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The Virtual Conference focused on advancing the Sustainable Development Goals. The themes for short paper submissions were based on the Sustainable Development Goals.

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# Contents

Gender Equality and Women Empowerment ........................................................................................................... 3

A Low-Cost Product Based Waste Management Model For Itanagar-Naharlagun, Arunachal Pradesh, India ......................................................................................................................................................... 7

The Whole is Greater than Sum of its Parts .................................................................................................................. 12

Fulfilling SDG-3: DALYs averted in rural kitchens through design ............................................................................. 18

Climate Change in India: Challenges and Solutions .................................................................................................... 24

Quality Education- A Modern Approach Towards A Noble Cause ............................................................................... 29

Development Of Clay Based Water Purifier Considering Local Needs, Skills And Materials ............................... 34

Legislative Approach to Hunger Mitigation in India: The National Food Security Act, 2013 ................................. 40

Sustainable Development Through Community Farming: Case Study Of A Western Indian Tribal Village ............................................................................................................................................................. 45

Combat Climate Change With Solar Power .................................................................................................................. 50


Climate-Smart Agriculture: An Address of Food Security and Climate Change ......................................................... 60

Status of Renewable Energy in India: A Review ............................................................................................................ 68

The Human Rights Approach To Climate Change ....................................................................................................... 73

Health Drinks for Moderately Acute Malnourished Children ................................................................................. 77

Assistive Device For Indoor And Outdoor Mobility Of Visually-Impaired People .................................................... 83

Climate-Smart Agriculture: An Address of Food Security and Climate Change ......................................................... 89

Applications Of Nanotechnology In Smart Civil Construction ................................................................................ 95

Case Study: Understanding the effectiveness of Light Shelves for deep office spaces in Warm and Humid Climate ............................................................................................................................................ 103

Engineering for achieving Social, Economical and Environmental Goals of Sustainable Development ................................................................................................................................................. 108

How Equal is Gender Equality? ..................................................................................................................................... 113

Bridging Self-Sustenance and Corporate Social Responsibility .................................................................................. 120
Gender Equality and Women Empowerment

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ABSTRACT:
Today achieving gender parity has become a major challenge for the world. It is considered as a vital part of development strategy in many countries. The development of the country would be faster when both men and women have equal access to use the services and resources without any prejudice. The gender equality reinforces the ability to grow, to eradicate poverty and to administrate properly in the country. But still gender discrimination remains insidious in many dimensions worldwide even after the creation of awareness, different strategies and programmes and considerable efforts. Women and girls abide the direct costs for these inequalities. The women’s empowerment gives the power to the marginalized women, eliminates gender inequalities and enhances on women’s wellbeing.

KEY WORDS: GENDER, EQUALITY, WOMEN, EMPOWERMENT, EDUCATION, EMPLOYMENT

INTRODUCTION
In the Book of Genesis (Hebrew Bible), it is mentioned that God created Eve from the rib of Adam as of his companion. The equally charming myth is also associated in religion Hindu. The creation of woman was done by the supreme God ‘Brahma’. He accessed the beautiful constituents of nature and created woman out of it. From the both myths, it is clear that woman was created as play-mate or as a companion for inherent loneliness. The myths itself give their approved status. The subjugation of women was due to age-long prejudices and cultural barriers. They were confined to home and restrictions were laid to their mobility and face seclusion. In the social hierarchy, the view for women was biased due to the racial prejudices. As a result of patriarchal code of living, she got the inferior status and had no personality of her own in her family. With the 74th amendment to the Constitution, a whiff of change was caused due to the empowerment in the substantial role of women. Empowerment means ‘to become powerful’. It is an active multidimensional process which enables women to recognize their identity and power in all spheres of life. With the globalization and technological developments, women were given the
opportunity to show that they are equal or excel men in getting the skills and knowledge. They were encouraged to come out of the four walls of the house.

**Women Employment:**

With the globalization, women have gained the exposure in the global network. It has raised the hopes of them for better and elevated status. But there is a contradictory situation where one side they are economically independent paid workers but have no economic liberty to take the decision. In one form or another, most of the women in India work and contribute the economy but their work is not documented for in official statistics. According to Census 2011, the female participation in workforce at the national level was 25.51% compared to men with 53.26%. In the rural area, the women participation rate was 30.02% compared with 53.03% of men. While in urban area, it is 15.44% for females and 53.76% for males. As per the Census 2011, 41.1% female workers were engaged with agricultural labors, 24.0% with cultivating, 5.7% with household industry and 29.2% with other works. But the good news is the gender pay wage gap is shrinking due to the education of women. They earn 56% of what their male colleagues earn for performing the same work. In the industrial and occupational regime, the gender differences can be seen. The high demand is given to the female workers for their efficiency and their dedication. The marginal decrease can be seen in the men employment and increase in Women. “Educated women in the labor market who are unemployed are far more than their male counterparts 62.7%...... it seems IT enabled sectors in recent years may have benefitted educated women...... HDR reports that women spend 457 minutes at work as compared to 391 minutes per day for men.” [Selvam, p.78]

**Education**

<table>
<thead>
<tr>
<th>Year</th>
<th>primary (I-V)</th>
<th>Upper-primary (VI-VIII)</th>
<th>Secondary (IX-X)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Total</td>
</tr>
<tr>
<td>2012-2013</td>
<td>681</td>
<td>639</td>
<td>1321</td>
</tr>
<tr>
<td>2013-2014</td>
<td>672</td>
<td>628</td>
<td>1300</td>
</tr>
</tbody>
</table>

(In Lakhs)

**Fig:1 Level wise Enrolment**

For the women empowerment, education is the fundamental tool. The comprehensive provision made for women’s right to education is Article 10 Convention on Elimination of All forms of Discrimination against women. According to this Article, State has accountability to take measures for all discrimination against women to ensure the equal rights. There are a lot of
Welfare Schemes introduced by the Ministry of Human Resource development for the women in order to bridge gender discrepancy. Gender sensitive curricula would be introduced in all educational system to address gender discrimination. A well-known feminist activist and social scientist Kamla Bhasin in a leading newspaper the Hindu gave her interview and mentioned: “Our men don’t need to change to support women, but to save themselves from being brutalized by centuries of exposure to patriarchy……. Education will empower our girls to break the manacles of a repressive society which in turn will help build a milieu where a boy and a girl would be seen as equals.” (April 26, 2013). She dedicated a beautiful song of her own for the women’s determination to remain strong, resilient against the strong winds of injustice and inequality.

“We have decided to dispel darkness
We have decided not to remain uneducated.

With all our might we will learn to read
We will learn to read and understand the world
We will open our minds and broaden our horizons.

With all our might we will learn to write
We will learn to write our own destinies
No more will we sit and curse our fate.

We will master skills and master knowledge
We will dream of a brand new world
And walk with pride we have decided.

Our life partner will be a knowledge
Which teaches us our rights and responsibilities
Which empowers us to fight injustice
We have decided, yes we have decided.

**CONCLUSIONS**

Thus, the gender disparity index is fast decreasing. A new vision of women is emerging- who are giving their contribution in social and economic progress. The Central as well as the State Governments have taken their initiatives for the socio-economic upliftment of women.

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A Low-Cost Product Based Waste Management Model For Itanagar-Naharlagun, Arunachal Pradesh, India

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ABSTRACT

In this study, a conceptual method for waste management is forwarded in the form of low-cost energy efficient products. Here, the product is low-cost air coolers from plastic bottles that is designed on the business model of waste to resource. The air-cooler works on the Bernoulli’s Principle, such that when air is compressed, the temperature drops proportionally. The implication of such product is towards the energy sustainability for low income communities, such that UN-Sustainable Development Goals (SDG) can be adhered. Here, the main focus is towards the fulfilment of SDG – 11: Make cities inclusive, safe, resilient and sustainable and SDG-12: Ensure sustainable consumption and production patterns; through proper waste management. Moreover, this model has a larger role in bottom up waste management plans for rapidly growing city like Itanagar-Naharlagun, where there is a clear lack of guidelines for sustainable waste management. Future work lies in stakeholder analysis and quantification of plastic wastes, which can facilitate detailed and robust waste to resource management for the capital complex of Arunachal Pradesh.

KEYWORDS: WASTE MANAGEMENT; SDG-11 AND 12; WASTE TO RESOURCE; LOW-COST PRODUCT.

INTRODUCTION

Energy accessibility and affordability is an essential indicator of development. India is the second largest populated country in the world, with around 60% of the population living in rural area. However, the rapid urbanization is affecting this rural-urban mix. With more people moving to cities, the access to energy, housing, healthcare and jobs is becoming critical. The formation of slums and large coagulation of urban poor are the outcome of such rapid urbanization and rural-urban migration [1]. Climate change is another such outcome of urbanization and industrialization. India is the fourth-largest greenhouse gas (GHG) emitter, liable to 5.8% of the global GHG emissions [2]. This has resulted in an average temperature rise of 0.8-1 °C, thus,
making India susceptible to high temperature and consequently large number of deaths from heat stokes [3]. As a consequence of this, the use of mechanical cooling systems have gone up tremendously, resulting in power shortages. But, the use of air conditioners and coolers are limited to upper and upper-middle class population, owing to high electrical charges and high initial investment on buying air-conditioners [4]. In India, with a 12.4% of the 1.2 billion population living below poverty line (BPL), it becomes a huge challenge to cope up with the effects of the climate change, and rising deaths from heat stokes. These 172 million people, live in tin huts and temporary structures, where temperature can reach a whopping 45°C during peak summer months, whereas the recommended comfortable temperature is 26-28 °C [5], [6]. Therefore, sustainable cooling technologies are needed which can be accessible and affordable to the poor and low income group population.

**Problem statement**

Climate change is rising the surface temperature on an average of 1°C in India. On one hand the economically stable households can afford modern cooling systems like air conditioners and air-coolers, the poorer household is forced to resort to natural ventilation or fans. However, with a peak temperature rise upto 45°C in the houses made up to tin and temporary material in the poorer households, a sustainable technical intervention is required. This has direct implication over UN-Sustainable Development Goals (SDG) – 11: Make cities inclusive, safe, resilient and sustainable and SDG-12: Ensure sustainable consumption and production patterns [7].

**Motivation**

In a report published by Arunachal Pradesh State Action Plan on Climate Change (SAPCC) in 2011, it had been reported that the rise in maximum temperature in the state is appreciably higher (0.35 °C) as compared to minimum temperature (0.25 °C) and shows spatial inconsistency in rainfall trend (increasing as well as decreasing trend). The rainfall is estimated to decrease from 5% to 15% by 2030, along the Brahmaputra Basin [8]. Moreover, there is an urgent need for waste management in the state, as there is a lack of waste management guidelines in the state. With the formation of Municipal Council in the capital in 2013, this is the right moment to work towards sustainable waste-management plans. In this study, I use the pathway of waste to resource generation [9] of plastic bottles for low-cost air coolers, indigenously built in Bangladesh [10].

**METHODOLOGY: WASTE TO RESOURCE**

Central Pollution Control Board of India (CPCB) states that approximately 12 Million tones plastic products are consumed every year, out of which 50-60% are directly thrown into the waste
Therefore, waste is a huge resource, which needs to be converted into useful products. Therefore, I forward this method for waste management in the capital complex of Arunachal Pradesh (Itanagar-Naharlagun city) to use the waste plastic bottles for making eco-friendly yet affordable devices for low-income community (Figure 1).

**Fig.1: Waste to resource Product (Image source: Google Image)**

**Working Principle of the low-cost air cooler: EcoCooler**

This cooler works on the Bernoulli’s principle which states that the faster air moves, the lower its pressure. This lower pressure is associated with the low temperature air oozing out from the bottlenecks based on the Guy-Lussac Law:

\[
\frac{P_1}{T_1} = \frac{P_2}{T_2}; \text{ where, } P = \text{Pressure (Pa)}; T = \text{Temperature (T)}
\]

**DISCUSSION**

This eco-friendly device can be way forward for Itanagar Municipal Committee, where they can form essential guidelines for using wastes to make useful products like EcoCool. This will have multiple benefits right from the perspective of environmental sustainability to employment generation as shown in Figure 2. This will create a chain of processes towards waste management in the capital city, such that future burden of wastes are also automatically channelized into creating such products through waste to resource methodology and cater to the SDG-11 and 12.
CONCLUSION

In this study, a simple waste to resource model is designed for the Itanagar Municipality of Arunachal Pradesh, such that the plastic waste bottles are reused in the form of low-cost energy efficient air-coolers for the poorer communities. Although this model is in a conceptual stage, but such models can be a key addition to the much needed waste management plan for the municipality. By adhering to such models, the local municipality can ensure the fulfillment of SDG-11 and 12, as discussed above. However, detailed quantification and proper waste segregation process is required to lay the foundation for such waste to resource intervention. My future work lies in accumulating daily city waste data and identifying key stakeholders in such waste management processes with respect to the city of Itanagar-Naharlagun, Arunachal Pradesh.

ACKNOWLEDGEMENT

I would also like to thank Mr. Sanjib Kumar, Teacher, KV No. 1 Naharlagun, for his due mentorship. Due acknowledgements to Shri Haripada Das, Principle, KV No. 1 for his initial motivation and support.

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ABSTRACT

On 25 September 2015, 193 countries from all along the globe, adopted the resolution made by the UN General assembly for the welfare of our sphere. These are the Sustainable Development Goals to protect our planet and are officially known as “Transforming our world: the 2030 Agenda for Sustainable Development”. On this globe, no one is satisfied completely. Everyone has things to complain on. We are living on a heaven, the only home we have to live on but we complain our globe and wanted to move out all the problems to a new home whose existence in unsure. We have only one planet to live on or we do not afford technology to move to a new home even if it exists. It is our duty to unite and clean our home. Let us all decorate it the way with love and care as a whole without war and bloodsheds. Development is the result of progress. Progress is the result of peace. Peace is the result of unity. Unity is the result of love ultimately. You can do a few things and me a few things; together we can make miracles. This document is about the goals of the resolution and the path to walk to transform our world by 2030 to its proposed agenda. It gives the principle for development process to take place and sustain. This document gives a common solution to all the problems- unified love.

In world of love there aren’t any problems. When this emotion triumphs all others, it is care that is throughout and no war. So in love people have enough time to work on the progress of development as a team. Love can unite people in purpose, culture and peace ultimately it has the power to unite the whole world. Love never claims, it ever gives, said Mahatma Gandhi. Love is a wonderful gift that is to make all happy. Happiness is finally the feeling that could give us satisfaction that no war victories could. In war one fails for others victory. But in love no one fails. It is the greed, pain, anxiety, anger, selfishness and all bad attitudes that fail to love. 17 goals or a million problems, love is the only solution.

KEYWORDS: earth history, need of transformation, 17 goals, relay to success, global unity
INTRODUCTION

The space had a cloud of gases. Over time, these gases and the space dust came together due to gravity, attained mass, undergone some nuclear reaction and the sun was born. It was the first time ever known when we were left unrecognized. After the formation of sun, there were some leftover gases and masses which were flattened into disk due to the gravity of the sun. Over time, these disks collided and formed bigger mass. It was how; a mass of $5.972 \times 10^{24}$ kg was formed at a distance of 149.6 million km from sun. The condition were so promising that this mass turned to be a heaven over time. Life formed on the heaven, it developed to advanced levels; brains evolved, followed by the organs and their systems; senses were born, so the feelings, hunger, pain, love and greed finally. This heaven had everything for everyone need, but lost the word to greed. It took years together for man to realize that unity is strength. He himself united into small groups and did his maximum effort to see if his group is ahead in the race of life that actually doesn’t exist. Heaven is a place for good people to live on. As the evils like greed, enmity, selfishness, etc started to grow, this heaven realized itself that "I do not have good people; I mustn't be the heaven" and started to change slowly to be a hell.

HISTORY

In the mean of infinity BC, when human actually evolved, he realized that he had to stay in group, protect each other in the wild against the Apex predators. The population developed within a group. Human started exploring the region around him by foot for resources. He built his own territory and owed everything in his region. But this wasn’t the only human territory. Some distance near another territory developed with its own race. A lots of similar territories existed all along the earth. Each had their own land space and ecosystem. Each had their own culture, practices and rules to live. Each territoried developed by themselves, had an language, education and became a complete system on their own. Slowely as human civilized, his greed increased. He wanted to aquire the knowledge and resources of the other territories. He showed his power, frightened death to the opponents or fascinated them with his offers and started expanding his territory. For this process, he needed a co-ordinator, a leader to unite and expand. He choose the strongest among him as a leader and gave him all the power. This power made him autocrat and he himself crowned him respect. Some were really respected. These territories expanded enormously and paved to the formation of kingdoms and countries. Yet the greed of him didn’t vanish. He tried expanding his kingdom further. He made himself fit for this war by developing his own resources, knowledge and wealth. He started to work on technology and hence protect and fulfil all people on his territory. The leaders changed. The system changed. Technology attained great levels. These all were results of his competition, his sustenance and protection against other opponents. In this timeline of human history, human had many trial and errors on
various systems for him to attain satisfaction. Some had adverse effects while some were little convincing. None could satisfy all. In 1972, human realized this war doesn’t sustain development and wanted to frame out global sustainable development goals. In 1983, a world commission for this cause was created and adopted their agenda 21 in 1992. Twenty years later, at Rio+20 conference, the resolution known as the future we want was adopted. After several voices from all across the globe, finally on 25 September 2015, a developmental agenda comprising of 17 goals named “Transforming our world: the 2030 Agenda for Sustainable Development” was adopted by many countries all along the globe with a belief of future satisfaction that all the available systems failed.

AGENDA-17 GOALS

The Agenda has 17 goals that are the visions that we must work on to bring us a promising future. These 17 goals are the solutions to all the problems in our society. These goals could be grouped into five

BASIC LIVING NEEDS

Poverty is due to the over stagnation of resources on ones hand. This created the condition; Rich get richer and poor get poorer. Certain condition like population explosion is usually blamed for this cause, but our mother earth has enough for all. Poverty is because the people with their satisfied needs grab the needs of the others, protect them and show off. When people start sharing and caring, these stagnant resources could be utilizes by the needy. When the goal is achieved, everyone on the globe could get their diet on a proper nutrition. When clean water and sanitation are not billed, everyone could utilize them. In such a world of healthy diet, clean water and proper sanitation, health is guaranteed. Poverty is the worst form of violence.

QUALITY AND EQUALITY

Quality comes in honesty. When money became the market and every human became slaves to it, people were taught that money is the goal. So people forgot about the term quality and hence love. Education is a service but it didn't fail to enter the market. Education is the process of facilitating learning of skills, values, beliefs and habits but it ultimately today teaches the way to sustain in today's market failing all its duties. Quality education isn’t to expertise all in all fields. It is to help you identify your talents. It mustn’t train you to perform in a market. It should pave the way for you to do your passion and make it your job. This hence would increase entrepreneurship and hence helps in economic growth as a consequence. But in reality, dropouts succeed besides the educated in large number questioning the standard of the education. Education is the most powerful tool that can be used to change the world. We are the one human
community. But we are not one. Human well knows that unity is his strength, but always require a common enemy for him to be united. When he has a fight next door, he unites as a family; the enemy is a community, he unites to his community; the enemy is a religion, he unites as a religion; when he fights a country, he gains patriotism and is ready to sacrifice himself for the nation. Great wonders of the world are possible by unity. We were all human until race disconnected us, religion separated us, politics divided us and wealth classified us. No one here could give equal rights to others; they themselves possess it. Everyone here came by birth and go by death. Our life is not to fail, fight and war, it is to share and care. In the world of equality to all, a place where there are no caste, religion or countries, where the rights of women and men stand equal on unbiased balance, development integrates. Development is not possible when one strives to stop others development. We cannot all succeed, when half of us are held back.

**Mother Nature**

Mother is the only life on earth who fed us with our her blood. Nature a mother for all human race. When we are hungry, she gives us food. When we all needed shelter, she gave us houses and land. Every resource that we possess are the gifts of our mother nature. She satisfies all our wishes, but our wishes never stop. Demanding more and more, we started depleting our mother. We deforested a large area leaving a large number of wild homeless which starve and die. Since we disturbed our mother nature, she cries in pain creating a variety of changes in climatic pattern. Ozone depletion, global warming, irregular rain patterns, etc are all interlinked and are due to the over exploitation of our mother nature by ourself. We totally contaminated the place we live, land and didn’t forget to spoil the waters. Hence, the nature totally changed its nature. We must sustain the nature for it to sustain us. We have only one home to live on. Needs beyond basic Human needs don’t always stop. The satisfied food and shelter couldn’t create any development. Innovative minds with social responsibilities are those who create development. The solutions to human problems are always possible by innovations. Innovation develops when recognized. Development is a never ending process. As an evidence of development, the higher level infrastructure of the system, the cities develop in large numbers. This generates an easy market, and creates large number of employment and hence interlinks with the other goals. Resources never complete without energy. Energy can neither be created, nor be destroyed. But the process of conversion from its raw form to usable form costs. Our world today faces an energy crisis. In fact it faces a resource crisis. While the pipes of the world leak in one part, a proportion of the world lacks some basic water. While the decoration glows to space with high power, one portion forgot about the light at night. It is our duty TO WAKE, WALK AND MAKE SURE RESOURCES AREN’T WASTED BECAUSE PEOPLE ARE IN NEED OF THE THING WE WASTE.
System

We all live in a society. The thoughts and actions of each individual are restricted to the system of our society. It is very much important for the system to provide us with valid restriction. The administration system of the country takes this responsibility. From the laws of justice to our basic needs, it’s the duty of our government to make us accessible. The purpose of this governmental system could be evidently seen as we travel to past on our timeline. Government is by and for the people to take care of their basics while the people take care of their other jobs. People have the complete right to question when things go wrong. It is not the government with authority; it is people on the top of the system. When either people start questioning on the wrongs, or the government itself realizes its ultimate goal of service, the stable system would be born, satisfying all in terms of administration, law and justice.

Unified Love

From the denial of the basic needs to wars, it is no system to bring in a complete change or solution. It is an emotion that on integration could change the world and achieve our goals. We are human with 6 senses, born on this world by the love of two lives, with an expiry period of 122 years recorded maximum to do some wonders within the span. It is such short span, who no one is sure of to either do some wonders or war. History remembers both good and bad people, but bad people remembered as bad forever. Our life is complete set of emotions. Anger and greed destroys development. Love saves life. Love brings unity. Love births the thought of sharing to eliminate poverty. Lovedeleted discrimination resulting in equality and unity. Love towards the nature and other creatures, stops us from depleting them. Love makes you feel responsible on your duties and hence make the system complete. We are no enemies to fight for our communities, states or countries. We human need no common enemy to unite. We are here to share and care. Wars just bring in losses. Love stops wars, brings in a global unity and hence created development as a whole rather than the sum of the distinguished parts. It is this emotion implemented on all minds, could result is global unity resulting in shared development that finally consequents in Agenda 2030- a goal for the sustenance of the future achieved.

CONCLUSIONS

When the globe is united and work together, the globe don’t require working on sustenance, instead putting their full efforts on development. Unity is not possible with any global law. It is emotions that human are made off, and love is the emotion to do the necessary miracles. The 17 goals need one common tool to be achieved, Love.
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Fulfilling SDG-3: DALYs averted in rural kitchens through design

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ABSTRACT
In this study, we discuss the efficacy of a ‘well-built’ rural kitchen with a solid-fuel traditional cookstove in determining the health and well-being of the occupants. Rural kitchens are susceptible to a high level of household air pollution (HAP) due to biomass burning for cooking. The current mitigation strategies like improved cookstoves (ICs), shifting to cleaner fuel and adoption of alternate cooking technologies offer short-term benefits in terms of mitigating HAP and its related health hazards. Here, we compare the efficacy of the well-built kitchen design in terms of Disability Adjusted Life Years (DALYs) averted in comparison to other HAP mitigation interventions such as ICs and LPG using Household Air Pollution Intervention Tool (HAPIT). The results show that design plays a significant role in averting DALYs and deaths due to HAP and can impact health and well-being. This study is a discussion on the effect of effective design strategy in providing better health outcome, without the introduction of ICs or shifting to a cleaner and more expensive form of fuel, which may be unaffordable and inaccessible to millions of Indians.

KEYWORDS: HOUSEHOLD AIR POLLUTION; SDG-3; RURAL KITCHEN; DESIGN; DALY.

INTRODUCTION
The current paradigm of the household air pollution (HAP) mitigation strategy includes improved cookstoves (ICs), or shifting to cleaner fuel like LPG, solar, etc. However, these strategies are limited by their short-term applicability, serviceability and unaffordability [1]. WHO recommends HAP mitigation through ICs, shifting to cleaner and modern form of cooking fuel and through a kitchen design that would facilitate effective ventilation to mitigate HAP [2]. This approach of addressing HAP through built environment design was addressed by Debnath, Bardhan & Banerjee [3], where a bottom-up design approach was derived to design sustainable kitchen, which is inclusive of socio-cultural dynamics of the place and also facilitate sufficient ventilation (see Figure 1 and Figure 2). In this study, this designed algorithm (see Fig. 2) was
further discussed in terms of its ability of mitigating HAP related DALYs and Deaths along with interventions like ICs and LPG as per Household Air Pollution Intervention Tool (HAPIT) [4].

The lack of design sensitization in rural kitchen design is a social problem than a technical one. Moreover, having a well-built kitchen which has a lower age of air [1], better ventilation and sufficient aspect ratio, while adhering to the socio-cultural practices of the place, has long-term implications on health sustainability[3]. This is independent of whether the household incorporates ICs or shifts to cleaner fuel. By adopting technical advancement or fuel shift, the degree of sustainability will increase. Therefore, in this study, we want to address a ‘well-built’ kitchen design as a basic necessity for low HAP rural kitchens, which can be further complimented by ICs or modern fuel. We also emphasize on the need for sustainable rural habitat design guideline as a long-term measure for HAP mitigation in terms of sustainable development goal (SDG) No. 3: ‘Good health and well-being for all’ [5], along with short-term high-impact solutions like ICs and shifting to modern cooking fuel.

**METHODOLOGY**

In this study, we assess the efficacy of a ‘well-built’ rural kitchen using HAPIT and the specified metrics therein: i) the Reduction in Disability Adjusted Life Years (DALYs) and ii) the Cost Effectiveness of the intervention as compared to a pre-defined set of ICs (Chimney and Rocket stove) and LPG for cooking [4].
Using the HAPIT toolkit

HAPIT estimates and compares health benefits attributable to ICs/ or modern fuel program that reduce exposure to HAP resulting from solid fuel use in traditional stoves. Here, we add ‘well-built’ and ‘existing kitchen design’ as other scenarios to reduce HAP exposure. Table 1 illustrates the input parameter for HAPIT analysis: Table 1. Input parameters for HAPIT

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Scenario</th>
<th>Post-PM$_{2.5}$ Exposure ($\mu g/m^3$)</th>
<th>Targeted Households</th>
<th>Fraction Using Interv</th>
<th>Useful Interv Life</th>
<th>Cost per Interv (USD)</th>
<th>Maintenance Cost (USD)/yr/HH</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Existing kitchen</td>
<td>157600</td>
<td>25000</td>
<td>0.6</td>
<td>5</td>
<td>10</td>
<td>1</td>
<td>[3]</td>
</tr>
<tr>
<td>2</td>
<td>Well-built kitchen</td>
<td>8365</td>
<td>25000</td>
<td>0.6</td>
<td>5</td>
<td>10</td>
<td>1</td>
<td>[3]</td>
</tr>
<tr>
<td>3</td>
<td>LPG</td>
<td>22119</td>
<td>25000</td>
<td>0.6</td>
<td>3</td>
<td>85</td>
<td>240</td>
<td>[4]</td>
</tr>
<tr>
<td>4</td>
<td>Chimney</td>
<td>110596</td>
<td>25000</td>
<td>0.6</td>
<td>2</td>
<td>20</td>
<td>5</td>
<td>[4]</td>
</tr>
<tr>
<td>5</td>
<td>Rocket stove</td>
<td>88477</td>
<td>25000</td>
<td>0.6</td>
<td>2</td>
<td>30</td>
<td>2.5</td>
<td>[4]</td>
</tr>
<tr>
<td>6</td>
<td>Advanced/Fan</td>
<td>80</td>
<td>25000</td>
<td>0.6</td>
<td>2</td>
<td>75</td>
<td>7.5</td>
<td></td>
</tr>
</tbody>
</table>

Assumptions:
The PM 2.5 exposure level which was considered as the ‘ideal’ counterfactual exposure was 35$\mu g/m^3$, below which there is no risk to health (as per the Interim Target -1, WHO AQG Report [6]). The PM calculations in the existing and well-built kitchen design was carried out using a linear on/off model of the US EPA's PM.exe toolkit [3], [7]. The pre-intervention exposure of PM 2.5 concentration during 4 hours of cooking/day was assumed to be 157600 $\mu g/m^3$ [3]. The intention behind such assumption is to portray the relative change in PM2.5 exposure levels post interventions. As, kitchens are designed to last for at least 60 years, the cost of ‘well-built’ kitchen was assumed to be $10, whereas the annual maintenance cost was assumed to be $1, pertaining to its long-term usability [1], [3]. Fraction of the population using this intervention and the targeted households were kept as the default value of 0.6 and 25000 respectively [4]. The useful intervention life values were kept at default values for LPG, Chimney, the Rocket cookstove and Advanced/Fan [4], whereas the kitchens are made to last a lifetime, but pertaining to the limitation of the HAPIT toolkit, the useful intervention life for ‘well-built’ kitchen was kept at 5 years (see Table 1). The results obtained from HAPIT reports values for chronic diseases adjusted using EPA 20-year Cessation lag. Deaths and DALYs in children (due to acute lower respiratory infection, ALRI) are unadjusted and assume to accrue quickly after intervention deployment [4]. The cost-effective is determined by WHO’s CHOICE model [4].

RESULTS

HAPIT estimates the averted and unaverted DALYs by the scenarios, which is illustrated in Table 2. Table 3 illustrates averted deaths and DALYs due to ALRI in children.
It is evident that the well-built kitchen could significantly reduce DALYs without even introducing any cleaner fuel or ICs. Figure 3 illustrates the DALYs averted out of 25000 household, and supports the long-term sustainability claim of effective kitchen design. Table 4 complements this sustainability clause by showing economic-effectiveness with respect to ICs and LPG.
CONCLUSION

This study is a discussion on the effectiveness of kitchen design in mitigating health effects of HAP in rural areas, with a solid-fuel traditional cookstove. It was found that design played a critical role in promoting sustainable rural habitat habitation by relatively improving the health of the occupants, as compared to the perceived silver-bullet solutions like ICs and modern fuel. But the efficacy of bottom up habitat design strategy breaks all the silos in terms of health benefits. Although, this study incorporated simulated data for DALYs averted calculations, the greater aim was to provide evidences to the importance of integrating rural kitchen guidelines in the planning and development process. Further work is needed in evaluating the efficacy of such bottom-up design measures through field experiments and anthropological evidences.

ACKNOWLEDGEMENT

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Climate Change in India: Challenges and Solutions

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ABSTRACT

The Sustainable Development Goals (SDGs) have laid a path for India to lead in terms of an inclusive wholesome development. What would be India's strategies to achieve the global goals of action on climate change and the environment, as part of the SDGs that come as a successor of the Millennium Development Goals (MDGs)? India being among the most vulnerable countries to the repercussions of climate change, what are the obstacles that come in the way of addressing and tackling this global crisis? The first section of the paper, discusses the approach of SDGs as different from that of the MDGs. In the main section of the paper, the issue of climate change is addressed. The importance of domestic ownership and integration with other SDGs, for an overall success of SDGs has been explored. Through the three sections, the paper aims to address the challenges that India faces with respect to the goal 13 of the sustainable development goals and tries to offer feasible solutions to the same.

KEYWORDS: CLIMATE ACTION, CHALLENGES, OWNERSHIP, INTEGRATION.

INTRODUCTION

India having been a part of the Millennium Development Goals, has learnt many lessons on how to approach a set of goals like the SDGs. Among the many lessons, one is the importance of "national ownership" of the goals. a) The top-down planning and implementation approach is a compromise on the participatory approach in which communities and countries set their own priorities. Distorted priorities lead to mischanneling of resources within definite nations. b) The MDG approach also led to a preoccupation with quantitative rather than qualitative achievement, such as the number of children enrolled in schools rather than the quality of the education. Though slightly late, it has been agreed consensually by world leaders that sustainability is key. Environment sustainability especially plays a role in supporting the natural, social and economic wealth of any country. Like most governments, the present government of India has, at several occasions, been tempted to go towards the 'grow now pay later' model. Although India has not been a significant contributor to the carbon emissions in the past, we cannot ignore the additive nature of the impact of emissions on the climate. From melting glaciers, extreme average summer
temperatures and heat waves in the north and west to droughts, floods, cyclones, erratic monsoons and rising sea levels in the east, centre and south, India, by the virtue of its location, faces the effects of climate change in catastrophic magnitudes. Therefore, any development strategy that India adopts must have climate action as an integral part of it, which is why SDG 13 holds much significance in the context of a wholesome development, especially that of India’s.

CLIMATE ACTION: CHALLENGES AND SOLUTIONS

Challenges

There are many challenges that India faces, structural, institutional, financial, political, and social among many others. i) Dependence on coal for power generation, and other industrial purposes is very high, contributing highly to the greenhouse gases (GHGs) emissions. (South East Asia Energy Outlook: World Energy Outlook special report, September 2013). Small scale industries, for example, due to non-upgradation of technology contribute to reckless addition to the already existing stock of GHGs in the atmosphere. According to the International Energy Agency, India’s coal consumption is set to become more than two times its present consumption by 2035 and become one among the world’s largest coal importers by 2020. (South East Asia Energy Outlook: World Energy Outlook special report, September 2013; World Energy Outlook 2015, 2015). ii) Experts have identified defining indicators, financing, monitoring, ownership and measuring progress to be some of the institutional challenges. (Kapur, 2015). iii) Politically, the inability of any regime to showcase explicit development outcomes within the short term of five years raises insecurities regarding their continuance in power. This leads them to formulate policies that lack long term vision. This is especially vital to climate policies as in the short run, sustainability seems to come at the cost of development or vice versa, therefore it is always sustainability which is traded off for “development”. iii) Immense pressure is put on India by the developed nations to cut down its emissions despite having double standards on the issue, themselves. India has neither the technology, nor the financial resources or institutional infrastructure to develop mechanisms to take immediate action in response to this pressure. iv) Unlike in the western countries, in India, climate action is not only about a change in lifestyle, but also about millions of livelihoods. Structurally, a majority of the population depends on climate sensitive means of livelihood, like agriculture. This poses a challenge in terms of social, and economic security of these communities apart from the obvious implications it has on the national income of the country. v) Gender and caste disparity, an integral part of the social fabric of India is yet another obstacle that comes in the way of the effectiveness of policies for the marginalized affected by climate change. vi) Haphazard urban planning, lack of awareness and lack of community involvement in rural areas are crucial challenges that need to be overcome. Solutions: Integrating climate action with domestic policies and other SDGs Rather than addressing the above
mentioned challenges one by one, an integrated approach is a more feasible and practical one. In this way not just challenges pertaining to SDG 13 are addressed but also of those pertaining to other SDGs that can be directly or indirectly linked with SDG 13. According to a paper published by the UN DESA, the number of other goals to which SDG 13, i.e. “Taking Urgent Action to Combat Climate Change and its impacts” is linked directly is six- SDG 7,8,9,11,12 and 14 (Blanc, 2015). Figure 1 shows SDGs as a network of targets.

i) To address the challenges of GHG emissions, gender disparity and pressure from international communities, Clean Development Mechanism(CDM) which is a part of the UNFCCC, can be extended to household or community level projects, the ones that often, most directly affect women. (Financing that makes a difference, 2009). The government could create a market for carbon trading even within the small scale industries, by setting a cap on the emissions, ensuring monetary gains, thereby incentivizing the up-gradation of technology. ii) Decentralized power generation through renewable sources will ensure greater accessibility and cost efficiency iii) Establishing an autonomous statutory body, which is unaffected by the election dynamics would be an answer to the lack of long term vision of government policies. This body can dictate standards in accordance with an overarching climate policy that all domestic policies must meet. In such a scenario, all decisions taken by the various ministries will first have to be screened by this regulatory body. Only if in alignment with the long term climate policy of the country, shall these decisions be allowed to materialize. “Gender-balanced participation in stakeholder and consultative processes, especially on climate finance issues, is critical to ensuring that funds are responsive to differentiated needs and build on varied capacities.” (Financing that makes a difference, 2009). iv) In rural areas, women can be made an active part of disaster management (DM). They could be trained to be aware of look-out signs before calamities, or in drought/flood-crisis management so that in times of disaster there can be reduced losses and quick mitigation. Making them part of such DM teams gives them financial support, and at the same time ensures community involvement. v) Meticulous planning, keeping in mind considerations of climate resilience for the upcoming urban spaces, like the smart cities will ensure reduced losses from extreme weather conditions and monsoon plights. (Climate proofing Indian Cities: A Policy Perspective, March 2014). vi) Urban and rural lifestyles in India are drastically different, a carefully designed curriculum, customized separately for urban and rural schools must be provided to ensure adequate awareness among the younger generation. Knowing about protocols made at the global level may be of little use to a child in a remote village in India, he/she may never relate to it, but perhaps knowing about how climate change has affected the crops in his father’s field or that of his neighbors’ or that of other villages like his own and by letting them know what they can do to reduce these ill effects would perhaps be more useful and practical. It
is however very important to keep updating this information from time to time as no rural or urban society is static in terms of demographics, occupational, social composition etc. Besides awareness to younger generations, spreading awareness to farmers and other producers about more climate sensitive means of production and consumption by government or non-governmental organizations can help increase productivity of agricultural lands and other production units, therefore contributing to higher food and financial security.

Figure-1: SDG13 as a network of targets (the various colours represent different SDGs that are directly linked to climate change)

CONCLUSION

India has learnt some important lessons from its performance in the MDGs. It has also identified obstacles that it must overcome in order to successfully implement the SDGs. On the specific goal of SDG 13, domestic ownership and integration of all global sustainable development goals along with domestic policies is vital for its successful accomplishment. In this paper, institutional, structural, political, social and financial challenges have been briefly addressed. It is clear that climate change adaptation and mitigation is something that needs an extensive network of policies linking multiple sectors along with adequate financing and technology. It is more complex than what can be expressed within the scope of this paper, however, keeping in mind the complexities, an attempt to give some feasible solutions to the same has been made.

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FIGURE CREDITS

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Quality Education- A Modern Approach Towards
A Noble Cause

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Janardan Dattani

ABSTRACT

Education is one of the most powerful tools that has enabled countless people towards changing their lives. But if we see the present scenario then the quality seems to be degrading at an exponential rate and that has become a major concern for the society. We as individuals are wanting to help people with problem so that the term education could retain what it is best doing at! The first thing that we want to do is actually help those who are soon going to become the ambassador of the living community “The Youth” from the very base we want to lead these people in the right direction by introducing them with real life happenings in forms of projects in order to identify the things that they are good at! We then want to train this people with specialized organization on different fields to make them have the best exposure possible in the fields they are good at by conducting training camps and such other things. The whole idea is to transform the youth from the very base so that when they come of age they could spent their time with things they are good at in a way improving the quality of education as well as getting fulfilled the goal of creating quality jobs!

KEYWORDS: EDUCATION, JOBS, YOUTH

INTRODUCTION

Education from the time being has proved to be one of those important gifts that has helped us transform this world from having nothing to having things which are just unimaginable! But if we see at certain statistics and compare this terms throughout the whole planet then not everywhere the quality is sustained at the same level and this has become a huge problem as it directly affects the whole economy of a certain country. In this symposium we would try to talk in the terms of the country named ‘India’ which is the third largest economy of the world and has one of the
biggest population talking in terms of the youth. In a country like India it can rightly be said that 
the educational system is very stereotype in nature just because of the thing that practical 
exposure are almost nil in all the educational courses run across India. Due to such reasons a lot 
of factors the major one being 'Development' is suffering horribly. If we go to the very base the 
main reason is that other than education one other important thing is 'Direction' a lot of people 
actually don’t know why they exist in this world, what is the reason? Rather than finding answers 
to these questions they go on pursuing things that others are doing in all becoming the a part of 
one of the biggest races of all times in the country India ‘The Rat Race’. To provide the right 
direction it is very important to take steps that lead towards helping people enter into the fields 
that they are good at, by doing this we are making sure that the best people are entering into the 
different existing fields and the problem related towards having quality jobs can be solved as jobs 
are not know by what they actually give to people but by who are actually pursuing those 
particular jobs!

THE IDEA

Our idea here actually is to develop a network inform of a school consisting of different people 
and organizations from different fields who would be try to impart quality services in terms of 
helping the youth in form of students to pursue the right path for which they are made which 
进一步 leads to a successful life of theirs and creation of a secure future for the country in terms 
of development and growth! One of the major sectors which we actually want to help the youth 
with is those who are underprivileged who don’t receive the important things which is important 
for them as well as their families and also remembering the fact that around 40% of the 
population of India lives in poverty!

A COMPARITIVE STUDY

Now let us explain our idea by adding a comparative study the education in the United States v/s 
education in India. If we thoroughly have a brief glance at the education system of the states it 
represents the very essence of flexibility into itself, the way students are being treated and 
directed in this system itself creates a huge difference between the education systems of both the 
countries. India being one of top most listed economies of the world is yet to obtain a tag of being 
a developed the very reason being poverty leading to lack of education in form of formal study 
and awareness leading to a slow growth in the economy leading the nation to be underdeveloped! 
Therefore education is a huge concern and not only that the way it is being pursued and promoted 
in India is a much bigger one. Let’s take a very straight example out of the top 14 talks by students
under the age of 20 listed in the playlist in the official TED Talks website not one talk is by a student who is brought up in India while United States has more than 5 speakers in the same playlist just considering the matter of fact, TED itself is a huge global platform for spreading ideas across the globe! Therefore there lies a huge gap between the education systems of both the countries and we as individuals are wanting to bridge this gap via introducing students with the people, with the organizations who can totally understand the student’s talent, who could help them develop skills, who could make them reach out places that suits their personality the most leading to a life no one ever thought of, leading to better economic growth, leading to a better nation in future!

TEAM

Before moving on to help people firstly we actually require people who could help us pursue what we want to do! The team would consist individuals from different fields like science, engineering, management, commerce etc. who could either be students, professionals or organizations as a whole willing to help towards such a noble cause.

COLLABORATIONS

It would involve creating relationship with different organizations who could either provide us with volunteers or could function as an organization as a whole towards providing students with great amount of exposure by calling in experts from different fields

SURVEY

The first step towards this idea is to conduct a survey by visiting different educational organizations and introduce students with real life projects from different fields after which we would tend to fill out forms in regards to different students thereafter going through a thorough analysis of the data collected and selecting students and batching them into different fields as per their aptitude into a certain field.

CALLING TO THE SCHOOL

Now after creating the whole student community now we would take in students to experience different sessions where they would taught things from the very base towards the advance learnings that could be taught at their age. A very important point here to be noticed here is that
many a times students go on to pursue their passion but they can travel the distance just because personalized care and motivation is not provided to them, one of our most important objective is to help students with the same.

STATISTICS

40% of India's population is below the age of 18 years which at 400 million is the world's largest child population. Less than half of India's children between the age 6 and 14 go to school. As per MHRD report more than 2 crores of students are under the age group of 6-14 years. So if we just have a look hypothetically and target at least changing a thousand students’ lives then a time may come that out of these 1000 there may be a 100 who would actual open companies that would change the lives of many people and there are many such uncountable opportunities that could be converted into reality by doing this task.

CONCLUSIONS

As in one of the most crucial thing that we want to do is to take that very first step of actually transforming this field, there are many hurdles but if no one takes any decision then it may so happen that a community may certainly diminish or become extinct just because of the lack of educated individuals in that particular community such is the importance and impact of this terms 'EDUCATION'.

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INFORMATION CREDIT


STATISTICS CREDIT

Development Of Clay Based Water Purifier
Considering Local Needs, Skills And Materials

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ABSTRACT
Sustainable Development Goal (SDG) 6 on clean water and sanitation through its target 6.1 states “by 2030, achieve universal and equitable access to safe and affordable drinking water for all”. Further, target 6.b focuses on “strengthening the participation of local communities in improving water and sanitation management”. In this regard, this article illustrates the process of development of a water purifier considering local needs, skills and materials. Turbidity and microbiological contamination have been identified as the major issues affecting the quality of drinking water in India. Similar problems were encountered in few villages in the Konkan region of Maharashtra. In this context, the ceramic water purifier is developed using locally available clay and burn-out material like saw dust to address the issue of turbidity. The prototype developed offers turbidity-free (~ 0 NTU) water when supplied with input water of turbidity close to 20 NTU. All in all, this study is very much in line with the target 6.b of SDG 6 and is a model on participatory approach in product development in the domain of improving water and sanitation management.

KEYWORDS: WATER PURIFICATION, CERAMIC WATER FILTRATION, CLAY-BASED FILTER, PARTICIPATORY PRODUCT DEVELOPMENT, TURBIDITY

INTRODUCTION
Nearly a third of India’s ground water sources in rural areas are reported to be polluted [1]. Fortunately, many of these could be reduced by household treatment options, esp. the diarrheal illnesses, by up to 40% [2]. The objectives of the study were to identify the issues in water quality
and other needs and constraints existing in the project area, then study and finalise on relevant water purifying technologies considering local skills and materials and finally develop the relevant purifier. The study as part of master’s project employed extensive iterations of prototype building, involving among various parameters, type and size of burn-out material and firing profile [3]. However, the best results finally obtained have been reported considering the requirements of a short paper.

**Study area and field investigations**

The field investigations were carried out at two sets of locations in the Konkan region of Maharashtra. One group of villages: Vavoshi, Ransai and Shedashi were located along the Pen-Khopoli road in Pen and Khalapur talukas of Raigad district. The next set of villages: Nimboli, Kochechapada and Garelpada were located near Ganeshpuri in Wada taluka of Palghar district.

Surveys regarding water quantity and quality were undertaken. Water in the field areas were mostly sourced through open wells and hand pumps. Water samples were collected, tested and mapped for a few villages to understand the spatial and temporal variations in water quality. Turbidity and microbial contamination were identified as the main problems concerning water quality. Through surveys it was found that an affordable purifier capable of working independent of electricity and made of local resources and skills was in need. The traditional skill of making ceramic wares in the villages covered in the field area was studied. This local skill was perceived to be an advantage for taking up ceramic water filters as a mode of water treatment which could be locally manufactured.

**MATERIALS AND METHODS**

**Literature Review**

The water purifier developed was actually a composite model incorporating ceramic filtration and copper based disinfection. The ceramic filter was developed using locally available lateritic clay in the Konkan region. The filter operates in the microfiltration range and generally has pore sizes between 0.6 µm to 3 µm [2]. There have been several organisations working on ceramic filter made of locally available clay like Potters for Peace. The manuals which have been published by such organisations regarding pot shaped ceramic filters have been used as references for adopting general guidelines in the making of ceramic filters in this study [4, 5]. The basic principle involved in making the ceramic filters using locally available clay was as follows. When clay and burn-out material like saw dust or grounded rice husk is moulded in the form of a pot or a disc and then fired in the kiln beyond the vitrification, the burn-out material burns away creating fine pores in the vitrified ceramic body allowing faster passage of water but trapping impurities. This vitrified clay body in the form of a disc or a pot then becomes a porous water filter.
“Contact with copper” as a disinfection mechanism was also incorporated in the water purifier in the form of copper wool or copper scrubber. Disinfection of water through copper contact has been reported with E. coli as the test specimen [6]. When water was inoculated with E. coli and then and stored in copper pots or in bottles containing copper coil with a surface area of 15.2 cm² per litre of water, for a period of 16 hours at room temperature, complete killing of E. coli was observed [6]. Copper vessels have been in use for collecting and storing water since age old times and this practice still continues in many of the surveyed villages. This paper shall basically cover the findings regarding ceramic filter as the studies regarding copper based disinfection need further investigation before they can be reported.

Prototyping

Of the different burn-out materials considered, saw dust was finalised for its high flow rate and the minimal effect caused on other water quality parameters. The saw dust used to make the discs was procured locally from a carpenter working in the Konkan region. The clay mixture was prepared according to the following proportions by mass: locally sourced lateritic clay 70%, saw dust 30% (of the total 30% of saw dust, 15% was in the range of 180 – 420 µm and remaining 15% was in the range of 420 – 600 µm). The ceramic discs were made in replicates and compression moulding mechanism was employed to make the ceramic discs. The moulded discs were baked in the furnace raising the temperature by about 100°C every hour up to a temperature of 900°C and holding constant for the next two hours.

The prototypes were prepared by then sealing the ceramic disc-filters within PVC reducers using silicone sealant. PVC pipes were then attached to the PVC reducers to hold a water column of height 0.4 m. The ceramic disc-filters were then washed/soaked in potable water for close to 72 hours to overcome the transient effects on different water quality parameters. Water quality testing involved long-duration experimentation close to 26 hours. Each of the filters was filled with 4 L of input water with turbidity of ~ 20 NTU which was prepared using A2 fine test dust and prescribed by WHO for evaluating household water treatment technologies [7]. The water was refilled periodically up to the initial height of water column ~ 0.4 m regardless of the volume of water filtered out by the respective filter. The cumulative output was measured for every two hours. The water quality tests for turbidity, pH and TDS were carried out for nearly every four hours. The standard used for water quality testing was IS 10500:2012. Turbidity, TDS and pH were electrometrically tested with digital probes. The experimental setup is shown in Figure 1.
RESULTS AND DISCUSSION

Table 1: Final cumulative results of water quality parameters after filtration for a period of 26 hours.

<table>
<thead>
<tr>
<th></th>
<th>Input water</th>
<th>Treated water (Replicate 1)</th>
<th>Treated water (Replicate 2)</th>
<th>Acceptable limit (IS 10500: 2012)</th>
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<tbody>
<tr>
<td>Average turbidity (NTU)</td>
<td>18.92</td>
<td>0.00</td>
<td>0.00</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Average TDS (ppm)</td>
<td>79</td>
<td>79</td>
<td>80</td>
<td>&lt; 500</td>
</tr>
<tr>
<td>Average pH</td>
<td>8.0</td>
<td>8.2</td>
<td>8.2</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>Average flow rate (mL/cm$^2$/min)</td>
<td>0.04</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 indicates the final results obtained after several rounds of prototyping. The results indicated are average values of readings noted down for a total of 26 hours. It is clear that turbidity of input water about 20 NTU, is reduced to 0 NTU. The concentration of the total dissolved solids (TDS) has roughly remained the same and pH has slightly increased but is still within the potable limits. Variations in TDS and pH have been found to be caused due to the constituents of the ceramic filter [8]. Since different ceramic filters tend to have different shapes and vary in terms of effective filtering surface area, the flow rate per unit surface area was considered. The flow rate (~ 0.04 mL/cm$^2$/min) is comparable to that obtained with commercial candle filter tested earlier. The effective surface area of the ceramic disc-filter made was limited to about 65 cm$^2$ which means about 156 mL was obtained on an average per hour.
CONCLUSION

The purifier developed from locally available materials is effective in turbidity reduction which was identified as a major problem. The purifier is capable of running without electricity, is affordable and can be locally made and replaced. Saw dust of 180 µm – 600 µm has been identified as a suitable burn-out material for the clay mixture. Flow rate is comparable with candle filters (> 0.02 mL/cm 2 /min). Further, there is a huge scope for research in ceramic filtration domain like achieving higher flow rates for extended periods, easy-to-handle design development and also in novel disinfection mechanisms like copper based disinfection.

ACKNOWLEDGEMENTS

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Legislative Approach to Hunger Mitigation in India: The National Food Security Act, 2013

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ABSTRACT

This paper is an attempt to introduce The National Food Security Act, 2013 in the light of its potentials of eradicating hunger from India. It begins with the conceptual understanding of food security followed by the scenario and various dimensions of this phenomenon in India. The core part of the paper contains Introduction of The National Food Security Act, 2013 its objective and salient features.

KEYWORDS: HUNGER MITIGATION, FOOD SECURITY, NUTRITIONAL SECURITY, LEGISLATION.

Food Security:

Food security is a condition related to the supply of food, and individuals' access to it. Concerns over food security have existed throughout history. There is evidence of granaries being in use over 10,000 years ago, with central authorities in civilizations including ancient China and ancient Egypt being known to release food from storage in times of famine. At the 1974 World Food Conference the term "food security" was defined with an emphasis on supply. Food security, they said, is the "availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices"[1].

Later definitions added demand and access issues to the definition. The final report of the 1996 World Food Summit states that food security "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life"[2].

Indian Scenario in Terms of Food and Nutrition Security:

While India has seen impressive economic growth in recent years, the country still struggles with widespread poverty and hunger. India’s poor population amounts to more than 300 million people, with almost 30 percent of India’s rural population living in poverty. The good news is,
poverty has been on the decline in recent years. According to official government of India estimates, poverty declined from 37.2% in 2004-05 to 29.8% in 2009-10. Rural poverty declined by 8 percentage points from 41.8% to 33.8% and urban poverty by 4.8 percentage points from 25.7% to 20.9% over the same period (World Bank 2012)[3].

India is home to 25 percent of the world's hungry population. An estimated 43 per cent of children under the age of five years are malnourished (WFP 2012). India remains an important global agricultural player, despite the fact that agriculture’s share in the country’s economy is declining. It has the world’s largest area under cultivation for wheat, rice, and cotton, and is the world’s largest producer of milk, pulses, and spices (World Bank 2012). Nearly three-quarters of India’s households are dependent on rural incomes. Agricultural productivity in the country’s semi-arid tropical region is impeded by water shortages and recurrent drought, while environmental degradation and vulnerability to weather-related disasters pose challenges to the country as a whole.

Poor populations also face a lack of access to productive assets, financial resources, education, health care, and basic social services. The government has recently begun to focus on microenterprise development as a way to address these challenges, as well as initiatives to bring basic services to the rural poor. With the country’s population and economy continuing to grow, huge demands will be placed on critical infrastructure in the coming years. It is estimated that US$1 trillion will be needed to meet India’s infrastructure needs in the next five years (World Bank 2012).

Several important issues have emerged in the context of food security in India. These have been (a) the liberalization of the economy and its impact on agriculture and food security; (b) the establishment of the WTO and the agreement on Agriculture; (c) climate change and its impact on food production and prices; (d) the prevalence of hunger and poverty coexisting with high levels of food stocks; (e) the introduction of the targeted Public Distribution System (f) the “Right to Food” campaign; and (g) the National Food Security Act. These important issues have posed severe challenges for food security in the country. The Food and Agricultural Organization (FAO) states that food security emerges when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Food security has three important and closely related components, which are availability of food, access to food, and absorption of food. Food security is thus a multi-dimensional concept and extends beyond the production availability, and demand for food. There has been a definite and significant paradigm shift in the concept of food security from mere macro level availability and stability to micro level household food insecurity, and also from an assessment of energy intake to measures and indicators of malnutrition[4].
The National Food Security Act, 2013:

This act has been passed with the objective to provide for food and nutritional security in human life cycle approach, by ensuring access to adequate quantity of quality food at affordable prices to people to live a life with dignity. The Act provides for coverage of up to 75% of the rural population and up to 50% of the urban population for receiving subsidized food grains under Targeted Public Distribution System (TPDS), thus covering about two-thirds of the population. The eligible persons will be entitled to receive 5 Kg. of food grains per person per month at subsidized prices of Rs. 3/2/1 per Kg for rice/wheat/coarse grains.

The Act also has a special focus on the nutritional support to women and children. Besides meal to pregnant women and lactating mothers during pregnancy and six months after the child birth, such women will also be entitled to receive maternity benefit of not less than Rs. 6,000. Children up to 14 years of age will be entitled to nutritious meals as per the prescribed nutritional standards. In case of non-supply of entitled food grains or meals, the beneficiaries will receive food security allowance. The Act also contains provisions for setting up of grievance redressal mechanism at the District and State levels. Separate provisions have also been made in the Act for ensuring transparency and accountability.

Following Special Features of the Act makes it an Important Piece of Legislation Ensuring Food security in India:

- **Coverage and entitlement under Targeted Public Distribution System (TPDS):** Upto 75% of the rural population and 50% of the urban population will be covered under TPDS, with uniform entitlement of 5 kg per person per month. However, since Antyodaya Anna Yojana (AAY) households constitute poorest of the poor, and are presently entitled to 35 kg per household per month, entitlement of existing AAY households will be protected at 35 kg per household per month.

- **State-wise coverage:** Corresponding to the all India coverage of 75% and 50% in the rural and urban areas, State-wise coverage will be determined by the Central Government. Planning Commission has determined the State-wise coverage by using the NSS Household Consumption Survey data for 2011-12.

- **Subsidized prices under TPDS and their revision:** Food grains under TPDS will be made available at subsidized prices of Rs. 3/2/1 per kg for rice, wheat and coarse grains for a period of three years from the date of commencement of the Act. Thereafter prices will be suitably linked to Minimum Support Price (MSP).

- **Identification of Households:** Within the coverage under TPDS determined for each State, the work of identification of eligible households is to be done by States/UTs.
• **Nutritional Support to women and children:** Pregnant women and lactating mothers and children in the age group of 6 months to 14 years will be entitled to meals as per prescribed nutritional norms under Integrated Child Development Services (ICDS) and Mid-Day Meal (MDM) schemes. Higher nutritional norms have been prescribed for malnourished children up to 6 years of age.

• **Maternity Benefit:** Pregnant women and lactating mothers will also be entitled to receive maternity benefit of not less than Rs. 6,000.

• **Women Empowerment:** Eldest woman of the household of age 18 years or above to be the head of the household for the purpose of issuing of ration cards.

• **Grievance Redressal Mechanism:** Grievance redressal mechanism at the District and State levels. States will have the flexibility to use the existing machinery or set up separate mechanism.

• **Cost of Intra-State transportation & handling of food grains and FPS Dealers’ margin:** Central Government will provide assistance to States in meeting the expenditure incurred by them on transportation of food grains within the State, its handling and FPS dealers’ margin as per norms to be devised for this purpose.

• **Transparency and Accountability:** Provisions have been made for disclosure of records relating to PDS, social audits and setting up of Vigilance Committees in order to ensure transparency and accountability.

• **Food Security Allowance:** Provision for food security allowance to entitled beneficiaries in case of non-supply of entitled food grains or meals.

• **Penalty:** Provision for penalty on public servant or authority, to be imposed by the State Food Commission, in case of failure to comply with the relief recommended by the District Grievance Redressal Officer.

**Concluding Note:**

This revolutionary piece of legislation has potential to make history; this act is nothing but investment in human capital. It has all potentials to bring security in people’s lives and make it easier for them to meet their basic needs, protect their health, and educate their children. Enactment of such a law shows the socialist commitment of the government as enshrined in the preamble of Indian constitution. If implemented in its true spirit this legislation has all potentials to make India free from hunger, malnutrition and resultant poverty.

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ABSTRACT

The villagers of Gadewadi, a tribal village in Ambegaon block of Pune district, Maharashtra have limited livelihood opportunities. The village comprises of only 93 households. During the Kharif season, rice cultivation is done for self-sustenance. People from the village are dependent on NTFP and labor for their livelihood. 80% of the households survive on an income of Rs. 10,000 – Rs. 25,000 per annum. There is no cultivation during Rabi season. Extensive qualitative and quantitative methods were employed with the help of NGO Shashwat to know the economic condition of the people and to suggest sustainable livelihood opportunities. After resource mapping, household surveys and focused group discussion, it was concluded that community farming during Rabi season is a viable option. The study deals with the idea of how community farming will operate, designing the system cost effectively with the limited resources present, how everyone can benefit and policies to be implemented for equitable distribution of profit. The study is an attempt to reduce the poverty levels (sustainable development goal 1) and promote inclusive and sustainable economic growth and employment (sustainable development goal 8).

KEYWORDS: SUSTAINABLE LIVELIHOOD, POLICY FOR COMMUNITY FARMING, TRIBAL, COMMUNITY FARMING, LIFT IRRIGATION

INTRODUCTION

Community farming is a viable livelihood option for people of Gadewadi. Self-help groups are already active in the village, which can get loan from NABARD for this scheme. Rajpur has good watershed but it is not being utilized, this project will create awareness that they can take Rabi crop in same land and area, in future more farmers will practice Rabi crop by creating new water sources. Currently to no one practices Rabi farming because of lack of awareness and lack of
irrigation facility hence instead of starting with individual farming particular area needs to be irrigated and community farming should be done. To avoid conflicts among villagers about community farming focused group discussion was conducted and policy guidelines were introduced so that it becomes sustainable. The policy guidelines intended to be introduced are:

- During Kharif season, villagers will cultivate rice individually and in Rabi season (October-March) land will be given to practice community farming.
- Initially 30 acres land will be irrigated for community farming and after one year it can be increased or decreased as per availability of water.
- Profit sharing: 30% of total profit will be shared with land owners and 70% of profit will be shared with all households (including land owners) in the village.
- Employment sharing: 70% of generated employment will be offered to land owners and if they failed to fulfill the demand, then it can be given to other landowner in the queue and later to landless household. Remaining 30% will be offered to landless households and a waitlist will be prepared by the village level committee.
- Since the Hemade family was the owner of well and bandhara, for compensation one valve will be given to them for their personal use or individual farming, but Hemade family will need to pay electricity bill for use of exceeding than 5 hours.
- Gram Sabha will decide whether to consume the produce at village level or to sell in markets.
- The assets created during the community farming project such as tractor will be given on rent (cost will be decided by the committee) during kharif and other season.
- This policy was proposed in a meeting with 40-50 people and they agreed to follow it without any hesitation. This was our first step towards the project.

Designing pipe water system: The methodology involved and action taken is given below in steps

Step 1: Taking soil and water sample for testing at district level (Krishi Vigyan Kendra, Narayangaon) and take suggestions from experts about crops to be taken. According to the experts, based on the climate, soil and water quality, wheat, gram, bajra and potato can be grown.

**Step 2:** Understanding water requirement and checking feasibility. Initially we thought of irrigating 57 acres of land without looking at the water availability, but then due to water availability in bandhara we come to know that only 30 acres can be cultivated as per availability of water.
**STEP 3:** Identify and measure the area and convince land owners are to make affidavit that they will give their land for community farming from October to March. 14 land owners were agreed to complete the task.

**STEP 4:** Compute the elevation and distance from well to farm pond for lift irrigation. From the data following things are computed: Height= 17.02 m, Distance = 509 m, Maximum slope = 17.4% and Average slope= 4.7%

**STEP 5:** Computing Discharge from well and discharge needed at the lake

**STEP 6:** Suggest guidelines for distribution of water among the area. To keep the investment cost minimum, we need to manage the water cycle timetable for given area: Thirty acre of land cannot be irrigated in one day so the land will be divided into six zones and irrigated one per day. It was found that a 15 HP pump will be suitable for operation and should be run for 5-8 hours per day per cycle.

**STEP 7:** Designing system with following factors: Length of pipe needed, Material of pipe, Pump and motor requirement and Electricity requirement

**STEP 8:** Cost estimate are obtained from Pune district schedule rates available at Panchayat samiti office Ghodegaon and also from local contractor in Ambegaon block as shown in Table 1

**Table 1:** Cost estimate for designing pipe water system

<table>
<thead>
<tr>
<th>Name and Item</th>
<th>Amount</th>
<th>Rate</th>
<th>Total amount (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation in soft marum and soil (m²)</td>
<td>360</td>
<td>137</td>
<td>49,320</td>
</tr>
<tr>
<td>(Average depth of 1.5 meter and 500 meters)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavation in hard rock for jack well (m²)</td>
<td>847.47</td>
<td>554</td>
<td>4,694,98</td>
</tr>
<tr>
<td>(Radius 6.07 meter and height of 7.26 meter)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavation in soft marum for pond (m²)</td>
<td>1518.75</td>
<td>137</td>
<td>208,068</td>
</tr>
<tr>
<td>(Length=12.2 meters, breadth=12.2 meters, height=10.20 meters)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavation in hard rock for pond (m²)</td>
<td>619.82</td>
<td>554</td>
<td>3,433,80</td>
</tr>
<tr>
<td>(Length=12.2 meters, breadth=12.2 meters, height=4.16 meters)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCC construction for jackwell (m²)</td>
<td>4.31</td>
<td>8000</td>
<td>34,480</td>
</tr>
<tr>
<td>Pamp house construction</td>
<td>35,000</td>
<td></td>
<td>35,000</td>
</tr>
<tr>
<td>Concrete base for pipeline (m³)</td>
<td>1.9</td>
<td>8,000</td>
<td>15,200</td>
</tr>
<tr>
<td>Pipes needed for irrigation scheme 500 meters (dia. 75mm)</td>
<td>500</td>
<td>85</td>
<td>42,500</td>
</tr>
<tr>
<td>Pamp motor system (15HP)</td>
<td>65,000</td>
<td></td>
<td>65,000</td>
</tr>
<tr>
<td>Pamp and pipeline accessories</td>
<td>20,000</td>
<td></td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12,47,446</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ECONOMIC ANALYSIS**

To calculate payback period of whole project, cost of cultivation for Bajra and wheat are shown in table 2 [1]. Quadri Javeed Ahmad Peer et. al studied economics of potato growing towards livelihood security[2] the data for which is represented in the above table. The price per quintal was obtained from the Pune APMC website, as Rabi Crops which will be produced can be sold in month of February [3]. The cost of irrigation is not included as in this area cost of electricity for
agriculture pump is tariff base and will remain same for all three crops. Due to unavailability of data for Chickpeas (Gram) payback period is not calculated for it. Payback period calculation is shown in Table 3:

Table 2: Cost of cultivation

<table>
<thead>
<tr>
<th>Cost</th>
<th>Bajra</th>
<th>Wheat</th>
<th>Potato</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per acre</td>
<td>Total cost</td>
<td>Per acre</td>
</tr>
<tr>
<td></td>
<td>cost</td>
<td>for 30 acres</td>
<td>cost</td>
</tr>
<tr>
<td>Unskilled labor</td>
<td>1,852</td>
<td>55,562</td>
<td>1,297</td>
</tr>
<tr>
<td>Bullock labor</td>
<td>1,151</td>
<td>34,525</td>
<td>295</td>
</tr>
<tr>
<td>Skilled labor</td>
<td>935</td>
<td>28,065</td>
<td>916</td>
</tr>
<tr>
<td>Seed</td>
<td>265</td>
<td>7,940</td>
<td>631</td>
</tr>
<tr>
<td>Fertilizers and manures</td>
<td>477</td>
<td>14,322</td>
<td>1,143</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,680</strong></td>
<td><strong>1,10,414</strong></td>
<td><strong>4,282</strong></td>
</tr>
</tbody>
</table>

Table 3: Payback period calculation

<table>
<thead>
<tr>
<th>Profit</th>
<th>Bajra</th>
<th>Wheat</th>
<th>Potato</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield per acre (Quintal)</td>
<td>7.65</td>
<td>9.44</td>
<td>104.00</td>
</tr>
<tr>
<td>Total yield from 30 acre (Quintal)</td>
<td>229.68</td>
<td>286.32</td>
<td>3120.00</td>
</tr>
<tr>
<td>Price (Rupees per quintal)</td>
<td>2,000</td>
<td>2,100</td>
<td>800</td>
</tr>
<tr>
<td>Total Income (Rupees)</td>
<td>4,59,260</td>
<td>6,01,272</td>
<td>24,96,000</td>
</tr>
<tr>
<td>Profit (Rupees)</td>
<td>3,18,946</td>
<td>4,72,810</td>
<td>16,22,412</td>
</tr>
<tr>
<td><strong>Payback Period (Approximate)</strong></td>
<td><strong>4 years</strong></td>
<td><strong>3 years</strong></td>
<td><strong>1 year</strong></td>
</tr>
</tbody>
</table>

Payback period above is only calculated for thirty acres of Rabi crop but this system will also useful in monsoon season when there is no rain for paddy cultivation. According to above result, potato will be more efficient crop but which requires more capital investment. Wheat requires more water as compare to bajra but if we consider payback period there is only one year difference in them as calculated above. Hence it is advisable, in first three years to calculate water availability in each month and combination of crops should be taken.

**CONCLUSION**

To generate livelihood opportunities of the rural people, community farming has been proposed. The main hurdle of the study was to talk to the people, know their economic status and propose a viable option which can be adopted by the people. To increase the involvement and co-operation of all people in the village towards community farming, a set of rules had been proposed which were readily accepted by people. Villagers were involved in all the steps so that they can operate in a self sustained manner with no external help in the future. Through this scheme, the whole community will get benefitted through profit shared. Both land owners as well as landless people will get wages. Seasonal migration will decrease as labor days will be generated. Moreover, the water which is going out of village will be utilized in this scheme. Already available infrastructure (unused well) which is present near the site proposed for community farming will reduce the cost for lift irrigation.
FUTURE WORKS

According to the soil sample checked in KVK, it was found that the soil quality is fit for organic cultivation. If the land is organic certified then good price for the agriculture produce can be fetched in Pune and Mumbai. So the immediate future work will be to try and get an organic certification for the land, so that the agriculture produce can command a higher price.

ACKNOWLEDGEMENT

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Combat Climate Change With Solar Power

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ABSTRACT

There is recognisable paradigm shift in our environment due to the human activities that impacted the climate and ecological balance of the earth. To combat this climate change at COP 21 in Paris, parties to the United Nations Framework Convention on Climate Change reached a landmark agreement with an objective to “stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system[1]” and develop national programmes in fields such as agriculture, energy and natural resources to slow climate change, adapt to its impacts and to reduce greenhouse gasses emissions, especially from energy, transport, industry.

One of the ways to achieve the objectives of the Paris agreement is to utilize the abundantly available and renewable solar power for the energy needs at homes, in agriculture, in commercial areas, etc.

The basic causes to adopt solar power as a tool to reduce climate change is that in the recent years the price of the solar modules has been decreased steeply and their efficiency which is around 15-20% for the Mono-Si crystalline photo voltaic cells 15-17% for Multi-Si photo voltaic cells and durability with a maximum degradation of 10-20% over 25 years of life [2] have been increased significantly since last decade. Because of the above factors the usage of solar became economical and was able to reach to grid parity and can slowly displace the use of coal for energy production.

India is located in the equatorial sun belt of the earth, there by receiving abundant radiant energy from the sun. But for the major power needs it depends on the thermal power which adds huge amount of the greenhouse gases. As solar panels already reached the grid parity in many places increase in the use of the available renewable solar power would reduce the dependence on the coal and other fossil fuel fuels for the energy needs. Solar power is available at a time which is most needed by the domestic consumer thus by encouraging use of solar photo voltaic panels by the domestic consumer would not only decrease use of conventional power but also reduce the load on existing grid which is a major problem for our country which faces grid fail and meltdown often during peak summer season.
Ministry of New and Renewable Energy of India by Jawaharlal Nehru National Solar Mission promotes and supports the growth and use of the renewable power. Thus India is striving to achieve a sustainable power production state by utilizing solar power and reducing the impact on environment along with realizing the objectives of UNFCCC Paris agreement through its Jawaharlal Nehru National Solar Mission [4], and realizing Goal 13 – Combat Climate Change and its Impacts as per Sustainable Development Goals.

**KEYWORDS:** **Combat climate change, Greenhouse gases, Grid parity, Jawaharlal Nehru National Solar Mission, Ministry of New and Renewable Energy, Sustainable Development Goals, United Nations, Framework Convention on Climate Change.**

**INTRODUCTION**

Reducing the impact on environment as per the Paris agreement is possible by utilizing abundantly available renewable energy such as solar power by promoting and supporting its use through Jawaharlal Nehru National Solar Mission to obtain sustainable energy with minimal damage to environment.

**SOLAR POWER TO COMBAT CLIMATE CHANGE**

The Paris agreement requires all parties to put forward their best efforts through “Nationally Determined Contributions” (NDCs). India is utilizing its huge potential for solar power to combat climate change in the subsequent years by targeting production of 100 GW [7] of solar power by JNSM.

**THE PARIS AGREEMENT**

At COP 21, in Paris, parties to the UNFCCC reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future.

1. The Paris Agreement establishes in seeking to strengthen the global response to climate change, reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees [1].
2. The Paris Agreement establishes binding commitments by all Parties to prepare, communicate and maintain a nationally determined contribution (NDC) and to pursue domestic measures to achieve them [1].
3. The Paris Agreement establishes a mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development, as well as defining a framework for non-market approaches to sustainable development [1].

4. The Paris Agreement reaffirms the obligations of developed countries to support the efforts of developing country Parties to build clean, climate-resilient futures by Financial Mechanism of the Convention, the Green Climate Fund (GCF)[1].

**WHY USE SOLAR**

Usage of Solar Power is one of the key ways to succeed in achieving the objectives of The Paris Agreement and to combat climate change.

1. **ABUNDACE OF POWER:** India is located in the equatorial sun belt of the earth, thereby receiving abundant radiant energy from the sun. The India Meteorological Department (IMD) maintains a nationwide network of radiation stations which measure solar radiation and also the daily duration of sunshine. In most parts of India, clear sunny weather is experienced 250 to 300 days a year. The annual global radiation varies from 1600 to 2200 kWh/sq.m. which is comparable with radiation received in the tropical and subtropical regions. The equivalent energy potential is about 6,000 million GWh of energy per year [5].

2. **EFFICIENT:** Most commonly used solar photo voltaic panels in the India Multi-Si photo voltaic cells are having a good efficiency of 15-17% [2]. And the ongoing research of third generation solar panels with low surface occupancy and higher efficiency are showing promising results.

3. **DURABILITY:** The degradation of solar panels is very less, most manufacturers claim their panels would produce 90% of power after 10 years and 80% after 25 years and minimum life span of a well maintained panel is warranted for 25 years [2].

4. **GRID PARTY:** It is a condition in which the power produced from a solar plant is of same cost as that is offered by the grid. Solar power has reached the grid parity in many parts of the India. Recently 4.64 rupees per unit power was bided by a company in Andhra Pradesh which is similar to grid charges.[6]

5. **ECONOMICAL:** According to the Swanson's law, the price of solar photovoltaic modules tends to drop 20 percent for every doubling of cumulative shipped volume. According to the benchmarks of the MNRE 75rupees per watt [7] is the benchmark cost for a residential user.

6. **SOLAR POWER IS GREEN POWER:** According to the study by IISC up to 30.75 tonnes of carbon dioxide emission is reduced by using a 1 kWp solar rooftop plant while it will generate 5 kWh of electricity per day (considering 5.5 sunshine hours)[7].
NATIONAL DETERMINED CONTRIBUTIONS BY INDIA

As per The Paris Agreement India under Ministry of New and Renewable Energy established Jawaharlal Nehru National Solar Mission to promote the solar usage in country by providing subsidy to the domestic consumers 30%[4] for installing the solar photo voltaic panels, solar pump sets, solar water heaters, etc, and to reach set targets for production of solar power in various modes to achieve about 100GW under Renewable Power Target of 175GW achieved by 2022[8] from the existing grid connected 8 GW India also aspires to produce about 40 per cent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 [4].

BENEFITS TO ENVIRONMENT AND END CONSUMER

With the above initiatives take by the government under GOAL 13-Climate Action OF Sustainable Development Goals and The Paris Agreement at COP 21 by all parties of UNFCCC.

1. ENVIRONMENTAL BENEFITS: Significant reduction of the production of the Green House Gases and their release into the atmosphere because most of the power in the India (173 GW) [8] is produced by thermal power stations. In turn reducing the global temperature and production of clean power without harming environment.

2. END CONSUMER BENEFITS: Production of the cheap and reliable power at the time of peak needs which is economical. Utilization of solar power in remote places where the grid power is unreliable. Subsidy to install the solar panels of up to 30% [7]. Reduction of the load on grid at peak usage times preventing their failure and thus realizing the 24/7 reliable power dream of Indian people.

CONCLUSIONS

India as a country supporting the Combat Against Environment Change has launched its Solar
mission in accordance with the National Determined Contributions of The Paris Agreement to promote usage of renewable energy and reduce GHG's emission along with educating the consumer the importance of renewable energy and supporting there use by giving subsidy to make it economical and in turn improving sustainable power in the country.

ACKNOWLEDGEMENT

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A Case Study of Aligarh City

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ABSTRACT

Energy plays a vital role in the development of any country. India's energy consumption has almost doubled since year 2000 and the potential for further rapid growth is enormous. It is important that India unfailingly sets up a system that doesn't just cut down the rampant increase in unhygienic surroundings but also recovers at least a fraction of what we have already lost as waste. This paper is an attempt made to estimate the quantity of energy that can be generated in the Aligarh city from the municipal solid waste (MSW), checks the on-ground details about energy recovery from waste, present scenarios and future challenges. The waste-to-energy has proven itself to be an environment friendly solution for the disposal of MSW. Study has revealed that the amount of municipal solid waste collected by the private body in Aligarh city is of the order of 400 tons per day and approximately 7MW of electricity can be generated. Representative samples of the MSW were collected from open dumping sites of solid wastes and analyzed for calorific value by using a Bomb Calorimeter in the laboratory. It was found that the collection efficiency of the private operator & Aligarh Municipal Corporation
is about 80%. Energy value is not utilized properly and there is no proper provision of energy recovery system. Present Practices of SWM in Aligarh city are weak. Approximately 80% of the collected wastes is being dumped on low lying or open areas in the outskirts of the city without engineering and scientific methods. In this regard, Waste to Energy (WtE) provides a solution towards complying with government regulations, and achieving integrated solid waste management and energy recovery. This paper is related to United Nations Development programme (UNDP) Sustainable Development Goal: 7 Affordable and clean Energy.

INDEX TERMS — MUNICIPAL SOLID WASTE (MSW), ALIGARH MUNICIPAL CORPORATION (AMC), WASTE TO ENERGY (WTE), SOLID WASTE MANAGEMENT (SWM)

INTRODUCTION

Municipal Solid Waste disposal sites are not often seen as opportunities for energy solutions. Growing urban waste is typically viewed as a liability because of concerns related to disposal and management. However, Waste can be turned into an asset. Developed countries have addressed growing concerns about waste generation while making a profit from energy projects using Waste to Energy (WtE) technologies. These waste to energy (WtE) projects provide a valuable service to the environment and a potentially profitable business venture, while contributing a new energy resource to local and regional communities.

According to the World Bank, the world currently generates about 4 billion tons of all types of waste per year. The world's cities alone generate about 1.5 billion tons of solid waste per year. This volume is expected to increase to 2.4 billion tons by 2025[1]. Waste generation rate in urban areas of India will be approximately 0.7 kg/person/day in 2025, which is roughly four to six times higher than it was in 1999[2]. In lower income countries, waste generation will more than double over the next 25 years. Three-fourths of this waste is disposed of in landfills, with only one fourth being recycled [1][3]. Today, India is the fifth largest energy consumer in the world. While the world consumes 12000 million tonnes of oil equivalent (mtoe) of energy resources, India consumes 4.4% of the world total (524.2 mtoe). Global consumption of primary commercial energy (coal, oil & natural gas, nuclear and major hydro) has grown at a rate of 2.6% over the last decade. In India, the growth rate of demand is around 6.8%, while the supply is expected to increase at a compounded annual growth rate of only 1%. It is estimated that the amount of waste generated in India will increase at a per capita rate of approximately 1-1.33% annually [4]. Thus simultaneous demands are met both for energy and waste management, by adopting integrated SWM and WtE technologies.
**WHAT IS WASTE TO ENERGY?**

Waste-to-Energy (WTE) technology utilizes Municipal Solid Waste (MSW) to create electric and heat energy through various complex conversion methods. It is an alternative source of renewable energy in a world with limited or challenged fossil reserves. These technologies can be applied to several types of waste: from the semi-solid (e.g. thickened sludge from effluent treatment plants) to liquid (e.g. domestic sewage) and gaseous (e.g. refinery gases) waste. However, the most common application by far is processing the Municipal Solid Waste.

![Waste to Energy Scenario](image)

**CASE STUDY OF ALIGARH CITY:**

A) Description of town: Aligarh city is situated in the western part of Uttar Pradesh on Delhi-Kolkata Railway link and historical Grand Trunk (GT) road. It is situated at a distance of 130 km southeast of Delhi, the capital city of India. The Aligarh District has an area of about 5014 sq. km with city occupying an area of about 34 sq. km. The population of Aligarh city is about 8,72,575 [7] which makes it medium-sized as per Indian statistics. The population density in the district is 1007 per Km² and in the city 14115 per Km². The city lies at 185 m above the mean sea level (MSL) in a low-lying area in between plains of two major plains, Ganges and Yamuna.

B) Generation of Solid Waste in Aligarh City: Aligarh is rapidly developing city, it is one of the important city of western U.P. The following nature of waste are generated in Aligarh city.
- Household waste (food leftovers, vegetable peels, plastics, house sweeping, clothes, glass, ash etc.)
- Waste arising from educational, administrative and commercial buildings (paper, plastics, glasses, furniture, bottles etc)
- Hazardous wastes from hospitals, nursing homes, laboratories etc. (hazardous chemicals, infectious wastes, medicines)
- Waste arising from road cleaning (leafy matters, due tree cutting,
- Construction debris, tins cans, old newspaper, polythene bags, worn
- Out furniture, old appliances, plastics, bottles, utensils)
- Waste from industries (scarp, dust particles)
- Waste arising from vegetable markets (Rotten vegetables, fruits) etc.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>UNITS</th>
<th>TEST RESULT</th>
<th>TYPES OF WASTE</th>
<th>QUANTITY IN TONS / DAY</th>
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<tr>
<td>Proximate Analysis</td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td>%</td>
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<td>Commercial Waste</td>
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<tr>
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<td>Institutional Waste</td>
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<tr>
<td>Fixed Carbon</td>
<td>%</td>
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<td>Industrial Waste</td>
<td>10</td>
</tr>
<tr>
<td>Ultimate Analysis</td>
<td>%</td>
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<td>Street Waste</td>
<td>15</td>
</tr>
<tr>
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<td>Paper</td>
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</tr>
<tr>
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<td>%</td>
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<td>Plastic</td>
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<td>%</td>
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<td>Food</td>
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</tr>
<tr>
<td>Chlorine</td>
<td>%</td>
<td>43.20</td>
<td>Leather</td>
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<td>Mineral Matter</td>
<td>%</td>
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<td>Leaves + Yard</td>
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<tr>
<td>Compostable Matter</td>
<td>%</td>
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<td>Metal</td>
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<tr>
<td>Gross Calorific Value</td>
<td>K.Cal / Kg</td>
<td>1650</td>
<td>Bones</td>
<td>2.3</td>
</tr>
</tbody>
</table>

*Approx: per capita waste generation rate based on the population of cities and towns. [8]

**ENERGY POTENTIAL OF MSW FOR ALIGARH CITY:**

As per composition and characteristic of MSW of Aligarh City,

Total MSW generated per day = 400tons/day

Power Generation potential

Net power generation potential (Based on experimentation):

GCV = 1650 kcal/kg
NCV = Gross calorific value – latent heat of water vapour formed.

= GCV - 0.09 x H x 587 = 1650-0.09 x 3.43 x 587 = 1468.79 kcal/kg
For 400 tons,

Energy recovery potential = NCV x W x 1.16 = 1468.79 x 400 x 1000 x 1.16 = 681518.56 kWh

Considering the conversion efficiency = 25%

Power generation potential = 1.16 x NCV x W /24 x 0.25 = 7099.15 kW

By the above value it can be predicted that energy potential of MSW of Aligarh City is 7 MW.

CONCLUSION:

The assessment of MSW generated at Aligarh district of Uttar Pradesh, India for power generation by waste leads us to realize that there is a great potential of power generation from it. Net and Gross calorific value of mixed MSW was also estimated as 1650 kcal/kg & 1468.79 kcal/kg respectively. Waste-to-Energy (WtE) technologies can address two sets of environmental issues at one single stroke – Elimination of unhygienic waste and energy recovery. These technologies can significantly reduce the consumption of fossil fuels for energy thus achieving sustainable goals. This technology for conversion of MSW into power generation would not only be beneficial to meet the power demand but also reduce the environmental pollution to certain extent.

REFERENCES:

Climate-Smart Agriculture: An Address of Food Security and Climate Change

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ABSTRACT

Hungri ness: The world’s hungry population waiting for an aid. Government and non-government agencies is constantly engaged in various activities for the welfare of the farmers across the world. There is yet need to be done to foster the agriculture and together the hands for assistance of economic and techno-social development of farmers. The farming needs to involve awareness towards new technologies in transitioning farmers from current strategies to new climate-aware ones and developing technologies that can assist farmers as the climate changes. Climate-smart agriculture is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a new realities changing climate.

KEYWORDS: CLIMATE-SMART AGRICULTURE, SUSTAINABLE DEVELOPMENT, FOOD SECURITY, CLIMATE CHANGE.

INTRODUCTION

A growing global population and changing diets are the factor of driving up the demand for food (Figure 1). Production is struggling to keep up as crop yields level off in many parts of the world, ocean health declines, and natural resources—including soils, water and biodiversity—are stretched dangerously thin (Figure 2). One in nine people suffers from chronic hunger and 12.9 percent of the population in developing countries is undernourished. The food security challenge will only become more difficult, as the world will need to produce about 70% more food by 2050 to feed an estimated 9 billion people [1].
Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a new realities changing climate [2]. Climate-smart agriculture is a sort of overview concept originally put forth in 2010 by the United Nation’s Food and Agriculture Organization (FAO) [3]. The farming needs to involve significant investment, especially money, in developing technologies that can assist farmers as the climate changes; in transitioning farmers from current strategies to new climate-aware ones; and in encouraging farmers to abandon or lessen
reliance on methods that increase greenhouse gas emissions [4]. Thus, Climate-smart agriculture is a tool to address Food Security and Climate Change (Figure 3).

![Climate-smart Agriculture](image)

**Figure 3.** Climate-smart agriculture is a tool to address Food Security and Climate Change

**International Scenario**

UN Headquarter, New York had organized Climate Summit 2014 with having geographical coverage of more than 20 countries in Africa, Asia, Europe and Latin America, and more than 35 organizations [5]. They come up with action plan: Global Alliance for Climate-Smart Agriculture. It is a voluntary, farmer-led, multi-stakeholder, action-oriented coalition committed to the incorporation of climate smart approaches within food and agriculture systems. It will seek to improve people’s food and nutrition security by helping governments, farmers, scientists, businesses, and civil society, as well as regional and international organizations, to adjust agricultural practices, food systems and social policies so that they take account of climate change and efficient use of natural resources.

The World Bank continuously emphasizes a lot on fostering the Climate-Smart Agriculture [6]. The Bank has supported projects and program on CSA in making a difference across the globe, such like:

- In Uruguay, the Sustainable Management of Natural Resources and Climate Change (DACC) project is supporting sustainable intensification through a number of initiatives including the establishment of an Agricultural Information and Decision Support System (SNIA) and the preparation of soil management plans.
• The Morocco Inclusive Green Growth project supports the national green growth agenda by increasing the supply of agro meteorological information and facilitating the diffusion of new, resilience-building technologies such as direct seeders.

• In Senegal, the West Africa Agricultural Productivity Program (WAAPP) and its partners have developed seven new high-yielding, early-maturing, drought resistant varieties of sorghum and millet. Released in 2012, these varieties are being widely diffused to farmers and show positive yield result.

• In Ethiopia, the Humbo Assisted Natural Regeneration Project has helped restore 2,700 hectares of biodiverse native forest, which has boosted production of income-generating wood and tree products such as honey and fruit.

• African farmers who have adopted evergreen agriculture are reaping impressive results without the use of costly fertilizers. Crop yields often increase by 30 percent and sometimes more. In Zambia, for example, maize yields tripled when grown under Faidherbia trees.

**Indian Scenario**

India is an important global agricultural player, despite the fact that agriculture's share in the country’s economy is declining. It has the world's largest area under cultivation for wheat, rice, and cotton, and is the world's largest producer of milk, pulses, and spices (World Bank 2012) [7]. Nearly three-quarters of India's households are dependent on rural incomes. Agricultural productivity in the country's semi-arid tropical region is impeded by water shortages and recurrent drought, while environmental degradation and vulnerability to weather-related disasters pose challenges to the country as a whole.

India is home to 25 percent of the world's hungry population. An estimated 43 per cent of children under the age of five years are malnourished (UN's World Food Program 2012) [8]. Poor populations also face a lack of access to productive assets, financial resources, education, health care, and basic social services. The government has recently begun to focus on microenterprise development as a way to address these challenges, as well as initiatives to bring basic services to the rural poor. With the country's population and economy continuing to grow, huge demands will be placed on critical infrastructure in the coming years. It is estimated that US$1 trillion will be needed to meet India's infrastructure needs in the next five years [9].

In India, Climate Smart Agriculture is not just about building resilience to climate change and mitigating negative impacts; it also requires a focus on increasing farmers' incomes. Together with PepsiCo and university and finance partners, the World Business Council for Sustainable Development (WBCSD) and Monsanto are launching the India Agriculture Tool (IAT) that aims to
increase farmer incomes through water saving, which dually decreases resource use and builds resilience to drought [10]. National Innovations on Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR) launched in February, 2011 [11]. The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management.

**Gujarat State Scenario**

In Gujarat, under the President ship of Hon'ble Justice B P Singh, formerly Judge, Supreme Court of India and President of The Environmental & Consumer Protection Foundation (ECPFO), New Delhi, in 2010, National Council for Climate Change Sustainable Development and Public Leadership (NCCSD) was established [12]. This Council may facilitate and carry out appropriate and target oriented action for climate change mitigation and adaptation. This Council has also found that there is need to promote Climate Smart Agriculture.

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This Council may facilitate and carry out appropriate and target oriented action for climate change mitigation and adaptation. This Council has also found that there is need to promote Climate Smart Agriculture.

CONCLUSIONS

Climate-Smart Agriculture which addresses Food Security and Climate Change based on two major components: (i) Research and Development towards the three pillars of CSA. (ii) Development towards the armers: it will bring scientific and techno-social upliftment of farmers. The Techno-legal experts from CSA could deal with various mitigation and adaptation
strategies to cope up against food security and climate change and come to solution of Hungriness: The world’s hungry population.

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Status of Renewable Energy in India: A Review

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ABSTRACT

The paper focuses on the past, present and future perspectives of renewable energy sources in India. Wind, biomass, small hydro, waste-to-power and solar constitutes India’s renewable energy sources. India is a large country with an area of 3,287,263 sq. kilometres. Thus, it has access to ample of renewable resources. With prevailing threats of global warming and exhaustion of conventional energy sources, it becomes mandatory to exploit renewable sources and to develop technologies for efficient extraction of power from them.

India has shown remarkable growth in its renewable sector over the last decade. In India, the total installed capacity of power generation from all sources is around 284,302 MW as on 31 December, 2015. About 38,822 MW of power is generated from renewable sources which constitutes nearly 14% of the total installed capacity. Over the years India achieved significant power in the world and in line to establish its strong hold in solar and biomass. Nearly 62% of power is generated by wind alone from total renewable installed capacity.

Comprehensively, it is increasingly essential to develop renewable energy conversion systems since they provide environmental benefits as well as other benefits to humans like energy security, job creation, economic growth and lesser dependency upon the exhaustible energy resources.

India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems. Indeed, it is the only country in the world to have an exclusive ministry for renewable energy development, the Ministry of New and Renewable Energy (MNRE). India targets around 175,000.00 MW power generation from renewable sources by the year 2022 and with the current growth it seems achievable.

KEYWORDS: RENEWABLE ENERGY, RENEWABLE SOURCES, CONVENTIONAL ENERGY SOURCES, MINISTRY OF NEW AND RENEWABLE ENERGY (MNRE).
INTRODUCTION

Energy security and sustainable development are important concerns for every nation of the world due to their high demand, volatility and global impact. According to the United Nations, economic growth, climate stability and social equality are connected by an abstract thread of sustainable energy. In past few decades, the rate of natural resources depletion has increased considerably due to accelerated growth in population and fossil fuel consumption. Thus, development of renewable technologies can be considered as an alternative for achieving the challenge of sustainable development.

On a global scale, the renewable energy provided an estimated 19% of final energy consumption in 2012. After USA, China and Russia, India is the largest consumer of energy in the world but it does not possess profuse energy resources. Recently, the power availability in India has increased but the supply is not commensurate with the demand. Renewable energy sources play key role in power generation in addition to conventional sources. Currently, a major portion of power (about 86%) in India is generated from conventional sources. This cause greater climate change and rapid exhaustion of conventional energy sources. Thus, it becomes mandatory to install myriads of environmental friendly renewable power stations for a sustainable future. Technologies include biomass gasification, bagasse-based biomass cogeneration, non-bagasse based biomass cogeneration, onshore wind energy, grid connected solar photovoltaic, solar thermal and small hydropower plants [1].

In past few years, there has been an appreciable growth in Indian renewable energy sector that encouraged the investors to invest into this region. From figure 1, it can be observed that the cumulative grid interactive power capacity of renewable energy has been increasing tremendously and the installed capacity is 38,822 MW as on 31st December, 2015 [3].

Figure 1: Renewable Energy Installed Capacity Growth (in MW) in India from the period 1999-2000 to 2015-16
INDIA’S HISTORY AND CURRENT STATUS

History of Renewable Energy in India

For last few decades renewable energy has been an important part of India’s energy planning process. To ensure energy security and to reduce the dependence on oil imports, India started to develop and deploy alternative fuels such as hydrogen, bio-fuels and synthetic fuels and to increase clean power (renewable electricity) the technologies that were opted by India are bio, wind, hydro, solar, geothermal and tidal energy technologies. Eventually, India became the first country in the world to have a dedicated Ministry of Renewable Energy (MNRE) [2] [3].

Growth of Renewable Sources of Energy

The total all India installed capacity of power generation from renewable sources has witnessed 25% growth from 14.40 GW in 2009 to 33.70GW in 2015. India occupies 5th position in the world with a wind power installed capacity of 22.6 GW. Biomass power -generation is around 4.6 GW. Power generation from small hydro projects is around 4.1GW. Solar power projects installations have witnessed tremendous growth with over 1.68 GW capacity solar power plants using solar photo-voltaics and solar thermal technologies being commissioned during the year 2013-14. Figure 2 shows the installed renewable power generation capacity (in MW) [2].

![Renewable Power Installed Capacity](image)

**Figure 2: Renewable Power Installed Capacity (in MW) of different power sources in India in 2015.**
FUTURE PROSPECTS OF RENEWABLE ENERGY IN INDIA

The Vision

The growth in the dependency on renewable energy in the last few decades has given a hint for a highly renewable energy dependent future. With the depletion and harmful effects of non-renewable sources, countries like India are giving a special focus on the extraction of energy from the renewable sources. India is surging very fast in this department and is expected to achieve all targets till 2022 regarding this department. Table 1 shows installed capacities of different renewable energy sources from March, 2012 to the target 2022, while figure 3 shows year wise renewable capacity on year basis from 2007 to 2015. Significant growth in the renewable energy can be observed from the figure.

<table>
<thead>
<tr>
<th>Source</th>
<th>Installed capacity by end of 11th Plan (March 2012)</th>
<th>Current installed capacity (March 2015)</th>
<th>Target as per 12th Plan (March 2017)</th>
<th>Revised Targets till 2022</th>
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<tbody>
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<tr>
<td>Wind power</td>
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<td>TOTAL</td>
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<td>34351</td>
<td>54,914</td>
<td>1,75,000</td>
</tr>
</tbody>
</table>

TABLE 1: Installed Capacity and Target for the different renewable sources by MNRE

![Graph showing source wise renewable capacity](image)

FIGURE 3: SOURCE WISE RENEWABLE CAPACITY ON YEAR BASIS.

CONCLUSIONS

The exhaustive nature of conventional energy sources coerces the nations to shift its vision towards the exploration and development of technologies for power generation from renewable energy sources. India has shown a serious growth in the energy generation from
renewable sources and is growing every year. In terms of wind power generation, India has reached to the fifth position. Additionally, the large scale installation of solar PV will also contribute towards the sustainable future of India. Thus, over the period of time, India’s energy policies need to be shaped to ensure energy security and attaining energy self-sufficiency [1].

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The Human Rights Approach To Climate Change

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ABSTRACT

Climate Action is one of the 17 Sustainable Developmental Goals adopted by the UN Resolution in 2015. It is touted to become one of the most important environmental issues of the 21st Century as it challenges the very existence of the world as we know it. Humanity has risen to fight this problem by adopting various international conventions. The issue has already resulted in large scale destruction in terms of the increasing greenhouse gases and the rising sea levels. The increase in sea levels, particularly, affect low lying coastal States, threatening to wholly submerge them by the end of the century. While adverse Climate Change is taking place at an increasingly alarming rate, the international community has failed to take adequate measures to tackle it. World leaders have led to the formation of various international conventions, hoping that it would be enough to restrict the disasters Climate Change brings. However, these international conventions and treaties go a long way in bringing various Climatic Change issues to the global forum. But apart from highlighting the issue, there is no practical difference made in terms of enforcement. Moreover, the issue of Climate Change has been dealt with as an environmental law issue, reducing the gravity of the situation. This paper is an attempt to show how bringing in Climatic Change issues to the same level as any other human right issue would go a long way in infusing seriousness over the Climate Change issues into the States.

KEYWORDS: CLIMATE CHANGE, HUMAN RIGHTS, ENVIRONMENTAL LAW, CLIMATE ACTION.

INTRODUCTION

Humanity is slowly waking up to face a new danger, one that not only threatens economic growth, but humanity's very existence. This danger is Climate Change. As with any problem, the world raced to reach an international consensus on how to combat Climate Change. The results, however, were not very helpful. This is because most of the international conventions that have had any mandatory obligations have treated Climate Change as an issue that is different
from human rights issues. Climate Change is not a problem in the backdoor of a distant country in a distant land. It is one that is constantly affecting our work, our life, and our future. More importantly, it is one that affects the lives of millions of humans all around the world. The tragedy is that Climate Change is still not taken as a problem at par with a human rights issue. It is this problem that we seek to highlight in this paper. Furthermore, the paper also attempts to reason why Climate Change cannot be treated as environmental law problem, but rather should be considered as a human rights issue.

**CLIMATE CHANGE CRISIS**

Climate Change is a phenomenon that has a global impact. It is a combination of various contributing factors from a plethora of States. More importantly, its effects are felt by the inhabitants of not only the contributing states, but also states that have not contributed towards the change. It usually results in abnormal flooding, draughts, food shortages...etc.

The inhabitants are forced to pay a price for acts of pollution they never committed. At an international level, the State in which they live in is expected to follow up and demand compensation on their behalf. However, the problem is that the State themselves are not pro-enforcement of Climate Change standards.

States, especially developing States, tend to give low priority to addressing issues on Climate Change. This is not only because of the lack of funds to comprehensively address the issue, but also because of the very nature of the issue. Climate Change is not a phenomenon that can be tackled by one State alone. Each affected State will have to adhere to a set of mandatory norms to ensure that Climatic Changes with disastrous effects do not occur. The adherence to mandatory norms by a State would dilute the concept of sovereignty for the state.

Mandatory norms do not give the option of derogation to States. The lackadaisical attitude adopted by developing nations is largely due to the lack of mandatory norms at the international level, and the lack of an enforcement mechanism that would affect the States directly. This position, however, is rapidly changing, with many adjudicatory bodies holding States accountable for liabilities arising out of environmental problems. For instance, in Budayeva v. Russia, 1 the European Convention on Human Rights was used as a tool to hold Russia accountable for mud slides not caused by the State. While a definitive duty has been set out in various international documents, their enforcement has not been given much importance. The enforcement is conducted with far lesser seriousness than that of a human rights issue because the liability of States for breaching environmental norms is far lesser than that of a human rights issue.
HUMAN RIGHTS APPROACH TOWARDS CLIMATE CHANGE

International treaties and conventions on Climate Change including the United Nations Framework Convention on Climate Change (UNFCCC) do not delve into the grey area of implementing ‘Climate Change adaptation’ but discuss ‘climate mitigation’ only. 2 ‘Climate Change adaptation’ is the real need of the hour as it analyses the means to respond and rebuild the damage already done due to the disastrous consequences of Climate Change. The Framework Convention has broadly talked about Climate Change adaptation by forming an ‘Adaptation Fund’ but has not laid down the States’ obligation towards adaptation. Moreover, the global nature of Climate Change requires the international community to act in unison. And the world is acting, but by viewing it only as an environmental law issue.

However, Climate Change is satisfying the requirements of an international human rights dilemma. International environmental law is the study of collective action of various states rather than individual efforts. 3 However, Climate Change requires complying with individual obligations to reduce emission of greenhouse gases by a citizen of a State with regards to the entire international community, similar to international human rights law. The causal link between Climate Change and human rights may not have been directly established however, the indirect effects are several. For instance, emission of greenhouse gases into the atmosphere causes depletion of ozone layer, leading to an increase in ultraviolet rays of the sun reaching the earth’s atmosphere. This causes skin cancer and other diseases to people. Also, these emissions cause global warming and melting of the Permafrost in the Arctic glacier, thereby resulting in a rise of the sea level and making States more prone to natural disasters like landslides and floods. Recently, the Third Assessment Report of Intergovernmental Panel on Climate Change said that the Climate Change may not be manifestly linked with human rights, but it recognises its effects on human health, food security and natural resources. 4 The discussion of human rights approach to solve the Climate Change adaptation crisis has begun among the U.N. Agencies through passing resolutions like U.N. Human Rights Council Resolution 7/23 in 2008 and Resolution 10/4 in 2009. They have focussed on the human rights impact of Climate Change. However, there is no settled law. Gradually, human rights remedies shall also be considered and proposed by the United Nations Organisations.

THE WAY FORWARD

Climate Change is gradually spreading its wrath over the entire international community giving rise to deadlier repercussions which cannot be ignored easily. So, one of the 17 Sustainable Development Goals (SDGs) adopted by the resolution A/RES/70/1 in September
2015 is ‘Climate Action’ i.e., the objective of taking immediate action against the rapidly changing climate. It should be the duty of every person in the planet to act upon it. Internationally, the obligation of climate action is not taken as a custom rather as a passing remark as the short term consequences of Climate Change are negligible. As a consequence, the matter is politicised by States rather than to adhere to the obligations laid down under various treaties and conventions. Any issue on Climate Change and its impacts is covered under the garb of international environmental law matters, which reduces the gravity of the situation. This Paper attempts to bring out the facet of deprivation of human rights due to Climate Change. The U.N. believes that we can rebuild “The Future We Want”, and this paper is a contribution for a future without adverse Climate Change.

REFERENCES

Health Drinks for Moderately Acute Malnourished Children

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ABSTRACT

The nutritional deficit in the initial 1000 days of a child’s life affects long-term cognitive and behavioral development. Second and third Sustainable Development Goals focus on the improvement in the nutrition to bring down hunger among children and ensure healthy lives for all ages respectively, reducing the preventable deaths. As per WHO 2014 Report, Infant Mortality Rate and Neonatal Mortality Rate in India are 41.4 and 29.2 respectively. Different initiatives by governmental such as Integrated Child Development Services along with different Non-Governmental Organizations has been successful in reducing Under Five Mortality Rate from 74 in 2005 (National Family Health Survey-3) to 53 in 2014 (WHO). Prevention of transition from moderate malnourishment to severe malnutrition reduces possible deaths due to severe acute malnutrition. Different products such as fortified food products with adequate nutrients (macro and micro) are being used for the community-based management of malnutrition but children of age less than 2 years prefer liquid-foods. Different commercial infant formulas available in the market are too expensive for the families of malnourished children. The work reported here proposes two formulations using local raw materials e.g. soybean, flaxseed, whole milk powder, sugar, soybean oil. One contains whole milk powder (Health-drink 1, HD1) and the other (Health-drink 2, HD2) without milk-powder. Two formulations proposed and tested provide the majority of the micronutrients to a child imparting nearly 500kcal on consumption of 250g of the feed. To ensure the replicability of the process at household level simple processes such as soaking, drying, grinding and blending have been used. These formulations provide more value in terms of affordability, accessibility, and availability with lesser cost as compared to existing products. Characterization of the two formulations in terms of physical and chemical properties vis-a-vis existing products e.g. ready-to-use Therapeutic Food (RuTF), F-75 and F-100 is presented. Preliminary sensory evaluation with children of age group 1-8 years has been encouraging in terms acceptability.

KEYWORDS: SOYBEAN, FLAXSEED, HEALTH-DRINK
INTRODUCTION

Cognitive skills developed during initial 1000 days of the childhood helps a child in completing more grades at school, earning more wages in later life as an adult and having a healthier family as compared to a malnourished child [1, 2]. According to World Food Programme, poor nutrition accounts for 45% of deaths of children under the age of five years. As per UNICEF 2015 Report, most of the Indian states have not been able to achieve targets of child mortality rate set under Millennium Development Goals (MDGs) even after different initiatives. As per Rapid Survey on Children 2014 report, 32%, 7% and 15% of the children in India under the age of five years are stunted, wasted and underweight respectively.

MATERIALS AND METHODS

This section describes the ingredients and the character of two health-drink formulations. Flaxseeds are the leading source of omega-3 fatty acids i.e. ~52% of total fatty acids [3]. India is the fifth major producer of flaxseed in the world and Madhya Pradesh with Uttar Pradesh accounts for nearly 70% of the national production [4]. Soybean with its high protein content (35-48%) and protein digestibility equivalent to animal protein provide nutritionally balanced amino acids [5]. Madhya Pradesh is major producer state of soybean in India.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>HD1 (in g)</th>
<th>HD2 (in g)</th>
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<tbody>
<tr>
<td>Processed soybean flour</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Whole milk powder</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Flaxseed powder</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Soybean oil</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Sugar powder</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Micronutrient premix</td>
<td>4.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Addition of whole milk powder provides high-quality protein with milk flavor to a child. The solubility of the oil particles increases as protein content increases reducing interfacial tension in oil in water emulsion [6]. Soybean oil was preferred due to its low cost, availability and acceptable omega-6 to omega-3 fatty acids ratio (7.5:1). Sugar powder has been used as the sweetening agent. Cardamom is used as the flavoring agent.
RESULTS

Viscosities of the two drinks are in the range of 200cP. Values of Osmolalities of the HD1 and HD2 are 580±0.05 mOsmol/kg and 544±1.06 mOsmol/kg respectively. From plate count method, Microbial loads for HD1 and HD2 in terms of colony forming units are measured as 6±0.7x10^4 and 1.4±0.3x10^4 respectively against permissible 1x10^4 per millilitre for milk based products. Fig 2 provides particle size distribution in HD1 and HD2. Table 2 compares HD1 and HD2 with existing Nutrition-formulations currently being used to address malnourishment in children.
After 8 hours of the sedimentation period at 8-10°C in a cylindrical column, when analyzed using Particle Size Analyser (Beckman coulter LS 13320), it was observed that more than 90% of the volume was occupied by particles of diameters below 6.96µm, 18.71µm, 0.94µm and 1.23µm in F-75, F-100, HD1 and HD2 respectively.

**CONCLUSIONS**

Two formulations developed, tested and proposed here are richer in macro and micronutrient contents than existing and commonly used F-100. As moderately malnourished (MAM) infants have better physiology than Severely Acute Malnourished (SAM) children, formulations are recommended for the former. Particle sizes lie within recommended range of 200µm improving
nutrition absorption probability inside human gut. Simple processes used also create an opportunity for management of malnutrition by replicating the processes even at community and household level. The two drinks proposed are cheaper than all the commercially available infant formulas costing around ₹5.3 and ₹3.8 respectively, excluding the costs of water and processing. Usage of locally available raw materials reduces the availability and affordability issues. Two drinks are not recommended for the children with soybean allergy and diarrhoea as osmolalities of the two drinks are higher than 295mOsmol/kg. Higher water activities (~1.0) can cause higher chances of spoilage from microorganisms so consumption should be done within 6 hours (HD1) and 10 hours (HD2) after blending at room temperature. Overall two formulations show promising results as per the recommended nutrient intake for the desirable weight gain of MAM children.

ACKNOWLEDGEMENT

We acknowledge support of Hexagon Nutrition Pvt. Ltd., Cryo FEG SEM and PSD analyzing facilities. We thank the team of staff members at Foods Lab, IIT Bombay for helping in characterization of the two formulations. We are extremely grateful to Vatsalya Trust for the assistance in sensory evaluation. The M.Tech fellowship of first author was given by Tata Centre for Technology and Development at IIT-Bombay

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ASSISTIVE DEVICE FOR INDOOR AND OUTDOOR MOBILITY OF VISUALLY-IMPAIRED PEOPLE

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ABSTRACT

Creating equality among the population and making everyone’s life better through innovation has been a crucial part of the 10th and 9th Sustainable Development Goal respectively, especially for the population with disabilities or with low income. There are more than 8.9 million blind people in India and millions more suffer from the moderate visual impairment. These people face serious problems in daily activities e.g. road-crossing, indoor mobility, public transport and workplace. They have to seek assistance from another person in performing different daily tasks and it becomes very difficult for them to avoid obstacles in crowded places, uneven terrain and unfamiliar surroundings without such assistance.

Though there are many products in the market but they have different drawbacks. First, they are too expensive for the family of the person with visual impairment as the majority of these families belong to the bottom of the income pyramid. Second, these devices are too sophisticated to be user-friendly. Third, they required handholding of the device which keeps one hand busy, decreasing the productivity of the person. Fourth, they are limited for indoor mobility or familiar surroundings. Fifth, it suppresses the other hyper senses e.g. hearing. Sixth, these devices have limited range and spread in detecting obstacles. Here we propose an innovative wearable device for the assistance in mobility of the visually impaired people which is user-friendly, cost-effective and able to detect an obstacle within a range of 4 meters in any direction by giving a warning signal with increasing frequency as obstacle gets closer. As the device is mounted with the goggle and armband, a person can perform the task with his both hands boosting productivity and self-confidence. The device can be used for the indoor as well as outdoor mobility, reducing the reliance on the assistance of other people and improving the overall quality of life of the visually impaired people.

The inclusion of the innovative device with the existing platform (goggle) requires the least effort from the user and provides more value in terms of better exposure to the surrounding obstacles,
lesser dependence on external assistance and enhanced productivity with lesser cost and perturbation.

**KEYWORDS:** **ASSISTIVE DEVICE, VISUAL-IMPAIRMENT, SUSTAINABLE DEVELOPMENT GOALS**

**INTRODUCTION**

According to WHO bulletin, there were nearly 314 million people around the world who are visually impaired of which around 45 million were blind in 2006. Out of this, 90% of these people belong to developing countries [1].

These numbers will increase by 2020 [2]. They face many day-to-day problems e.g. crossing the road, traveling, workspace etc. Though there are many products available in the market e.g. Drishti, Visparsh, Smartcane, Ultracane, BlindAid, Lechal haptic shoes, iGlasses, Roshni, Teletact etc. to assist visually-impaired people [3, 4, 5]. But these products have not penetrated to the level where it can reach needed population due to their high cost, inability to detect a small and low obstacle, non-availability and sophisticated design. These drawbacks open up a huge opportunity for a disruptive product that would overcome all these issues.

**DEVICE**

The device is divided into three parts: sensory, interface and output. The sensory part includes ultrasound sensors (HC-SR04), Arduino nano microcontroller, Battery and a voltage regulator. This part is embedded in the plastic goggle, commonly used by the people with visual impairment. Interface part includes radio-frequency (RF) transmitter (KST – TX01C) and RF receiver (KST – RX820). RF transmitter is attached with the microcontroller of the sensory part while RF receiver is connected to the microcontroller of the output part which also include a 2V vibration motor, a battery, and a voltage regulator. Output part is embedded in the armband. Mounting sensor and output system in any types of gadgets used other than goggle and armband respectively will require compromises by the user. First, use of cane will limit obstacle detection to the lower part of the body from waist only. Second, use of audible output will disturb the hyper hearing ability of the user as well as the surrounding people. Third, putting vibration motor in the belt will affect the nervous system. Ultimate goal of the device is to maximize assistance with minimum sensory overload.
Working principle

The device can detect an obstacle within a range of 4 meters. Ultrasound waves are generated by the crystal present inside the transceivers periodically, which gets transmitted to the transmitter module. The transmitted ultrasound wave gets reflected by an obstacle. The reflected wave is received by the receiver module. The transceiver module sends the information of time lag between the transmitted and the received waves to the Arduino Nano microcontroller board through a "Digital read" pin. Knowing this time lag and the velocity of the sound, the controller can calculate the distance between the obstacle and the user. Information of the obstacle distance is transmitted through the RF transmitter present at goggle side to the RF receiver present in the armband side, which contains the tactile interface.

Based on that information of the obstacle distance, the controller generates different pulse wave pattern which is transferred to the mechanical vibratory system, making the visually-impaired people aware of the obstacle distance through tactile senses. The intensity of the vibration is roughly inversely proportional to the distance of the sensor from the obstacle. As the obstacle gets closer to the sensor, the vibration becomes more frequent and hence intense to tactile senses. The variation of pulse pattern with respect to the obstacle distance has been depicted in fig. 2. This serves as a warning signal to avoid the obstacle. By rotating the head in different directions, a substantial range of obstacles can be covered. Detailed description of the electronic circuitry involved in the device is given in [6].
Testing results with the fabricated prototype

The fabricated prototype of the device is shown in fig. 3 and 4. Preliminary testing of the fabricated prototype of the device is carried out and results are included. The vibration pattern is consistent with the distance range. On average, it can detect obstacle distance with an error of 3cm. There was a lag period of ~2 seconds when the device is switched on. The device was able to detect protrusions of size ~3mm from a distance of 25cm. Obstacles with sharp give a unique warning signal of three-one-three vibration pattern.
CONCLUSIONS

The device can detect obstacle accurately within a range of 4m with a resolution of 2cm. Size customization of the goggle and armband increases the scope of customers. It is affordable as the overall cost of the prototype is about ₹3000 which can be reduced further to nearly half in mass production. Simple and user-friendly design reduces the time of learning. Hence minimal training would be required. Mounting of the sensors in goggle relieves usage of an additional stick for the mobility, freeing both hands to perform tasks more effectively and efficiently. It also boosts up self-confidence and improves self-reliance as minimal or no assistance will be required, improving overall productivity and lifestyle of the visually-impaired people. Future work is needed to miniaturize the device.

ACKNOWLEDGEMENT

We acknowledge the help provided by our colleagues Akshay Subramaniam and Vikram Singh as well as the facilities and support provided by the TATA Center for Technology and Design, IIT Bombay for fabrication and testing of the device. We are grateful to staff and participants of Kumudben Dwarkadas Vohra Industrial Home for Blind Women for their periodic feedbacks about the device. We are thankful to our mentor.

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Climate-Smart Agriculture: An Address of Food Security and Climate Change

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ABSTRACT

Hungerness: The world’s hungry population waiting for an aid. Government and non-government agencies is constantly engaged in various activities for the welfare of the farmers across the world. There is yet need to be done to foster the agriculture and together the hands for assistance of economic and techno-social development of farmers. The farming needs to involve awareness towards new technologies in transitioning farmers from current strategies to new climate-aware ones and developing technologies that can assist farmers as the climate changes. Climate-smart agriculture is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a new realities changing climate.

KEYWORDS: CLIMATE-SMART AGRICULTURE, SUSTAINABLE DEVELOPMENT, FOOD SECURITY, CLIMATE CHANGE.

INTRODUCTION

A growing global population and changing diets are the factor of driving up the demand for food (Figure 1). Production is struggling to keep up as crop yields level off in many parts of the world, ocean health declines, and natural resources—including soils, water and biodiversity—are stretched dangerously thin (Figure 2). One in nine people suffers from chronic hunger and 12.9 percent of the population in developing countries is undernourished. The food security challenge will only become more difficult, as the world will need to produce about 70% more food by 2050 to feed an estimated 9 billion people [1].
Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate [2]. Climate-smart agriculture is a sort of overview concept originally put forth in 2010 by the United Nation’s Food and Agriculture Organization (FAO) [3]. The farming needs to involve significant investment, especially money, in developing technologies that can assist farmers as the climate changes; in transitioning farmers from current strategies to new climate-aware ones; and in encouraging farmers to abandon or lessen reliance on methods that increase greenhouse gas emissions [4]. Thus, Climate-smart agriculture is a tool to address Food Security and Climate Change (Figure 3).
Figure 3. Climate-smart agriculture is a tool to address Food Security and Climate Change

International Scenario

UN Headquarter, New York had organized Climate Summit 2014 with having geographical coverage of more than 20 countries in Africa, Asia, Europe and Latin America, and more than 35 organizations [5]. They come up with action plan: Global Alliance for Climate-Smart Agriculture. It is a voluntary, farmer-led, multi-stakeholder, action-oriented coalition committed to the incorporation of climate smart approaches within food and agriculture systems. It will seek to improve people’s food and nutrition security by helping governments, farmers, scientists, businesses, and civil society, as well as regional and international organizations, to adjust agricultural practices, food systems and social policies so that they take account of climate change and efficient use of natural resources.

The World Bank continuously emphasizes a lot on fostering the Climate-Smart Agriculture [6]. The Bank has supported projects and program on CSA in making a difference across the globe, such like:

- In Uruguay, the Sustainable Management of Natural Resources and Climate Change (DACC) project is supporting sustainable intensification through a number of initiatives including the establishment of an Agricultural Information and Decision Support System (SNIA) and the preparation of soil management plans.

- The Morocco Inclusive Green Growth project supports the national green growth agenda by increasing the supply of agro meteorological information and facilitating the diffusion of new, resilience-building technologies such as direct seeders.

- In Senegal, the West Africa Agricultural Productivity Program (WAAPP) and its partners have developed seven new high-yielding, early-maturing, drought resistant
varieties of sorghum and millet. Released in 2012, these varieties are being widely diffused to farmers and show positive yield result.

- In Ethiopia, the Humbo Assisted Natural Regeneration Project has helped restore 2,700 hectares of biodiverse native forest, which has boosted production of income-generating wood and tree products such as honey and fruit.
- African farmers who have adopted evergreen agriculture are reaping impressive results without the use of costly fertilizers. Crop yields often increase by 30 percent and sometimes more. In Zambia, for example, maize yields tripled when grown under Faidherbia trees.

**Indian Scenario**

India is an important global agricultural player, despite the fact that agriculture’s share in the country’s economy is declining. It has the world’s largest area under cultivation for wheat, rice, and cotton, and is the world’s largest producer of milk, pulses, and spices (World Bank 2012) [7]. Nearly three-quarters of India’s households are dependent on rural incomes. Agricultural productivity in the country’s semi-arid tropical region is impeded by water shortages and recurrent drought, while environmental degradation and vulnerability to weather-related disasters pose challenges to the country as a whole.

India is home to 25 percent of the world’s hungry population. An estimated 43 per cent of children under the age of five years are malnourished (UN’s World Food Program 2012) [8]. Poor populations also face a lack of access to productive assets, financial resources, education, health care, and basic social services. The government has recently begun to focus on microenterprise development as a way to address these challenges, as well as initiatives to bring basic services to the rural poor. With the country’s population and economy continuing to grow, huge demands will be placed on critical infrastructure in the coming years. It is estimated that US$1 trillion will be needed to meet India’s infrastructure needs in the next five years [9].

In India, Climate Smart Agriculture is not just about building resilience to climate change and mitigating negative impacts; it also requires a focus on increasing farmers’ incomes. Together with PepsiCo and university and finance partners, the World Business Council for Sustainable Development (WBCSD) and Monsanto are launching the India Agriculture Tool (IAT) that aims to increase farmer incomes through water saving, which dually decreases resource use and builds resilience to drought [10]. National Innovations on Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR) launched in February, 2011 [11]. The project aims to enhance resilience of Indian agriculture to climate change and climate
vulnerability through strategic research and technology demonstration. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management.

Gujarat State Scenario In Gujarat, under the President ship of Hon’ble Justice B P Singh, formerly Judge, Supreme Court of India and President of The Environmental & Consumer Protection Foundation (ECPFO), New Delhi, in 2010, National Council for Climate Change Sustainable Development and Public Leadership (NCCSD) was established [12]. This Council may facilitate and carry out appropriate and target oriented action for climate change mitigation and adaptation. This Council has also found that there is need to promote Climate Smart Agriculture.

CONCLUSIONS

Climate-Smart Agriculture which addresses Food Security and Climate Change based on two major components: (i) Research and Development towards the three pillars of CSA. (ii) Development towards the farmers: it will bring scientific and techno-social upliftment of farmers. The Techno-legal experts from CSA could deal with various mitigation and adaptation strategies to cope up against food security and climate change and come to solution of Hungerness: The world’s hungry population.

ACKNOWLEDGEMENT

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Applications Of Nanotechnology In Smart Civil Construction

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ABSTRACT:
Since nanotechnology was introduced by Nobel laureate Richard P. Feynman during his now famous 1959 lecture “There’s Plenty of Room at the Bottom,” [1]. Nanotechnology has the potential to make construction faster, safer & cheaper, resulting in smart construction. In this article, use of nanotechnology in building materials on behalf of a range of Civil Engineering mechanism is discussed. Concrete science is a multidisciplinary area of research where nanotechnology potentially offers the opportunity to enhance the understanding of concrete behavior, its properties and to lower production and ecological cost of construction materials. Strength, durability and other properties of materials are dramatically affected by a scale of Nano-meter(10-9m). This article as well reveals how the use of Nano-technology makes concrete more stronger, durable and more easily placed. Different types of Nano materials used are discussed with its wide applications. The properties like self-sensing, self-rehabilitation, self-structural health monitoring and self-healing are studied. It can also provide self-powered failure prediction and prevising mechanisms for high capital structures. This paper emphasizes on the use of nanotechnology in concrete in order to make an innovative infrastructure and building of a smart city.

KEYWORDS: Nanotechnology, Civil Engineering, Cement, C-H-S, Concrete, Smart-construction, Nanoparticles.

INTRODUCTION

1. Nanotechnology: Nanotechnology is an emerging field of science related to the understanding and control of matter at the Nano scale, i.e., at dimensions between approximately 1 and 100 nm (www.nano.gov) Nanotechnology encompasses Nano scale science, engineering, and technology. How small is "Nano"? In the serviceability index system of units, the prefix “Nano” means 1-billionth or 10-9. Therefore 1 nm is 1-billionth of a meter.

1 Nanometer (nm) = 1 x 10^9 m [2]
2. **Civil Engineering:** Civil Engineering is always bounded within cement, sand, stone and aggregate, but it is way beyond that. Nanotechnology can be used for plan and construction processes in many areas ever since nanotechnology generates products have many only one of its kind characteristics.

3. **Cement & Concrete:** Typical concretes consist of ordinary Portland cement (OPC), fillers such as sand, coarse aggregates, admixtures, and water. This combination of materials allows concrete to be produced in a fluid form that can be pumped and molded.

**Definition of Nano-concrete:**
For discussions presented in this paper, Nano-concrete is defined as a concrete made with Portland cement particles that are less than 500 Nano-meters as the cementing agent. Currently, cement particle sizes range from a few Nano-meters to a maximum of about 100 Micro meters. In the case of micro-cement the average particle size is reduced to 5 Micro Meters. An order of magnitude reduction is needed to produce Nano-cement.

**Application of Nanomaterials in Smart Civil Construction:**
Nanotechnology has a significant impact in the construction sector. Several applications have been developed for this specific sector to improve the durability and enhanced performance of construction components, energy, efficiency, and safety of buildings, maintenance and providing increased living comfort. There are various nanoparticles with their applications are used in the field of construction.

<table>
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<tr>
<th>S.NO</th>
<th>Nano-Particles</th>
<th>Applications Area</th>
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<tr>
<td>1.</td>
<td>TiO₂ (Titanium dioxide)</td>
<td>Used for its ability to break down dirt &amp; pollution when exposed to UV lights.</td>
</tr>
<tr>
<td>2.</td>
<td>Al₂O₃ (Aluminum tri-oxide)</td>
<td>Used to make surfaces scratch resistance.</td>
</tr>
<tr>
<td>3.</td>
<td>ZrO₂ (Zinc Oxide)</td>
<td>Used to have UV resistance in both coating &amp; paints.</td>
</tr>
<tr>
<td>4.</td>
<td>Nano-silica (SiO₂)</td>
<td>Replaces part of the cement to densify the concrete and strength.</td>
</tr>
<tr>
<td>5.</td>
<td>Slurry of amorphous nano-SiO₂</td>
<td>Improves segregation resistance in self-compacting concrete (SCC)</td>
</tr>
<tr>
<td>6.</td>
<td>Carbon nanotubes</td>
<td>Provides mechanical &amp; thermal durability and cracks prevention in cement products</td>
</tr>
<tr>
<td>7.</td>
<td>Copper Nano-particles</td>
<td>Benefits are weldability, corrosion resistance, and formability in steel.</td>
</tr>
<tr>
<td>8.</td>
<td>Polymer fiber matrix Nano-silica</td>
<td>Self-Structural Health Monitoring system in Repairs &amp; Rehabilitation.</td>
</tr>
<tr>
<td>9.</td>
<td>Quantum dots</td>
<td>Benefits are effective electron mediation in solar cell.</td>
</tr>
<tr>
<td>12.</td>
<td>Micro encapsulated healing polymer (smart material)</td>
<td>Automatically closes the cracks in concrete when they occur.</td>
</tr>
</tbody>
</table>

**Futuristic Implementation of Nanotechnology in Smart Civil Construction:**

A. Improving Concrete strength with Nano-particle’s and Nano-porous Thin Film Technology: Concrete is one of the most widely used construction material. Nanotechnology is widely used in studying its properties like hydration, alkali silicate reaction (ASR), and fly ash reactivity, calcium–silicate–hydrate (C–S–H) is the “glue” that
holds concrete together and is itself a nanomaterial. Nano-silica: Particle packing in concrete can be improved by using Nano-silica which leads to a densification of the micro and nanostructure resulting in improved mechanical properties. Nano-silica addition to cement based materials can also control the degradation of the fundamental C-S-H (calcium-silicate-hydrate) reaction of concrete caused by calcium leaching in water as well as block water penetration and therefore lead to improvements in durability. The technology necessary to apply NPTF (nonporous thin film) on aggregates is already available in the market. Improvements in compressive, tensile, and flexural strengths and reduction in drying shrinkage have been observed.

**FIG-1: CONCRETE COATED WITH NPTF OF SILICA**

**TiO2:** Titanium Dioxide Nano-powder added to concrete can give ability to break down dirt or pollution and then allow it to be washed off by rain water on everything from concrete to glass. TiO2 is a white pigment and can be used as an excellent reflective coating. It is incorporated, in sun-block to block UV light and it is added to paints, cements and windows for its sterilizing properties.

**Fig-2: brick coated with TiO2**

Nanosized particles have a high surface area to volume ratio, providing the potential for tremendous chemical reactivity. Much of the work to date with nanoparticles has been with nano-silica (nano-SiO2) and nano-titanium oxide (nano-TiO2). There are a few studies on incorporating nano-iron (nano-Fe2O3) and nano-alumina (nano-Al2O3), and nanoclay particles. Additionally, a limited number of investigations are dealing with the manufacture of nanosized cement particles and the development of nanobinders.

**B. Self-cleansing action in Glass:** Research is being carried out on the application of nanotechnology to glass, another important material in Construction. Titanium dioxide
(TiO2) nanoparticles are used to coat glazing since it has sterilizing and anti-fouling Properties. The particles catalyze powerful reactions that break down organic pollutants, volatile organic compounds, and bacterial membranes. TiO2 is hydrophilic which can attract rain drops that then wash off the dirt particles.

![Fig-3: Self Cleansing action in glass](image)

C. **Fire-protective glass:** This is achieved by using a clear intumescent layer Sandwiched between glass panels (an interlayer) formed of silica nanoparticles (SiO2) [8], which turns into a rigid and opaque fire shield when heated. Most of the glass in construction is on the exterior surface of buildings. So the light and Heat entering the building through glass has to be prevented. The nanotechnology can provide a better solution to block heat coming through windows and allow light.

![Fig-4: Fire Protective Glass](image)

D. Nano reinforcements: nanotubes/nanofibers: Carbon nanotubes/nanofibers (CNTs/CNFs) are potential candidates for use as Nano reinforcements in cement-based materials. CNTs/CNFs exhibit extraordinary strength with moduli of elasticity on the order of TPa and tensile strength in the range of GPa, and they have unique electronic and chemical properties [14–15]. Single-wall CNTs (SWCNTs), multi-wall CNTs (MWCNTs), and CNFs are highly structured graphene ring-based materials with very large aspect ratios (of 1000 or more) [16]. Unlike CNTs, CNFs present numerous exposed edge planes along the surface that constitute potential sites for advantageous chemical or physical interaction. Compared to CNTs, vapor grown CNFs have a lower production cost (about 100 times lower than SWCNTs [17]) and are suitable for mass production. While CNTs/CNFs have been extensively studied in polymeric composites [18], their use in cement has, to date, remained limited.
The use of carbon nanotubes (CNT) as a reinforcing material is intended to move the reinforcing behavior from the macroscopic to the Nanoscopic level. In addition to the well-known advantages of these materials as reinforcements, which include extremely high strengths and Young's moduli, elastic behavior and advantageous electronic and thermal properties and to enhance quality of the paste-aggregate interface. As a result, much stronger and tougher concretes may be possible when made as a CNT composite.

**Fig: 5-6: Photo-catalyst Nanofiber & Carbon NanoTube**

**E. COATINGS, PAINTS, AND ISOLATION MATERIALS:** The coatings should have self-healing capabilities through a process of "self-assembly". A new technology is being applied to paints to obtain the coatings having self-healing capabilities and Corrosion protection under insulation. Since these coatings are hydrophobic and repel water from the metal pipe and can also protect metal from salt water attack.

**Fig-7: Aero Gel: Evacuated Nano pores in SiO2 matrix**

Silica aero gel particles with Nano sized pores in combination with reinforcing fibers paints and coatings are beside on aesthetics arguments and protection also used for insulating properties. Aero gel has a very low thermal conductivity with an extremely low density. This means that aerogel is usually only 15 times lighter than air, and has been produced at a density of only 3 times that of air.
CONCLUSIONS:

The present paper reviews the current state of the field of nano-technology in concrete and recent key advances. The potential of nanotechnology to improve the performance of concrete and to lead to the development of novel, sustainable, advanced cement-based composites with unique mechanical, thermal, and electrical properties is promising and many new opportunities are expected to arise in the coming years. The advances in instrumentation and computational science are enabling scientists and engineers to obtain unprecedented information about concrete, from the atomic through the continuum scale, and the role of nanoscale structures on performance and durability. This information is crucial for predicting the service life of concrete and for providing new insights on how it can be improved. New developments have taken place in the nano-engineering and nanomodification of concrete; however, current challenges need to be solved before the full potential of nanotechnology can be realized in concrete applications, including proper dispersion; compatibility of the nanomaterials in cement; processing, manufacturing, safety, and handling issues; scale-up; and cost. Additionally, introduction of these novel materials into the public sphere through civil infrastructure will necessitate an evaluation and understanding of the impact they may have on the environment and human health. What is clear, however, is that, now, 50 years after Feynman’s famous treatise, nano-technology is changing the way scientists and engineers look at one of the world’s oldest man-made materials, concrete.

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Case Study: Understanding the effectiveness of Light Shelves for deep office spaces in Warm and Humid Climate

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ABSTRACT

For economic reasons, one of the most common design configurations amongst the commercial building is the deep plan office layout as it employs the maximum ratio of usable floor area to the exterior envelope. The penetration of daylight in these types of buildings is mainly through windows at the perimeter which reaches only up to few distances because of physical obstructions, primarily interior partitions. Also some buildings are located in very dense urban areas where daylight availability already gets reduced by the surrounding buildings. This results in non homogenous illumination, with high concentration of illumination levels near the glazing causing discomfort glare. At the same time the lighting levels are very low in the middle of the floor plate. Therefore, the deeper spaces of these buildings are in dark and depend exclusively on electrical lighting for obtaining an adequate illumination. This results in increase in the overall energy consumption. Integration of day lighting strategies with electrical controls can provide automatic adjustments to provide minimum light levels with minimum electricity use. Also, on the other side day lighting highly depends on climate and the sky conditions. Amongst all type of climate, Warm and Humid climate is considered as critical for achieving adequate daylight due to overcast sky conditions at most of the time of the year. Thus, to achieve comfortable illumination levels in deep spaces on working surfaces, different day lighting strategies are being used and Light Shelf is one of the ways to penetrate daylight deep into the interior. Hence, the paper focuses on understanding the effectiveness of Light Shelf Strategy for achieving the adequate Lux levels for deep office spaces in Warm and Humid Climate through a case study. Keywords: Daylight, Deeper Office Space, Light Shelves, Lux Levels, Warm Humid Climate.

INTRODUCTION

Daylight is a full-spectrum source of light to which human vision is adapted. Day lighting is a practice of placing windows or other openings and reflective surfaces so that during the day natural light provides effective internal lighting. Although electric lighting has now assumed the role of being the primary means of illumination for many buildings, people generally express a
strong preference for natural light in their work environment. Recent studies have shown that proper day lighting of a building can increase productivity, decrease sick time and even increase sales. Day lighting is highly depends on climatic conditions. Warm and Humid Climate has overcast sky condition for most of the time of the year, thus to achieve comfortable illumination levels in deep spaces on working surfaces in this climate, different day lighting strategies are being used and Light Shelf is one of the ways to penetrate daylight deep into the interior.

**AIM**

The main aim of this study is to understand the effectiveness of Light Shelves for achieving the adequate Lux levels for deep office spaces in Warm and Humid Climate.

**SKY CONDITIONS FOR DAY LIGHTING**

For day lighting purposes, sky conditions are classified as Overcast, Clear or Partly Cloudy. Each classification has characteristics that influence day lighting design.

![Image of sky conditions]

*Figure 1: Overcast, Clear and Partly Cloudy.*

Warm and Humid Climate is characterized with high humidity, diffuse fraction of solar radiation is quite high due to cloud cover but radiation can be intense on clear days and Precipitation is also high about 1200 mm per year or more.

Thus, case study analysis should be done for the critical month of the year with overcast sky condition.

**CASE STUDY**

**INFOSYS, Pocharam, Hyderabad (Climate – Warm and Humid).**

Software giant Infosys located in Hyderabad, Andhra Pradesh (Lat: 17°26'N, 78°27’ E) with total area of 460 acres has received LEED Platinum certification from the Indian Green Building Council for its Software Development Block 1. Natural light penetration in more than 90% of the office space, which in turn reduces energy usage for lighting. It has incorporated Light Shelves along all windows to allow deep passage of natural light inside.
February is considered as a critical month as 61% of the days clear sky condition prevails. July is a critical month as 40% days on the month there is overcast sky condition. But the sun is shifted to northern hemisphere during this month. As a result August is taken as critical month with 36% overcast sky condition.

**COMPONENT SCALE STRATEGIES USED FOR DAY LIGHTING**

Light Shelves are used in the southern face of the building in order to penetrate light deeper into the space. Vertical fins are also used to prevent from low angle evening sun rays. Light Shelves are not used in the northern face of the building as this face receives diffused sunlight. The building is stepped on the eastern and western façade in order to prevent from harsh low angle sun.

**ON SITE ANALYSIS THROUGH LUX METER**

Lux levels are taken for the critical month of August with a Lux Meter at three different points on the floor space at a height of a working table. (Note: Actual illumination levels may vary on site with change in weather conditions.)
INFERENCES

It is observed from the chart that the illumination level in the north side is less than the southern side. Light Shelves are more effective in the southern side than in the northern side, since it is available throughout the year on this side. The illumination level almost remains constant after point 2 in both the cases. Use of artificial light is more in the northern side than in the southern side. Uniform illumination is observed in both the cases.

CONCLUSIONS

Warm and humid climate receives maximum illumination from zenith on the southern side for most of the time of the year. Due to this max illumination is on the horizontal surface of the building and thus Light Shelves is an effective strategy to day lit the deeper spaces in order to receive uniform illumination for most of the part of the year. Theoretically, the maximum penetration which can be achieved without Light Shelves is 2.5 times the height of the window or less but it is observed in the case study that with Light Shelves day light penetrations can be 3 to 4 times the height of the window, and Light Shelves are more effective where diffuse fraction of solar radiation is quite high and have high solar altitude angles.
ACKNOWLEDGEMENT

I would like to thanks Ar. Kalyan Chatim from Goa for being a resource person and would thanks authorities of Infosys, Hyderabad for allowing me to visit their premises for the study.

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Engineering for achieving Social, Economical and Environmental Goals of Sustainable Development

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ABSTRACT

Engineering has given us the world we live in. It is an incredibly diverse activity covering many different areas and levels. The world is becoming a place in which the human population is becoming more crowded, more consuming, more polluting, more connected, and in many ways less diverse than at any time in history. There is a growing recognition that humans are altering the Earth's natural systems at all scales, from local to global, at an unprecedented rate. The question now arises whether it is possible to satisfy the needs of a population that is growing exponentially while preserving the resources for our future generation. A related question is what should be done now and in the near future to ensure that the basic needs for water, sanitation, nutrition, health, safety, and meaningful work are fulfilled for all humans. Considering the problems facing our planet today and the problems expected to arise, the engineering profession must revisit its mindset and adopt a new mission statement - to contribute to the building of a more sustainable, stable, and equitable world. Thus, the paper is intended to understand the concept and challenges of Social, Economical and Environmental goals of Sustainable Development, which in turn can be used to develop a basic framework that can be considered for bringing a change in engineering practice to move us in the desired direction of sustainability.

KEYWORDS: ENGINEERING, ECONOMICAL, ENVIRONMENTAL, SOCIAL, SUSTAINABLE DEVELOPMENT.

INTRODUCTION

Engineering is the field or discipline, practice, profession and art that relates to the development, acquisition and application of technical, scientific and mathematical knowledge about the understanding, design, development, invention, innovation and use of materials, machines, structures, systems and processes for specific purposes. Engineering plays a vital role in human, economic, social and cultural development to achieve United
NATION (UN) MILLENNIUM DEVELOPMENT GOALS, ESPECIALLY ENVIRONMENTAL SUSTAINABLE development. Sustainability, or Sustainable Development", is the concept of enabling life on earth to continue indefinitely within the constraints of the planet"s carrying capacity. It encompasses the idea that the planet could supply us with air, food, water and energy, and absorb our wastes, and do so whilst providing as high a quality of life as possible for all. The term „Sustainable Development“ can thus encompass any action that moves us in this direction, and „Engineering for Sustainable Development“ can be seen as a change in engineering practice that also moves us in this desired direction.

**AIM**

The paper focuses on understanding the concept and challenges of Social, Economical and Environmental goals of Sustainable Development and achieving a basic framework that can be considered for bringing a change in engineering practice for Sustainable Development.

**SUSTAINABLE DEVELOPMENT: CONCEPT AND DEFINITION**

Sustainable development, as defined in the Brundtland report, is development which meets the needs of the present without compromising the ability of future generations to meet their own needs. Concept of Sustainability has been evolved since 1972, when the international community first explored the connection between quality of life and environmental quality at United Nations Conference on the Human Environment in Stockholm.

**Social Approach**

Maintain the stability of social and cultural systems. Sustainable economic development is directly concerned with increasing the standard of living of the poor, which can be measured in terms of increased food, real income, education, health care, water supply, sanitation, and only indirect concerned with economic growth at the aggregate.

**Economic Approach**

Maximize income while maintaining constant or increasing stock of capital. Sustainable development means basing development and environmental policies on a comparison of costs and benefits and on careful economic analysis that will strengthen environmental protection and lead to rising and sustainable levels of welfare (WorldBank, 1992).

**Environmental Approach**
Maintain the resilience and robustness of biological and physical systems. Sustainable development – maintenance of essential ecological processes and life support systems, the preservation of generic diversity, and the sustainable utilization of species and ecosystems (IUCN, WWF, UNEP, 1987).

**SOCIAL, ECONOMICAL AND ENVIRONMENTAL CHALLENGES FOR ENGINEERS**

**Social Challenge**

When large numbers of people live in agglomerations, actual or perceived social inequalities and social exclusion of sections of the population can lead to social unrest. Thus, it is important to take into account the risks of alienating important groups of citizens. All models of Sustainable development have to ensure that public transport, water, sanitation, electricity, and telecommunications are affordable and accessible to all population groups. Social sustainability also refers to trans-generational well-being that encompasses current and future generations.

**Economical Challenge**

Economic growth also helps to improve social capital (education, worker health, etc.), which in turn results in further growth, fostering a virtuous cycle (Spangenberg, 2005; Andad and Sen, 2000). Economic sustainability relates to the achievement of new levels of socio-economic, demographic and technological output that will strengthen the foundations of the urban system in the long term (Basiago, 1999). The basic dimensions of socio-economic sustainability are population or demography, economic activity, per capita GDP or personal income, rates of change in employment and output, and community/culture. The presence of minority languages and cultures strengthens regional identity (Copust and Crabtree, 1996).

**Environmental Challenge**

Environmental concerns are growing in cities. Three pressures arise. The first is on resource limitations, such as water scarcity and quality, or fuel requirements. The second is on Quality of Life and health. Not only are citizens and authorities more environmentally aware, but the economic implications of pollution can be serious, due to the impact on health and the attractiveness for businesses to operate from the city. The third is risk management and resilience to environmental shocks (such as heat waves and flooding caused by climate change).

**ENGINEERING RESOLUTIONS TO THE CHALLENGES**

Traditional engineering considers the object or process, focuses on technical issues, solves immediate problem, considers the local context and assumes others to deal with Social (societal),
Economic (political) and Environmental (ethical) issues. But now in order to achieve Social, Economical and Environmental goals of Sustainable Development, it is important to see the challenges in contingence with sustainable development principles. Integration of these principles results in a social, economy and environmental challenge diagram which in turn can be overcome with some engineering resolutions shown in figure 1.

**Figure 1: Challenge Diagram and Engineering Resolution.**

These challenges can be the major focus for Sustainable Development and engineering resolutions can form a basework to develop a conceptual framework for bringing a change in engineering practice which can lead us in the desired direction.

**Conclusions**

The approach for bringing a change in engineering practice which can lead us in the desired direction is been thought by considering different parameters of social, economic and environmental goals of Sustainable Development. Thus, engineering for Sustainable Development can be seen in contingence with the social, economical and environmental goals of Sustainable Development, which considered the whole system in which the object or process will be used,
CONSIDERS BOTH TECHNICAL AND NON-TECHNICAL ISSUES SYNERGISTICALLY, STRIVES TO SOLVE THE PROBLEM FOR INFINITE FUTURE (FOREVER), CONSIDERS THE GLOBAL CONTEXT AND ACKNOWLEDGES THE NEED TO INTERACT THE EXPERTS IN OTHER DISCIPLINES RELATED TO THE PROBLEMS.

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How Equal is Gender Equality?

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ABSTRACT

This paper is based on the implied connotations and literal meaning of Gender Equality, from a sociological and psychological perspective. It critically examines the underlying ideologies that establish “Sociology of Gender”; the social construct of gender and the establishment of inequality between men and women. Along with the establishment and evolution of social systems based on caste, colour and creed, there evolved another set of disparities that were based on gender roles. Just like a hierarchical order among different castes in India, or racial discrimination which held one race superior to the other in the Western world, a similar pattern emerged between the two genders the world over. Of the two genders, women came to be considered the inferior one of the two sexes; exploited, subjugated, and disregarded by men. However, after several generations of discrimination, there came a point of time in history when women started to fight for their rights – to dignity and equal opportunities – worldwide. These led to various women’s movements, though sporadically in different parts of the world. Gradually, with the spread of education, Renaissance, the French Revolution, the Industrial revolution, women felt empowered to raise their voices and bring about changes in the male-dominated laws of their respective countries. For instance, over the years, having a girl child no longer meant a matter of disgrace but pride, for girls and women now received equal right to education, job opportunities, freedom to choose, the right to be heard and compete with men in several parts of the world. As evident from status quo, this reform was not absolute in nature, which is why undying effort and continuous push is given to the establishment of an equal arena for women as for the ever dominating men.

However, now that we have reached a level of marginal improvement in the gender gap reduction, it is time to view Gender Equality as a product of identification and intervention of issues faced by both men and women, and not just women issues in isolation. In other words, Gender Equality should not echo Feminism but Egalitarianism, in this socio-cultural context, for it is a fundamental human right. There is a need to re-examine gender roles not just for women, but also for men. Upliftment of one gender need not be by pulling the other down. There needs to be a holistic approach to gender equality where both the sexes are seen as complementing and not opposing each other. Society has to take a leap of faith and trust the so-considered "superior” sex as an equal
partner and make amends for all the atrocities committed towards the so-considered „weaker” sex.

There has to be a paradigm shift in the way men are looked at by women, and similarly how men regard and value women in society. Equality, by its true definition, is the state of being equal in rights, opportunities and responsibilities. Therefore, an equal and balanced effort to acknowledge, accept and integrate both the gender groups as complementary parts of society and not two opposing forces, must be made. Where on the one hand, empowering women and girls will make us move closer towards reducing gender disparities, on the other hand, targeting one gender group in society will only lead to furthering of gender disparities between the two groups, leading to an unsuccessful attempt at achieving UN’s Sustainable Development Goal 5 of Achieving Gender Equality, which is why equal efforts in both these modules must be made.

**KEYWORDS: GENDER, EQUALITY, GENDER EQUALITY, SEX, Egalitarian, Feminism, Stereotype**

**INTRODUCTION**

According to UN Women, Gender refers to “the social attributes and opportunities associated with being male and female and the relationships between women and men...These attributes, opportunities and relationships are socially constructed and are learned through socialization processes... Gender determines what is expected, allowed and valued in a women or a man in a given context. In most societies there are differences and inequalities between women and men in responsibilities assigned, activities undertaken, access to and control over resources, as well as decision-making opportunities.” (1)

This definition suggests Gender to be a social concept, in order to keep the functioning of society and its established norms to continue for generations to come. With Gender come highly defined, stringent and inflexible gender roles. These roles then bring with them the unfortunate stereotypes and biases against both men and women, which further divide and create opposing groups of the two sexes. These groups gradually are seen as a threat to each other’s presence and well-being. This leads us to two viewpoints – The first being, that the moment a woman generically characterizes a man as a victimizer, she unknowingly portrays herself as a victim, or if a man stereotypes all women to be insignificant, he assumes himself to be powerful with women being assumed as lesser beings, which creates inequality of power, position and potential between the two genders. The second viewpoint suggests that the constant criticizing and demeaning of one gender group on the other, brings about inequality of regard and cooperation between the two genders. Both these viewpoints lead to a lack of empathy and regard for each-other and the roles that they perform, furthering the divide between the two genders. In other words, the stage is set for Gender Inequality. Gender Equality, as defined by UN Women, is “the
equal rights, responsibilities and opportunities of women and men and girls and boys. Equality does not mean that women and men will become the same but that women's and men's rights, responsibilities and opportunities will not depend on whether they are born male or female. Gender equality implies that the interests, needs and priorities of both women and men are taken into consideration, recognizing the diversity of different groups of women and men. Gender equality is not a women’s issue but should concern and fully engage men as well as women. Equality between women and men is seen both as a human rights issue and as a precondition for, and indicator of, sustainable people-centred development.”

Gender Equality, has become “synonymous with man-hating” as quoted by UN Women Goodwill Ambassador and Hollywood Actor, Emma Watson. She feels that suicides among men are four times those among women, which is a disturbing fact. This makes one wonder why, if the men truly are as privileged as the “feminists” consider them to be. Just like women face the social responsibility of bearing and rearing children, men, too, have to give in to societal pressures of being the breadwinners for their families, build a position of social and economic stability for not just themselves but also for their parents, wives and children. (2)

Women since centuries have been deprived, threatened and denied rights and opportunities, and this is where feminism became a movement to bring them all justice, till the feminist movement went ahead blamed the all men – irrespective of whether they „all“ were the perpetrators of atrocities or not. Moving ahead, we shall get a deep insight into how gender roles are formed and how the root to gender stereotype is planted, along with a critical analysis of how it is hindering the process of achieving Gender Equality.

**ROLES, STEREOTYPES AND EQUALITY**

This deals with the socio-cultural differentiation of existing sexes of males and females, recognizing them as men and women and girls and boys, who are assigned their respective gender roles which they are supposed to conform to, in order to be accepted by their society. The various stages of imposition of gender identity are given, discussing how gender roles are formed through the course of one"s lifetime, and conditioning and confining both the groups to their assigned gender norms, acting as an obstacle in the path towards Gender Equality:

**Stage 1: Acculturation of Sexes**

Around the age of 2-3, when children begin to become aware of their being, their surroundings and their family, the process to mould them into acceptable participants in society gets initiated. They witness this by the way they are dressed, the toys they play with, the gifts they receive, the recreation they are introduced to, and so on, forming a Gender Identity of the child. Social
Learning Theory (Bandura, 1977) maintained that gender identities and roles are acquired and learnt from the environment. Bandura suggested that a child learns about his/her gender through observing his/her role models and later imitating them. Through use of reinforcement and punishment a child’s behaviour is further cemented. (3) This is where the process of socialisation forms the first phase of Gender and its norms, extremity of which creates disparity and a sense of aversion for the other gender group.

**Stage 2: Development of Gender Identities and Conflicting Sexualities**

At the occurrence of adolescence, growing children can relate to the anatomy they are born with and simultaneously are introduced to the concept of sexual orientation and interests, defining them to be homosexual or heterosexual. This leads to creation of separate identities and confrontation with the society and its expectations, in case of deviance from what society considers acceptable or “normal”, on the basis of the gender identity it creates at Stage 1. David Benatar, in his book, The Second Sexism: Discrimination against men and boys”, defends by the title how men are considered to be the second sex and prioritised over women and their needs, and talks about how male homosexuals are more discriminated against than lesbians due to signs of higher deviance from gender norms of males in gay men when compared with females. Since quite recently, “cross-dressing” has become a new trend, as a movement to normalise men dressing up as women without facing discrimination, exactly like how women can freely dress themselves in the attire typical to men.

**Stage 3: Division of Labour and Workplace Gender Ethics**

The division of labour is devised such that a man is titled the breadwinner and the woman is expected to tend to her family and household. There has been much improvement in the status and quality of women and their work, and men too, no longer bear the burden of being sole breadwinners of their family. Yet, these confined social constructs are visible in many corporate and other offices where prejudices like unjustified gender pay gap, maternal wall theory (denial of deserved progress to mothers by virtue of their conformity to societal expectations of prioritising their children and family above their career) are visible. Once again, due to this distinction, gender disparities only increase, weakening the establishment of an equal world for both the genders to co-exist in unity.

It also needs to be noted that there exist social and legal constraints for men to necessarily participate in military and combat situations. Denying participation leads to shame and ostracism on the part of men, if they wish to exert their will over coerced 'duty'. Women, however, are not coerced to engage and are given the freedom of choice. In most societies, tradition prevails where preservation of lives of 'women and children' are considered more precious and take a forefront
over the preservation of adult male lives. In the movie 'Titanic' also, the females and children boarded the life boats first and if any space was left were the men allowed to escape the sinking ship. There are many such examples to be seen in our everyday routine, where male lives are often compromised over female lives. (Benatar, 2012) (4)

Apart from these, some theories are established which demonstrate how gender bias has given rise to various other social issues:

Theory of Intersectionality

Intersectionality coined by Kimberle Crenshaw (1991, 1989) highlighting and focusing on the disadvantages faced by Black women as compared to white women in numerous domains of life. The theory talks about how the intersection of two identities - race and gender, leads to more stereotypes and inequality among women, hence a white woman suffers less than a black woman - as she is not only a woman (gender) but also because she is a black (race). However, when focusing on black men, Intersectionality theory completely devoid from taking into consideration of how black men are scrutinized and investigated more as compared to White men and more importantly Black women too. For example, in terms of racial profiling, Black men are seen with more suspicion and scepticisms as compared to Black women. (5)

Gender-based Violence and Assault

The book „The Second Sexism: Discrimination against men and boys”, by renowned author David Benatar (2012), discusses how men, just like women, are victims of violence, and receive far lesser attention than violence against women. Data from the USA suggests that men suffer twice the number of assault cases against women, and that men are victims of murder thrice that of women; however, the cases of violence and assault against men are far less reported than against women. One of the prime reasons of this could be how men are instructed at their younger age to be “strong”, “macho”, “masculine”, “brave”, “not to cry” – in short, to be a man. This makes them believe how easier it is deny or succumb to the violation they face, than to confess and accept that they have been wronged and have an equal right to complain and be served justice. Moreover, “aggressiveness” in men considered a lot more “obvious” than in women, to an extent, that one cannot fathom the possibility of a man being victimised as a result of aggressive violence by women. Coming to domestic violence, researchers have found that difference between males and females in terms of aggression and violence is not as major as it is misconceived to be. In many real life circumstances, women behave as aggressively and violently as men and sometimes even more so than men (Benatar, 2012).
CONCLUSIONS

Women have been considered powerless, inappreciable, incompetent and been wrongfully offended and mistreated for years, making it the need of the hour to ensure immediate extrusion of male dominance and women subjugation out of our societal structure and ambit of acceptance, along with greater avenues of growth and success for women in all spheres. However, only tackling women issues will not help us achieve this goal. We must also address men’s issues, howsoever big or small, with as much importance as of women, for they are equals in the society, who must not bear the brunt of the injustice committed by certain other men, just like how women must not be collectively blamed for offenses committed by specific perpetrators, regardless of their gender or any other social identity. One must not generalise and stereotype or promote existing stereotypes linked with gender roles and identities. One must also not, at any level, equate gender equality with purely feminism.

No violation or offense should be associated with one’s gender, and must be individually handled regardless of any social connotations and associations. The key step towards achieving Gender Equality would be to negate and eliminate gender disparities by its root – not just by men and their oppression on women, but also by women and their stereotyping of all men to be the violators. The solution to eliminating bias towards men is not to introduce collective blame on all men. Instead, effort should be made by both men and women towards ensuring equal opportunities for both men and women for the upliftment and development of both men and women, for that is the true essence of “Equality”.

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Bridging Self-Sustenance and Corporate Social Responsibility

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Abstract
Prime time reporting on business ethics and corporate social responsibility for trust gathering and loyalty generation among stakeholders has risen over the past two decades. The financial health reflected in Annual reports for majority of organizations has a component of sustainable and responsible goals which are built on weakly adjusted cash flow to build customer sentiment and also build supplier trust. What happens to these goals during recession and how the organizations are managing their balance sheets in the name of sustainable development has been highlighted. The article captures the divide between self-sustenance and corporate social responsibility and portrays the models in which these gaps can be bridged in future.

KEY WORDS: CORPORATE SOCIAL RESPONSIBILITY, CSR, TRIPLE BOTTOM LINE, BOTTOM UP MODEL

Introduction
Loyalty towards society is often reflected by the hefty sums that organisations spend to fulfil their social norms of responsibility in the form of CSR budgets. Often misread as a tool to boost long term profits, what most of the critics miss out is the fact that these companies are overflowing with money. Their deep pockets seem to be unaffected by the miniscule allocations to the so called social benefits. Even the highly mobilised and trustworthy companies reflect a sense of goodwill towards their people by showcasing their “attractive” philanthropic activities. Social activities and business ethics seem to be interlaced by these organisations to build on their perceived brand building exercise.

Naturally, the question arise is that what would be the response of these companies during the times of recession. Would they be generous enough to the society in spite of them dwindling in low revenues? Would there not be a natural tendency to shun these so called societal pressures in order to sustain their businesses? Why would they be willing to listen to a multitude of opinion that links their financial health to the money spent on corporate social responsibility? Some of these very questions provide me a stark opinion difference when I ponder over business ethics and the role of society in building these corporate echelons. My article
reflects on these nuances of current state of “CSR” as well as critically examining the market oriented approach.

**Recession and CSR**

Let me just highlight some facts. A stress test to good intentions as has been rightly pointed out by a survey conducted on behalf of Business for Social Responsibility showed that almost a third of firms expected their spending on sustainability or “CSR” to fall during the times of crisis. The times of crisis in the organization truly reflect on their perceived noble deeds. [1] Also interesting is the aspect of environmental sustainability that these firms don’t stop to harp on endlessly. During the times of recession, it has been found that environmental sustainability fell from 29% to 17% in the companies’ high priority list. It is important to reflect the so called green mission of these firms. Notably this drive towards building green energy sources is a natural response to the demand for such projects due to changes in government regulations. Surprisingly, what most firms fail to understand is the reasons why the recession took place in the first place. It was only due to the corporate social irresponsibility that we witness the dramatic collapse of heavyweights like Lehman Brothers, Satyam, Kingfisher Airlines, Sahara, etc. Their natural tendency to milk money without concerned relook towards societal benefits that they received was enough to wash away their long surviving businesses.

**Strategic importance of Triple Bottom line for sustainability**

Traditional businesses have largely focused on the financial component in the accounting framework to analyze company’s performance and also to highlight market leaders in each category. Fiscal policies have thus been replete with examples on improving profit margins while the people and planet, i.e. the social and environmental factors have been either side-lined completely or are shown only as a corporate social responsibility measure for organization’s performance.[2] Indian industrial sector is the major area of concern when we develop this framework as the environmental and social impact is enormous and the industry's development cannot be sustained without raising issues like employee's health, ergonomic feasibility, safe working conditions, environment friendly operations, social structure prevalent in the society, and benefits of flexible timings. Triple bottom line, in itself builds on a robust framework of people, planet and profits and while devising a technology friendly environment through Information technology, our major focus should be on employee and institutional sustainability and development. The supply chain surplus [5] that would be foreseen through this strategy would be evident in long term and also help in the managerial growth of nation's workforce. Technology is the precursor to this growth and it is thus relevant that new mediums need to be developed for “Smart Factory” as well as “Smart Accounting” practices.
Bottom up model for rural markets

There have been certain instances when CSR activities in India have in fact seen daylight through better managerial practices. Highlighting the growth of e-Choupal is relevant since the percentage rural population in India is almost 65% and we still do not cater to their needs. Also, the outcomes accomplished through ITC’s e-Choupal venture are an important source of knowledge for the future that Information technology can accomplish in the coming days in Indian rural markets. The “Sanchalak”, who deals with the farmers and ITC officials for gathering market information as well as price trends of agricultural products, is a trained farmer who shares critical market information with the farmers. There are around 7000 e-Choupals [4] affecting the lives of more than 4 million farmers across the country. The model is very robust with the Sanchalak being the front-runner in providing the agricultural community access to ready information about weather conditions, market prices, risk management and also providing knowledge on scientific farm practices. Sanchalak is primarily driving the click and mortar capabilities by working on the internet kiosks and responding to the trends. The initial success of E-choupal needs to be transformed by the Government of India to build a national network and improve the margins of the farmers. The model has some important lessons for the future course of action for sustaining the livelihood of our hard working farmers.

Conclusion

The corporate social responsibility is being highlighted as a medium for generating both government grants as well as building the trust of the stakeholders involved in the operations of the organization. Even though serious measures have been taken in this front from some organizations who have allocated funds for the same, yet it seems like a green washing as the sustainable development of the people and planet always are embedded to generate higher margins for the organizations, The firms fail to realise that money is a by-product of the natural resources that this planet and its living beings and have generated over thousands of years. The focus needs to be shifted so that truly the aim of sustainable development is achieved.

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Gender Inequality and Women Inequity - Deficiency in Human Rights Approach and Religious Personal Laws

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ABSTRACT

Gender inequality is an acute problem prevalent in our country. Any serious shift towards a sustainable society has to include Gender Equality. “Gender Equality is more than just a goal, it is a precondition for meeting the challenge of reducing poverty, promoting sustainability and building good governance.” - Nelson Mandela. While the Indian Government should be applauded for taking seriously its obligations to protect women from domestic violence and eliminate women inequity, this research paper critically analyses the two major issues that utterly degrade the status of women and have rightly been exploiting them - 1) The drawbacks in the approach of Human Rights and 2) The interference of the Religious Personal laws. These negative consequences have overshadowed the benefits that these laws were intended to provide to women who have been victims. Further it demonstrates that even a legislative framework against domestic violence and religious personal laws can be limited or counterproductive due to powerful cultural and institutional barriers. This paper along with the issues addressed focuses on measures that could be adopted to have a fundamental growth not only socially but economically as well. Gender Equality and Rights are one of the basic concepts in the Constitution of India, which is assured to every citizen, but the real scenario is conceptualized. The discrimination faced by women in this male dominated society has failed for them to understand their own right and freedom. Since gender inequality and women’s disempowerment occur in different domains, they have given rise to a large number of potential indicators such as indicators of gender inequality to compare the status of women and men on particular characteristics of interest, indicators of disempowerment to measure roles, attitudes and rights of women.

KEYWORDS: GENDER INEQUALITY, WOMEN EMPOWERMENT, HUMAN RIGHTS, STATUS OF WOMEN, DOMESTIC VIOLENCE
INTRODUCTION

“It is impossible to imagine the welfare of a nation unless the condition of women is improved. It is impossible for a bird to fly with one wing” - Swami Vivekananda. The adverse sex ratio, gender discrimination, violence against women are prevalent in Indian society even today and continues to be an enormous problem. From our total population, 50% is female population. Among them two-thirds are illiterate. This highlights the fact that India is a male dominant society and customized habitually. Time and again women have been victims of acid attacks, rapes, molestation. The dignity of women is at stake now. We shouldn’t forget that men and women are the two halves of humanity who need equal support and cooperation and without the one, another cannot reach up to the excellence.

DOMESTIC VIOLENCE IN INDIA

India’s National Crime Records Bureau has recorded a crime against women in every three minutes in India. Every 60 minutes, two women are raped in this country. Every six hours, a young married woman is found beaten to death, burnt or driven to suicide. This is becoming a legacy being passed on from one generation to another. Domestic Violence undoubtedly a human right issue. The most common causes for women stalking and battering include:

- Inaccess to resources
- Fraudulently acquiring the property owned by women after marriage
- Refusing to have sex with the partner
- Preference for son as a child
- Going out of home without telling the partner
- Cruelty by husband or in-laws
- Abuse & insult by sexual harassment, molestation, immoral traffic, rape, sodomy and all other inhuman acts.

“In most parts of the country when a girl is born her wings are clipped. She is not able to fly”- Ziauddin Yosafzai. At an institutional level, rampant police corruption has led to week enforcement of domestic violence laws, as cases against wealthy or influential suspects are not properly investigated and recorded, and other suspects escape prosecution civil penalties through bribes. The Indian Supreme Court has noted that the provisions Section 498A which sets forth a presumption of guilt, gives “a license to unscrupulous persons to wreck personal vendetta or unleash harassment” this could create a new legal terrorism. These adverse effects have prevented Indian domestic violence law from providing the sort of protection women the Indian Government anticipated.
PERSONAL RELIGIOUS LAWS

The status of women in society is an outcome of the interpretation of religious texts and of the cultural and institutional set-up of religious communities. Religious personal law is absent from the Constitution, but it is persistent in Indian culture. The religious personal law system in India has resulted in less justice for women and more tension between minority and majority religions.

There are communities that don’t understand- “the roles of men and women are different but their rights are equal.” Muslim women in India suffer from double oppression: as part of a patriarchal community in which women are discriminated against and as part of a minority community subjected to discrimination by Hindu fundamentalism.

The Muslim population feels insecure and threatened, and thus clings tightly to its own customs and practices. These traditions have become an important symbol in the struggle of Muslim groups against attempts by the Hindu majority to assimilate and destroy their Muslim identity.

In reality, the government takes sides in religion when it transfers political power to religious leaders. Also, the religious personal laws have had the effect of ‘freezing’ minority religious cultures, thereby silencing internal dissent.

Intimate partner violence and Victimization

It has been observed that, generally unemployed women are at a higher chance of being prone to sexual and physical violence. This is more prominent the rural areas, as the age at which they get married is at an average about 16.8 years. At such young age they are exposed to pregnancy, affecting their health and nutrition. Also, victimization by men partners have found that the health of the women drops drastically. This also has a long-term psychological impact on the women and is more likely to commit suicide in case it persists over a long period of time. The suicide cases of women in rural areas have risen from 12% to 17% in these 4 years. Gender differences in Education Only two-thirds of girls and three-fourths of boys aged 6-17 years are attending school. Gender disparity in education is much greater in rural than in urban areas. 41% of women and 18% of men aged 15-49 have never been to school. The consequence of high dropout rate at primary school levels the low educational attainment of adults.

Access to Resources

Women’s access to resources especially in the rural areas is highly circumscribed. Women have lower access to media than men in any group. Their freedom is highly curtailed and only 1 in every 3 are allowed to go to the market, healthcare or outside the community. Women in the rural areas have no personal access to bank or savings account. About 15% of women age 15-49 have access to a bank or savings bank account. Practices of Religious groups Depicts women
as being entirely subservient to men: a girl is governed by her father, a married woman by her husband, a widow by her sons. The trait is seen in every other religion: women are men’s belongings; they do not have any authority over men. In 2011 a militant group called Lashkar-e-Jabar demanded that Muslim women in Kashmir wear burqas, head to toe garments that cover their clothes, or risk being attacked. Men threw acid in the faces of two women for not covering up in public. A Muslim Indian woman maybe unilaterally divorced by her husband without cause, however, she can obtain divorce only on statutory specific grounds.

**Police harassment**

Through corruption it is difficult to measure, but there are many police officers who choose not to enforce domestic violence laws. It has been found that about 39% of police officers and judges improperly report and investigate domestic violence and dowry death related issues [13]. The unwillingness to investigate and to report incidents of domestic violence can be attributed to the widespread view “that domestic violence is a family problem and should be dealt with privately[14].”

![Crime rate against women, India 2013](image)

**CONCLUSIONS**

India’s Constitution has noteworthy commitment to gender-equality however, its provisions are hollow promises if the laws governing women’s most intimate relationships are not subject to real constitutional scrutiny. Government should collect accurate data pertaining to the misuse of current domestic violent laws on a range of issues including false complaints, police failures to investigate and extortions by both the police and complainants, since it will help the government in designing more effective legislation to combat domestic violence.
Further initiate disciplinary sanctions against state officials - incising police officers and judges who improperly investigate or adjudicate domestic violence claims or use the threat to extort money from men. Update Religious Laws because this process will open up the debate over personal laws with religious communities. Each committee would comprise of its own religious members with at least 42% of committee members be female with the same percentage required for males so that none of the gender dominates any community. Uniform Civil Code to ensure legitimacy in the process by leaving no concerned vices out of the discussion. No religion will have special majority. The uniform civil code so that it serves as a vehicle for the realization of women's equity in India. Establish a permanent commission for gender and religious concerns so that legal equality can transfer into actual equality. The state must ensure that women are given access to educational and economic opportunities so that they have critical tools to challenge received norms and to make the world their own.

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FIGURE CREDITS


River Tapi: The Dying Lifeline Of Surat – A Case Study

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Abstract

The case study “The Dying Lifeline of Surat” describes about the demolition of the Tapi River because of the human activities. It not only demolishes but also affects the “Life Below Water”. It also provides some of the information about the major threats faced by Tapi River and its life.

Introduction

Geographical Features: Tapi River (Figure 1) (Saiyed, The Indian Express, 2016) is a major river that flows in Central India from east to west, between the Godavari and Narmada rivers. It also flows through Surat and is crossed by Magdalla ONGC Bridge. (Indianetzone)

Country: India
Basin area: 65,145km²
Source: Saputara Range
Mouth: gulf of Khambat
States: Madhya Pradesh, Maharashtra, Gujarat
Locations in Surat: Dumas, Surat, Gujarat.

Tapi River is one of the major rivers in India. It flows through Maharashtra, Gujarat and Madhya Pradesh. In earlier time Tapi River at Surat was a major part for the purpose of exports of goods and also as an important stopover destination for Muslim pilgrimage called Haj to Mecca.

Social and Religious Significance: According to mythology, Tapi river is the daughter of Surya Dev, the Sun God. Tapi is sacred river of Hindus, where people perform religious activities related to water. Thus, Surat is famous for its holy river. Along with the holy river (Tapi), Surat is the main attraction for trade and commerce due to its geographical features. So, people majorly focus on setting up their business of diamond and textile industry. Thus, Surat became a part of Industrialization. As industrialization grew up, ‘DOWNGRADE OF TAPI RIVER’ began.
Flora and Fauna: There is no research done on the flora and fauna below Tapi River, so we can assume that there is some life present as all water bodies do.

Potable water supply from Tapi River: According to the information provided by Surat Municipal Cooperation (SMC) in 2015, “In last 3 years water supply population coverage reached upto 95% and gross daily average daily supply increased from 840 Millions of Liters Per Day (MLD) to 1050 MLD”. Per capita water supply is maintained at 150 liters per day.

The two major reason for the downgrade of Tapi River:

1. Religious Activities
2. Industrialization

1. Religious Activities:
   - Idol Immersion: Mainly made up of POP (Plaster of Paris) are decorated with different attractive decorations and chemical colours which are hazardous for the water (Figure-2) (Times of India (TOI), 2016)
   - POP (Plaster of Paris): It has high amount of calcium sulphate hemihydrates derived from gypsum which may take anywhere between several months to years to dissolve fully.
   - Bone Immersion: According to the Hindu mythology, the left out ashes of the cadaver are immersed in the Tapi River (Figure 3) (Asti Visarjan, Pitradev)
   - Decoration and colourful paints: The paints are made up of heavy metals such as mercury and lead which seep into the water. Decorations are changing the external quality of the water.
   - Materials of Pooja: The floral wastes are discarded in the water and is not disposed properly due to the religious belief. Thus increasing the waste in water. (Figure 4) (The Spokesman-Review, today in photos, 2015)

2. Industrialization:
   - Radioactive Waste (Figure 5) (Can Stock Photos)
   - Thermal Waste (Figure 6) (Article, Mehta, TNN, 2012)
   - Oil Spilling (Figure 7) (Lukose, The Indian Express, 2014)
   - Other Pollutants (Figure 8) (Environmental water pollution, goodpixcool)

Causes: The affluent are directly released in the water bodies thus changing the pH, chemical composition and temperature. All these lead to many changes in the Environment. Not only had the above mentioned waste is carried out by the river. It also holds the sewage waste of 6,043,737 population of Surat (Mehta, TOI, 2012) (Table 1).
How the above two cause affect the life below water:

- Wastes like litter and plastics block the passage of food, thus causing death of life due to starvation (Figure 9) (UN News Center, 2014)
- Death of fishes, larva and eggs due to thermal shock (Figure 10) (Environmental Solution, Daner of water pollution, 2015)
- Bioaccumulation: Increase in the concentration of substances in organism or a part of that organism. (Figure 11) (World water, blog spot)
- Eutrophication (Figure 12) (Tutor Vista)
  - Over productivity
  - Reduction in phytoplankton and dissolved oxygen content.
  - Growth of harmful algal blooms
  - Anoxia conditions
- Low dose of radioactive substances also causes fatal damage to the aquatic organism (Figure 13) (Rodney Smith Media, 2016)
- Biomagnifications: Increase in the concentration of substances in a food chain and not in organism (Figure 14) (Sylvia Mader (Marietta), iwashkoapes, wordpress).

One of the incident took place in Surat, that a “dolphin found in Tapi river”. It was a female Indo-Pacific humpback dolphin. The post-mortem found no specific reason for its death. But, the head of Aquatic Biology Department, Mohini Gadhia, from VNSGU said that the dolphin died due to lack of oxygen and fresh water flow in river. The dolphin was found at the location inflow of sewage water is high. (Mehta, TOI, 2013) (Figure 15(a) and 15(b))

Preventive measures:

1) Every industry should have environmentalist to guide the proper disposal of waste. GPCB (Gujarat Pollution Control Board) should make a check for every waste and effluent that is being discarded by the industry.
2) Action plan should be developed to maintain the water quality so as to save the life below water.

3) The idol should be made up of natural clay and should be immersed in the tank or in a bucket of water at home.

4) At least every 2 - 3 years, government should fund for the cleaning of Tapi River.

**Conclusion**

From the above parley, it can be concluded that if people blindfold themselves in the name of God and expand the industrialization, in the upcoming days, this will create havoc to the environment as well as the life below water. As being a responsible citizen, it is our duty to secure and save the “life below water” on which we are dependent.

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