of Machu Picchu, and the subsurface layer of rocks helped the water to penetrate the ground quickly.

To understand the problem of urban surface drainage at Machu Picchu, it is important to remember that the city appeared much different in the 15th century than it does today. The buildings in the urban sector would have been covered with thick thatched roofs. Also it was estimated that about 60 percent of the water yield from the urban area would have occurred as surface flow.

To deal with the runoff problem, the Inca incorporated about 130 drainage holes into the walls and other structures at Machu Picchu. They also integrated numerous drainage channels into stairways, walkways, and building interiors to carry runoff to the main drain. One especially carefully constructed channel drains water away from the entrance to the emperor's residence. To direct water away from building foundations, the Inca carved channels that would collect the water that dripped from the roofs.

Based on their measurements of the urban drainage outlets, The team calculated rough Inca drainage criteria. They determined that the Inca placed one outlet for a tributary area of about 200 m^2, and the design flow per outlet was about 500 L/min. The typical outlet size was 10 by 13 cm. The Inca departed from this scheme, however, when other means were available to remove runoff. As the Temple of the Condor, for instance, they built only one drainage outlet for an area of 0.045 ha, apparently because they understood that a system of subterranean caves beneath the temple was sufficient to handle the runoff.

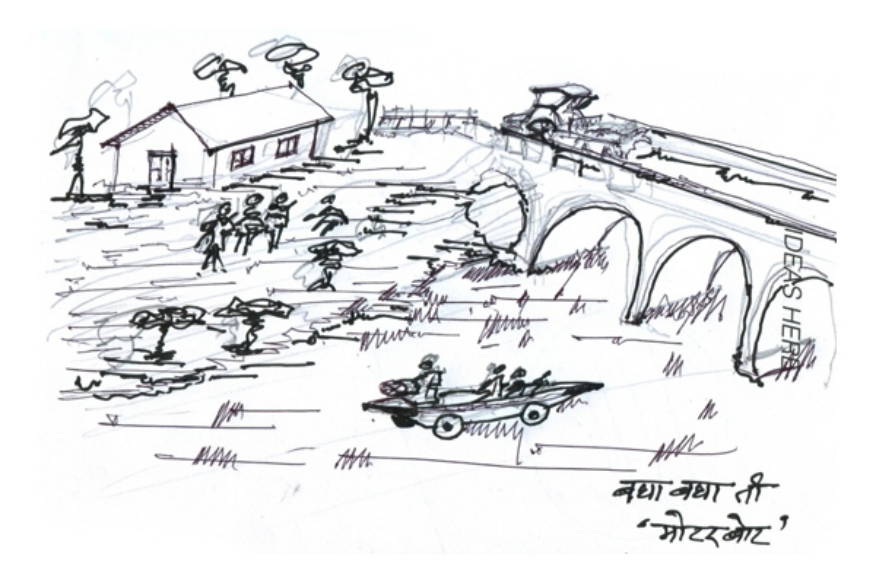
Machu Picchu's well-designed drainage infrastructure is one of its most remarkable secrets. It is also one of the keys to its longevity, "They built for permanency. They didn't go halfway." Perhaps the greatest testimony to their success is that the city still exists in such good condition.

Agriculture

Were the crops irrigated or was rainfall sufficient to support the agriculture? Did the terraces produce enough food for the population?The analysis of the annual rainfall and crop requirements determined that the rainfall was sufficient to supply the crops. This finding corroborated his study of the water supply and drainage infrastructure, which showed no evidence that the Inca irrigated their crops. The water supply canal crosses the agricultural sector but includes no turnouts to irrigate the terraces. In addition, the team found no evidence that surface runoff was used for irrigation; it was simply directed into the drainage system.

The study did show, however, that the crops grown on the agricultural terraces–probably mostly corn and potatoes–would not have been enough to feed the resident population. Therefore, he concluded, the Inca must have imported food to Machu Picchu.

Green Toon



Ar. Pramod Chaugule
Editor, Greenergy

Green Thinking !

If you know the art of being friendly, you can share with as many people as possible, with as many animals as possible, with as many trees as possible !

Compiled by AGS

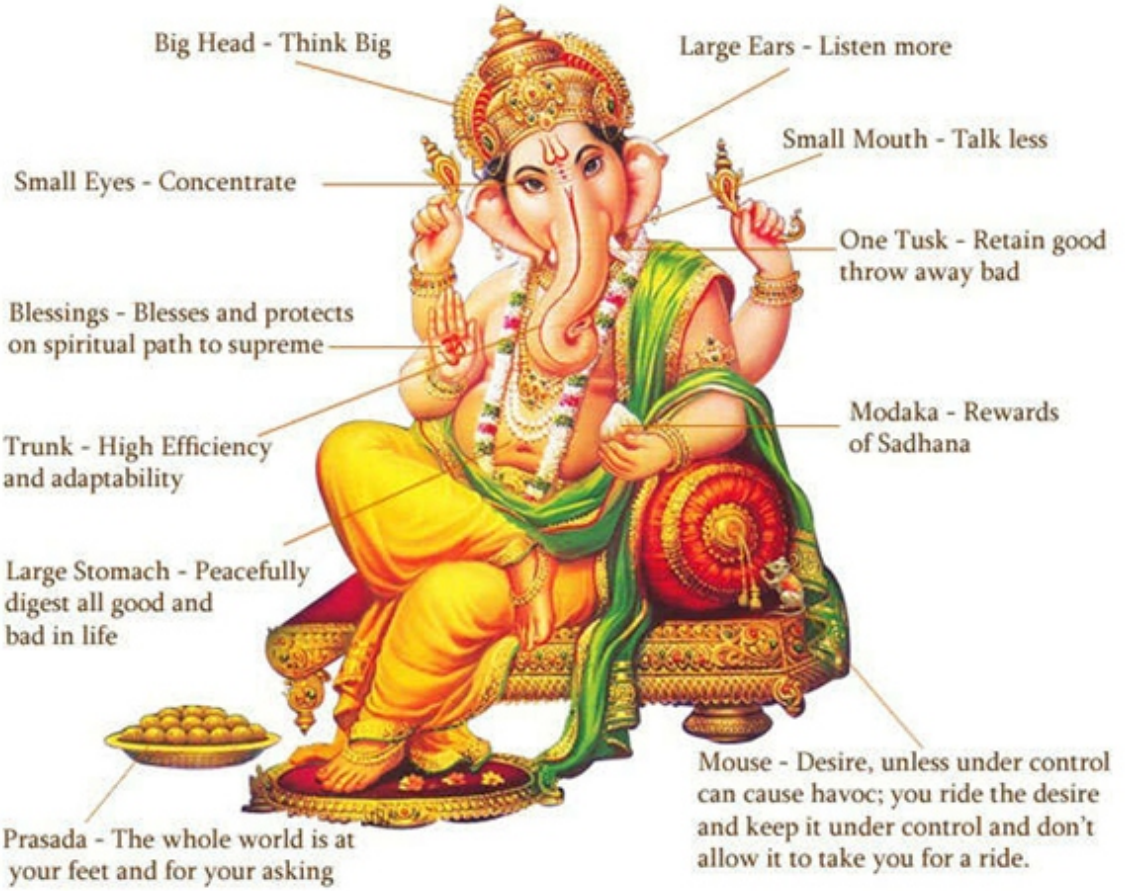
Green Dose !

Trees provide us benefits, that too without tax, Inspite of that, we put them under axe !

Trees are useful to us in one way or other, But to preserve them do we really bother !

Devendra Khot

Green Ganesha !



Origin of the Festival:

- Ganesh is the God of Wisdom.
- It is celebrated on in the Hindu Calendar month of Bhadrapada, starting on the Shukla Chaturthi.
- In olden days Ganesh festival was a purely family affair.
- There are also references in historical records to similar celebrations during Peshwa times.
- Years later it became a practice to end the festivities on 'Anant Chaturdashi' with the immersion of the Ganapati idol in water.

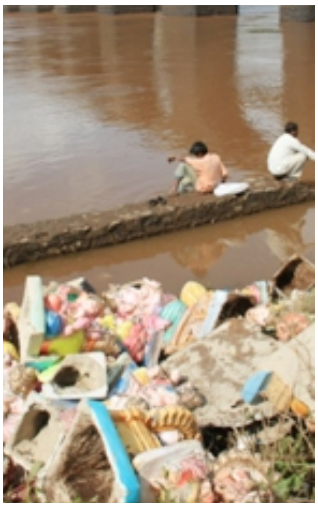
Sarvajanik Celebration:

- Lokmanya Tilak in 1892 saw the grand scale festival was celebrated in Gwalior and the enthusiastic participation of people therein. This alone inspired him to make the Ganesh festival a public event in Maharashtra.

- Tilak wished to bring about social change for political reasons too. He was convinced that social change was the key to political awareness.

- It is in these circumstances that in 1893 he appealed to the people to make it a festival of masses.

Current Scenario:



- Everybody loves celebrate Ganesh festival with great zeal.
- But the most serious impact of the Ganesh festival on environment is due to the immersion of idols.
- The immersion of idols made out of chemical materials causes significant water pollution.
- The use of thermocol and plastic in pandals as well as for garlands and other decorations increases non biodegradable waste.
- The toxic waste from these materials kills plant and animal life in the water bodies.

What can we do...????

- USE ECO-FRIENDLY GANESH IDOLS AVOIDING POP & SYNTHETIC COLOURS.
- LIMIT SIZE & NUMBER OF IDOLS IN
- YOUR COMMUNITY.
- SAVE ENERGY.
- USE NATURAL COLOURS FOR RANGOLI
- ECO-FRINDLY DECORATION.
- BAN PLASTIC.
- LIMIT THE NOISE POLLUTION.
- MINIMIZE THE PUBLIC PENDOLS.
- USE ARTIFICIAL IMMERSION TANKS.
- COMPOST PIT FOR NIRMALYA.
- SUITABLE PLACE AVOIDING TRAFFIC CONGESTION.
- SYMBOLIC IMMERSION

Compiled by AGS

Hindu temple architecture and style

Brihadeeswarar Temple, Tamil Nadu

One of India's greatest architectural traditions is Hinduism – a religion that focuses on the worship of powerful gods and goddesses. Hindu architecture in brick and stone begins only in the 4th-5th centuries AD, but has developed more or less continuously to the present day. It is hardly surprising, considering the extent of India and the diversity of building materials and techniques, that Hindu temple architecture evolved distinctive regional patterns that are sometimes classified into two broad categories: Nagara, or the North Indian temple style, and Dravida, the South Indian style.

Nagara Temples

Jagadamba Temples Khjuraho, MP

Terraootta Temple, WB

Solanki Architecture

Sun Temple, Konark

Hoysala Architecture

Tirumala Venkateswara Temple

Meenakshi Temple

Sri Thendayuthapani Temple

The important aspect of Hindu temple is that it serves as a cosmic intersection of man, God, and the Universe. But it also is the Universe, reflected in its repeating architectural forms.

The temples inIndiahave always taken an important place in their cultural and spiritual life of its people, from the early times and till nowadays. In fact the whole cultural and spiritual life of Indian people is built around the temple. The overall purpose of the Hindu temple can be presented in such a way: like theHimalayas, the temple points to the heavens, the abode of the gods. The Hindu temple, "step by step, shape-by-shape" reverses this primeval descent and places man back on the path toward heaven.

Early Hindu temples as sanctuaries associated with the cult of some deity, appeared inIndiain the late first millennium BC. They are characterized by reproduction of the main forms of the Vedic altar, with the elaboration of new structural units subordinated to the problem of symbolic reproduction of the structure of the universe. The basis of the plan of the temple was laid mandala – a conventional image of the universe. It turns out that the temple – is a model of the universe.

Temples were usually built in places marked by special holiness. The legends associated them with the acts of Vishnu, Shiva, Durga and other gods. In the 4-5 centuries, when Hinduism during the reign of Gupta dynasty, became the state religion, the main structural elements of the temples were plinth, sanctuary and superstructure. The stone base of a Hindu temple symbolized the altar, on which the temple itself was sacrificed to a deity. With the modular characteristics of the proportions of the temple measure can nottaken into account. The temple was conceived as a structural unit, resting on the altar. In some early temples the wall of the sanctuary served as main walls of the building, in others – the sanctuary was surrounded by a second ring of walls, which created a special gallery to circumvent. In any case, the churches were dark inside.

Module for Hindu temples and their center was a sculpture of a deity – his idol. Templepriests were called "guardians of the idol and the servants of God, whose dwelling was in the temple. Modern scientific analysis of a temple shows that temple-space is surcharged with great positive energy and the visitors can feel physical welfare and mental well-being. This fact rises a lot of questions: how could a structure built of stone or of brick have that kind of energy? What makes the temple so powerful?

There is a scientific view that a temple is "not a home of God but it is the form of God" that means that the temple structure itself is worthy of worship.

The temple architecture is a scientific phenomenon. The basic concept that determines worthiness of the structure and form of temple is ***"The layout adopted for temple form is synonymous with the layout of the Cosmos".*** The plan of the layout of a temple is technically called *Mandala* or *VaastuPada*with a grid of 8x 8 =64 spaces or 9x 9 = 81 spaces of equal dimensions. In modern architectural terminology this can be addressed as energy-grid. Those two layouts are the geometrical formulae to replicate the subtle substance of the universe into visual material form.

The important aspect of Hindu temple is that it serves as a cosmic intersection of man, God, and the Universe. But it also is the Universe, reflected in its repeating architectural forms. The careful mathematical measurements that lie in the basic construction of a Hindu temple express the structure of the Universe. For example, in order for the temple to face east, its width must be a perfect multiple of the fraction three-eighths. The outer dimensions of the temple must also satisfy five other equations relating to stars, planets and the passage of time.

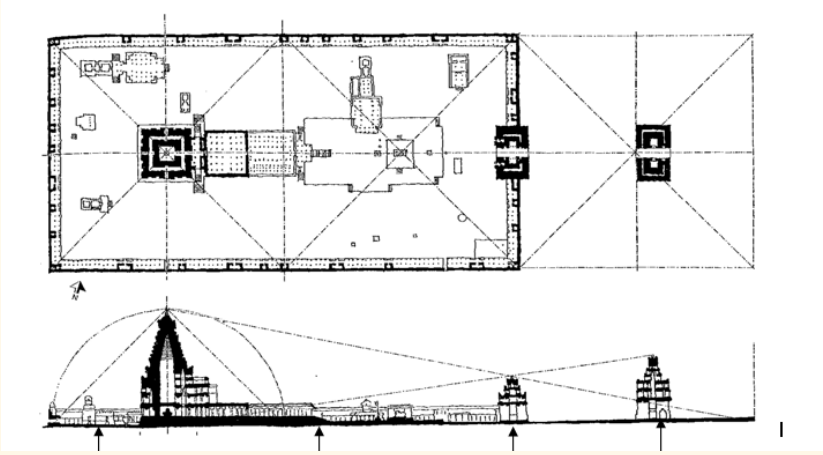
Another important analogy is between the temple and the mountain that can help to understand the divine purpose of the temple—to serve as a meeting place between man and the gods. It means that the gods could descend to be in the presence of man, like human souls rising up to meet the gods. The piece of land upon which the temple stands is itself a sacred location – a *tirtha*, a Sanskrit word literally meaning "crossing place" is a site favored by the gods where water, shade and seclusion are plentiful.Temples must be built on tirthas in order to serve their true purpose as crossing places, and this site selection is only the first step in building a temple.

Another important aspect is the *vastu-purusa-mandala* , that is a rough architectural blueprint for the foundation of the temple, that serves both a practical and a highly symbolic purpose, becoming the architectural and spiritual foundation of the Hindu temple.

The *garbhagrha*, the sanctum sanctorum of the Hindu temple, presents itself as a point of departure: if the temple is a mountain, the garbhagrha is the cave inside the mountain. The garbhagrha is dark, and its walls are largely undecorated, that contrasts the exterior of the temple, which is often highly ornate and replete with thousands of sculpted images. The simple darkness of the sanctum reflects its function as a "womb house," one of the meanings of garbhagrha.

The distinctive architectural styles of Hindu temples have so developed due to its broad geographical, climatic, cultural, racial, historical and linguistic differences which are especially significant in the two major styles of Hindu temple architecture i.e. in the temples of the northern plains and in the southern peninsula of India. Hindu temples of these two regions have been classified as the ***Nagara***or 'northern' style, the ***Dravidian*** or 'southern 'style. The temples in India are found everywhere varying from small villages to the metropolitan cities. The Indian Temples are not only the abode of God forming the link between God and man and a place of worship, but they are also the cradle of knowledge, art, architecture and culture.

The Hindu temples of India has been a subject of study for numerous historians, religious scholars, art historians, photo-journalists, archaeologists, architects and other professionals. There is scope formuch study on Hindu temples in different regions of India not just based on the iconography, form andtransformation but more on their building technology and structural analysis. Some studies have beenundertaken.Therefore there is scope for further understanding of the structural aspects of Hindu temple and it can be a subject of more structural analysis like safety analysis and stabilityanalysis of structures including calculation of the maximum average stress at the foundation andcolumns, the thrust analysis of the *sikhara*, and post & lintel etc.



This diagram shows the plan and section of the traditional grid and ratio of elements with each other, primary sacred spaces of the ***Brihadeeshvara Temple*** (1010 AD) in ***Tamil Nadu***, India, listed as one of UNESCO"s World Heritage sites.

ABHALMAYA FOUNDATION

Studio 8-8-8, Local Board Colony, Near Udyog Bhavan, Sangli. 416416.
Ph.: +91 233 2675888, Fax : +91 233 2670388.
E-mail: abhalmaya888@gmail.com, web: abhalmaya888.org