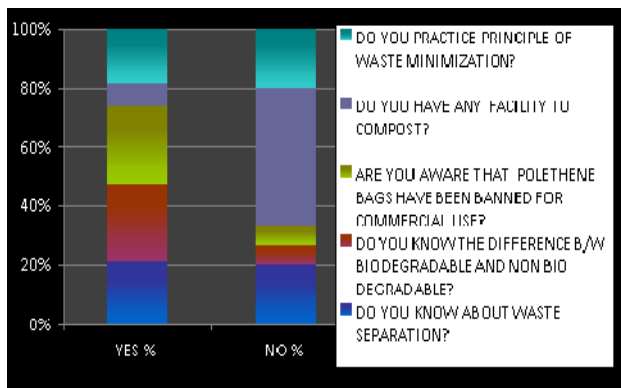
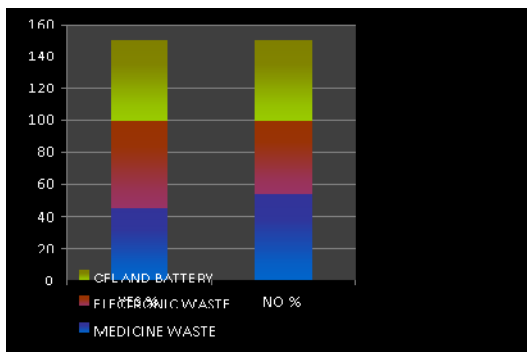


| | YES % | NO % |
|--|----------|----------|
| DO YOU KNOW ABOUT WASTE SEPARATION? | 72.72727 | 27.27273 |
| DO YOU KNOW THE DIFFERENCE B/W BIODEGRADABLE AND NON BIO DEGRADABLE? | 90.90909 | 9.090909 |
| ARE YOU AWARE THAT POLETHENE BAGS HAVE BEEN BANNED FOR COMMERCIAL USE? | 90.90909 | 9.090909 |
| DO YOU HAVE ANY FACILITY TO COMPOST? | 27.27273 | 63.63636 |
| DO YOU PRACTICE PRINCIPLE OF WASTE MINIMIZATION? | 63.63636 | 27.27273 |



| 7. SEPERATION OF WASTE | YES % | NO % |
|------------------------|----------|----------|
| MEDICINE WASTE | 45.45455 | 54.54545 |
| ELECTRONIC WASTE | 54.54545 | 45.45455 |
| CFL AND BATTERY | 50 | 50 |



| 5 GARBAGE DIPOSAL METHOD | GARBAGE PICKER | THROWING IN NEAREST DUMP | BURNIN G | THROWING ON THE STREETS |
|--------------------------|----------------|--------------------------|----------|-------------------------|
| | 81.81818 | 27.27273 | 0 | 0 |



| 9. RE-USE PRACTICE | BOTTLE | BOXES | POLYTHENE | PAPER |
|--------------------|----------|----------|-----------|----------|
| | 72.72727 | 72.72727 | 45.45495 | 59.09091 |



Qualitative Analysis

From this survey we inferred that majority of people interviewed are either not interested in the concept of waste management or are not aware of the same. But out of the people interviewed, there are a few who practice the principle of waste segregation. We also asked people to tell if their local authority(RWA,MCD,NDMC) provisions for different bins forwaste disposal.

At some places in Delhi, MCD has started a door-to-door garbage collection van, which ,to an extent , is now ensuring that there is zero garbage on streets. To elaborate a bit more, maximum number of people suggested that in order to reduce waste, the principle of Reuse, Recycle, Reduce(3R's) should be followed. This involves reusing polythenes, paper bags and plastic bottles. Also, spreading more awareness among the youth about the same can help reduce waste.

Moreover, we asked the people what do they do with the left over cooked and raw waste,since we observed a lot of left over cooked food being thrown.To this, a majority responded that they dispose raw food in dustbins .However, a number of people also give it to stray dogs.Some respondents use raw food items ,provided they haven't become too stale to be used.While certain feed that to their pets. In respect to the cooked left over,majority give away to the stray dogs and cows.However, a certain percentage of people throw it into bins while a minority gives it to the needy such as beggars or servants.

JESUS AND MARY COLLEGE

Project Title: STREET VENDORS :SERVICE PROVIDERS OR TRAFFIC HAZARDS

Project Code: JMC – 103



THE UNSUNG HEROES

1. Objective (150 words):

Our objectives lie in analyzing and estimating the social and economic contribution of street vendors to the urban life and devising a methodology whereby they can be incorporated into the urban structure without disturbing the aesthetic beauty and the architectural master plan of the rapidly urbanizing and globalizing city of Delhi. The study qualitatively and quantitatively portrayed the positive role that street vendors play in meeting the everyday needs of the common man, the plight of this class and its problems, the role of the government and the current developments in the field of administration and policy making.

2. Final Findings (300 words):

- The licensing system in the state of Delhi is very vague and opaque. After interacting with an approximate of 1000 vendors we have not been able to find many vendors who are aware of the licensing system and about the basis of granting a license.
- The numbers of vendors in Delhi who possess a vending license or a *teh-bazaari* are extremely few and the numbers of vendors who know of such systems being extant are meagre.
- Economically, there is a wide variation in the incomes of the vendors. We have encountered some vendors whose incomes are extremely high (and lie in the taxable income bracket) while there are some others who are barely able to provide for their families. This variation is prima facie due to the location of the vendor (in terms of how big the market is) and the goods sold.
- Legally, there is a very nebulous legislation regarding street vendors and they are unprotected by law. However, this is only an initial finding based on our interaction with organizations like National Association for Street Vendors in India (NASVI) and SEVA.
- Socially, the street vendors are a vulnerable group. Typically belonging to lower income categories many of them are migrants from the states of Uttar Pradesh and Bihar. Lack of identification cards and other social security measures, they are often harassed although the degree and nature of harassment is widely different in different markets. Also, we were unable to find many vendors who were immigrants from neighbouring nations of Bangladesh, Nepal and Bhutan. This is contradicting our previous assumptions where we were expecting some proportion of the vendors to be international immigrants.

3. Learning for Students (200 words):

The students were given a one of its kind opportunity to undertake an innovative research project. It inculcated research skills in them familiarized them with research methodologies and most importantly gave them an opportunity to work independently. Through research-based learning students developed the intellectual skills of critical analysis and also valuable transferable skills such as group work, time- and resource-management and data handling. On a whole it has been an intellectually stimulating experience for the students.

4. Benefits to College (100 words):

The college got an opportunity to facilitate and encourage research aptitude amongst its students by engaging in such an innovative project. The funding that was provided by the university also had gone a long way in supporting and enhancing the project.

5. Benefits to Society (100 words):

As our project was a socio economic project , the society played a pivotal role in it . Through our project we tried to develop various innovative methods that will aim to revolutionize the occupation of street vending . This study has suggested four innovations that aim to resolve the various conflicts that arise in the incorporation of street vendors into the urban life. In particular, impending tasks of information asymmetries, lack of infrastructure and revenue generation that haunt the street vendors are taken into consideration.

6. Further Plans (100 words):

We further plan to propose the revenue generating cooperative model to the ministry as a possible policy option that could be delved upon .We further wish to introduce the vendor guide and vendor smart cart as an innovative solution to the problems street vendors face with help of NGOs like NASVI , SEWA.

JESUS AND MARY COLLEGE

Project Title: DELHI: THE CITY AS TEXT

Project Code: JMC- 104



1. Objective (150 words):

This aim of this project was to explore different ways of imagining, accessing and mapping the social and cultural life of Delhi. Reading Delhi as a multi-layered text has provided insights and enabled the students to creatively imagine and access the diverse experiences of living in the city. The students visited various areas of the city in order to collect diverse experiences and histories. They worked in groups of two and divided facets of the city according to their interests. This resulted in an exploration of the rich and layered history of the city which ranged from the Partition to the present.

The first area of research excavated the trauma and experience of the Partition through oral narratives, recounted by the refugees who settled in Delhi and helped in building the character and economy of the city. The second area dealt with the ways in which Delhi has emerged as a cultural capital of India, wherein various cultures have blended to give the city a unique texture. The role played by migrant communities, especially the Tibetan refugees and the migrants from Bangladesh, was explored within this. The third project took the students into the streets of old Delhi and reimagined the glorious past of the city through the ancient traditions and practices which are still found in nooks and corners of old Delhi. The next project tried to understand the city through the medium of cinema, especially by recounting the transition from single hall theatres to the multiplexes, indicating the changing dynamics of the relationship between the city and forms of entertainment. The fifth project focused on the changing architecture of the city, concentrating on the two landmark events that shook the city plans of Delhi- the Asiad Games and the recent Commonwealth Games. The last project focused on the contemporary moment, by charting the emergence of Delhi as the Music capital for Independent music practitioners.

2. Final Findings :

The project looked at the effects of partition and saw many contrasting and striking revelations about the hardships of refugees who now form a dominant group of Delhi influencing it socially, culturally, economically and politically. It focused on Old Delhi and its historical significance and documented how the Old Delhi is still a part of the new existing metropolitan by contributing certain traditional practices and customs to it and effectively making Delhi's culture richer and varied. It also looked at how theatre's role in shaping Delhi's culture and encoding the changing trends and accepting cultures and ideologies

that exist in the city. It traced the emergence of a new kind of cinema with the coming of multiplexes. It looked at the independent music industry which has continuously been on its way to becoming something that defines the new idea of entertainment and forms a huge part of culture. In the process it looked at various music festivals like the South Asian Bands Festival and saw how to document the shift from the pre-existing music industry which was pre dominantly Bollywood to a new independent music scene. The project also looked at cultural spaces across the city and how they promote a certain kind of culture, like Delhi Haat. It looked at the major communities populated by people from other cities and how these areas actively contribute to our culture making it a beautiful amalgamation of elements of multiple others. Lastly, it looked at the Asian Games of 1982 and the Commonwealth Games of 2010 and how these two events have radically altered the design and plan of Delhi and transformed it into a world class city with impeccable infrastructure.

The projects, in their entirety, captured various facets and moments of Delhi and took it up for research.

3. Learning for Students (200 words):

For the first time we got an opportunity to apply of theoretical knowledge obtained in class, to real life. We got to know and discover Delhi through interviewing people and visiting places as a part of our fieldwork. The project gave a first-hand experience of primary research wherein we collected data, visited libraries and explored various places in the city.

The project was also a revelation as the project has changed the way we look at the city. The fact that different histories and experiences are embedded in the city, waiting to be excavated, was both challenging and exciting. We also understood the importance of oral narratives that allowed us to access several hidden and emotional histories that we were unaware of. Putting it all together as a multi-layered text was a daunting task and we also learnt to co-ordinate with each other and work effectively as a group, while running against time and meeting tight deadlines.

The final seminar allowed us to present our work to the entire college and share our experiences with them. We answered many queries and were given suggestions on how to take forward our research and include other ideas.

4. Benefits to College (100 words):

The project provided our students a unique opportunity for research, over and above that provided by the curriculum. The ability to travel to different parts of the city was very exciting and the students saw the city in a new light. The seminar proved useful and inspiring to other students who then wished to be a part of further Innovation projects and was very excited by the presentations.

This exposure honed their curiosity and developed their research skills. Several students planned to develop their research further and publish their findings, which is very exciting for them.

5. Benefits to Society (100 words):

The interaction with the refugees was like a cathartic experience for the refugees, who were glad to know that the youth of today was interested and pained by their experiences. The oral narratives were both revealing and saddening for the students who felt that these incidents need to be recorded.

The parents of the students were also happy with the involvement of the students in interactive activities such as the project which provided the opportunity for research and further learning.

6. Further Plans (100 words):

We intend to bring out a photo intensive book about our project.

Jesus and Mary College

Project Title: Understanding the lives of the working poor in Delhi

Project Code: JMC - 105



1. Objective (150 words):

The project aimed at developing an empathetic understanding of the lives of working class men and women living in Delhi/NCR. For this purpose, it was decided that the students would conduct fieldwork comprising of open-ended interviews with men and women who are engaged in some sort of work/occupation but earn a meager income and therefore are generally referred to as 'poor'. The emphasis of fieldwork was on collection of in-depth life-stories of a few individuals rather than filling a survey questionnaire for a large number of respondents. Through these interactions, the students were expected to learn about

- nature of urban poverty
- problems faced by the poor
- pattern and causes of migration as well as its impact on the migrants' way of living
- understanding and exercise of the democratic rights by the poor
- aspirations of the working class and their views on other social – political matters

2. Final Findings (300 words):

Project students asked the respondents about their past and present lives and aspirations for future. The respondents were a diverse group aged between 15 – 70 years and belonging to different castes and religions (details in the attached Excel sheet). Their occupations included: rickshaw pulling, domestic help, gardening, construction work, ironing clothes, vegetable selling, driving autos etc. The students transcribed these narratives and though each story is unique, they attempted an analysis under following main themes:

Migration: Majority of the working poor in Delhi have migrated from various districts of U.P. such as Meerut, Mirzapur, Kanpur, Allahabad, Bulandshahar, Gorakhpur, Faizabad etc. but few others are from Bihar, Orissa, Jharkhand, Chhattisgarh, Rajasthan, West Bengal, Assam and even Nepal. When migrated: 3 months to 40 years back. Main reason: livelihood.

Problems faced: Escalating prices, high cost of living; financial problems, unemployment, difficulty in finding work, electricity, water, housing, sanitation and adjusting to city life.

Gender issues

Majority of the respondents were women and though many were the sole/major bread earners, they faced problems such as abandonment or divorce, domestic violence, pressure from family for sex-selective abortion etc.

Education: Though most respondents were either illiterates or drop outs under economic pressures, they want to ensure that their children get as much education as they can afford. Most of the children go to school and some even attend tuition classes and a few are doing graduation also.

Aspirations: While the older aspired for education, jobs and marriage of children, the younger ones wanted to own a car, house, latest mobile phones, learn computer and open a cyber café etc.

Citizenship Issues: Most respondents were unaware of their rights as citizens. Majority had a voter or aadhar card and many had voted during elections. Their interaction with the *Sarkar* included harassment by police and MCD fines.

3. Learning for Students (200 words):

Through this innovative project, the students began to understand the meaning of poverty, social mobility, migration, citizenship and democracy, concepts which they had read about only in theory so far but now they could relate these to real life people and situations. Interactions with the people brought out many interesting aspects of their lives which were unknown to the students earlier. The methodology of open-ended narrative style interviews used in this project, helped sensitise the students about the important issues/problems confronting our society. The students in their summary reports have mentioned that they were impressed by the hard work, resilience and courage of many of the working poor they met and they also developed a better understanding of how these people manage to survive on very little income as well as understood their aspirations. The findings thus support the main hypothesis that a humane interaction with poor people, who earn their livelihood through their labour, develops empathy, understanding and respect among the youth. In addition the students acquired skills to carry out fieldwork and analyse data and present their findings before others. They also learned to use still as well as video camera and other aspects of making a documentary film.

4. Benefits to College (100 words):

The project has helped initiate a truly inter-disciplinary culture in the college which will encourage future collaborations of this kind beneficial to both the faculty and the students. It also created tremendous enthusiasm and an intellectually stimulating environment in the college. The college on its part provided both the infrastructure as well as human resources for the successful execution of the project. The faculty, administrative staff and the principal all pitched in to make it a success. Another benefit to college is that the project equipment is available in college for use by other students who desire to conduct fieldwork.

5. Benefits to Society (100 words):

Project work of this kind is essential for bridging the gap between theoretical knowledge and hands on experience in learning and analysing the diverse problems of our society. Education thus not only becomes more meaningful for our young people but also inculcates a spirit of service, concern and commitment for change and progress. We hope that the learning from this project will guide their lives in the long run and will shape their actions in whichever field they choose to work in whether in government or business and help combat the widespread apathy and indifference that afflicts our society today.

6. Further Plans (100 words):

The transcribed interviews provide insights into many aspects of the lives of the working class in Delhi. Given time and other resources, these can be used to develop a paper of publishable quality. As of now, a

summary analysis along with pictures and quotations are compiled for a joint book (with other JMC innovative projects) that the college is planning to get published.

Some of the themes identified in our project, namely rural-urban migration and its impact on the lives of the poor, participation of the poor in the democratic process etc. offer exciting possibility for undertaking research in future.

JESUS AND MARY COLLEGE

Project Title: Beyond Relocation: Experiences from the Urban Fringes

Project Code: JMC-106



A Tale Of Two Cities: Delhi and its Fringes Dilli dilwalon ki hai kya?

1. Objective (150 words):

The Objective of the study was to look at how Development induced Displacement is affecting the life of the people. Development essentially refers to a process of social change which is planned and desired by a society. While state plays an important role in all major areas of development projects, it also encourages private business and industry to partake in development projects. As enshrined in the Constitution of India, the goals of development are to guarantee its citizens equality, freedom, justice and overall improvement in the quality of life for all. But contrary to the Constitutional promise, developmental projects in the country have not benefitted everyone equally. The urban displaced poor are the most visibly excluded social groups who are badly affected by urban development programmes. Displacement disrupts not only their lives but their livelihood as they are forced to move from their original site of residence to locations which are determined by public and private agents. It is in this context that our study tried to focus on the following:

- 1) Examine the socio-cultural changes among the displaced social groups.
- 2) Analyze the state policies pertaining to land acquisition, resettlement and rehabilitation.
- 3) Study the economic repercussions on the displaced population.

2. Final Findings (300 words):

The study of Bawana and Madanpur Khadar JJ colonies was an exploratory research. Through observation and interviews the students were able to collect an estimable qualitative data for subsequent analysis of the main objectives.

The study looked at the economic repercussions, socio-cultural changes and legal implications of displacement.

Both the colonies consist of mainly self employed, full time workers in small factories and daily wage workers. The study showed that women were largely unemployed, although before relocation many of them worked as domestic help. The most frequent reason cited was distance to the place of work. Employment opportunities within the colonies were practically non-existent for both men and women. Most of the respondent said their economic earnings were just enough

to make both ends to meet.

In both the colonies, few have started small retail shops, food outlets etc, but because these shops etc were on illegally occupied land, they had to fill many pockets to continue with their endeavor. Although promised, more respondents complained that they were not paid any compensation. On the one hand they were made to pay certain amount of money based on the size of the land allotted. Many of them had incurred debt in order to build houses which led to further economic deterioration. But at the same time, the researchers also felt that perhaps many of them had a better economic condition than what they claimed, since they wanted to portray themselves as BPL and avail the associated benefits.

The analysis also revealed how the relocated residents were going through a process of changing identity. Class differences have become more significant rather than caste and kinship ties. Class based disparity was more evident in Madanpur Khadar than Bawana where houses along the main road were bigger than the ones in the interior, The owners had converted the ground floors into shops, dispensaries and clinics which lead to an improvement in their position.

At the same time the, distance from the main city, apathy of the police and civic authorities has led to a growing crime rate. Illegal trafficking and drug addiction are common place. The most vulnerable groups were women and children as most women reported about insecurities they are facing in the JJ Colony. School dropout rates for girl children are very high. However, school enrolment had increased appreciatively.

As far as legal implications of relocation are concerned, the study found that people were unaware of their rights which were mostly due to their illiteracy. None were even aware of the Basti Vikas Kendra. Although laws are in place , implementation is lacking. Even after 10yrs of relocation, these colonies are without water and sewage systems.

The researchers, however, found that various NGO's are trying to bring about a positive change in the lives of these people.

3. Learning for Students (200 words):

Development forced displacement and resettlement is a widely existing phenomenon in Delhi . When students selected to examine and document issues of relocation and resettlement, their immediate worry was how would they temporarily relinquish their comfortable, modern and urbanized lifestyles in order to collect data from places far removed from their privileged environment – in a world of hardship, squalor, dirt, crime and disconnections. For these students, being involved in this innovation project has been a learning experience. As one team member remarked. “In my 3 years of Sociology, this is the closest I came to being a ‘Sociologist’ ”. The Project not only gave students immense insight into research methods, but also enabled them to trace the route from field experience to analytical results. Field work helped them to understand not just ”Society” and “Culture” but also the processes by which cultures and societies are transformed. It also allowed them to gauge the dynamics of the interplay between the economic, the political and the social in determining societal life. In order to make the most of the opportunity afforded by the University, the students imbibed commendable levels of dedication, team spirit and motivation. For all this, they have Delhi University and the Innovation Project to thank .

4. Benefits to College (100 words):

As an educational institution, college empowers the students to build their future through various initiatives. In the academic year 2012-13, one of them was DU Innovation Project, which was first introduced for the first time at the undergraduate level. After the completion of the project, our

college gave us the opportunity to showcase our project by organizing a seminar on the 16th April'2013.

As the emphasis was more on inter-disciplinary approach, this gave the students a learning experience which was beyond classroom teaching. The seminar was attended by all the students who were otherwise not part of the innovation project. The seminar was successful to the extent that students were made aware that real learning extends beyond curricula and course work. It enthused students, many of whom are now looking forward to such opportunities and initiatives in future.

5. Benefits to Society (100 words):

The need of the hour is to propagate the notion of "Development for All". The project wants to highlight that development induced displacement should be minimized. When unavoidable, projects that impose displacement must be designed to improve and restore the affected people's standard of living. Effort should be made to rehabilitate them within the city itself by rebuilding their slums into low cost housing complexes. These people are mostly migrants who have come to the city for a better life. They are the manual service providers whose services are required by all. The study aims to highlight that we cannot push them to the fringes and yet avail their services. The project also tries to create awareness that there should be desirable policy changes which will not only avoid displacement but also protect the rights of the dislocated.

6. Further Plans (100 words):

Analyzing the problems faced by the displacement affected people (DAPs), we have tried to give suggestions regarding improvement and better implementation of the schemes and policies of the government.

Since the root cause of all the problems was lack of Education and illiteracy and Improper implementations of Policies, our further plan would be:

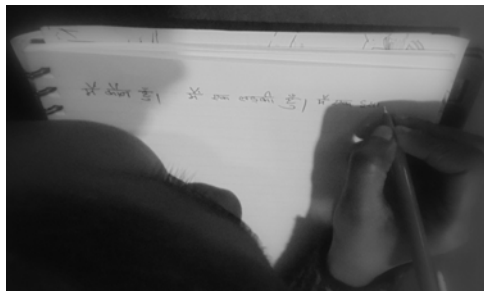
- a) To bring about awareness among the residents about their Rights.
- b) Encourage functioning of Microfinance and Self Help Groups.
- c) Help to organize a collaborative city feeder bus service for residents commuting to the main city for work, wherein the drivers and other conductors for the feeder service ,can be trained and employed from among those living in the colony itself.
- d) It is also recommended that there should be participation of the local residents in teaching the children at various schools. Teachers belonging to the community would be more sensitive to the problems of these children.

JESUS AND MARY COLLEGE

Project Title: A cultural and contextual understanding of Resilience and the role of voluntary organizations in its development: A study of marginalized urban girls in Delhi
Project Code: JMC 107



“Hope
where none
might be expected...”*



1. Objectives (150 words):

- To understand the concept of Resilience in the Indian context
- To develop culturally and contextually sensitive research tools
- To study the nature and range of opportunities provided to students (in the voluntary sector) which impact Resilience
- To identify the impact of such initiatives on the attitudes towards learning, gender, social hierarchies and other stereotypes
- To establish the relationship between education and development of resilience.
- To propose a model for intervention in formal schools where core components that promote resilience are integrated in the academic and co curricular activities.

2. Final Findings (300 words):

With the above said objectives the study was conducted in three phases.

The first phase of the study lead to the development of conceptual framework ofresilience based on review of literature and study of 26 organizations working in the area.

There is a little consensus in definition of resilience. It results from factors both internal and external to the child such as the family, environment and community. Culture plays a key role in understanding

resilience thus, it is critical to understand it in a context. Resilience is a long and developmental process that views children with strengths rather than with deficits/ weaknesses. There appears to be no single path to resilience. Both risk and protective factors may have different impact on children at different stages of development. Identifying developmentally appropriate, adaptive functioning is important in defining resilience.

Our research points that resilience cannot be taught. Most after school programs that were studied focus only on vocational skill development. Most of the ventures give little support after individuals leave the center. Children are shifted from one center to the other. They have to appear before the CWC several times.

The second phase initiated with the implementation of the five tools developed to gain insights into the lives of girls living in two shelter homes. Coping mechanism for most of the girls include: belief in self; having aspirations; viewing education as a tool for mobility; empathy ; determination; humor; openness to new ideas; build peer relationships; cooperation; sharing with peers; writing personal diaries.

Based on the first two phases, we propose the following for preparing formal schools as protective environment for children. Therefore DEVELOP: sensitization workshops for educators at different levels and all students; school programmes and policies to promote positive peer interaction; group work among students and community; mentor support, multi grade groupings; strong network with religious/ community/ government/ voluntary agencies to provide comprehensive support; strong networks with other at risk children using e-platforms for mutual support, friendship.

Most of these programs should be part of regular school day so that it does not lead to further stigmatization and polarization of vulnerable children.

3. Learning for Students (200 words):

The project gave a unique opportunity to the students for getting involved in research. Through various ongoing discussions and workshops with the faculty, the students initiated their journey towards scientific thinking. They realized the need to seek evidence before deducing. They learnt how not to generalize but appreciate the individual contexts. The students got involved in identifying relevant literature, referencing, summarizing the work already done in the field. They also learnt about the process of tool development and validation.

Direct exposures to the field helped them in coming out of their ivory towers and appreciate the complexities of the world around them. They interacted with institutions, experts and participants under study. This helped them to see the world from others' perspective.

They stuck together as a team, discussed and argued their perspectives and also made presentations. A few students oriented the others regarding technology. They formed a Google group and very systematically would send agenda for a meeting and follow it up with minutes, observation and to-do lists.

They have started to learn, to think and find solutions. They evaluate a problem from various perspectives and the nature of understanding is substantially good. They also learnt to deal with their inner conflicts that arose during the interaction with the participants and their own growing up.

Antardhwani presented another opportunity where they observed other projects, and got feedback on their own project. The whole experience has motivated them tremendously. According to a student, " It is the

best thing that has happened to her in the three years of college”.

4. Benefits to College (100 words):

The interdisciplinary nature of this project brought faculty members from different areas to work together. At the same time, it gave teachers and students a space to work as a team and understand their potential. This has created a charged atmosphere and the nature of discourse has also become more academic and challenging. Besides the project team, many more students have got enthused about research in this process. The equipment bought for the purpose of the project like camera, laptop, and printer will be used subsequently in the department.

5. Benefits to Society (100 words):

The project shall help in sensitizing young students about girls who are at risk. This work will also sensitize communities and contribute to the larger discourse and visibility of this large group of children.

Given the Right To Education framework we assume that all children will be in school soon and we know that education is a crucial tool for upward mobility .Thus, in order to let this group not drop out psychologically or physically from the system the project will give suggestions to the administrators and teachers to gear the system to needs of this group and let their dreams find wings.

The need to change has to come from within else we have often seen negative impact of superficial reforms With over three years since RTE has been implemented efforts are focused primarily on getting basic requirements like infrastructure in place –this work shall help in developing qualitative aspect as well.

6. Further Plans (100 words):

In the next phase we would like to test the tools for measuring resilience developed in the first phase .We propose to develop a model for intervention in schools where core components of resilience are integrated in the academic and co curricular activities. Workshops to sensitize school administrators and teachers towards resilience shall be designed .We propose online campaigns to reach out by formulating groups for mutual support. A database of various agencies in the area can be effective in provide comprehensive support.We propose to study other aspects that emerged in the first phase.

KALINDI COLLEGE

Project Title: CONVERSION OF MECHANICAL ENERGY TO ELECTRICAL ENERGY IN DELHI METRO.

Project Code: KC-101



INNOVATION PROJECT GETTING SHAURYA SAMMAAN FROM Smt. SUSHMA SWARAJ

1. Objective (150 words):

The aim of this project was to study the feasibility of harnessing wind energy ushered in by the fast moving

metro trains in Delhi to produce electricity. In this project our objective was:

- To study the feasibility of utilizing wind energy for generation of electricity by making Energy calculations and Cost calculations
- To simulate the generation of electricity (amount) from fast running Metro trains On the laboratory scale On computer (if possible)
- We have completed the first part and for second part we have gone ahead with actual execution of project instead of simulation.

Final Findings (300 words):

Through this innovation project an effort is made in the direction of converting wind energy, abundantly available all along metro tracks which otherwise is a waste, to generate and to supplement the ever increasing demands of clean, green and cheap electricity.

We have extensively studied the various parameters on which generation of electricity from wind turbines depend. The calculations were made to estimate the no. of blades required, length of the blades, material of blades, type of turbines etc. required for optimum generation. The power calculations were made for different lengths of blades taking in account the losses in wind turbine and other components.

- On the basis of our findings and calculations we devised a prototype of rotor with 3 bladed-systems with span area of 0.2826 m^2 coupled with a horizontal axis turbine of 500 watt of power generation capacity.
- The conservative estimate of energy that can be harnessed with a 500 watt turbine at wind velocity of 6 m/s will be 0.541 kWh for the blade length 30 cm and assuming the conversion to be only 60% and rest 40% is taken as loss. This will increase exponentially with size of blades and wind velocity.

- In addition to electricity generated at above stated condition single turbine will be able to save more than 500kg of coal, more than 1.5 metric tons of CO₂ emissions and save one tree per day.
- The cost of installing turbine would be approximately Rs.30,000 /= per turbine and would be recovered within a year even if generation is at a rate of 0.5kWh per day per turbine.

Without obstructing the operation, safety and security of currently running metros it was decided to put the turbine along the underground metro tracks at the mouth of tunnel where the maximum wind velocity available is 6.5 m/s. The process of installation has begun in collaboration with Delhi Metro Rail Corporation (DMRC)

2. Learning for Students (200 words):

It was a great learning experience for the students.

- We were trained in basic research methodology. During the project we, the students, developed research bent of mind. We learned how to conduct literature survey. Visualize and analyze a given unknown problem. Our endeavors took us to various universities and research institutes like DMRC, IIT-Delhi, DTU, NPL, IUAC etc where we actively interacted with scientists and people who are pioneers in this field. We conducted extensive literature survey which exposed us to the vast volume of research done in this area which otherwise is not inaccessible to undergraduate students of pure sciences. We got to know our university (DU) better by participating and attending various meetings, conferences and festivals.
- We attended the Stakeholder's meet organized by DMRC where we came to know the energy efficient measures taken by DMRC in their ongoing projects. This meet further highlighted the importance of our project.
- We were trained in various scientific software like MATLAB, ORIGIN, MS. Office etc. We were trained in writing papers and articles, making documentaries, power point presentations, posters etc. We did all our calculation, simulation, presentations in international and national conferences on our own with the help of teachers. We also learnt management of accounts, maintenance of stock books etc.
- We can work as a team with no conflict of interest. We developed effective management skills in various areas due to our interaction with DMRC engineers and equipment vendors. We also learned time management and balanced our regular studies with our project. We did extensive market survey for cost comparison and quality of equipments etc.
- We presented three papers in international and national conferences.

3. Benefits to College (100 words):

This project has brought huge recognition to the college at various forums viz. national and international forums and media.

- We have won the motivational award and the best poster award at Indo-German Workshop on Advanced Materials for Future Energy Requirements (WAMFER-2012).
- This project got laurels for its uniqueness and was praised by the Hon'ble Vice Chancellor and other dignitaries present. Our efforts have won the second prize at ANTARDHAWANI-2013 organised by UNIVERSITY OF DELHI.
- We have been awarded the certificate of appreciation at Swadeshi Science Movement of India, Delhi organized by Council of Scientific and Industrial Research.

- Our college has made headlines due to this project in National Dailies like Hindustan Times, Times Of India, Navbharat Times, Deccan Herald, Dainik Jagran, etc.
- The college once again was in news headlines when project team was honoured with Shaurya Samman and applauded by Ms Sushma Swaraj.

4. Benefits to Society (100 words):

In the developing country like India, there has been considerable need for cost effect source of energy. The electricity generated along the metro tracks has following benefits to society and country at large

- In addition to electricity generated at above stated condition single turbine will be able to save more than 500kg of coal, more than 1.5 metric tons of CO₂ emissions and save one tree per day.
- There is the potential for real contribution to our energy supply, however minuscule it may be, towards the ultimate goal of self-reliance for energy needs.
- An indigenously developed small wind turbine being a simple technology, can become a huge home grown industry.
- While producing energy, small wind turbines produce no environmental emissions.
- Small wind turbines will help meet the national need for energy diversification and national security.
- A carbon credit (often called a carbon offset) is a financial instrument that represents a ton of CO₂ (carbon dioxide) or CO₂e (carbon dioxide equivalent gases) removed or reduced from the atmosphere. The carbon credit earned from this project can be used by governments, industry or private individuals to offset damaging carbon emissions that they are generating by consumption of fossil fuel being used for generating electricity.

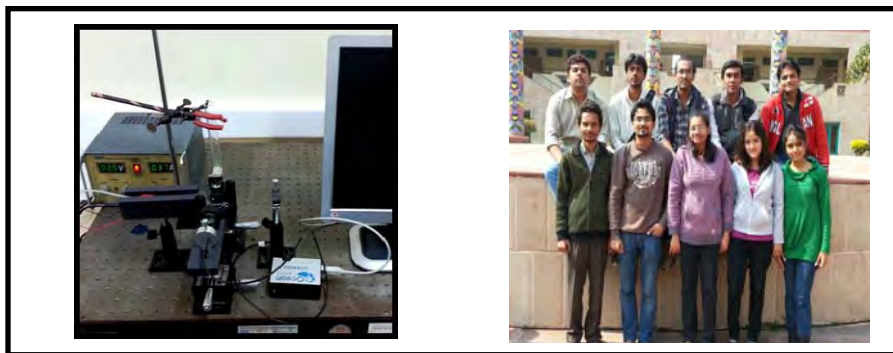
5. Further Plans (100 words):

- We have purchased a wind turbine of 500 watts with suitable data logger system. We have also been allocated a place for its installation in one of the Metro station premises, the required permissions for which have already been acquired. Our next step is to complete the installation work.
- The power and cost calculations using real-time data.
- Costing for large scale implementation.
- To generate electricity using Vertical Axis Wind Turbine (VAWT) with suitable modification to reduce air drag, friction etc. and to compare with HAWT results.
- If need be to suggest suitable modifications in tunnel design (civil part) to make provision for housing in built turbines in future metro projects.

KESHAV MAHAVIDYALAYA

Project Title: Design and development of a low cost computerized laser Raman spectrometer indigenously for DU student laboratories

Project Code: KM-101



Set-up for Raman Spectrometer and the innovation project students team

1. Objective (150 words):

Raman spectroscopy, while continuing to gain importance in material science, chemical and biochemical research, remains an experimental technique not familiar to undergraduate students. The major hurdle of making Raman spectroscopy is the expensive equipments used in the spectroscopy analysis, thus placing the experiment beyond the budgetary scope of most undergraduate student's laboratory. The major objectives of the project are briefly outlined below.

- The present project introduces students to light scattering techniques and a low cost bench-top laser Raman spectrometer was designed and developed using the knowledge and ability of undergraduate students by integrating related technologies in optics, electronics and computer science. Further the setup was calibrated with standard samples. The possible uses of this instrument and its individual module would assist in undergraduate teaching laboratory
- Image processing techniques are used. Neighborhood averaging and smoothing by image averaging are done to remove additive noise and extract pure signal.

Simple ab initio quantum-chemical calculations on Raman vibrational spectra are been done which can provide detailed insight into molecular properties.

2. Final Findings (300 words):

A low cost Raman spectrometer is indigenously designed for undergraduate students (set up shown in page 1). The setup has a grating monochromator, photomultiplier-tube detector, and an intense monochromatic light source. The spectrometer uses a green laser pointer ($\lambda=532$ nm) to illuminate the sample via a microscope objective. Backscattered Raman radiation is collimated by the same objective, green-laser light is blocked by a filter, and the remaining Raman radiation focused into a glass fiber that is connected to a visible spectrometer with a grating monochromator and a linear diode array CCD detector. Signals are transferred via the USB connection to a computer where the signals are processed and displayed. During data acquisition of the spectrum with CCD, noise superimposes on the signal. Image processing is done to remove the additive noise to extract the pure signal. Most of the noise in the spectrum is recorded by the CCD array arises from different dark currents of the different pixels. The spectra for different liquids were recorded, which were superimposed by noise spectra (an example shown in Fig. 1).

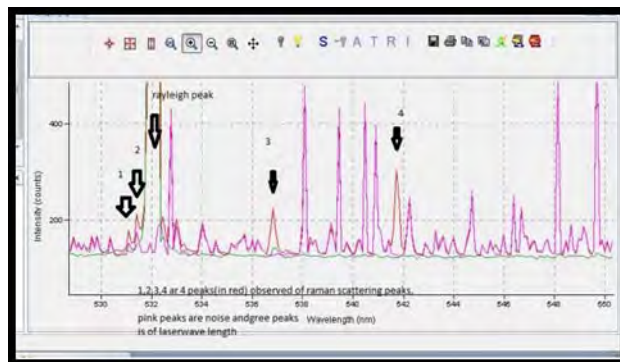


Fig1. Spectra of a sample superimposed by noise.

This systematic noise was reduced by subtracting a stored dark spectrum recorded with the laser switched off. Remaining statistical noise was minimized by increasing the integration time during exposure of the CCD array to achieve high signal levels and by accumulating and averaging several spectra thus using image processing techniques. A typical example is cited below:

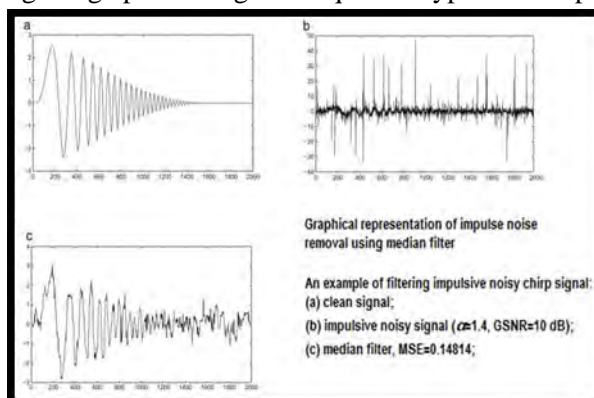


Fig 2: Graphical representation of impulse noise removal using median filter

Fundamental Raman bands were observed corresponding to known spectra of Benzene. For a benzene molecule, there are totally 20 vibrational modes and six of them have very large Raman scattering cross-sections. A dominant band of symmetric CC-ring vibration around 990 cm^{-1} was observed.

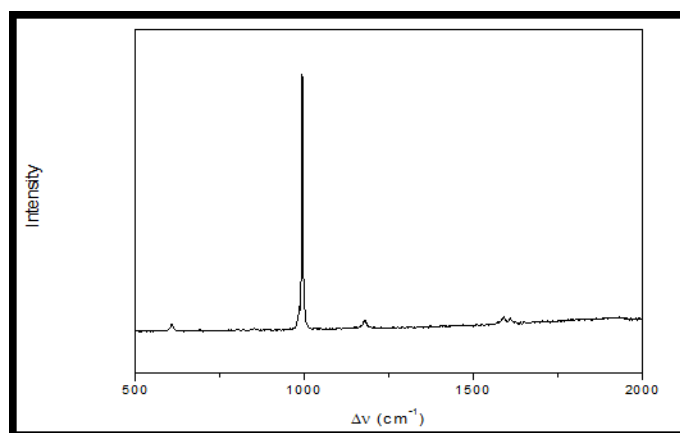
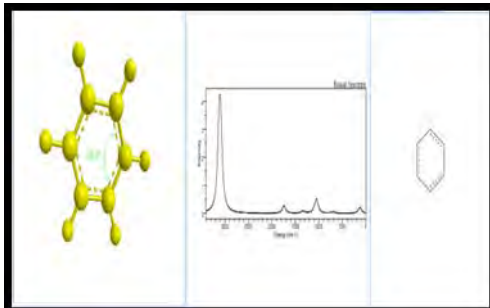


Fig 3: Raman Spectra of liquid Benzene.

In combination with theoretical calculations, spectroscopy can provide detailed insight into molecular properties. In the present project we have performed some simple ab initio quantum-chemical calculations on Raman vibrational spectra using quantum chemistry packages.

Raman analysis of benzene (C_6H_6)



Raman analysis of CCl_4

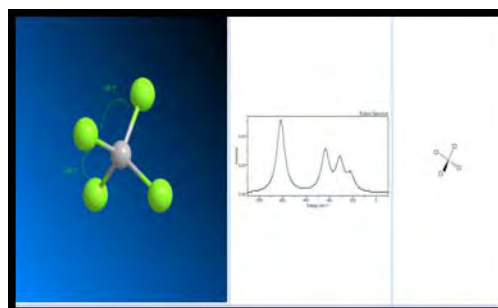


Figure 4: Raman spectra of benzene and carbon-tetrachloride using quantum chemistry software packages.

3. Learning for Students (200 words):

The present project work was a great learning experience for the students of both streams (physics & computer science). Students had a practical hands-on-experience and learned to design a low cost Raman spectrometer on their own. The project has triggered the creativity for innovative ideas amongst the students in setting up experiments in the science laboratories. They themselves had tried various setups and techniques to improve the Raman signals. This very process of learning has inculcated a research aptitude in these undergraduate students. The innovation project has motivated not only the students involved in the project but also has generated an interest among other undergraduate students towards research in science which is nowadays very feeble among the students.

Students had visited Chandigarh for presenting their paper in “1st IAPT National student symposium on Physics”, held between 25-27th February 2013, organized by Indian association of physics teachers.. Their work was appreciated by one and all and their paper may get published in a student’s journal Prayas. During their visit to Chandigarh they had visited to various research labs including DRDO’s lab TBRL (terminal ballistic research laboratory) situated in Ramgarh, 25 km from Chandigarh. Students has also participated and presented a paper in poster presentation in a national conference "Redefining Science Teaching: Future of Education", held between 7-9th March 2013 in South Campus, University and bagged a consolation prize for the same. Participating in conferences has given them an excellent platform for discussing their research work with eminent scientists and academicians which have given a new direction for the future work. Such opportunities are normally available for a PhD student but this innovation project has helped undergraduate students to avail the same.

4. Benefits to College (100 words):

The major benefits to the college due to the project are outlined below:

- Such a spectrometer is not available in the student laboratories anywhere in India, and shall greatly benefit in enhancing the curriculum by designing simple experiments for students in the Physics, Chemistry and Biology stream.

- The final setup is placed in the college, so students can perform Raman analysis of their samples.
- The individual modules used in the present setup can be used in the teaching laboratory in various undergraduate classes. Students are encouraged to design simple experiments that can be performed in college laboratories, which would further enhance the curriculum.

5. Benefits to Society (100 words):

In the project undergraduate students have indigenously designed a low cost Raman spectrometer. Raman spectroscopy experiment at the undergraduate level in India is neither explained in detail, nor is the experiment done due to the lack of an inexpensive Raman spectrometer. Such equipment is still not available from commercial sources in India, and need to be imported at a huge cost. Raman spectrometer designed in the present project resolves such issues and help an undergraduate student to learn indepth Raman analysis for which Sir C. V. Raman got a Nobel prize. This endeavor can be further extended with future students towards the development of miniaturized and portable Raman spectrometers for specific field use and for strategic applications of the Indian space research with further innovation in design and development .

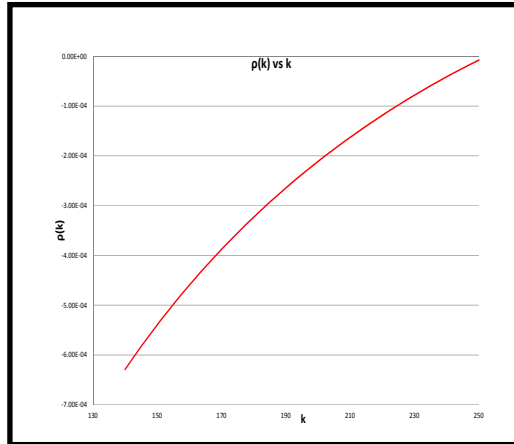
6. Further Plans (100 words):

The cost of the present spectrometer can be further reduced by replacing the linear array of spectrometer with other options. The present setup would be improved as well as new setups would be designed so as to develop a commercial devise which would be useful for all DU colleges. The present setup is calibrated for liquid samples only so our future plans would also include the improvisation of the setup to analyze solid samples.

KIRORI MAL COLLEGE

Project Title: Study on Quark Gluon Plasma and Neutrino Physics

Project Code: KMC -101



New density of states ρ Vs. k

- Objective (150 words): The main objectives of the project were as follows:
 - We had to investigate Quark Gluon Plasma (QGP) further under different conditions of density of states of the constituents, mean field potentials as well as chemical potential. Semi –phenomenological ansatz for density of states of quarks and gluons, consistent with Lattice-QCD calculations, was to use to generate extensive QGP phase transition scenarios, which could be tested with ongoing experimental data for LHC and other laboratories.
 - We had also to study the different neutrinos related model and symmetry properties of Neutrinos beyond the standard model.
 - Mathematical programming related to QGP and neutrino physics was to be innovated.
 - Our intension was also to collaborate with various groups in India and abroad who work for the Physics of URHIC (QGP) and Neutrino Physics.

2. Final Findings (300 words):
While having further analysis about Quark Gluon Plasma (QGP) State (a de-confined hadronic state), we have tried to find out new density $\rho(k) = \frac{\alpha}{k} + \beta k + \delta k^2$ of states for quarks and gluons. But still we have to finalize it. In addition to this work we have also investigated how phase transition is changing under different values of chemical potential. How chemical potential depends upon temperature – we have tried to find out. Under this chemical potential (temperature dependent) the order of phase transition has

again been revisited through computing free energy of QGP droplet under a pion medium followed by entropy and heat capacity calculations.

In neutrino part, we studied on CPT violation in neutrino oscillation and the matter effect. We also got papers “CPT Violation in Neutrino Oscillation and Matter Effect” and “CP Phase effect in long baseline Neutrino Experiment” published in International J. of Theoretical Phys. (2013).

3. Learning for Students (200 words):

Before starting the main project, we imparted them the basic essence of Particle Physics (High Energy Physics) to understand the building blocks of our nature. We also convinced them to revisit their Mathematical Concept as well as Mathematical Programming concept (C and C++ languages). They did that part very carefully for data analysis. While doing the main project, they learned how to use the existing resources. They also understood whatsoever they had done during their undergraduate course would be utilized for further extension of any field. Thus they got idea how to handle new work with a proper methodology associated with the work. During that part they knew the importance of literature survey. We also encouraged them to participate in the conferences. They had a great experience about Antardhwani -2013 as well as Academic congress organized by our University of Delhi. We (with students) also visited Raja Ramanna Centre for Advanced Technology (RRCAT), Indore. During the visit they also got exposure about experimental tools of learning. We organized a one-day seminar on 23rd March 2013 on Quark Gluon Plasma and Neutrino Physics at Department of Physics, Kirori Mal College, University of Delhi, Delhi to provide more exposure to them regarding the subject. We invited Prof. Saeed Uddin, Department of Physics, Jamia Millia Islamia, New Delhi, Prof. R. Ramanathan, Department of Physics and Astrophysics, University of Delhi, Delhi (Our Mentor) and Dr. V. Singh, Department of Physics, Banaras Hindu University (BHU), Varanasi to deliver the talk. We also invited our colleagues and other students to attend the seminar. Really we have a wonderful academic experience through this project.

4. Benefits to College (100 words):

Now we have a working place (Staff Room, Near PLT-3) with basic equipment (purchased from Innovation Project 2012) doing theoretical work in the college. So we can invite others (from the college) to join us to enhance the academic atmosphere of the college. It is a fact that without research knowledge can't be spread well. We organized a seminar and invited very distinguished professors from other universities (JMI & BHU). That might be helpful for the college while making collaboration (work) with the universities.

5. Benefits to Society (100 words):

In the seminar others (from outside the College) were also invited to attend the seminar. That might be beneficial for them to understand the new subject. We have also encouraged faculties and students from other colleges to collaborate with us. In Antardhwani-2013 we interacted with different classes of people and tried to impart the basic essence of our work.

6. Further Plans (100 words):

We will try to continue this work. We have also applied for the Innovation Project-2013 with new objectives in QGP and Neutrino Physics.

KIRORI MAL COLLEGE

Project Title: Phytoremediation of Lead And Zinc Polluted Soil using *Helianthus* Plant Species- A New Green Technology

Project Code: KMC-102



(L-R): Rhizosphere study; Yamuna site; Perkin Elmer AAnalyst 400 model; *Helianthus* plant with flower; *Helianthus* plant in greenhouse

1. Objective (150 words):

Phytoremediation of Lead(Pb) and Zinc(Zn) polluted soil of Yamuna bed and controlled garden soil by using phytoextraction technique in reference to *Helianthus* and *Brassica* species.

- To find out the factors and parameters that enhance *Helianthus* and *Brassica* species capacity to uptake Pb and Zn in its above ground parts to develop a successful phytoremediation technology on long term contaminated soils.
- To investigate the vertical distribution of Pb and Zn in different parts of *Helianthus* species and *Brassica* sp.
- Effect of microbes to compare the enhancement rate of metal ion absorption by plants.

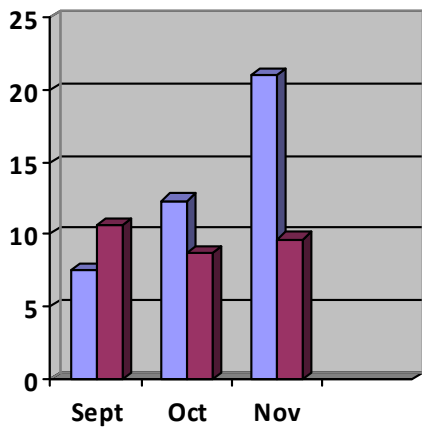
2. Final Findings (300 words):

The fresh weight and dry weight of the plants was studied to compare the biomass amount and was found to be high in controlled soil plants as compared to Yamuna soil plants. Observation regarding healthy growth rate of controlled soil plants, considering they are of same age, is much better and than that of Yamuna soil plants due to the presence of various contaminants in Yamuna soil.

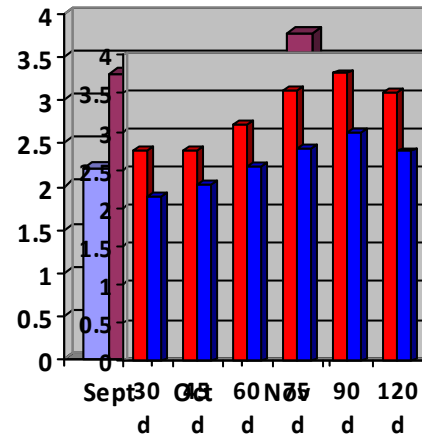
As growth of plant increases, the amount of lead in soil decreased while it increased in plant due to phytoextraction potentiality of *Helianthus* species. Study was also conducted on *Brassica* spp. It was found to be much better for this desired purpose as it was easy to be grown in Yamuna soil while *Helianthus* plants strived hard to survive in Yamuna soils. Rhizosphere study was done and certain fungal growth was observed which are reported to be helpful in phytoremediation process. The observations are summarized in graphs below.

Helianthus species.

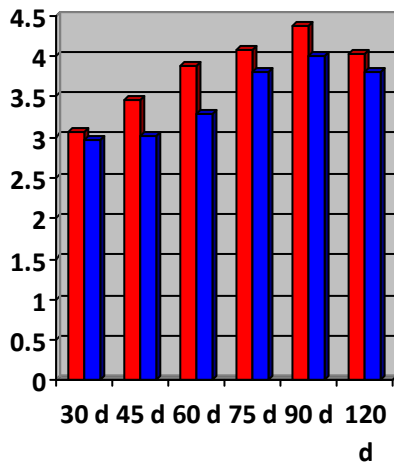
1. Shoot & Root length
2. Fresh & Dry Weight
3. Phytoremediation of Pb & Zn using *Helianthus* species



■ Yamuna Plants-Shoot length (cms)
■ Contolled Plants-Shoot length (cms)



■ Yamuna Plants-Root length (cms)
■ Yamuna Plant weight (gms)
■ Controlled Plants-Root length (cms)
■ Controlled Plants weight (gms)



■ Yamuna Plants-Fresh weight (gms)
■ Controlled Plants-Fresh weight (gms)

| S.NO | SOIL SAMPLE | pH |
|------|-----------------|-----|
| 1. | Controlled soil | 6.9 |
| 2. | Yamuna soil | 6.6 |

HELIANTHUS SP.

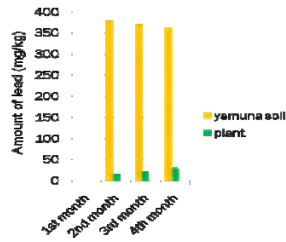
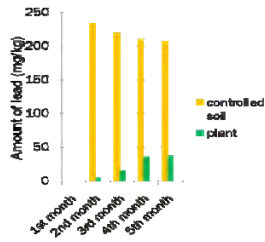
| S. NO. | SAMPLE (Helianthus sp.) | Pb(mg/kg) | Zn(mg/kg) |
|-------------------------------|-------------------------|-----------|-----------|
| CONTROLLED SOIL | | | |
| 1 | 2SC | 233 | 87 |
| 2 | 3SC | 220 | 76 |
| 3. | 4SC | 210 | 64 |
| 4. | 5SC | 206 | 52 |
| CONTROLLED PLANT (HELIANTHUS) | | | |
| 1. | 2PC | 4 | 37 |
| 2. | 3PC | 16 | 48 |
| 3. | 4PC | 36 | 58 |
| 4. | 5PC | 37 | 70 |

| S.NO | SAMPLE | Pb(mg/kg) | Zn(mg/kg) |
|--------------|--------|-----------|-----------|
| YAMUNA SOIL | | | |
| 1. | 2SY | 394 | 245 |
| 2. | 3SY | 380 | 154 |
| 3. | 4SY | 371 | 104 |
| YAMUNA PLANT | | | |
| 1. | 2PY | 17 | 92 |
| 2. | 3PY | 23 | 144 |
| 3. | 4PY | 31 | 168 |

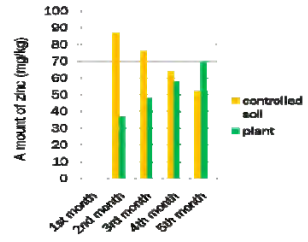
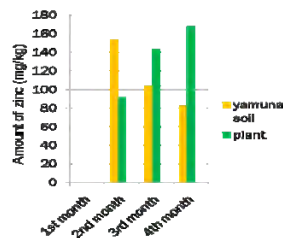
*Data represents average of three replicates.
2,3,4,5 represents samples after 2,3,4,5 months.
As growth of plant increases the amount of lead in soil decreases while it increases in plant as shown by amounts of lead and zinc in the table. This is due to phytoextraction by Helianthus species.

F

LEAD IN SOIL AND PLANT (HELIANTHUS)

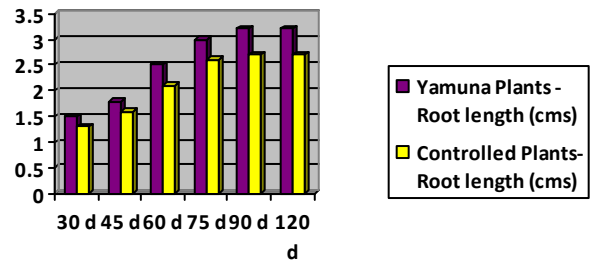
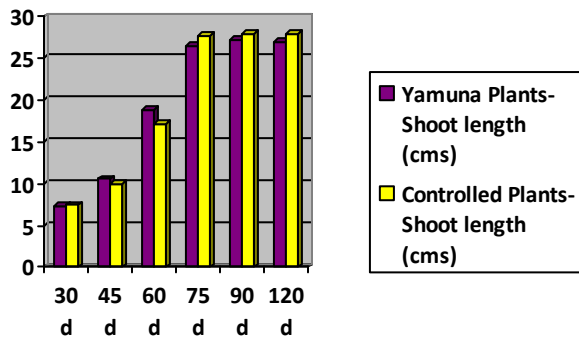


ZINC IN SOIL AND PLANT (HELIANTHUS)

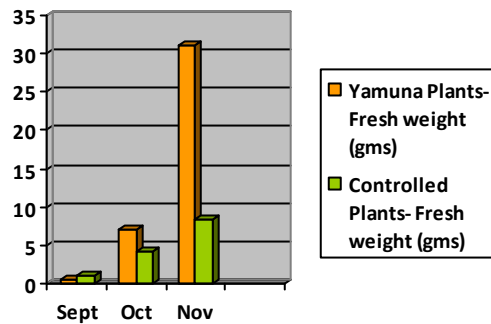
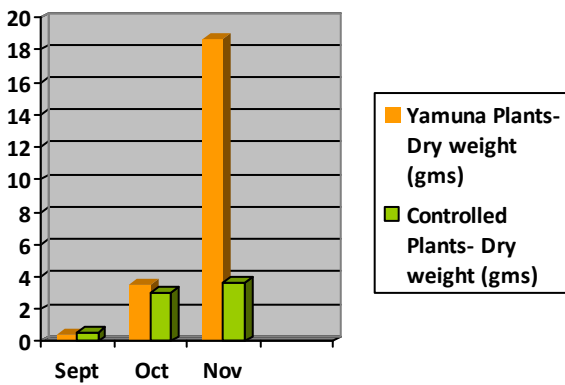


Brassica species

1. Shoot & Root Length



2. Fresh & Dry Weight:



3. Phytoremediation of Pb & Zn using Brassica species

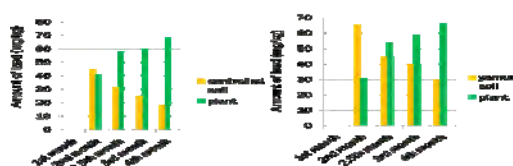
BRASSICA SP.

| S.NO. | SAMPLE (Brassica spp.) | Pb(mg/kg) | Zn(mg/kg) |
|-------|------------------------|-----------|-----------|
| | CONTROLLED SOIL | 86 | 124 |
| 1 | 2SC | 45 | 72 |
| 2 | 2.5SC | 31 | 68 |
| 3 | 3SC | 25 | 42 |
| 4 | 4SC | 19 | 20 |
| | CONTROLLED PLANT | | |
| 1 | 2PC | 41 | 52 |
| 2 | 2.5PC | 58 | 57 |
| 3 | 3PC | 60 | 80 |
| 4 | 4PC | 68 | 104 |

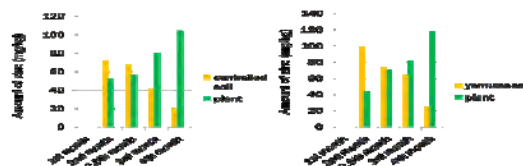
| S NO | SAMPLE | Pb(mg/kg) | Zn(mg/kg) |
|------|--------------|-----------|-----------|
| | YAMUNA SOIL | 96 | 115 |
| 1 | 2SY | 65.6 | 99 |
| 2 | 2.5SY | 45 | 73 |
| 3 | 3SY | 40 | 64 |
| 4 | 4SY | 30 | 25 |
| | YAMUNA PLANT | | |
| 1 | 2PY | 30.8 | 41 |
| 2 | 2.5PY | 54 | 71 |
| 3 | 3PY | 59 | 82 |
| 4 | 4PY | 66 | 118 |

*Data represents average of three replicates
 2,2.5,3,4 represents samples after 2,2.5,3,4 months
 As growth of plant increases the amount of lead in soil decreases while it increases in plant as shown by amounts of lead and zinc in the table. This is due to phytoremediation by Brassica species.

LEAD IN SOIL AND PLANT (BRASSICA)



ZINC IN SOIL AND PLANT (BRASSICA)



3. Learning for Students (200 words):

- ❖ The innovation project proved to be a great learning experience for the students of undergraduate level.
- ❖ The inter-disciplinary approach of the project helped students to learn to work together as a team and the exposure to the high level of research work.
- ❖ The presentations, seminar and various workshops attended by students was very fruitful. Students also presented posters at various national and international seminar and were appreciated for this Nobel effort.
- ❖ Working in the direction of such environment friendly approach will be for the betterment of the society.
- ❖ After this short training, the students are ready to take up any research assignment given to them in research labs, industries etc.

4. Benefits to College (100 words):

- ❖ All the equipment's purchased under the project will be used by the college itself and will add to the infrastructure of lab facilities of the college.
- ❖ The shed used for growth of plants will be used by the department as green house to grow plants and in-turn a small nursery.
- ❖ This method of phytoremediation can be used in college premises that will not only solve the problem of waste disposal but will add to the beauty of the landscape.
- ❖ The unutilized chemicals and glassware purchased from this project will be used by undergraduate students registered in college.

5. Benefits to Society (100 words):

- ❖ As it is a relatively new technology phytoremediation is still mostly in its testing stages and as such has not been used in many places as a full scale application. However it has been tested successfully in many places around the world for many different contaminants. It is more economically viable using the same tools and supplies as agriculture
- ❖ It is less disruptive to the environment and does not involve waiting for new plant communities to decolonize the site.
- ❖ It is more likely to be accepted by the public as it is more aesthetically pleasing than traditional methods.
- ❖ It avoids excavation and transport of polluted media thus reducing the risk of spreading the contamination.
- ❖ It has the potential to treat sites polluted with more than one type of pollutant.

6. Further Plans (100 words):

- ❖ In future we would like to continue working on this project to determine the potential of various plant species for the phytoremediation in different soil samples from different topographical regions.
- ❖ Different metals can be studied which are toxic in the soil and affecting the growth of plants.
- ❖ Underground or drinking water samples near to the polluted soil can be tested for toxic metals and then using phytoremediation techniques in the soil water can be purified.

KIRORIMAL COLLEGE

Project Title: Understanding the Chemical Metamorphosis caused due to Industrial Pollution in the Shiwalik region of the Himalayan Belt

Project Code: KMC-103



1. Objectives

Industrialization is on the increase and so is the environmental pollution due to emissions and waste generated from these industries. The industrial pollution due to its nature has potential to cause irreversible reactions in the environment and is posing a major threat to sustainable development. Since the carrying capacity of the environment is not unlimited and some areas or ecosystems are more susceptible to adverse environmental impacts than others, the unplanned and haphazard location of industries might substantially increase the risk to the environment.

The goal of the present study was to determine the extent of environmental degradation and spread legal awareness of environmental issues in villages. To summarize, the key objectives were:

- a. To conduct comparative pedagogical sampling of the Siwalik Buffer region with and without industrial setup;
- b. To estimate the terrestrial and aquatic degradation in the region;
- c. To conduct workshops for the stake holders including villagers, environmentalists, people from industries, about environmental management strategies

2. Final Findings

Related to the nature of the effluents, different areas in different zones have alarming levels of pollutants especially the heavy metal ions in soil and water.

- o Areas near Rapur Jattan, Patti Nath villages, having paper industries, indicate higher levels of lead Pb(II), chromium Cr(II) and cadmium Cd(II).
- o Other physiochemical parameters including specific conductivity also indicate high levels of pollution.
- o Majority of pharmaceutical industries near Baddi indicate higher concentration of chromium Cr(II).
- o Cadmium Cd(II) and zinc Zn(II) are present in high concentrations near the cement industries situated in Paunta Sahib.
- o For good plant growth pH between 5.5 and 7.0 is suitable. However, in these polluted terrains, pH is well above 8 i.e., the soil is alkaline.

Decreasing groundwater level due to excessive utilization in industries and contaminated surface water due to hazardous industrial waste disposal are major causes. Depth of water near industrial area is less whereas it is exceptionally much deeper in the areas considerably away from the industries, e.g. In a

village of Solan, the depth of the hand pumps is 70ft (near the industry), while in a village of Rupnagar, about 20Km away from industrial area is about 200ft.

Already ecologically vulnerable, the study area is also experiencing adverse effects of climate change such as increased incidence of heavy rainfall, landslides and soil erosion

People living near industries have experienced increasing degree of pulmonary and other health disorders in recent years.

Case Study:

o In Rapur Jattan village of Nahan Tehsil, due to chronic exposures of pollutants, slowly the air and water pollution is manifesting itself in various layers and dimensions.

o Survey studies have indicated a definite correlation in pollution levels and the type of diseases occurring in this area.

o New skin ailments have come up in that area. No such skin diseases were existing before 2000 and now nearly 60% of the respondents complained of the burning sensation and decolouration of skin.

o 30-35% of people are suffering from some or the other lung ailment be it asthma, lung problems, occasional ulceration of nasal passages, cough, or shortness of breath which were earlier non-existent. Other related problems sleeplessness, irritability, loss of appetite or chest pain are due to these polluted effluents.

o According to majority of respondents, due to lack of adequate health facilities, proper diagnosis and treatment is not available.

o Post 2000 cardiovascular diseases are also coming in higher numbers. 70% of the people interviewed are anemic.

o Local residents Mr Ranveer Singh and Mohammad Yami (Gram Pradhan) informed that around 8 to nine people have died of cancer in the recent past related to lungs.

o Life expectancy of the animals (pet and wild) has decreased considerably as majority of them directly depend on untreated effluents for drinking etc.

o The annual output of the mango crop of the area has reduced to much less than the average. The seasonal Rabi crop fails now to meet the basic requirement.

o A lot of animals and birds are at the verge of extinction as reported by respondents as we can see in 34% area a common house sparrow is difficult to be seen by villagers same as in case of vultures, eagles and many more.

Already ecologically vulnerable, the study area is also experiencing adverse effects of climate change such as increased incidence of heavy rainfall, landslides and soil erosion.

There is a gross violation of environmental laws.

3. Learning for Students

University education system provides a platform for intellectual development of citizens and trains the professionals for their subsequent admittance into the workforce. Following just the theoretical and abstract education implies that students have had to manage this difficult transition of entering the workforce all by themselves. Innovative project provided this unique hands on opportunity to the students to explore this earlier forbidden territory. It has provided that crucial link between the academics and other stakeholders like the villagers, industrialists, legal luminaries and environmentalists. Through this they have been exposed to the challenges of the society to which they adjusted, adapting the education offered to them to comply with the demands of society and the workplace. "Living Labs" created in the society have been a forums to understand the challenges of society. The impact on the students has been amazing. They have been sensitized about this problem. Their experiences and anecdotes are very thought provoking. Some students got associated with this project without fellowship as they said that our aim is

to learn and not get internship. It is worth mentioning here that Manpreet Singh and Ravi Kumar from chemistry remained associated with the project without stipend right from the beginning.

4. Benefits to Society

Industrialization has affected almost all the parts of the environment, health, water bodies, vegetation and many other species living there. An interesting case study was conducted on the Ruchira Paper Mills in KalaAmb where we got to know that the site where the mill is set up was taken by the mill owner originally for building a college or school. The local people view the level of sickness and the now common diseases like asthma and several respiratory problems as the outcome of the smoke and dust produced by the factory. All these aspects require serious thinking and action.

The people from the villages we visited feel more empowered and aware. Our study is perhaps the first in a series of efforts that can potentially focus attention of stakeholders on resolving these problems, not just in our project site, but across India. It was decided to establish Stakeholders' Forum to continue this momentum, and to inform and support each other's efforts in carrying out this mission. Poster making competition was organized for the students across the colleges to spread awareness. We provided platform an interface between aggrieved villagers and the people from industries and environment at Nahan workshop. The KMC-103 team requested the media to assist them in this drive to which we got tremendous response from Times of India and Mail Today.

5. Benefits to College

The institution has become a 'co-operative innovation ecosystem', where the students and students are in a symbiotic relationship. It is part of a multilayer transition plan that is gradually unfolding thereby introducing students to altogether new college-going experiences, demands of college coursework and at the same time providing a wide variety of provisions tailored to choreograph their individual needs. Along with teachers they shared scaffolding experiences during workshops, seminars, practical challenges and various field visits to the interior of Himachal Pradesh. Project has helped the college in capacity building. Such applied research activities have protracted and enhanced the college mandate to produce contemporary, well prepared workforces by providing rich learning activities for them to experience real world challenges and hands-on training with leading edge technologies and advanced skills training in all sectors of the society.

6. Further Plans

From the present study, it is confirmed that in the present scenario economic development and environmental protection discount each other and even are in conflict with one another. However, key fortes of the concept of sustainable development is, in fact, its explicit submission that economic development and environmental protection are mutually reinforcing and its aim to provide a workable solution to the traditional encounter between the two. High-risk group include population living close to a waste dump and those, whose water supply has become contaminated either due to waste dumping or leakage from landfill sites. We can carry our work forward keeping the following objectives in mind:

- To prepare Toxic Discharge Profiles of the industries and find correlation of residential proximity with impact on physical and mental health.

- To identify the human exposure pathways and Disease Inventory of the study area

- To correlate the levels of annual ecological pollution in the form of increments of pollutants released to the prevalence of diseases.

- To evaluate the bioavailability of these pollutants (E.g., Heavy metal ions)

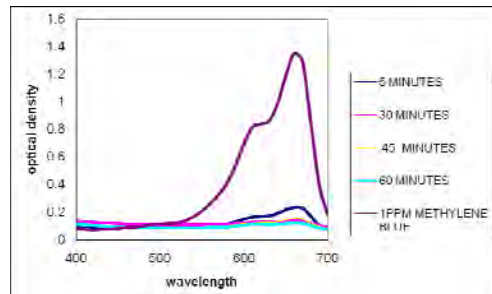
- To snapshot and document the risk assessment by evaluating the Hazard Quotient (HQ) and Health Risk Index (HRI)

To conduct workshops with the stakeholders in order to propagate awareness about the proactive steps to be taken to control exposure

KIRORI MAL COLLEGE

Project Title: Novel Strategies involving nanomaterials /nanocomposites and biosorption for removal of toxic metals from water

Project Code: KMC-104



PURIFICATION OF METHYLENE BLUE BY NANOCOMPOSITES (FIGURE SHOWS UV-VIS SPECTRA FOR 1 PPM METHYLENE BLUE BEFORE AND AFTER EXPOSURE TO POLYANILINE-IRON OXIDE NANOCOMPOSITE FOR DIFFERENT TIME DURATIONS)

1. Objective (150 words):

The main goal of this research was to develop low cost environment friendly nanocomposites of conducting polymers, metal oxides and biosorbents to be used as adsorbents for heavy metals and dyes from waste water and simultaneously purify the water from contaminants like microorganisms with *E. coli* as a model organism. In addition, the effect of various parameters like pH, contact time, temperature and initial dye concentration were also studied.

2. Final Findings (300 words):

The nanomaterials and nanocomposites for water purification were successfully prepared by sol-gel and coprecipitation method. Depending upon the processing condition, choice of solvent and precursor the methods have yielded different phases and sizes, the iron oxide prepared by sol gel method has yielded maghemite phases while by coprecipitation method we got magnetite phase but in case of iron oxide prepared by coprecipitation method using ferrous sulphate as precursor we got both magnetic and non magnetic green rust depending upon the rate of addition of aqueous solution of sodium hydroxide to the ferrous sulphate solution. The samples prepared were characterized by X-Ray diffraction. The Scherrer's formulae gave a size of 6 nm for magnetite, 12 nm for maghemite samples (unannealed), 30 nm for magnetic green rust and 35 nm for non magnetic green rust. The size was found to increase after annealing at 250°C. The lattice constants obtained were in good agreement with the literature values for maghemite and magnetite nanoparticles. Further the adsorption by these nanoparticles and their nanocomposites with conducting polymer (Polyaniline) for various dyes was studied. The dyes chosen were amido black, methylene blue and rhodamine. The UV-visible spectra show remarkable reduction in optical density after exposure to these adsorbents. The various adsorbents were maghemite, magnetite, rice husk polyaniline nanocomposite, polyaniline (doped) and green iron oxide. It was found that polyaniline iron oxide composites have maximum adsorption efficiency for amido black while iron compared with activated carbon. The effect of contact time on adsorption was also studied. It was found that adsorption almost reaches to saturation after 30 minutes for maghemite while for polyaniline composites saturation is reached within 2-3 minutes. It was observed that about 60-90 % removal of the dye took place in the first 5 minutes. The results for green iron oxide were not consistent. We need to stabilize those particles by modifying the

preparation procedure. The size variation of the nano-adsorbents was also done. The size was varied by annealing samples at different temperatures (250°C, 550°C). Adsorption capacity was not very much influenced by change in size (~10nm to 25nm). We need to take a broader range of size to study effect of size on adsorption. The industrial waste water containing dyes was collected from Faridabad industrial area, (Color Fabs Pvt. Ltd., cotton dye industry) and checked for purification by adsorbents prepared. It was found that 90% removal of

Polyaniline showed maximum inhibition of growth in *E.coli*. [Fig.], while Magnetite showed 20% inhibition. There was no zone of inhibition observed with maghemite.

3. Learning for Students (200 words):

Being a multidisciplinary project the students have got hands on experience of an entirely different field apart from their core subjects, for example in our project the physics students gets an idea of handling biological cultures eg. Parameters for growing *E. coli*, their growth kinetics, and evaluation of its removal from water. Similarly the Zoology students got an idea about crystal structure, the size dependent properties of nanomaterials, the physics behind X ray diffraction etc.

From this funding the students would be able to present their work in various conferences, so they will get a publication or poster presentation. The research work has started at undergraduate level.

4. Benefits to College (100 words):

We purchased the following equipments:

- i) UV-visible spectrophotometer- Zoology Department
- ii) Fume hood - Physics department
- iii) Muffle furnace- Physics department

Also, there has been a change in the environment where the students came to college through out the vacations and did some experiments. The undergraduate research gave them a poster, an oral presentation as well as an international paper. The place of work is the college so it derives obvious benefits.

5. Benefits to Society (100 words):

It was a novel attempt to develop an antimicrobial polymer nanocomposite based water filter to eliminate dyes.

Human development and population growth exert many and diverse pressures on the quality and quantity of water resources and on access to them. 1.1 billion people in developing countries have inadequate access to water. Close to half of all people in developing countries suffer at any given time from a health problem caused by water and sanitation deficits. For many years, granular activated carbon (GAC), has been the most commonly used medium for home and industrial water filter applications, effectively removing chlorine, odours, bad taste and colour from tap water but is unable to cope with bacteria problems. Polymeric disinfectants are ideal for applications in water treatment because they can inactivate, kill, or remove target microorganisms by mere contact without releasing any reactive agents to the bulk phase to be disinfected.

6. Further Plans (100 words):

Water purification is a dream for the third world countries. It is becoming more important as more people die every year from drinking the harsh natural water in our country.

While putting a glass of brackish, brown water into a machine and getting clear, clean water on the other side seems like something out of a futuristic movie, we are close to getting a system working with activated/functionalized polymers.

Our goal was :

- a) To enhance the production of advanced nanostructured functionalized polyaniline based composites;
- b) The demonstration that this material provides a superior antimicrobial surface; and
- c) The development and testing of the antimicrobial water filter.

KIRORI MAL COLLEGE

Project Title: Mapping the Spatial Topology of two sub-glacier basins of NW Himalayas for multi class change detection using MODIS, Landsat and IRS data

Project Code: KMC 105



KMC 105 Team trekking towards Zero Point of Khatling Glacier in Higher Himalayas in Uttarakhand to collect data (14 June,2012)



Picture 2: Enroute to Khatling Glacier from Kharsoli in Higher Himalayas in Uttarakhand for collecting Ground Control Points (17 June 2012)

1.Objective (150 words):

Spaces occupied by glaciers in the Himalayas have become an important area of study in the context of climate change in recent past. The recent tragedy in Uttarakhand Himalayas in June 2013 has further demonstrated the urgency for undertaking the research like present. Moreover, multiple and diverse results from within and outside India are surfacing about the shrinkage of glaciers in the Himalayas. To understand and spatially document the reality about changes in glacier regimen in last four decades using remotely sensed images in sub-glacier basins of Bhagirathi Basin was the main aim of the present project.. Climate changes may influence the spatial extent of the snow (Barnett et.al., 1989; Cess., et.al., 1991; Cohen and entekhabi 2001; Liang. Et.al., 2007) on the other hand for the seasonally snow covered regions, the snow cover effects the ecology, snow pattern and hydrological cycles (Walker,et.al., 1993 ; Jones 1999). The Objective of this study was two pronged, both academically driven- first was to map the Spatial topology of two sub- glacier basins of NW Himalayas for multi class change detection using MODIS, Landsat and IRS data and the second to demonstrate the trans disciplinary flavor for enhancing

the analysis and interpretation of the study. The Innovative Project KMC-105 therefore is an effort to understand the reality about changes in glacier regimen in two sub-basins of Bhagirathi Basin.

2. Final Findings (300 words):

The final findings in the present research though limited have been glaring and focused. One year however seemed less for the research like present and more so because the minimum third field work required for field testing just could not be undertaken due to the recent flash floods and subsequent landslides, etc., in the study area in Himalayas and the GPS data could not be corroborated well with the High resolution images of the study area as desired. The following findings are based on the study area (Figure 1) including the Khatling Glacier and Phating Glacier in Bhagirathi basin in N_W Himalayas

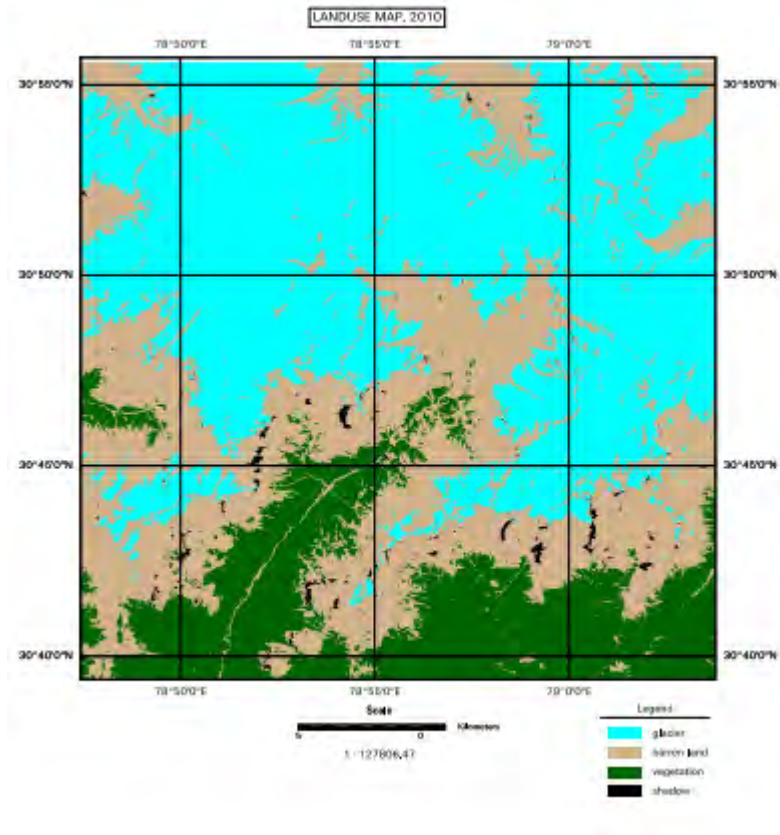


Figure 1: the Study Area

1. The Khatling ($30^{\circ} 50' N$ to $78^{\circ} 57' 30'' E$) and Phating glaciers ($30^{\circ} 50' 30'' N$ to $78^{\circ} 59' 00'' E$) present in Bhilangana basin are impacted by the climate variability in the North-West Himalayas,
2. Digital image Processing of Remote sensing data including Landsat, MODIS and IRS LISS 3 data along with topographic sheets and two field works have been used in the present research. Glacier is the after effect of snow and ice accumulation. It is important to distinguish snow and ice field and to note that a considerable period of time is required to give rise to snow pack or ice field and *firn* and *neve* are two stages that bring over the change from snow to ice. Rigorous analysis has led us to evolve an index using ERDAS IMAGINE V.10 and distinguish different parameters.

- Longitudinal foliation was observed in the region. It appeared represented by alternating light and dark coarse and line grained bands.



Picture 3: Longitudinal folia exposed in Khatling Glacier (15 June,2012)

- Thirteen glaciers have been visualized in all in Bhilangana basin with four as valley glaciers compound basins; three as mountain glacier compound basins; one as mountain glacier simple basin ; two as glaciated snowfield cirque and three as snow field niche with Khatling glacier as the largest glacier (Figure 1) with maximum orientation towards South –West. AAR % ranges between 0 and 100 in different part and depth varying between 10m and 90 m in different places, followed by the Phating Glacier. The area is calculated from the IRS LISS 3 data using NDSI.

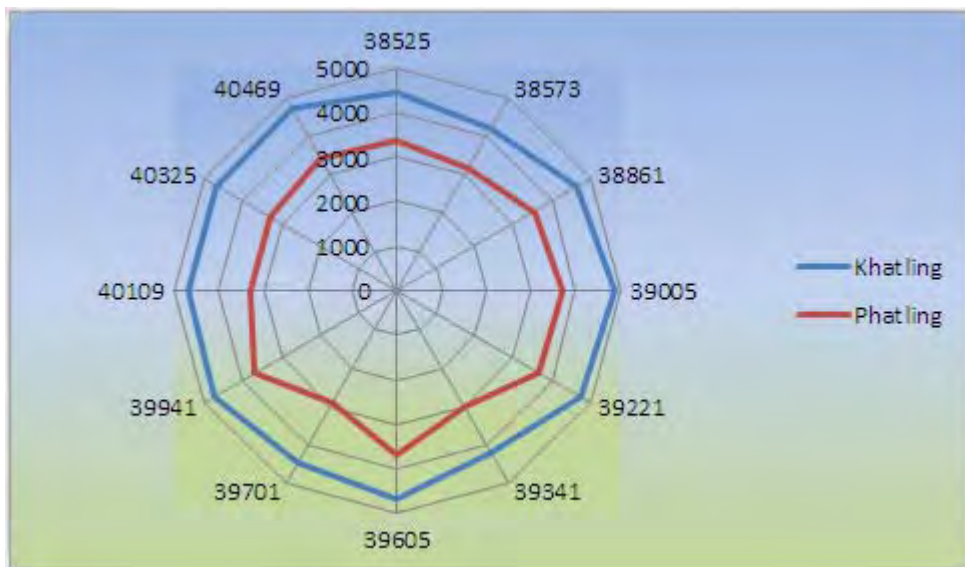
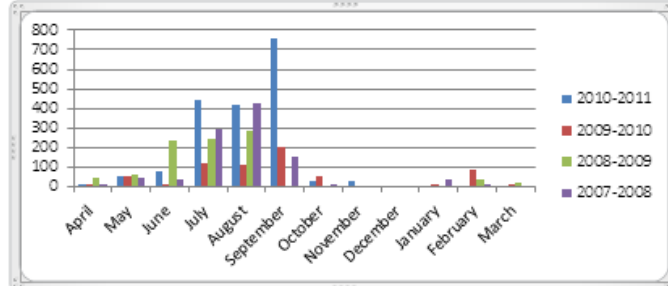


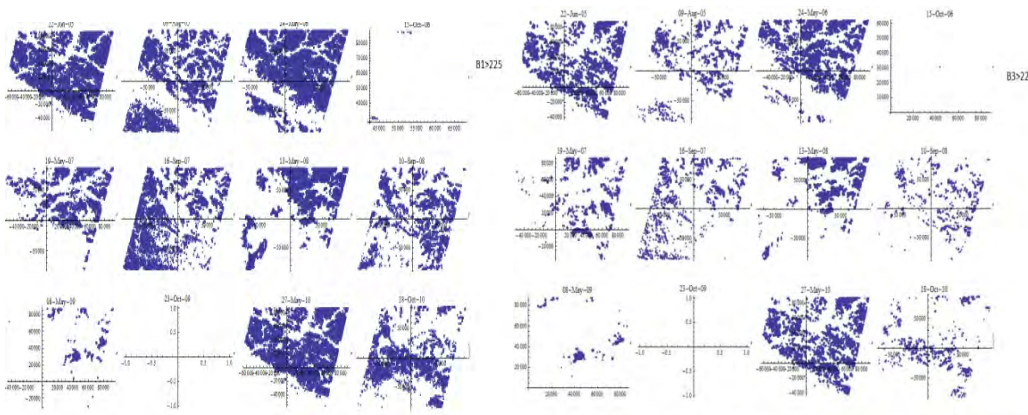
Figure 1: Area of two largest galciers Khatling and Phating glaciers in the Study Area.

- The data of rainfall indicates an above average rainfall in the year 2010-2011 and a lean period in 2009-2010. We also analysed the data on normal rainfall in the region for these 4 years. The actual rainfall

varies considerably from normal rainfall for the years 2010-2011 and 2009-2010. The data above indicates an above average rainfall in the year 2010-2011 and a lean period in 2009-2010. We also analysed the data on normal rainfall in the region for these 4 years. The actual rainfall varies considerably from normal rainfall for the years 2010-2011 and 2009-2010.



- The spatial topology also highlights the variability in glaciated region in different time period including 2005;2006;2007; 2008 and 2010. The reasons for this have to be probed further. This exercise has been completed for 25 datasets ranging between 2005 and 2010.

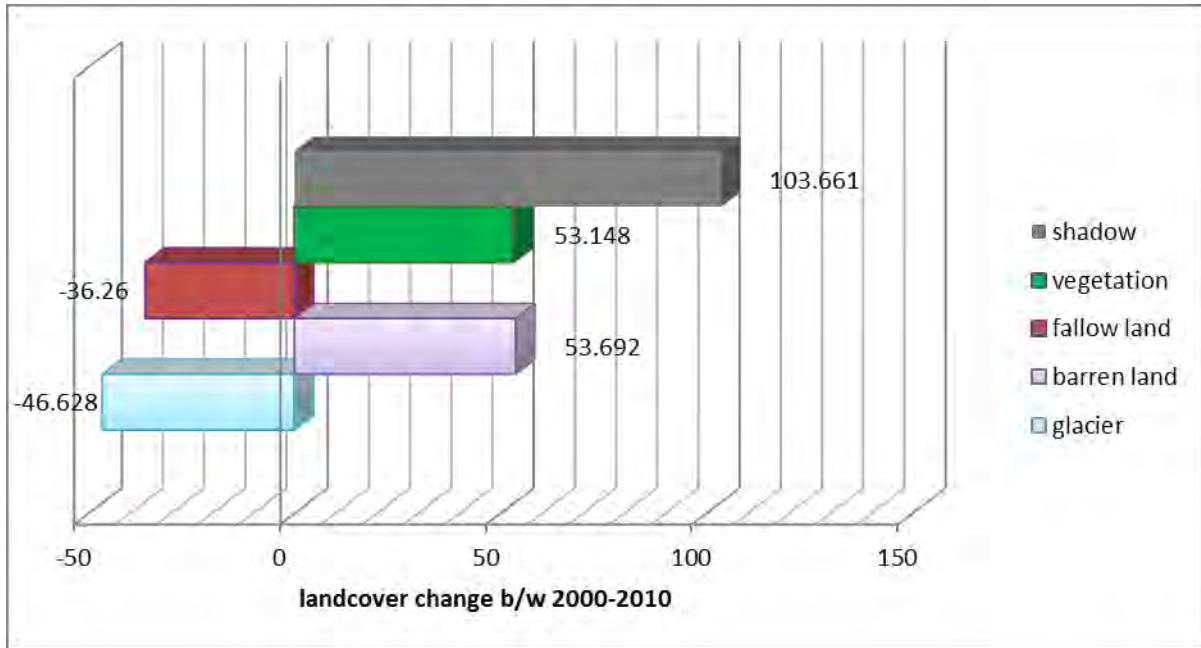


Calculation of the approximate area depicted that if on 22-Jun-05 the noticed surface area of the Khatling glacier was 4459.245 sq km, on 24-May-06 the surface area of khatling Glacier glacier was 4668.3 , the surface area on 06-Jun-08 was 4665 and on 27-May-10 it was noticed to be of 4693.9. Further, for Phating glacier on the same dates in May and June the area calculated was 3349.38, 3533.68, 3696.98 and 3303.92 respectively.

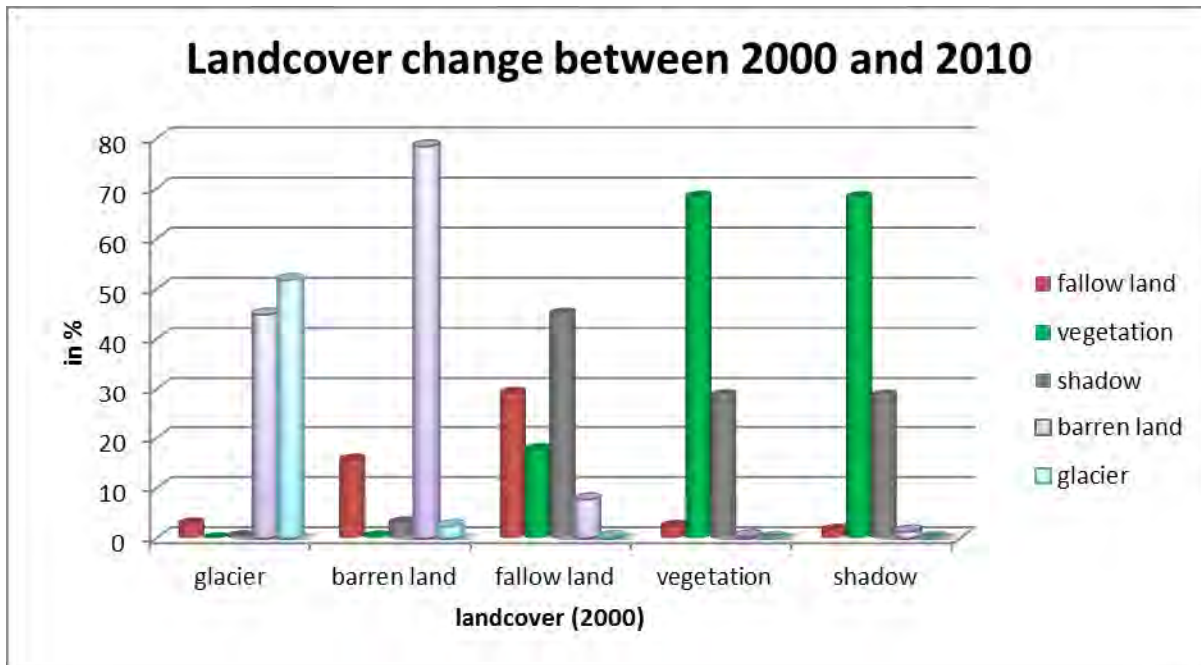
7. CHANGE DETECTION 2000-10:

Digital Image Processing of 10 year satellite IRS LISS 3 data has given us convincing result for the change in the size of the glacier. Though with the limited data it would not be able to convincingly show case the retreat but yes convincingly the variability in the size is there. Both the decrease and the increase in the size is simultaneously there as showcased below. Between 2000 and 2010 , if there

is a decline, between 2006 and 2010 there is an increase in the size of the glacier. Spatial topology too consequently is varying/.



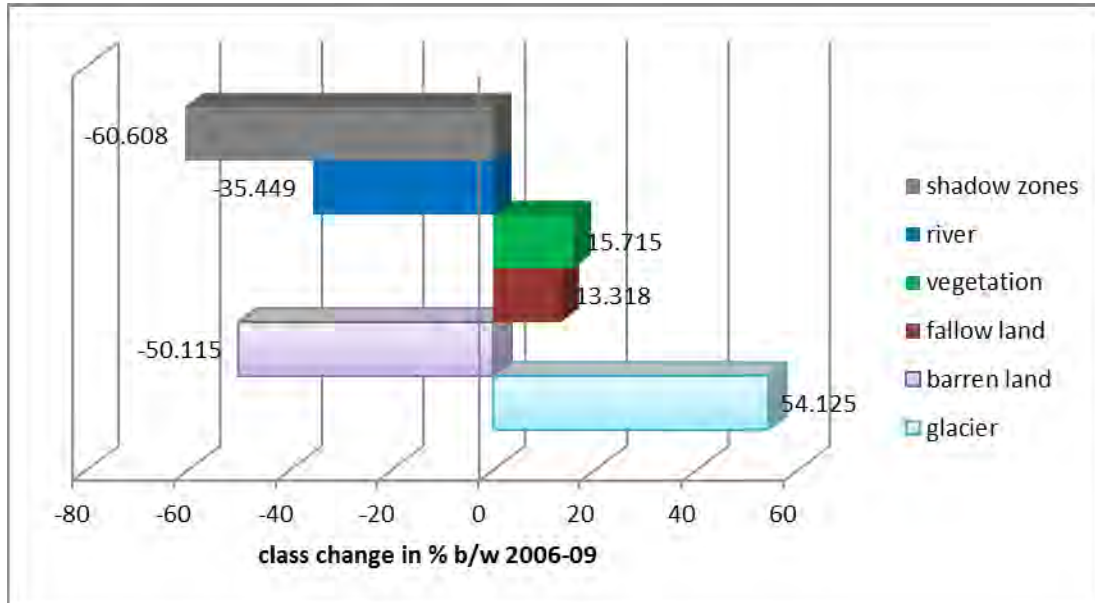
BETWEEN 2000 AND 2010 it appears that 46% of glaciated area is lost; with addition of 53.69% of barren land ;36.26% of fallow land lost; vegetation to be improved by 53.15% and 103% of shadow area has increased leading to loss of classified area.



For glaciated region of 2000, 51% is common to 2010, while 44% has been converted into barren land, 3% under fallow and 0.5% under shadow; For barren land of 2000, 78% is common to 2010, while 16% has been converted into fallow, 2% under Glacier and 3% under shadow; For fallow land

of 2000, 29% is common to 2010, while 17.7% has been converted into vegetation, 7% barren, 3% under Glacier and 45% under shadow.

8. CHANGE DETECTION 2006-09



BETWEEN 2006 AND 2009 54% of glaciated area is increased; 50% of barren land is lost; 13% of fallow land is added ;vegetation has improved by 15.7% and shadow area has decreased by 60%.

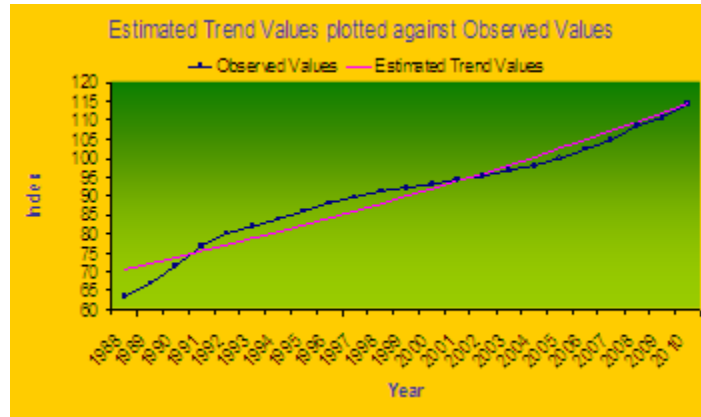
9. According to our observations in the field , Glaciers are retreating in the long term and not advancing; Weather fluctuations are frequent in the region, the evidence being the uneven and untimely rains; Melting of glaciers has been observed from past 6-7 years, where last year showed unexpected results for snow fall; Construction of dams and tunnels is disturbing the present climatic conditions. It lead to decrease in water resources which in turn causes climatic change and Glaciers are important for survival.

Effects of Glacier melting and climatic change:

- Increase in temperature
- Uneven rains
- Seasonal changes (shift in seasons)
- Decrease in water resources
- Decrease in agricultural produce

10. However, Observation of the data of the crops at district level of the study area was also considered for two reasons, one to conceptualize the macro behavior and second in a short span, this could only be made available in the form of secondary data from 1988 to 2010. As stated, this was to observe the macro behavior in different seasons , it highlighted that

Since First Differences of the Logarithms are Constant, First degree Exponential Curve can be selected the series when plotted on a Logarithmic scale resembles selected as the as a Trend type. Further, a Straight line, So, First degree Exponential curve was Trend curve.



Further, it was computed that there is no significant difference between the estimate of the variance of the Random component V_{10} and V_{11} and any of these two can be taken as the variance of the Random component. Hence, the Estimate of the Variance considered in the macro region from 1988 to 2010 Random Component is 0.003826 or 0.00337.

VARIANCE ESTIMATES

$$u_2'(\Delta^k U_i) = \frac{\sum (\Delta^k U_i)^2}{n}$$

| | | |
|------------------------------------|--|------------------|
| $u_2'(\Delta U_i) = 6.781818$ | $V_k = \frac{u_2'(\Delta^k U_i)}{2^k C_k}$ | $V_1 = 3.390909$ |
| $u_2'(\Delta^2 U_i) = 0.748571$ | | $V_2 = 0.124762$ |
| $u_2'(\Delta^3 U_i) = 1.496$ | | $V_3 = 0.0748$ |
| $u_2'(\Delta^4 U_i) = 3.893158$ | | $V_4 = 0.055617$ |
| $u_2'(\Delta^5 U_i) = 10.36444$ | | $V_5 = 0.740317$ |
| $u_2'(\Delta^6 U_i) = 24.68529$ | | $V_6 = 0.454167$ |
| $u_2'(\Delta^7 U_i) = 53.60125$ | $V_7 = 0.015618$ | |
| $u_2'(\Delta^8 U_i) = 113.434$ | $V_8 = 0.008814$ | |
| $u_2'(\Delta^9 U_i) = 258.0693$ | $V_9 = 0.005308$ | |
| $u_2'(\Delta^{10} U_i) = 706.8677$ | $V_{10} = 0.003826$ | |
| $u_2'(\Delta^{11} U_i) = 2377.074$ | $V_{11} = 0.00337$ | |

Thus to conclude, what is a major concern that all physical changes are indicating of the nature being bringing physical changes with unpredictable behavior and severe intensity. What is missing is the awareness of common man for it to be linked to climate variability. What worries is the unpreparedness of the local people towards it and both political and administrative caretakers are still lost in debating between their respective roles and the discourse between sustainable environment and urbane like development on the pristine Himalayas.

3. Learning for Students (200 words):

The learning for the students has been immense as the students in our group were from three disciplines , including four from Geography; three from mathematics and three from Statistics and above all most of them were high scorers in the University with positions in their respective batches. Though wanting otherwise Intra –learning’s’ appeared more than the inter-learning. The first and foremost learning came with their exposure to the idea of trekking in higher Himalayas with equipment for data collection. Buying trekking gears, using tents for sleeping and not getting a mode of transport for many days in continuation in the scenic environ of Bhilangana river brought team spirit in almost all of them. Taking care of each other and discussing on how to help local people and looking at them closely ignited sensitivity in them. As all of them were exposed for the first time to the remote sensing data they learned about this tool too with eagerness along with the importance of using GPS and toposheets. Downloading of Landsat and Modis data also taught them the importance of Open Source data along with the importance of purchased NRSC data. They also for the first time used NRSC data using different software, including ERDAS IMAGINE; Wolfram Mathematica 9; SPSS; EXCEL spreadsheet and were excited to share their results. Making the first phase of documentary and clicking the photographs of scenic landscape was also a unique learning with newness and excitement.

4. Benefits to College (100 words):

The College is made up of three pillars: students , teachers and administration. The students definitely became more enriched with getting a chance to be doing research that otherwise they would have only got after post-graduation. For teachers like us , provided we stay in a team with trust we definitely got a glimpse of research routed through our University. In other words an undergraduate environment got a flavour of real research with a hope that University will remember them as equals and provide research related opportunities in future also. Besides, for a work like ours , despite innumerable deterrents the analysis has definitely improved and brought that reality closer that how much is the scope for all of us to learn from our colleagues of different disciplines. In our college it seems the administration needs little more preparedness in handling and distributing finances despite its ready availability. Albeit deterrents, the innovative projects added the research culture in an undergraduate set-up and highlighted that student and teacher team even at Undergraduate level of Higher education can contribute and interdisciplinary research can be encouraged.

5. Benefits to Society (100 words):

Research like ours reiterates the fear that climate variability is bringing unprecedented changes for which we all are just not prepared. The disaster that took place in Bhagirathi basin in June 2013 though missed this tributary this time the research definitely forewarns for a disaster in future and the region needs a serious attention. Even that debate that whether glaciers are melting or not in Himalayas, the change is visible and it highlights that the fluctuations demands attention and action from the administration. This research therefore, is of immense utility not only to people belonging to the area but also to geologists, environmental scientists, engineers, technicians and other technical professionals who acquire, analyze, understand, interpret, and summarize environmental data and then communicate results.

6. Further Plans (100 words):

There is an immense scope of furthering the present research, especially because of its own importance and the changes that recent disaster has brought in the study area. There is still so much more to do in the present research, analysis to be improved, more data to be added, more field work to be conducted, a research paper to be sent for the publication and above all, there is an urgent need to find ways and means by which the stake holders who belong to that region may find ways to prepare themselves in case of disasters. This can be a topic of new research. Moreover, there is a need for more in-depth study of debris

around and the moraines for measuring the quantum of water flow downhill in the moments of calamity with better high resolution data sets and intensive field work. As stated above, the NDMA like parallel body cannot solve anything at the time of disaster, what is required is a carrying capacity programme for the region and a data bank with complete transparency available with supporting agencies. I saw another project during display of projects in Antardhwani who had developed a technology for which I visualize lot of scope in my study area. Therefore wishes to collaborate with them to take the research forward.

In addition, most importantly as so many agencies are collecting funds for recent held Uttarakhand disaster, and the region though not directly was affected, but certainly is a fourth order tributary of Bhagirathi Basin to visualize Foucault's concept of *dispositif*, or concrete social apparatus becomes urgently important and conceptualization in the form of research on '*thoroughly heterogeneous ensemble*' at the level of first order tributary becomes so important and urgent.





Attach 2 photos that show the achievement of this project



Team interacting with the young locals at Ghuttu in the Garhwal Himalayas. In the backdrop four Pradhans of different Gram Sabhas can be observed.

KIRORI MAL COLLEGE

Project Title: To assess the mutagenic potential of some of commonly encountered environmental pollutants and therapeutic agents

Project Code: KMC-106



Poster being presented at Antardwani and at ANDC.

1. Objective (150 words):

There has been an increase usage of various pesticides, herbicides and other chemicals in the agricultural practices. These chemicals gain entry in the food stuff and are potential risk to health of the people. Food preservatives are also being used indiscriminately to enhance the shelf life of food.

Commonly used preservative, such as Monosodium glutamate, Butylated hydroxyanisole, sodium nitrite and the common analgesic i.e., Disprin have been chosen for the present study. To study the potential effects of these chemicals, two systems have been used, a prokaryotic system, i.e., *E. coli* and for eukaryotic system *Allium cepa*. *Allium cepa* test has been found to be a very effective system to study the cytotoxic effect of these chemicals, since roots are directly exposed to the chemicals and the effects are quick. *E. coli* is also extremely sensitive to the growth conditions and has got a faster growth rate.

2. Final Findings (300 words):

The effect of various food preservatives, drugs and pesticides were studied using *Allium cepa* test and growth kinetics of *E. coli*. Both are very sensitive test, and it is very easy to study the concentration and time of exposure to chemicals. The food preservatives (BHA, MSG, NaNO_2) showed changes in mitotic index, only when given in higher dose. The recommended dose does not alter the mitotic index as well as bacterial growth. However, repeated dose is bacteriostatic.

3. Learning for Students (200 words):

- Students started their work with literature survey.
- A survey of the commonly used food preservatives and analgesics was conducted by the students. They identified the possible mutagens and the mitogenic principles in food preservative, medicines, and pesticides.
- The most common bacteria *E. coli* was identified and used for the present studies.



Crossing a Glacier near Khating Cave
17 June, 2012

- The students were trained to use digital imaging system, to store and analyze the images of cells showing mitosis in onion root tips.
 - Familiarization of various protocols/techniques, which were used for generation and growth of onion root and for growing and maintenance of *E. coli* culture.
 - Students learnt the selection of chemicals to be used and also the glasswares and apparatus for the experiments.
 - Students were familiarized with the concepts of biology and how to work in sterile environments and GLP.
 - Students also learnt the karyotyping of human blood cell, since a workshop was conducted by the mentor for the same.
 - The students have understood the scientific methodology and planning of experiments,
 - During participation in Antardhwani, festival of Delhi University, the students learnt how to organize the data, how to make inference from the data, how to make the poster and the brochure. They learnt how to explain their observations and defended their work while interacting with the people during the festival. They took pride in doing so.
 - The students also presented a poster in the "National Symposium "Scientists of the Future" that was held on 12-13 October, 2012.
 - It was concluded that single dose of analgesics indicated 30% cytotoxicity. But repeated dose of analgesics could be harmful.
7. Benefits to College (100 words): college has gained the following equipments purchased under the project KMC-106
- Nikon Binocular microscope
 - Laminar air flow
 - A fridge

8. Benefits to Society (100 words):

We have used common food preservatives and medicines to study their effect on cell division. This will help to understand the possible adverse effect of junk food and also that of indiscriminately used medicines.

As the food additives showed no response when added in recommended dose. This tells the significance of mention dose. Single dose of analgesic indicated cytotoxicity in bacterial culture but repeated doses of analgesic can be harmful.

9. Further Plans (100 words):

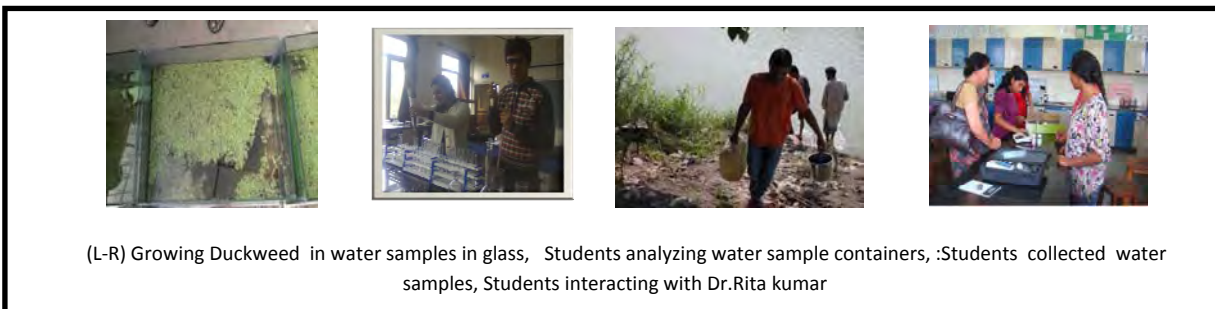
The work done by the students under the present project KMC-106, further needs to be reinvestigated. The availability of the students to repeat the experiments was not there because of paucity of time. However, the data collected is stored and need to be analyzed further by further analyzing stored images. The students were busy with their classes and the examination work.

Apparently the cells don't show much change at the recommended dose of therapeutic agents however, this need to be confirmed by further analysis of chromosomal behavior.

KIRORI MAL COLLEGE

Project Title: A comparative study of phytoremediation of stagnant water by free floating plants and making it potable with the use of various plant sources

Project Code: KMC – 107



1.Objective (150 words):

In metropolitan cities, there are civic agencies, which are responsible for the supply of clean water. In villages, however, people still have to largely depend on local water sources. Besides wells, one of the major sources of water is the pond water, which primarily is the rainwater. Water gets contaminated because of various human activities, which results in scarcity of potable water. This stagnant water is unhealthy for human consumption and even for drinking by the animals. Phytoremediation of water by growing the aquatic plants has a great potential. In addition, the plant sources like seed powder and leaves can also be used for cleaning water. The objective of this project is to demonstrate the three different ways to remove some of the pollutants from stagnant water. These are:

- By growing aquatic free floating plants such as duckweeds in the polluted water. Duckweeds are very fast growing and consume many of the pollutants from the water as nutrients for their growth. Simultaneously, they help to increase the dissolved oxygen content as well as reduce the unpleasant smell of water
- By using the powder of various seeds which have been found to act as effective coagulants for various impurities of water.
- By treating the water samples with leaves of different plants for removal of impurities present in water.

2.Final Findings (300 words):

As experiments are conducted in two parts, first phytoremediation of water by growing the free floating aquatic plants in the water, second by treating the water with plant materials, findings are also reported accordingly.

- Duckweed was grown in water samples collected from Delhi ridge and Wazirabad water bodies, however, water samples collected from the national zoological park, Delhi and lake from model town did not support the growth of duckweed.
- A significant reduction in turbidity¹ was observed in the water samples in which duckweeds had been grown, however, no significant changes could be observed in parameters such as pH, temperature, TDS, conductivity and salinity².
- Level of nitrate, phosphates³ and ammonia⁴ was measured and it was found that there was significant reduction in levels of phosphate and nitrate⁵ after duckweed had been grown in water samples.

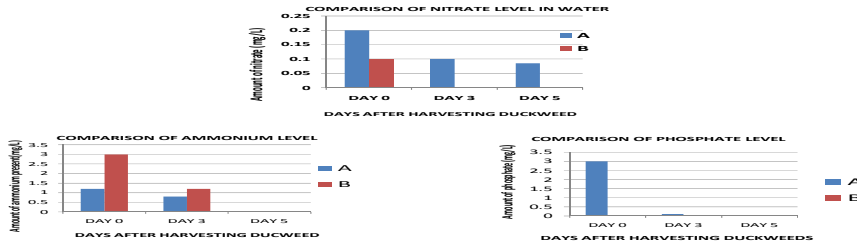
¹. Turbidity was measured using turbidity meter model no.----

2. pH, temperature, TDS, conductivity and salinity was measured with.....
3. Phosphate estimation was done using the method from 'Standard Methods for estimation of Water,' published by American Public Health Association, ISBN

No.-0- 87553-235-7, Phosphate estimation (4500-P.D.)

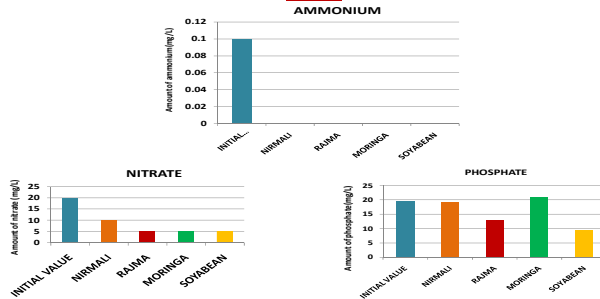
4. Ammonia estimation was done using the method (4500-NH₃ F.)
5. Nitrate estimation was done using the method (4500-NO₃-B)

Comparison of ammonium, phosphate and nitrate levels in two water samples (A&B) after growing Duckweed



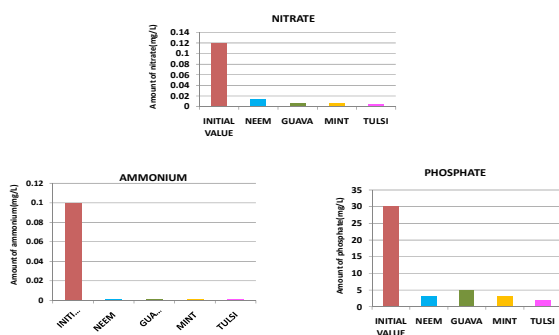
- Preliminary studies were carried out on studying the effect of seed powder of Rajma, Nirmali, Moringa and Soya bean on water from different sources.
- Initial studies show reduction in TDS values after treatment with seed powder.
- A slight change in the turbidity was observed.
- Other parameters such as pH, conductivity, salinity were also measured.
- The water samples treated with powder of seeds show reduction in ammonium and nitrate levels. However, level of phosphate does not show considerable change.

The changes in the level of ammonium, phosphate and nitrate after treatment of water sample for one hour with powder of different seeds



- Studies were carried out using leaves of Neem, Guava, Mint and Tulsi.
- There was drastic reduction in level of ammonium, phosphate and nitrate after treatment with the leaves.
- Some changes have also been observed in parameters, viz., TDS, salinity, turbidity, pH and temperature however, it needs further investigations.

The changes in level of ammonium, phosphate and nitrate in water samples for one hour after treatment with leaves of different plants



All the above mentioned observations need to be repeated in different water samples.

3. Learning for Students (200 words):

1. The students have become aware of problems faced by the peoples in villages. They have learnt about the contaminating agents of the water.
2. Students have learnt the techniques for estimation of phosphates, nitrates and ammonia in water.
3. They have learnt to prepare solutions themselves.
4. They have also learnt to use UV-spectrophotometer, turbidity meter, pH meter, and TDS/conductivity/salinity meter. They have learnt how to estimate BOD in water, however, data collected for BOD estimation in water samples needs further repetition.
5. Since the students used the green technology to clean water, they realized the significance of same.
6. Students also visited Sulabh International and International center for genomics and integrative biology. They interacted with the scientists, learnt the methods and used in their own lab.
7. The students went to collect water samples from Delhi ridge, Model Town Lake and the Nation Zoological Park, Delhi and Wazirabad water bodies.
8. Students cleaned the glassware themselves and learnt the significance of maintaining the clean and organized environment.
9. During participation in Antardhwani festival of Delhi University, the students learnt how to organize the data, how to make inference from the data, how to make the poster and the brochure. They learnt how to explain their observations and defended their work while interacting with the people during the festival. They took pride in doing so.

4. Benefits to College (100 words):

college has gained the following equipments purchased under the project KMC-107,

1. UV-spectrophotometer
2. Weighing balance, having capacity of weighing .001 g.
3. A pH meter

4. TDS, conductivity/salinity meter.
 5. Turbidity meter
 6. The shed, constructed under the project, can be utilized by the department, to grow the plants under protected environment.
 7. The glass containers, which were custom made under the project, can be used to grow the aquatic plants to be used by the department.
 8. Besides the above mentioned equipments glassware and chemicals have also been purchased under this project.
5. Benefits to Society (100 words):
Though further investigations are required, the present work done under the project KMC-107 has got huge value for the society. Now a day, to get clean potable water is a challenge, especially in villages. Most of the methods include treatment of the water with chemicals such as alum. Alum has been reported to be carcinogenic. The government is trying to develop various strategies to meet this challenge,

Using the green technology has got great potential in the future. The plant materials used in the present study are very commonly available. Methodology adopted for the conducting the experiments have been very simple, and these can be easily employed at household level.

Duckweed can easily be made to grow in the ponds, which can reduce the nitrate, ammonium and phosphate contents of the water. The animals can drink that water safely. The polluted water, before being released in river, can be treated by growing duckweeds. There are reports in the literature for such kinds of studies.

6. Further Plans (100 words):

The work done by the students under the present project KMC-107, further needs to be reinvestigated. The students could not repeat the experiments because of paucity of time, since students were busy with their classes and the examination work. Besides growing duckweeds to treat water, other plants such as *Salvinia*, or *Eichornia* can be grown in the polluted water and changes in the parameters of the water samples can be studied. In the present study, four types of seeds, and four types of leaves were used to study their effect on the remediation of water. A reduction in nitrate, ammonia and phosphate was observed, however no significant changes could be observed in the turbidity, conductivity and salinity of the water. A modification in the methodology might be required to achieve that. Various other commonly available plant materials can also be tried to get better results.

In the present study, effect on the microbial population of the water was not studied because of non availability of suitable facilities. In future changes in microbial population in water samples can also be studied.

KIRORI MAL COLLEGE

Project Title: Analysis of heavy metal content in soil and plants present near the road side and suggest plants to be grown in and around Delhi NCR.

Project Code: KMC-108



Survey of Regoins



Sampling of Soils



Heating of the soil sample



Grinding of the sample



Weighing of Sample



Digestion of sample



Filtration and Dilution



Sample for analysis



Interaction with local public



Interaction with local public



Participation in Conference



Presentation in Conference



Conference at Dehradun



Discussion with Mali at College about Plants



Survey of Plants at road side



Seminar Organised by KMC-108 Team



1.Objective (150 words):

The main objective of the project was to involve undergraduate students in basic research in the field of current research. This gives them the chance to know the upto date knowledge of the research practically in both field and laboratory setting. This study is initiated to assess the level of contamination of surface road soil and plants by some heavy metals along the major traffic highway and industrial regions in and around Delhi and NCR. The focus of the project was more towards removal of heavy metal concentration from soil by the phytoremedial method. This study is chosen in the innovative project because the heavy metal contamination in soil is a major concern because of their toxicity and threat to human life and the environment. During the last few years, the population of the cars and the number of construction projects in city of Delhi have steeply increased which may change the high levels of some heavy metals. These are hazardous to human health.

2.Final Findings (300 words):

In South zone region, there is presence of Cd in soil sample with variation in concentrations in summer season. The concentration of Cadmium is considerable in the south region in summer season whereas concentration becomes negligible in rainy season. This happens probably due to the percolation of Cadmium due to the heavy rains. It might seep in deep in the ground. But in the case of Pb, the concentration is found to increase in rainy season. This may be due to precipitation of Pb present in the atmosphere via rainy water or due to the flow of Pb from its surrounding possible sources. The concentration of Cd and Pb were found to decrease in rainy season as compared to summer season due to percolation of both of these heavy metals by the rain water in the central zone. The lead concentration in Delhi High Court was found to be negligible in summer season as compared to rainy season. The concentration of Cd was found to decrease in rainy season as compared to the summer season but the concentration of Pb increases in some of the regions in rainy season compared to summer season like Common wealth games Village (CWG-1), Sanjay Lake (SL-1). The concentration of Cd was found to decrease in rainy season as compared to summer except Kirti Nagar Metro Station area (KNM-1). Lead concentration was found to decrease in rainy season as compared to summer except in places like Rohini Sec -6(RH-6) and Kirti Nagar Metro Station (KNM-1). Especially Kirti Nagar Metro station has industries in its adjoining area .Hence, due to heavy rains, there must have been precipitation of lead from the atmosphere which has been released by the industrial chimneys. The concentration of Cadmium was found to decrease during the rainy season as compared to the summer season except in the case of Majnu Ka Tila (MKT-1). While in case of Pb, the concentration was found to increase during rainy season as compared to the summer season except in case of Majnu Ka Tila (MKT-1 & MKT-6).

1. ZONE-SOUTH DELHI : SEASON –SUMMER

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|-------------------|-------------------|-------------------|
| 1 | DLF-1 | 0.22 | -1.44 |
| 2 | East of Kailash-1 | 0.16 | 12.4 |
| 3 | IITD-1 | 0.06 | -1.73 |
| 4 | NCERT-1 | 0.09 | 5.90 |
| 5 | AIIMS-1 | 0.06 | 7.50 |

2. ZONE –SOUTH DELHI: SEASON-RAINY/MONSOON

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|-----------|-------------------|-------------------|
|------|-----------|-------------------|-------------------|

| | | | |
|---|---------|-------|------|
| 1 | DLF-1 | -0.38 | 1.35 |
| 2 | EOK-1 | -0.57 | 2.24 |
| 3 | IITD-1 | -0.39 | 1.98 |
| 4 | NCERT-1 | -0.73 | 0.99 |
| 5 | AIIMS-1 | -0.41 | 7.58 |

3. ZONE- CENTRAL DELHI: SEASON -SUMMER

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|-------------------------|-------------------|-------------------|
| 1 | Ram Leela Ground (RL)-1 | 0.19 | 11.88 |
| 2 | RL-2 | 0.17 | 12.45 |
| 3 | RL-3 | 0.15 | 9.75 |
| 4 | Darya Ganj (DG)-1 | 0.15 | 17.06 |
| 5 | Delhi High Court(DHC)-1 | 0.01 | -2.68 |

4. ZONE- CENTRAL DELHI : SEASON-RAINY/MONSOON

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|-----------|-------------------|-------------------|
| 1 | RL-1 | -0.63 | 1.38 |
| 2 | RL-2 | -0.41 | 2.03 |
| 3 | RL-3 | 0.30 | 3.35 |
| 4 | DG-1 | -0.44 | 2.04 |
| 5 | DHC-1 | -0.17 | 3.65 |

5. ZONE -EAST DELHI : SEASON- SUMMER

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|--------------------------------|-------------------|-------------------|
| 1 | CWG-1 | 0.09 | -1.98 |
| 2 | Mohan Nagar (MN, GZB)-1 | 0.15 | 8.46 |
| 3 | Seelampur (SP)-1 | -2.65 | 11.95 |
| 4 | Noida Atta Market (NAM, U.P)-1 | 0.16 | -0.86 |
| 5 | Sanjay Lake (SL)-1 | 0.22 | -0.94 |

6. ZONE- EAST DELHI : SEASON-RAINY/MONSOON

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|-----------|-------------------|-------------------|
| 1 | CWG-1 | -0.69 | 0.10 |
| 2 | MN-1 | -0.74 | 1.92 |
| 3 | SP-1 | -0.84 | 7.58 |
| 4 | NAM-1 | -0.64 | 1.20 |
| 5 | SL-1 | 0.01 | 9.04 |

7. ZONE-WEST DELHI : SEASON – SUMMER

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|---------------------------|-------------------|-------------------|
| 1 | Janakpuri -1 | 0.13 | 10.76 |
| 2 | Rohini (sect-1) | 0.16 | 10.24 |
| 3 | Rohini -3 | 0.15 | -2.67 |
| 4 | Rohini-6 | 0.11 | 6.45 |
| 5 | Kirti Nagar Metro (KNM)-1 | -0.10 | -2.15 |

8. ZONE-WEST DELHI :SEASON-RAINY/MONSOON

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|-----------------|-------------------|-------------------|
| 1 | Janakpuri-1 | 0.09 | 8.88 |
| 2 | Rohini (Sect-1) | 0.13 | -0.16 |
| 3 | RH-3 | 0.10 | -10.00 |
| 4 | RH-6 | 0.09 | 10.64 |
| 5 | KNM-1 | 0.16 | 9.98 |

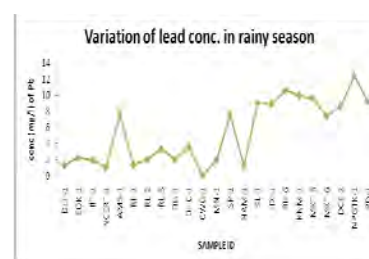
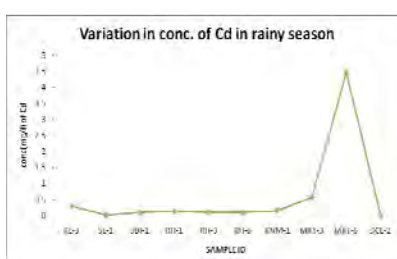
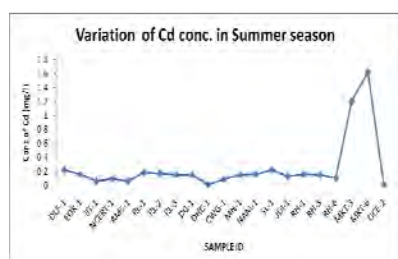
9. ZONE-NORTH DELHI : SEASON-SUMMER

| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|-----------------------|-------------------|-------------------|
| 1 | Majnu Ka tila (MKT)-3 | 1.21 | 10.72 |
| 2 | MKT-6 | 1.62 | 11.18 |
| 3 | DCE-2 | 0.01 | 4.97 |
| 4 | Nangli Puna-1 | -0.40 | 5.49 |

| | | | |
|---|----------------|-------|------|
| 5 | Rohini Depot-1 | -0.24 | 1.62 |
|---|----------------|-------|------|

10. ZONE-NORTH DELHI: SEASON- RAINY/MONSOON

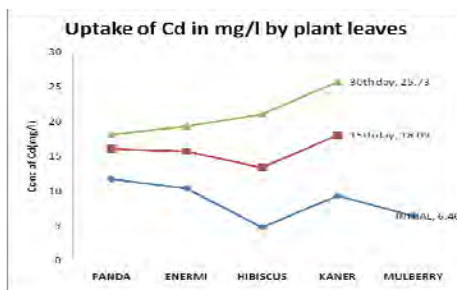
| S.NO | SAMPLE ID | CONC. OF Cd(mg/l) | CONC. OF Pb(mg/l) |
|------|----------------|-------------------|-------------------|
| 1 | MKT-3 | 0.57 | 9.62 |
| 2 | MKT-6 | 4.47 | 7.41 |
| 3 | DCE-2 | 0.02 | 8.63 |
| 4 | Nangli Puna-1 | -0.01 | 12.41 |
| 5 | Rohini Depot-1 | -0.56 | 9.23 |



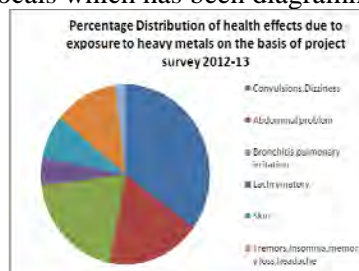
In analysis of the soil samples, it shows varying concentration of Cd and Pb in the five regions of Delhi and NCR. Out of which Pb was found to be at a higher concentration in most of the places like East of Kailash region in South, Daryaganj in Central, Seelampur in East, Janakpuri District center in West and Majnu Ka Tila in North were found to be highly contaminated with Lead. Cadmium concentration was found to be higher at few places like DLF in South, Ramleela Maidan in Central, Sanjay Lake in East, Rohini Sec -1 in West and Majnu Ka Tila in North.

Uptake Of Cd by different plant species by their leaves: In phytoremedial process, the certain plants were chosen on the basis of hit-trial method considering their economic and feasibility to delhi climate/weather conditions, life span, availability etc. The plants were Panda, Enermi, Hibiscus, Kaner and Mulberry. Out of these five, Hibiscus and Kaner had the maximum capacity to absorb cadmium, and still survive. But, it was observed that Mulberry, couldn't survive after duration of 15 days indicating that Mulberry doesn't have a high capacity to absorb cadmium. Hence, it can be concluded that Hibiscus, Kaner, Panda and Enermi can act as good choice for removing the cadmium contamination from the soil through phytoremediation method. Even out of these, Hibiscus and Kaner, are the most effective ones.

| Sl.no. | PLANT NAME | INITIAL(mg/l) | 15th day(mg/l) | 30th day(mg/l) |
|--------|------------|---------------|----------------|----------------|
| 1 | PANDA | 11.77 | 16.09 | 18.15 |
| 2 | ENERMI | 10.44 | 15.75 | 19.36 |
| 3 | HIBISCUS | 4.79 | 13.35 | 21.07 |
| 4 | KANER | 9.33 | 18.09 | 25.73 |
| 5 | MULBERRY | 6.46 | dead | dead |



A project survey was also carried out in the Delhi NCR by our project team KMC-108 on the problems/health issues faced by the locals which has been diagrammatically shown in a pie chart.



7. Learning for Students (200 words):

This project gives an opportunity to the undergraduate students to have practical hands on basic research. They started this project with literature study and learnt how to organize a physical survey and sampling for their research work. Meanwhile they divided Delhi into five zones and learned to draw the map of Delhi and NCR regions under the study. From the very beginning, the students started to work as a team which helped in an easy communication. The samples were collected which were made ready (digestion, crushing etc) for lab work. The procedure taught them to be more organized, disciplined, careful and cooperative. Our project also involved handling sophisticated instruments like Digital Oven, Magnetic Stirrers and AAS. Even the students learnt how to handle toxic chemicals with care. The project provided a perfect chance for them to interact with the localities, teachers, professors and some reputed stakeholders while attending some seminars. They learnt the way to conduct, manage and deal with big responsibilities like organizing and managing seminar, presenting themselves in conferences and interacting with high profile people in the course of their project. National seminars and conferences (Conference in Dehradun) provided the correct exposure to the students and boosted their confidence level. Students had a privilege of meeting APJ Abdul Kalam, Kriss Srikanth, Sanjay Bhargava, Vineet Joshi, Geeta Chandran etc. The Seminar titled KANOTOMIA was organized by the students where Dr Krishna Kumar (Prof from JNU) attended as a chief guest to give a lecture related to our project. Starting from the survey via field work and ending at lab work and analysis was an exciting ride providing a great experience to the students who all showed great level of interest.

8. Benefits to College (100 words):

The instruments that were bought for the project work like Double Distillation plant, Magnetic stirrers with hot plate, Cupboard, Computer set, Digital oven, the different glass-wares and the unused chemicals will be used for further work in college. The seminar that was conducted by the project team was useful for the students as it enhanced their knowledge levels. The project work conducted in the college has gone a long way in making the students passionate about the

research work. The plants grown in the college for the phytoremediation process helps in adding greenery to the campus.

9. Benefits to Society (100 words):

The team has helped in spreading awareness about the health effects, causes of heavy metal pollution. People were inquisitive about their role in environment management. The trees that have been suggested to plant in Delhi NCR in maximum regions can help in reduction of contamination of heavy metals from the soil. This would help in increasing the greenery of the capital and maintaining the ecology. The main motto of the students is to work with, by and for the nature due to which it has been highly successful.

10. Further Plans (100 words):

As the period of one year was limited for building the whole work, students were unable to analyse all the heavy metals except Cadmium and Lead due to busy schedule of students and concerned teachers and problems faced while AAS analysis. It was tough task for students to manage the whole work. As far as Phytoremediation Study is concerned, limited plants have been studied like Kaneer, hibiscus etc. If some more time is provided then students will like to expand the work in Phytoremediation as well as Analysis of heavy metals. The plants of Indian origin that are economically favourable and more effective in absorbing these metals from the soil, will be studied further.

KIRORI MAL COLLEGE

Project Title: Public Funds and Private Responsibilities: An Analysis of Cash Transfer as an alternative to PDS.

Project Code: KMC 109



1.Objective:

- Study the nature of interface between beneficiaries and a final link in the current mechanism of delivering subsidized food items through PDS.
- To analyze the switch over to cash transfers scheme from existing PDS and whether it has been more efficient when it comes to the question of access to food. We will survey the experiences of the beneficiaries in identified target population in Delhi and in one other state.
- To map the quantum of the beneficiaries' expenditure and associated costs.
- Cost and Benefit analysis of Cash Transfers System
- Policy recommendations.

2.Final Findings

1. The rate of participation of the households in the formal banking sector was fifty percent only. Even within this, there is a tendency of an increase in use of banking facilities above a threshold level of family income.
2. Approximately 70% preferred public distribution system over cash transfer scheme. 11% preferred cash transfer and the rest 19% had ambiguous preferences. These preferences do not vary as one move across family income levels. Preferences across geographical areas; urban-rural as well as plains-hills; also remains the same as above.
3. The preference for cash transfers is more pronounced among the male respondents in comparison to the female respondents.
4. All these preferences by beneficiaries were expressed despite a clear comprehension of the weaknesses in the public distribution system.
5. Case studies indicate that the transfer of subsidy in the form of food grains prevents families from falling into destitution in the face of disability- permanent or temporary.
6. There was fear of a loss of control over subsidies, among the female respondents, if provided in the form of cash.
7. Female respondents were aware and vocal regarding the direct link between subsidy in the form of food grains and nutrition of dependents-especially children and the elderly.

3. Learning for Students

The innovation project has given an ambience of professionalism to academic research at the undergraduate level. Undergraduate students were trained in the rudiments of the research process. This research project enabled the team to learn the documentation of reports and proposal. Most importantly, students worked in a team and acquired the necessary skills related to team work and leadership. The interdisciplinary approach of the project gave the team an opportunity to understand different aspects of analysis involved in research. It created an opportunity to learn techniques of data collection, to interact with respondents, work and learn under the guidance of experts in various disciplines.

The team gained an insight into qualitative research, community scoping, mapping techniques, issues of gender and community sensitivity, conducting interviews and collecting narratives, participant and non-participant observation and ethical issues when conducting research with humans. This has equipped the team with the basics of sampling techniques, research methodologies and tools for the analysis and management of data.

4. Benefits to College

The project organized a workshop in the college for students from all departments as well as for students of other colleges. This provided a platform for training and improvement of research skill. This also provided an opportunity of summer internship to students after being part of the project. The experience gained by the team members through this project had spillover effects on other fellow students of the college, which boosted a research culture in the college. The resources accumulated during the project will equip the college students to carry out research projects in future.

5. Benefit to society

Team members with its multi facet objectives raised awareness about the entitlement to the beneficiaries. The project has helped to get an independent analysis of the ongoing debate between the cash transfer scheme and Public Distribution System (PDS). This research would become an important source to policymakers in their assessment of ground level realities.

6. Further Plan

The team intends to publish several papers on this contemporary topic. It intends to combine the gathered data with previously available data to get a much deeper insight into the topic. The team members intend to equip themselves with various advanced analysis tools by organizing workshops and seminars. Individually, team members plan to further enrich themselves on this topic and carry out the research in their academic persuasions. The team members plan to expand their analysis of cash transfers to non-food items in future.

LADY IRWIN COLLEGE

Project Title: Multi-Criteria Framework for Sustainability Design Audit
Project Code: Li-101



Project team at exhibition stall during Antardhwani

1.Objective

Primary objective of the project was to formulate the criteria to evaluate the design of products for their sustainability. An effort was made to explore the reasons for failure of products much before their destined life. Today every product used on this globe should be sustainable in order to prevent adverse climatic impacts, resource crunch, reduce environmental degradation and pollution. The criteria developed will provide a framework to conduct a sustainability audit for products along these measures.

Through the project it was premised that if manufacturers offer choices to the users to select a product by its credentials specified on its label, like the life of a product, contents used for manufacturing it, process of manufacturing used, end use of the product, disposal practice to be adopted, its performance on social, economic, political and environmental aspects, consumers will be able to choose products that are sustainable. By this framework it would be possible to develop guidelines for certification and grading of products on the basis of their sustainability.

2.Final Findings

The project findings have been summarized based on the survey of consumers of electronic and lifestyle products, interactions with service center officials, e-waste recyclers, experts from legal departments, environmentalists, Ministry of environment and forest, manufacturers of electrical products, design professionals, auditors, etc.

Life cycle analysis of the selected products, i.e., laptops, mobile phones, refrigerator, television and air conditioners was done to ascertain the practices concerning use of appliances. In case of laptops, consumers changed to newer models in less than two years to keep pace with the new technology. Incompatibility and other problems were reported by the users in less than a year of purchase. To rectify the problems, laptops were sent either to the service centers for repair (one week to one month) and if not repairable consumers exchanged the old one by purchasing the new.

As regards the disposal of electronic appliances, most of the consumers had the same answer- “its lying in some cupboard or store or drawer of our home, it was too costly, how can we throw it off but keep it in the hope that it will get repaired some day.” They felt emotionally attached to them and retained them even though it was not in working condition. Some consumers sold it to Kabhariwalas and some went for the buyback schemes etc. and seemed to be unaware of the consequences of e-waste i.e., harmful radiations. The findings indicated that their purchases were influenced by social and technological factors rather than environmental. Survey findings exhibited that the life of the most electronic gadgets was rather short compared to the promise made by the manufacturer, further enhancement of products with newer and advanced technology led to frequent change of these products. For most of the lifestyle

products there was no warranty or guarantee. Most consumers reported that they experienced one or the other problems soon after purchase i.e., within six months for lifestyle products or within a year of purchase for electronic products.

Poor after sales service led to frequent change of old products with new thus the issue of premature waste accumulation. Manufacturers have shown very little or no concern towards method of disposal of the electronics safely.

Sustainability criteria for electronic products

A 100 point criterion has been developed with a threshold of 40 points. There are total 5 domains and 20 sub-domains. Each sub-domain is awarded a maximum of 5 scores and 2 scores for the threshold limit and zero for non compliance.

1. Design parameters

- Material quality: The material used for construction of the electronic gadget should be sustainable i.e., non-degradable, inert with low emissions, long lasting, possibility of reusing the materials (particularly the outer body using metals, rubber and plastic).
- Easy upgradability: Ease of up gradation of the parts, technology, software, components of the product by retrofit method.
- Use of advanced / upcoming technology at the time of manufacture.
 - If the manufacturer uses the latest or the upcoming technology for those requiring high precision and accuracy, likelihood of product becoming obsolete could be delayed by controlling the frequency of change of the gadget.
 - Use of hierarchical technology that is well supported downstream appropriate technology, for those who have limited functional applications or economic resources, re-conditioned or older technology could be made available at comparatively lower cost.
- Designed life of product: This is the period during which the product is expected to function within its parameters. The life expectancy of the product should be as mentioned by the designer / manufacturer.
- Serviceable life of product should be mentioned so that user is aware of the duration for which the product is expected to be 'serviceable' or supported by its manufacturer.

2. Energy efficiency

- Use of energy saving technology for design of the product.
- Compliance to energy star rating - innovative power savvy designs.
- Low embodied energy, i.e., the energy necessary during different stages of its life cycle (i.e., processes used for manufacturing) should be minimal as far as possible.

3. Environment friendliness

- Use of eco-technology with low carbon footprints during manufacturing, use and disposal.
- Less polluting – generate/emit low toxins and no health hazard from waste.
- Eco-labeling - life cycle follow up from inception to end life.
- Correct method of disposal of product emphasizing hazardous consequences of improper disposal.
- Authorized collection centers (for discarded electronics) and recycling centers.
- Compliance to legislations like CSR, CSE – follow cradle to cradle cycle - during selection of raw materials, pre-processing, processing, operation, maintenance, disposal and reuse / recycle.

4. User friendliness

- Proper channel to obtain post-purchase information.
- Self-instructional user manual (in different languages with pictographs).
- After-service schedule with complete contact details of service centers.

- Addresses of registered service & recycling centers on product label.
- 5. Labor responsibility
- Socially sustainable and safe work environment (with due focus on work, leisure, health and hygiene).
- No malpractices concerning labour sourcing, wages and exploitation.

Labeling on electronic products

Labels on electronic products must include the following information to enable users to select them according to their preference for sustainability aspects -

- Product life covering all the parts.
- Serviceable life of the product.
- Hazardous substances used in the product
- Method of disposal and hazards of improper disposal
- Address of the authorized collection centers after end use of electronic gadgets

3.Learning for Students:

The project no doubt provided a platform to collaborate with experts and synergize the efforts of experts working in the area of sustainability. It has been felt that there were several qualitative changes observed in the student volunteers that helped them to gain confidence, knowledge and use their spare time more effectively. The research acumen got strengthened by their participation in designing project methodology. Students realized the importance of work scheduling, approaching a difficult subject in a planned and organized manner.

- Interactions with recyclers, officials from Ministry of environment and forest, legal experts, auditors, environmentalists, service centers and consumers provided a holistic understanding of sustainability issues and concerns.
- The project encouraged students to select research topics concerning sustainability issues as part of major and minor projects in the college.
- The project team was able to collaborate with experts and institutions interested in sustainability in electronic products. College was able to share their expertise in the area of sustainability design and concerns for a variety of products.
- Student mentors were able to learn at a different level other than the UG student volunteers in the project.
- During five workshops, interactions among student volunteers with other colleges was highly successful in bringing out –
 - Booklets / user manuals highlighting sustainability aspect (missing from existing user manuals) for selected electronic gadgets (laptops, mobile phones, refrigerator, television and air conditioners).
 - Draft a PIL concerning sustainability features to be included during manufacturing and labeling of selected electronic gadgets.
 - Frame a sustainability audit criteria with experts and team interactions.

4.Benefits to College:

The project provided several opportunities to conduct explorations on environmental issues related with electronic gadgets that are vital in the present global sustainability crisis. Collaborations with experts strengthened the entire approach to a subject in a scientific and practical manner. The class projects improved in content due to the synergistic efforts.

Some of the benefits of the project were -

- The project helped us to collaborate and interact with service center officials, e-waste recyclers (formal & informal), experts from legal departments, environmentalists, Ministry of environment and forest, manufacturers of electrical products, design professionals, auditors, etc.
- Experts from various fields got familiarized with the college expertise, level and type of researches undertaken by students.
- College was able to enrich its equipment resource by the provision of finances for acquiring relevant equipment. Students also got familiar with the new equipment purchased for data collection and analysis.
- Students received offers for internships and placements by certain organizations that understood the quality of work capability of the students.
- Lot of material got developed (such as user manuals on sustainability, sustainability audit criteria) during the project that can be showcased during various academic forums.

5. Benefits to Society :

The project directly dealt with a subject that is highly pertinent in the present scenario. Since the focus was on developing consciousness among the users, manufacturers, law makers, policy makers, e-waste handlers towards e-waste issues in the environment and the society, therefore there is immense significance of the project outcome. The manufacturers have to take the responsibility of using materials that are sustainable and have proper standards for correct disposal. There must be policies and laws stating the guidelines for disposal. Toxic e-waste affects the human health. Many skin diseases are caused to the people handling this waste.

User manuals provided by the manufacturers were discussed with a couple of manufacturers and law professionals. Efforts were made to share the suggestions with concerned professionals towards correct practices concerning e-waste.

The sustainability audit criteria developed will help users and others to find out how an electronic gadget performs on its sustainability parameters and accordingly choose the product. When any such system of evaluation will be shared among more people, there will be a demand from users to follow the sustainability guidelines to improve performance of electronic gadgets on their long life and problem free operation. The criteria developed will help the users, policy makers and manufacturers to ensure product sustainability.

6. Further Plans :

The project team will work towards the following –

- Acceptance of sustainability criterion that will form the basis for selection by users as well as evaluation of electronic gadgets by the concerned regulatory authorities so that regulations for best practices could be imposed.
- Ensure sustainability certification on electronic products to offer choices to the users to select a product by its credentials, like the life of a product, contents used for manufacturing it, resource efficiency of the product, process of manufacturing used, end use of the product, disposal practice to be adopted, its performance on social, economic, political and environmental aspects.

LADY IRWIN COLLEGE

Project Title: Generating Energy Consciousness among Rural Households

Project Code: Li-102



Project Team conducting energy consciousness programme at Alumdipur Village, Haryana

1. Objective

Government of India has been on its mission to empower villages with renewable energy resources as electricity supply is either not available in these areas or its supply is highly irregular. Several programmes undertaken by them by installing renewable energy technologies (RETs) in rural areas are not gaining momentum despite Governmental continued and persistent initiatives. The rural residents seem to be either ignorant or apathetic towards the new energy equipment installed in their residential areas. Perhaps they do not associate themselves with RETs and fear that they cannot handle them. The project presumed that there is a gap in the programme implementation and peoples' felt needs and practices.

Another objective of the project was to plan an energy consciousness programme for rural residents to make them aware towards use of RETs such as solar energy, wind energy, biomass, etc. as these are the future energy resources. By the energy consciousness programme residents were told to use all energy resources judiciously owing to energy crisis in the country and reducing pollution. Energy consciousness will encourage rural residents to adopt the eco-friendly energy practices for a better and sustainable future.

2. Final Findings

Rural households were selected from U.P and Haryana villages. Visits were made to two villages namely, Gharoda (Faridabad) and Rabupura (Ghaziabad). The selected villages are located 16-23 kms from the block headquarter i.e., Ballabgarh (and 20-30 km from district HQ Faridabad) and Ghaziabad. In both the villages the occupation was primarily agriculture.

Energy use practices

The energy needs were predominantly met by women (who were at times assisted by young children) for collecting wood, biomass or dung and making dung cakes for cooking and other purposes (such as heating water, warming room in winters, etc.). Besides these energy resources, they were also using kerosene, LPG, diesel and electricity. Electric supply was erratic as there was heavy load shedding and power was available only for 6 hours either in the morning or in the night. Two families were found to be possessing biogas plant in Gharoda and they used it for cooking while its residue was used as fertilizer in the fields. Information concerning energy use practices for different activities is represented in table no. 1.

Table No. 1: Energy Use Practices of Rural Households

| Energy source | % Share | Purpose of use |
|---------------|---------|---|
| Wood | • 17.78 | <ul style="list-style-type: none"> • Cooking • Heating water • Keeping room warm in winters (ashes used to clean utensils) |
| Dung Cakes | • 45.79 | <ul style="list-style-type: none"> • Cooking • Heating water |
| Kerosene | • 7.4 | <ul style="list-style-type: none"> • Lighting (small kerosene lamps) • Small indoor fires |
| LPG | • 7.64 | <ul style="list-style-type: none"> • Cooking • Heating water |
| Biogas | • 0.22 | <ul style="list-style-type: none"> • Cooking • Residue used as fertilizer in fields |
| Diesel | • 17.73 | <ul style="list-style-type: none"> • Tractors • Generators |
| Electricity | • 7.09 | <ul style="list-style-type: none"> • Lighting • Household Equipments • Battery recharge |

Note: Percentages are more than 100% as some houses were using more than one energy source
Table 1 represents that maximum share of energy was of dung cake (45.79%) followed by fuel wood (17.78%) in the two villages surveyed. Solar energy did not occupy significant share as informed by the rural residents and also observed in their practices. Reason for poor usage of RETs was ineffective method used for the installation of solar devices, i.e., poor involvement of rural residents during planning, installation and after care (maintenance). Therefore many of them due to lack of knowledge, did not choose to use the improved energy source. Only a few families showed interest to use the solar equipment. In Faridabad villages, solar energy equipments installed were 5 KW power plant, solar home lighting systems, solar lanterns (kissan torch) and solar street lights. In Rabupura, Ghaziabad, solar street lights and solar lanterns were provided. In Gharoda, Emu hatching was done using solar energy wherein the eggs of emu were sold to pharmaceuticals companies to make medicines for treating cancer patients.

Residents seemed interested to use the RETs as they felt these provided them safety from theft, wild animals, visiting fields at night, performing household chores, studying of children etc. However, the system to repair and charging of batteries was not in place due to which most of the solar RETs were not functional. The residents were neither informed nor was there any provision for additional cost due to battery replacement every 3-5 years. Among various RETs installed, solar lanterns seemed to be a favourite option among hawkers as they were able to sell effectively late in the night. 150 hawkers benefitted under the Urja Unlimited Solar Lanterns project. Table no. 2 gives details of subsidy provided by the Government to facilitate use of solar RETs by the residents.

Table No. 2: Subsidy for different solar devices

Road blocks in using RETs

Several constraints in the adoption of RETs were reported by rural residents, which were later shared with the MNRE officials during the project meetings.

1. Inadequate knowledge about RETs and their benefits.
2. Inadequate training to use, operate and repair.
3. Inadequate financial assistance/loan available for purchase. Grameen Banks were not too keen to provide loan for solar products due to high risk perceived by them.
4. Inefficient functioning of repair shops and changing of batteries. Replacement and repair of products took time.
5. Theft of solar panels, batteries and poles, etc.
6. Due to quota benefit powerful people and certain castes like SC, ST and OBC got the benefits i.e., higher subsidy amount. Common people got neglected.
7. High initial cost of RETs.
8. Lack of community participation and ownership particularly the women.
9. Spurious RETs provided by some private companies led to misbelieve of rural residents in RETs. Lack of product standardization and certification due to which quality control of RETs was not possible.

Energy Consciousness Programme

Based on the survey findings, observations and interactions with residents, the research team planned an energy consciousness programme for Gharoda, Alumdipur (Haryana), Rabupura (Ghaziabad) and Morni hills (Panchkula) and motivated them to adopt RETs in their day to day life activities. This was done by demonstrations, role play and learning the construction of RETs. Working models of RETs were prepared to show the operation of solar and biomass RETs. It helped them to befriend the new technology rather than feel alienated from it.

The rural residents seemed to be inclined towards individual ownership of renewable energy devices rather than the community bound products like solar street lights, solar power grid, etc. The primary motivating force was saving in individual electricity bills. Based on survey results, the energy consciousness programme was designed focusing on Solar and Biomass RETs covering the following aspects –

- Importance of RETs based on the constraints and problems experienced
- Information about the technology involved in RETs, its repair and maintenance.

| Devices used | Actual rate | Subsidy | % subsidy |
|------------------------------------|------------------------------------|---|----------------|
| Solar lantern 10 W | 2350 | 1000 | 42.5 |
| Solar lantern shikshadeep 10W | 2350 | 2350 | Free for girls |
| Solar cooker (dish type) | 5710 | 3213 | 56.2 |
| Solar cooker (box type) | 3150 | 1945 | 61.7 |
| Home domestic light LED based 12 W | 6500 | 2000 | 30.7 |
| Home domestic light 37 W module | 9700 | 5000 | 51.5 |
| Solar street light (for panchayat) | 16000 | 4000 | 25 |
| Solar water heating system | 36000 | 12000 cash (per month electricity rebate) | 33.33 |
| Solar water heating system | 70% subsidy of total cost for NGOs | | 70 |
| Solar tube well | 2.85 lakh | 1.14 lakh | 60 |

- Comparative analysis of saving in electricity bills with conventional energy resources
- Applications of RETs in rural households.

- Understanding the construction of RETs by working models. This method proved highly effective in information sharing.
- Games (such as, match the energy equipment with energy source, wheel of renewable energy resources) were used to reinforce the understanding of RETs.

Participation of residents in the programme was encouraging as they wanted more information concerning repairs, subsidy and financial assistance.

3. Learning for Students:

The foremost learning that took place was concerning empowering students with the knowledge about RETs in the present environmental crisis. They learnt the importance of RETs in rural as well as urban life to save precious resources and the environment by using alternate technologies harnessing natural resources which are non-polluting and present in abundance such as sunlight.

The project encouraged the students to take up research in the similar areas of renewable energy as part of course work in the form of major as well minor projects in the college. Work of ongoing research in these areas also caught up momentum due the research project as lot of experience sharing took place among under-graduate and post-graduate students. It helped to enthuse students and to maintain a high level of interest among them.

Familiarization of under-graduate students with the rural families and village environment and lifestyle was an enriching exposure and insightful. Interventions by some post graduate students and doctoral students pursuing research to interface as mentors during field visits and sharing experiences during interactions with rural residents proved highly effective. Students gained confidence by hand holding of senior students.

4. Benefits to College:

The project no doubt provided a platform to collaborate with experts and people interested in renewable energy and synergize the efforts in a constructive manner. The benefits of the project were both quantitative as well as qualitative. Quantitative in the sense, students were able to deliver the programme planned and coordinated by them with the rural families. They prepared visuals and simulation models, role play scripts, etc. for empowering rural families in RETs. Qualitatively students gained confidence, knowledge and learnt multi-tasking by using their spare time more effectively for project activities along with their academic work.

- The project helped us to collaborate with NGOs, manufacturers of RETs, Government and private organizations working in the area of renewable energy.
- Interactions with manufacturers provided a holistic understanding of RETs – constraints and benefits.
- Demonstration by installation of solar RETs (street lights, home lighting system, water heating system) on the campus was an effective experiential learning for the students for years to come. They will understand not only the technology but also learn to manage the critical factors in the solar energy technologies.

5. Benefits to Society:

The project dealt with the rural families of the two selected villages where Government had already installed some RETs but were not being used by the residents to their benefit. Since the families did not gain enough knowledge about the new technology by Government installations, the project team was able to reinforce the existing programme by providing relevant information concerning functioning of RETs. Thus interventions during the project helped in not only addressing the barriers in adoption but also befriending the new technology and bringing it to practice s part of day to day life. There was change in their way of living and immense power saving in households which had electricity available, as reported

by the residents. The project findings also revealed certain critical factors that should be looked into, when any such programme takes place in future for introducing RETs in a rural area.

6. Further Plans:

The project team plans to undertake the following activities further –

- Prepare a self instructional booklet for rural families on RETs covering aspects like, information about the renewable energy technologies, find solutions to frequently occurring problems, instructions for use, care and maintenance, people to contact when need help, and so on.
- Develop products for day to day use using renewable energy resources to enable rural families to adopt the new technology in a more friendly manner as the RET driven products will enable use of non-conventional energy resources thereby relieving the load from the conventional energy resources (such as, electricity).

LADY SHRI RAM COLLEGE FOR WOMEN

Project Title: The study of CORPORATE SOCIAL RESPONSIBILITY PRACTICES of MNCs in INDIA

Project Code: LSR - 101



1.Objective:

The broad objectives of this study are:

- To familiarize students with aspects of corporate social responsibility in a developing economy setting.
- To synthesize the different stages of development of the idea and practice of corporate social responsibility, and suitable interventions in successive stages of development.
- To have an in-depth understanding of the four companies with regard to corporate social responsibilities in the field of education.
- To identify innovative practices in corporate social responsibility in India as per secondary data published.

2.Final Findings:

After our field research, we tabulated our findings by applying the HILLS index (based on Health, Impact, Leadership & Learning and Scholastic Ability score), and also identified areas of improvement. CSR is a broad field of work and the companies focus on specific areas pertaining to their area of expertise. For example, SRF does excellent work for reusing water used in their chemical plants. Since our research focused on CSR activities in the education sector only, therefore we didn't perform a comparative study or rankings of the companies in interest of objectivity.

The company wise findings are enumerated as follows:

- (i) Jindal Steel Works (JSW)

The sample analysis of the company under study reflected the following statistical results:

We interviewed 104 students, 3 volunteers and 5 teachers via questionnaires in the local language Marathi.

VASIND REGION HILLS INDEX SUMMARY

| Area | Score | Grade |
|-------------------------|-------|---------|
| Health | 14 | GOOD |
| Impact | 18 | GOOD |
| Leadership and Learning | 20 | GOOD |
| Scholastic Ability | 18.6 | AVERAGE |

The region scored well in Health, except for the fact that vaccination was not available for students. In impact and leadership and learning areas too, the region scores within the healthy range. However, the score in Scholastic Ability section implies that there is scope for improvement in this area.

ISPAT ANGANWADI CENTRE HILLS INDEX SUMMARY

| Area | Score | Grade |
|-------------------------|-------|---------|
| Health | 12 | AVERAGE |
| Impact | 16 | AVERAGE |
| Leadership and Learning | 28 | GOOD |
| Scholastic Ability | 19 | AVERAGE |

The findings from the HILLS index imply that this area is doing marginally less well than the Vasind region. Except for one sector, the remaining three sectors have wide scope for improvement. However the region scores exceptionally well in the Leadership and Learning index, hinting at a robust teaching structure.

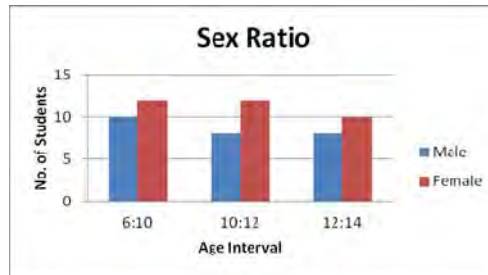
Analysis for the OPJ Vocational centre too presents a healthy picture of the mechanisms in place. The beneficiaries are better off than before the CSR intervention. However since it does not relate to our field of study-education, we omit the use of HILLS index for the analysis.

CONCLUSION

We see that JSW is doing good work for CSR in the field of education, and has definitely improved the situation before its intervention. A wide scope for improvement remains however, and the company can focus on the specific areas now that the initial phase and the teething troubles of starting any project is over. We recommend that JSW install a robust auditing plan, to keep track of their successes and to spur improvement.

(ii) Ballarpur Industries Ltd. (BILT)

All of the students interviewed were in the age group 6 to 14, with a total of 60 students interviewed in all. The sex ratio of the students was as follows:



CONCLUSIONS FROM HILLS INDEX

The HILLS index scores for the various areas are:

| Area | Score | Grade |
|-------------------------|-------|---------|
| Health | 10 | AVERAGE |
| Impact | 20 | GOOD |
| Leadership and Learning | 20 | GOOD |
| Scholastic Ability | 18.6 | AVERAGE |

The company is doing very poorly in the health section, as it does not provide Mid-day meal facility to the students. Its scores in Impact and Leadership & Learning are above the average, but have scope for improvement as the scores lie very close to the lower range for the grade. The score in scholastic ability too has wide scope for improvement.

CONCLUSION

BILT's performance in this sector is more akin to a CSR entrant, and we recommend that BILT focus more energy in bringing the scholastic aptitude of the student beneficiaries up to speed. Also, the company can consider sponsoring a mid-day meal scheme for the students.

(iii) Shri Ram Fibres (SRF)

Shri Ram Fibres is one of the most reputed companies in India today, and is doing good work in the field of CSR in education. We visited Mewat and Bhiwadi regions where the company is supporting a number of schools in various ways.

CONCLUSIONS FROM HILLS INDEX

| Area | Score | Grade |
|-------------------------|-------|---------|
| Health | 14 | GOOD |
| Impact | 10 | AVERAGE |
| Leadership and Learning | 18 | GOOD |
| Scholastic Ability | 23.2 | GOOD |

Findings threw up a few surprises for us. Although the scholastic ability index was found to be remarkably high for the students benefiting from the CSR activities of SRF, the impact was lacklustre average. Health and Leadership and Learning were above average but again, close to the lower bound for

the grade. We believe that SRF has made a conscious effort to ensure the students have access to good teachers, who teach regularly. But more effort can be put in the personality development of the students via games and extra curricular activities.

(iv) Tata Consultancy Services (TCS)

The Tata's are considered the pioneers of CSR in India, and we were favourably impressed by the efforts of this wing of the Tata Group. From organisation to attention to detail, we could see that every initiative of the company was well thought out and enthusiastically executed.

CONCLUSIONS FROM HILLS INDEX

| Area | Score | Grade |
|-------------------------|-------|-------|
| Health | 14 | GOOD |
| Impact | 20 | GOOD |
| Leadership and Learning | 28 | GOOD |
| Scholastic Ability | 19.4 | GOOD |

Validating our experience, the data present a favourable picture of the work done by the company. All indices have a healthy score, with especially excellent marks in Leadership in Learning. We believe the reason for this to be the friendly and enthusiastic teachers, who encourage the students to interact, and also the good teacher to student ratio. We feel that the company can better its score in the area of Health, and provide more amenities in vaccination and basic healthcare to its students.

Limitation : While recognizing that we visited and interviewed a small sample of the target population, and thus could not technically arrive at statistically significant results, we observed the aforesaid trends in the sample.

3.Learning for Students:

When we (the students) were asked how we felt about being part of the innovation project we exclaimed that it was the best experience ever! The project can only be described as “an invaluable learning experience”, “a once in a lifetime opportunity” and “truly enriching”.

At a time when a lot is being discussed and spoken about CSR, visiting the sites of different companies and seeing the actual work they do was a unique platform given to us. This project enabled us to take our learning to a different sphere and made us realize that we are not the owners of the wealth we possess but are stewards who have a duty to share it with our needy brothers.

The project has taught us a great deal of skills, in terms of collecting the information from the grass root and persuading the top management for granting permissions. Because we worked in a diverse team, there was always an enthusiasm to passionately share our experiences and there was willingness to learn from others. Some students also said that the project work was tedious and a lot of long hours were put into it but it proved to be informative, resourceful and interesting.

The innovation project has been instrumental in establishing an interface between industry and academics that has made us ask questions, challenge systems, be innovative and cope with the change. It was an opportunity to test our classroom knowledge in a real world situation. It not only helped us obtain clarity on the concepts we learn, but spurred us to further research to obtain greater depth in our knowledge base.

After this research project we can certainly say that CSR is no longer simply about writing a cheque for your local authority, it is rather about reaching out to the society at large to make an actual difference. CSR is good business. This project has bridged the gap between classroom learning and practical experience. Having an engagement with this project for one year, we have recognised not only a company's responsibility but also our own responsibility towards the society and fellow people. The seeds of social entrepreneurship have been sown in us which will bloom really soon. We want to make a difference in the lives of several people. And if we have the will to make a change, there are numerous ways to facilitate it.

4. Benefits to College:

Universities are often looked upon to take a leadership role within societies. They are expected to lead by example whether through advanced research or by extending the bounds of justice on a global scale. Meanwhile, a societal trend that has been gathering momentum over the past couple of decades or so is the significant role of corporate social responsibility (CSR).

The growing importance of CSR in the business world is clear. But is CSR important to educational institutions?

Of course CSR is important for an educational institution as this is the place where the leaders for tomorrow germinate. By imbibing these important social skills LSR is creating responsible citizens. As an apex institution LSR has played a pivotal role in developing and contributing to the society. And now with this research experience and exposure LSR will be able to discharge this responsibility in a more realistic manner.

This one year long research work on corporate social responsibility uncovered the various dimensions of the subject and gave in depth knowledge of the same. This type of a research introduces a new teaching pedagogy of learning outside classroom by direct interaction with the real world. The students have benefited from being in close association with the five group of MNCs included in project innovation 101. Having visited their corporate offices in Delhi as well as Mumbai and the CSR sites in Rajasthan and Haryana not only showcased our efficiency as a team but also our commitment towards it. In addition, organizing a National Seminar on Corporate Social Responsibility from Gender Perspective provided an insight to another area of CSR where eminent speakers of leading organizations and students from across the country were invited to present their contribution and understanding of the panel topic. This widened the horizons of the students of the institute which not only contributed to their overall development and understanding it also counts as a success for the institute because it is the students and faculty that form the heart and soul of any college.

Besides the multitude of innovation projects granted to various other colleges by the University, Lady Shri Ram College was privileged to be given this vital responsibility to work on corporate personality.

We are thankful to the college and especially our mentor, Dr. Menakshi Gopinath for her constant support and guidance to carry out the research program efficiently and effectively.

5. Benefits to Society:

Social Responsibility, a concept which developed in the 1960s, roots extending since 1800 is no longer viewed by corporate a duty or a work of charity but a scenario observed as the key to business growth and long term sustainability.

CSR has been a part and parcel of the activities of companies like the TATAs, BIRLAs and many more for whom the contribution both in terms of money and volunteerism on the part of their employees is at a nascent stage but still have the power and potential to bring about a positive change into the lives of the beneficiary hence the society.

In country like ours where a major junk of the population lives under abject poverty even a small effort can bring hope of a better future. India which is seen as the next economic superpower by 2030, a country full of diversity, has an indispensable asset-the human resource. But the full potential of this asset cannot be realised if the human has to survive under the conditions of hunger and illiteracy. Thus, it is the responsibility of every company, big or small, every mother, father, man and women to take care of their fellow beings.

A company by providing a feasible-happy and healthy working environment to its employees, especially its workers can create a significant mark in the society. And a step ahead to work for the welfare of others and not just employees is a step worth a pride.

An intention to work for the welfare of society as a whole in complete humility is what is expected. CSR is the new wave which now as we see many companies have opened their windows for.

6.Further Plans:

Collaborative research on CSR can be done with more corporates with special reference to one sector like IT or steel. Millennium development goals (MDGs), described by United Nations, can be taken as various functional area like health, sanitation, women empowerment for the future research.

Its highly recommended to have future research in collaboration with concerned department and ministry of Government of India in the light of upcoming bill of CSR. Further research may be done on public private partnership. Comparative study can be done with developed nations for practices of CSR.

Green working of companies.

Serious environmental issues.

Mid-day meal effectiveness.

How to ensure better infrastructure such as building, water, toilets, classrooms etc. for the educational institutions adopted by the corporates.

Reasons for poor attendance and their removal at primary and secondary level of the schools supported by the corporate sector.

For the enhancement of women's empowerment supported by CSR activities such as Women of WAZE (WOW) TCS activity.

Effectiveness of healthcare activities for employees and for the society.

LADY SHRI RAM COLLEGE FOR WOMEN

Project Title: The Imprisoned Dove: Transcending Conflict and Building Cultures of Peace

Project Code: LSR-102



The Research Project Team LSR-102 at the Seminar 'The Flight of the Dove: Building Cultures of Peace in the Classroom' held in January 2013

1. Objective (150 words):

- To assess the strength of religious identification of adolescents in Kashmir (a conflict zone) and Delhi (a non-conflict zone).
- To identify the nature of stereotypes held towards in-group and out-group members by adolescents in Kashmir and Delhi.
- To assess the nature of attributions made by adolescents in Kashmir and Delhi for behaviours by in-group and out-group members.
- To compare the dominant identities of adolescents in Kashmir and Delhi.
- To understand the inter-relationships among regional, religious, personal and national identity, and to see how this impacts the group's relationship with the Indian state.
- To understand teachers' perceptions about peace.
- To understand the nature and sources of conflict in the classroom.
- To explore the role of curriculum and pedagogy in creating cultures of peace.

2. Final Findings (300 words):

The data collected from Kashmir and Delhi produced several interesting findings. The results indicated that adolescents in Kashmir expressed stronger religious and regional identification than those in Delhi. On the other hand a strong sense of personal identity was found among adolescents in Delhi, which was missing in Kashmir. Moreover despite growing up in a region troubled by violent and persistent conflict, adolescents in Kashmir held more positive perceptions of Hindus as well as Muslims as compared to adolescents in Delhi. Encouragingly, the drawings made by the adolescents in Kashmir showed that the minority's relation with the nation state was not fractured but conducive. The presence of a strong Kashmiri identity in the valley did not appear to interfere with national identity. The influence of textbooks was clear in the drawings of the adolescents, indicating that the books students read in their classrooms play a critical role in shaping their world views. Teachers from Delhi as well as Kashmiri schools enumerated multiple sources of conflict and expressed that it operates at numerous levels- personal, relational, structural and cultural. Both overt and hidden curricula appeared to be serving as sources of conflict in the classroom. Verbal violence emerged to be a predominant form in which conflict was expressed. Majority of the teachers, both from Delhi and Kashmir felt that peace meant being able to live life on one's own terms and to have the freedom

of choice, decision and freedom to preach, practice, propagate and abide. However, when it came to transacting/implementing education for peace in the classroom, it narrowed down to a regimented order of disciplining/silencing. Teachers did not discuss contentious issues extensively nor were they equipped enough to handle them. Many teachers in the schools in Delhi expressed that peace can be *taught* while teachers in Kashmiri believed that peace could only be *experienced and felt*. The integration of peace into the curricula does not appear to be a priority for teachers considering that only specific subjects have been viewed as suitable to transact peace and conflict issues.

3. Learning for Students (200 words):

The Innovation Project has been a step towards understanding the nuances of original research and field work. The conception of ideas such as peace, violence and conflict are largely misunderstood by governments, peace agencies, civil society organizations and people at large. This initiative provided space to students to review theories, models and skills for theorizing and developing peace initiatives that can respond to deep-rooted contemporary social conflicts in India. The fieldwork, in particular the visit to Kashmir, has enabled the students to transcend religious and cultural differences and definitions of the 'other'. The students feel that the research has enabled them to see our society not just in black and white but in all its shades bereft of prejudices from either the media or other institutions of society. Issues which seemed distant and less relevant became a part of their daily reflections, such as the issues of AFSPA and its influence on the functioning of the school and the psychology of children. The interdisciplinary nature of the program is something which we hope the students will surely benefit from for future research. Our quest for peacebuilding has left our students feeling empowered and has facilitated us to see sparks of future peacebuilders in our students. And we hope they carry on the message of peace in all their future endeavours.

4. Benefits to College (100 words):

Endeavours such as these bring to the College enormous value and research potential from the academic scholarship at large. We believe that our research would contribute in envisioning the path to building cultures of peace within the classrooms of our college. The practical and knowledge-based resources acquired during the project will continue to enable teachers and students interested in studying the issues of peace and conflict to engage with these topics and develop the college into a knowledge hub and resource center for the same and add value to our already renowned centre for peace building called the "Aung San SuuKyi Centre for Peace". Further, "The Flight of the Dove: Building Cultures of Peace" seminar conducted to disseminate the findings was attended by a large number of college teachers who can benefit from the findings of the study and apply them to the way they manage their classrooms. In addition, the project has been influential in promoting interdisciplinary contact and undertakings, especially between the three departments involved in the study.

5. Benefits to Society (100 words):

In a society where all of us are living under constant fear, frustrations, crime, jealousy and conflicts, education for peace can be of great benefit since it does not offer readymade solutions but encourages people to pause and think critically. Researches such as ours provide concrete proof in dispelling deeply held religious stereotypes and attributions. This can have beneficial outcomes for important stake holders such as not-for-profit community service and welfare organizations, local governmental agencies, public and private schools, neighbourhood groups, and even individuals who reside in the region. All of us as stakeholders involved in this process must join hands. Our students

have been deeply moved by the current scenario of negligence of the critical issues of peace and conflict in the schools, and as future teachers shall work towards building cultures of peace in the classroom, thus advancing towards building of a peaceful society.

6. Further Plans (100 words):

This research has opened several avenues of future research. For instance while the present study was conducted in Kashmir, a Muslim dominated area troubled by conflict, we would like to replicate this study in a Hindu dominated area which has experienced conflict like Ahmedabad. Also during the process of the research we realised that there is a tremendous gap between theory and practise. To reduce this gap, we have begun the process of conducting workshops to impart cultural diversity training to adolescents to address their identity issues and equip teachers with pedagogical strategies to deal with issues of identity and conflict in the classroom. These workshops were carried out as a part of the project based seminar organised by us titled “*The Flight of the Dove: Building Cultures of Peace in the Classroom*” in January 2013. We hope to continue this endeavour and reach out to as many stakeholders and young people as possible, especially in conflict ridden areas where it is required the most.

MATA SUNDRI COLLEGE FOR WOMEN

Project Title: Working Conditions of BPO Employees: Social & Ethical Dimensions

Project Code: MSC-101



Self Defense Workshop- Preparing for the Future

1.Objective :

The Indian ITES BPO sector is growing at a rapid pace. They take people, capital and resources from the society and in turn give goods and services to the society. This give and take influences the life of people both positively by providing the means of employment and thereby improving the lifestyle and negatively by affecting the health of the people as people in BPOs work for long and odd hours. One cannot ignore the effect of the impact of the BPO industry on the society. The objective of this project is to gain familiarity with the various social, emotional and physical problems faced by BPO employees, to study the impact of long and odd working hours on the health of BPO employees, to find out various strategies adopted by the companies to help their employees maintain a good work-life balance and to provide various recommendations and suggestions to overcome these problems. Our hypothesis is based on above concerns.

The data so collected and collated largely confirmed the concerns that were the basis of this study. The study is based on data collected from a sample of 455 respondents working in the BPO industry in NCR of Delhi.

2.Final Findings :

Some of the important findings of the study have been:

- The largest majority (43 percent) of the employees in the BPO industry work to financially support their families. Working in BPO to get some extra income to sustain lavish lifestyle was reported by 25 percent of the employees. Of these, 65 percent belong to relatively younger age group of 20-25 years.
- Working during odd and long hours does impact the health of the employees. About 80- percent of the employees reported some kind of health problems associated with this. While 30 percent of the sampled respondents reported multiple health related problems, a fairly large proportion (15 percent each) reported headache and sleep disorder related problems (Figure 1).

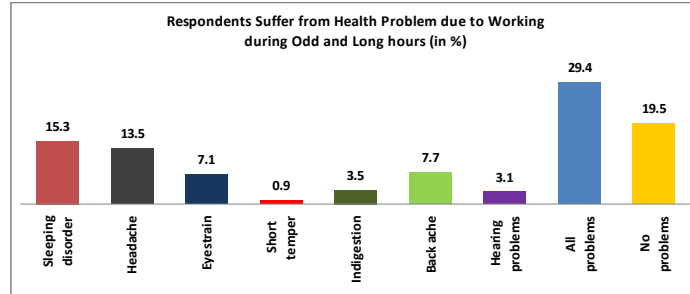


Figure-1

- Aware of the medical problems, the BPO industry has been providing medical care to attend to such problems of their employees. About 75 percent of the respondents reported that their BPO either has an on- site doctor available or have doctor available on call. However 40 percent of employees are not satisfied with the quality of medical facilities provided.
- Long and odd working hours in BPO industry does impact adversely the personal, family and social life of the employees. About 48 percent of sampled respondents reported that working in BPO has adversely impacted their personal life. The respondents reporting adverse impacts on family and social life were somewhat lower at 38 and 25 percent respectively
- Working in the BPO industry has also adversely affected the time the employees could devote to their children and in their upbringing. A very large majority of the sampled respondents reported that they have not been able to attend to such school events of their children as annual day (58 percent), sports day (75 percent) or parent teacher meetings (65 percent).
- Working in BPO industry has also impacted the employees in striking a right balance between work and social life. About 45 percent of the employees reported that they have not been able to celebrate major festivals with their families. About 42 percent of sampled respondents complained about not being able to attend to sick family members (Figure 2).

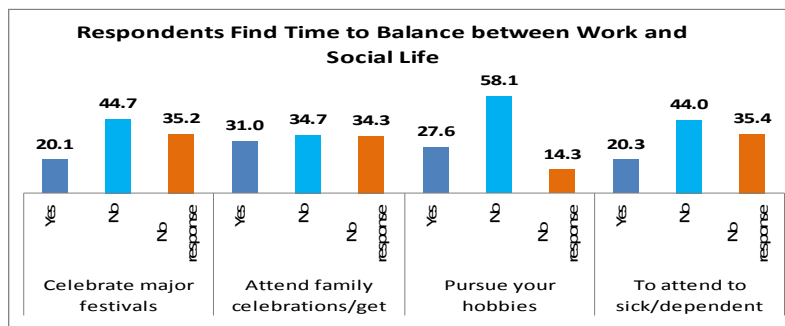


Figure-2

- A majority of the employees reported no gender discrimination in allocation of work (55 percent), salary and perks (58 percent), promotion (55 percent) or assignment of shift duty (48 percent).
- Almost 70 percent of the employees reported that the BPO provides transport facilities for pick up and drop free of cost or at subsidized rates. More than 50 percent of respondents reported that the company provided transport facility is quite reliable.
- Safety and security of employees, even in company provided transport facility, remains a big concern, more so for female employees. A relatively larger proportion (38 percent) of female respondents feel insecure while travelling in company provided transport as compared to their male counterparts (19 percent) (Figure 3).

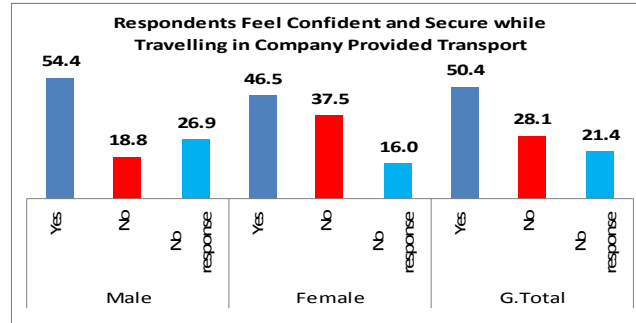


Figure-3

3.Learning for Students :

Experience of working in the Innovation Project Team was completely new and challenging. The scheme of Innovation Project was conceptualized by the Vice Chancellor of Delhi University to consider new ways of learning beyond class room teaching.

This project gave an opportunity to both teachers and students from different disciplines (commerce, philosophy) to work as a team and learn from each others' capabilities and skills.

The project has been very beneficial to the students in the following aspects:-

- **Team work**
The Innovation Project taught the students how to work as a team and learn from each other's expertise and skills to organize and manage a huge project which involved interacting with a large number of people. This made them realize that success/failure of the team matters not only that of individual's success and failure.
- **Communication**
Working on the project has helped students improve their communication skills. The project gave them an opportunity to interview different stakeholders such as BPO employees, their managers and other functionaries associated with BPO including transport contractors and providers of medical facilities. During a visit to a rural BPO Harva the students had an opportunity of interacting with villagers and rural women working in BPO. They were also associated with the making of a documentary film for the project which gave them an opportunity of learning basics of film making.
- **Organisation**
Involvement with the project has helped students in toning up their organizational skills. During the course of the project they successfully organized several seminars, workshops and lectures by eminent personalities.
- **Report Writing**
Another important learning from the Innovation Project was report writing. The students learnt how to write reports, seminar proceedings and press releases. This definitely is going to help them in their career in the professional world.
- **Research Methodology**
An important learning for the students was learning the research methodology. They learnt the various aspects of the research process like formulation of objectives, preparation of

questionnaires, sampling techniques, data collection through personal interviews, and data analysis using statistical techniques. It was indeed the most important learning for them.

- Self defense techniques

The safety of the women remains a big concern. To prepare the students to meet this challenge a workshop on self defense was organized under the guidance of the professionals Mr.Rakesh Dhawan and Ms.Indu Sharma. This workshop was a big success and enriched the students. .

This experience of working in the Innovation Project Team has groomed the personalities of students to a great extent.

4.Benefits to College:

The results of this in-depth study are going to be beneficial not only for those involved in the study but for the entire college fraternity.

- Issues pertaining to health, stress management and security of women employees were addressed in the various seminars, talks, workshops and interactive sessions organized during the course of this project.
- The ill effects of long and odd hours on the eyesight, digestive system, hearing, sleeping pattern, headache etc were discussed in a talk on health management by leading cardiologist Dr. K.K. Aggarwal. Students, teaching and non-teaching staff found this talk beneficial alike.
- Another talk by Mr.Vivekanandan on stress and time management was attended by more than 150 students and teachers, and was appreciated by all.
- Besides the 10 students who were directly involved in the project, 50 others were trained in self-defense in a workshop for self-defense and were distributed free pepper spray.
- Involvement of 10 students and 3 teachers in the project was a big motivation for others to take up research projects.
- The infrastructure created in terms of the hardware will remain an asset to the college.

5.Benefits to Society:

- The various talks, seminars and interactive sessions organized during the course of this study brought out interesting aspects about the work-life balance of BPO employees. It created more awareness regarding issues relating to ill effects on health due to long working hours, the stress induced in the competitive work environment and safety of women employees.
- The study has undertaken a critical analysis of the working conditions in the BPO industry. We hope that dissemination of the findings of the study will go a long way in contributing to creating a much safer, healthier and vibrant working environment in the BPO industry, especially for women employees. Our findings will help enable managements of BPO industry better appreciate the concerns of employees and take corrective actions in coordination with other service providers such as those involved in providing security, transport and medical services.
- The students who participated in the self-defense workshop can further train their family, friends and neighbors in this technique, as even a small act can make a big difference.

6.Further Plans :

This study has helped enhance the understanding of the work and life of employees in the BPO industry. However, a lot needs to be done further to understand the factors which affect the personal, family and social life of a BPO employee. Future empirical work in the same direction may include:

- A comparative study across different settings and according to regions.
- Other stakeholders like managers, executive as well as families of BPO workers can be identified as respondents for future study so that a more comprehensive picture emerges
- A cross-comparison of work-life balance between urban and rural settings may also be considered.
- Additionally, case studies of individual companies may be considered as there are variations in work-life practices and programs across different companies.

Project Title: STUDY OF SURFACE TENSION

Project Code: MT-101



Filtration of Polymer Solution

1. Objective :

Our project was based on surface tension. We see surface tension in the action of soaps, detergents, germicides, cosmetics and in the field of pharmaceuticals. These play an important role in everyone's life. We have therefore carried out a project involving the study of the effect of various surfactants on surface tension of water at different temperatures on CMC (critical micelle concentration). The CMC has an important role in determining the physicochemical properties of surfactants. The objective of the project was to determine the optimum conditions under which the efficiency of various surfactants will be maximum in their action as cleaning agents, germicides etc. Also, we proposed to determine the Krafft temperature of SDS in presence of different counter ions by conductivity method.

While the above experiments were carried out on one hand, on the other hand, a literature survey was done. It was found that the surfactants we were working with have great scope in the field of antistatic and corrosion inhibition applications. Therefore, we had the objective of preparing conducting polymer composite (PANI+ZnO) and its fabrication on cotton fabric using SDS as a surfactant to improve its solubility, processability, better conductivity and thermal stability for corrosion inhibition and antistatic applications.

It was also found that the aqueous surfactant solutions comprising of micelles are very-well studied and are used as media in a variety of chemical analysis and synthesis. Micellar systems have immense technological applications such as flow field regulators, solubilizing and emulsifying agents, membrane mimetic media, nanoreactors for enzymatic reactions, to name just a few. Favourable modifications in the physicochemical properties of dilute aqueous micellar solutions upon addition of select additive (e.g., cosolvents, cosurfactants, electrolytes, polar organics, nonpolar organics, polymer, etc.) will expand and enhance the overall capabilities and applications of aqueous surfactant solutions; utilization potential of additives will increase as well.

Due to their physicochemical properties and high solubility in many solvents, poly(ethylene glycols) (PEGs) are of great industrial, pharmaceutical, and biomedical importance. PEGs are condensation polymers of ethylene oxide with water having the general formula $H(OCH_2CH_2)_nOH$. The most widespread uses of PEGs (usually low-volatile and non-toxic) are in detergents and as emulsifiers and plasticizers.

As a result, we felt that it is rational to employ these environmentally friendly polymers such as PEG in concert with surfactant-based systems. Altering and modifying important physicochemical properties of

aqueous surfactant solutions is highly desirable as far as potential applications of such systems are concerned. In this work, we reported the alterations/modifications in the properties of dilute aqueous micellar solutions of a common anionic surfactant sodium dodecylsulfate (SDS), upon addition of a popular and common polymer poly(ethylene glycol) (PEG200)

2. Final Findings :

Effect of PEG200 Addition on Critical Micelle Concentration (*cmc*) of Aqueous SDS at Ambient Conditions.

| Concentration of PEG200 (wt %) | <i>cmc</i> (mM) (from Py I ₁ /I ₃) | <i>cmc</i> (mM) (from conductance) |
|-----------------------------------|--|---------------------------------------|
| 0 | | 8.0 |
| 5 | | 8.1 |
| 10 | | - |
| 15 | | - |
| | | 8.2 |
| | | 8.6 |
| | | 9.3 |

It has been found that our CMC values are in close agreement with those reported in literature. It is interesting to note that addition of PEG200 to aqueous anionic SDS solution results in increase in CMC. This is our early investigation and it indicates that increase in CMC will enhance the efficiency of the system in separation of membrane proteins and in the removal of detergents during purification of proteins. But this is a complicated process and more work is required to be carried out in order to substantiate our result.

We have also synthesized the anticorrosive and antistatic materials based on conducting polymer PANI-ZnO micro and nanocomposites in the presence of SDS and CTAB as a surfactant as well as a dopant. Results revealed that these nanocomposites were found to be an effective anticorrosive and antistatic materials. Antistatic performance of PANI-ZnO nanocomposites was better than that of PANI-ZnO microcomposites. Coating of these materials on the mild steel has evaluated for corrosion study in marine environment. Results revealed that both SDS as well as CTAB doped PANI-ZnO was found to be very durable and effective anticorrosive materials. Moreover, thermal stability, conductivity, crystallinity and processability were found to be improve using PANI-ZnO nanocomposites.

3. Learning for Students:

It is a learning experience not only for the students but also for the teachers involved in the project. Necessity is the mother of invention. So, the team has designed and fabricated its own apparatus required for the project.

For characterization of the polymer-coated ZnO with surfactants and of the nanocomposites synthesized by the students, they were taken to NPL, Delhi and for measuring the CMC's of various SDS-PEG systems, they were taken to IIT, Delhi. In these laboratories, they had learnt to operate the sophisticated instruments such as TEM, SEM, XRD, TGA, FTIR and spectrofluorometer. This is the opportunity which the undergraduate students do not normally get. When the students went to these reputed institutions, they interacted with eminent scientists and professors. The students felt that such interactions were quite educative and made them learn many important concepts.

The students learnt to compile the results and data obtained from the experimental work. While analyzing the data and interpreting the results, they learnt to do things objectively.

We are sure that the students involved in this project have developed the scientific temperament and inquisitiveness that will help them in their higher study and research.

At antardhvani all the students working under different fields came together and exchanged ideas for three days and gained knowledge which directly cannot be spoken of. Students learned to present poster and power point presentations at seminars organized. They got the opportunity to participate due the finances available to them.

4. Benefits to College:

Since the results of our work are encouraging, the team is hoping to publish this in a reputed international journal as per our mentor's advice. This, if published, would benefit both the teachers and the students. Getting a paper published at the undergraduate level itself is an honour to the students. The credit will go to the college and certainly the image of the college will go up.

Under this project, we have purchased various equipments/instruments which can be used for all our students in future.

The apparatus designed and fabricated by us and the precision water baths made to order according to our special requirements can be of much use to the students in their research projects introduced in the new course.

Since the work involved in our project was experimental in the undergraduate labs. We have to purchase new apparatus and instruments from the finances provided by the university. These instruments will be an asset to our department in the college and in future students can work on them as and when required. It has also increased the profile of students and faculty working in the project. It has increased the enthusiasm among other students and faculty to work away from regular curriculum.

5. Benefits to Society:

The synthesized nanocomposites are economically feasible and eco friendly. Use of conducting polymer nanocomposites such as polyaniline as anticorrosion coatings had been explored as the potential candidates to replace the chromium-containing materials, which have adverse health and environmental concerns. We have used powder coating techniques for coating the mild steel in the present work, this technique is also very easy to handle, economically feasible, highly durable as compared to that of other methods. Hence, automobiles, household materials, industrial equipments, and marine transport can also be easily coated with these nanocomposites using powder coating technique to protect the metals against corrosion in highly corrosive environment. These nanocomposites are being used for dissipation of static charge which is potential demand of electronic industry. Moreover, synthesized conducting polymers nanocomposites can not only used for above application but also used in other applications like gas sensor, EMI shielding, solar cell, OLEDs etc. This is the great benefit to society.

6. Further Plans:

Due to time constraints, the determination of CMC's by different techniques other than fluorescence technique could not be carried out.

Although the role of PEG in modifying the properties of aqueous anionic sodium dodecyl sulfate is demonstrated, further studies are required to see the effect of select additives on different surfactant-based systems. Moreover, in order to further substantiate our results, other techniques (such as conductance, surface tension, spectrophotometric method, etc.) will be utilized in future work to determine the CMC values of various systems.

MAITREYI COLLEGE

Project Title: Biocompatibility of Nanomaterials

Project Code: MTC – 102



Nanoinnovators: Back to future

1.OBJECTIVE:

Rapid progress has been made in the development and deployment of new and novel materials with exceptional properties (physical and chemical). This has resulted in these new materials coming into contact with biological systems. Our objective was to study the compatibility of nanomaterials/nanoparticles in the environment and assess the compatibility/toxicity of these novel materials to bacterial cells and plant cells.

2. FINAL FINDINGS:

Three broad categories of experiments were conducted under the project.

I) PREPARATION AND CHARACTERIZATION OF DIFFERENT NANOMATERIALS

a.) Students prepared nanoparticles of Zinc Oxide and Ferric oxide.

b.) Methods for characterisation of nanomaterials like AFM, SEM, TEM , XRD,UV-VIS Spectroscopy, Photoluminescence , Electrical properties.

II) TESTING BIOCOMPATIBILITY OF NANOMATERIALS IN PLANT CELL CULTURES.

Tobacco plants and cells in suspension cultures have been tested as assay systems for biocompatibility. We already have established some assays in the College Laboratory. In addition, onion bulbs which are used routinely for simple biological experiments were also tested. To study extent of toxicity of the nanomaterials, we first chose the simplest kind of cells, i.e. prokaryotes. Extensive literature exists on the effect of nanoparticles on *E.coli*. Among these, we have chosen *Escherichia coli* (*E.coli*, bacteria present in gut of human beings as the standard and *Agrobacterium tumefaciens* (a soil bacterium. That causes Crown Gall disease in plants). We analysed growth kinetics of both bacterial strains with and without the presence of nanoparticles.

After learning the methods on a bacterial system, we tested the effect on plant cells. Three different systems were tested:

- i) We used an established assay system – onion root-tip assay - for testing genotoxic effect of nanoparticles on cell division in the root cells.
- ii) We chose methi seedlings to assess the effect on a leafy vegetable. Effluent water is known to affect the levels of toxic chemicals in leafy vegetables.

- iii) Tobacco plants and a new tobacco callus cell line were also tested for studying the effect of nanomaterials.
- iv) We also tested cosmetic and cleaning solutions formulated using nanoparticles (Lactocalamine and NanoClean) on the onion root assay.

III) CONJUGATION OF NANOMATERIALS TO DNA: Preliminary experiments were carried out to test if nanoparticles could be used for delivery of DNA. We tested existing protocols to bind DNA (plasmid) to silver nanoparticles and nanoclay.

RESULTS OBTAINED:

I) PREPARATION AND CHARACTERIZATION OF DIFFERENT NANOMATERIALS

The students learnt to fabricate nanoparticles of Fe_2O_3 and ZnO . These were prepared in the college (Physics and Chemistry Labs) using human safe precursors. They used wet chemical methods to synthesize Fe_2O_3 and ZnO nanoparticles. These nanoparticles were characterized by various techniques as X-ray diffraction and Raman Spectroscopy. The technique of Raman Spectroscopy was employed to study the vibrational modes of iron-oxygen and zinc-oxygen bonds.

The X-ray diffractograms for Fe_2O_3 and ZnO showed characteristic peaks belonging to Fe_2O_3 and ZnO in all the samples when compared to the references. The particle sizes were found to be in the range of 10-20 nm. The commercial preparation of nanoclay was obtained from Sigma and tested for biocompatibility. It is a naturally occurring nano-material. Being an organic material it did not show the desired results.

II) TESTING BIOCOMPATIBILITY OF NANOMATERIALS IN BACTERIAL & PLANT CELLS.

- a) *E.coli* cells exhibited a variable response to Iron (II,III)Oxide nanoparticles. Higher concentrations inhibited the growth of the cells but at low concentrations growth was not inhibited.
- b) Another bacterial species, *Agrobacterium tumefaciens* was included in the study for comparison. These cells were treated with ZnO nanoparticles and Nanoclay. ZnO nanoparticle inhibited the growth of *Agrobacterium* at all concentrations, while Nanoclay enhanced the growth of *Agrobacterium*.
- c) Methi seedlings were very sensitive and delicate to handle and could not be maintained in pots/hydroponic cultures. This was a trial and error experiment.
- d) The effect of ZnO nanoparticles on onion root tips was studied in order to study the cytotoxicity of ZnO nanoparticles. Three different concentrations (0.2g, 0.4g, 0.8g) of ZnO nanoparticles were prepared in 100ml of water for each beaker.
- e) Experimental setup for onion root tip was made having three replicates for each concentration of ZnO /nanoclay nanoparticles (in distilled water). Three replicates were also made for control. The onions were allowed to grow in these ZnO solutions for 4 days with stirring after a constant interval of time. After 4 days, it was found that the growth of onion root tip increased with increase in concentration but decreased in comparison with the control ones. Also, all the replicas do not have uniform growth. This is probably because onions used were not of uniform size and also constant stirring was also not there. Moreover, all the solutions prepared using ZnO nanoparticles became yellowish in colour with time.
- f) Afterwards slides were made for microscopic examination at cellular level to study cell division. Control samples have normal cell divisions but vacuolation was there in cells. It

was found that as we increased the concentration the extent of vacuolation decreased. Also, elongation was observed in the treated samples as no elongation was there in control. As the concentration of ZnO nanoparticles was increased, more elongation in the cells was observed. Cell divisions were found normal in case of 0.2g concentration but decreased prominently in 0.4g and 0.8g. So, to conclude we say that ZnO nanoparticles have negative effect phenotypically and at cellular level also.

- g) The tobacco callus cell line exhibited a response similar to bacterial cells and showed higher sensitivity to zinc oxide than to nanoclay. Both, ZnO as well as nanoclay were toxic at 0.5g/L after 24h and 48h incubation. At 0.2g/L conc. of ZnO was quite biocompatible as well as least toxic among the four treatments. Cell count data also supported the above observation. Although both were toxic at higher level their use at lower level could be less cytotoxic and can be used for consumer product as well as delivery particles. It was inferred from the data, that ZnO NPs have more toxic effect at nuclear level whereas Halloysite has damage at cellular as well as at nuclear level.

II) CONJUGATION OF NANOMATERIALS TO DNA: In our experiments, DNA could not be stably bound to the nanoparticles (silver particles and nanoclay)

3. LEARNING FOR STUDENTS:

Students experienced the joy of performing new experiments based on what they had learnt as part of syllabus. There was learning outside of texts and syllabi as the project was interdisciplinary. They were exposed to an exploratory and creative environment. This gave the students an opportunity to hone practical skills and make their knowledge more broad and innovative.

4. BENEFITS TO COLLEGE:

Apart from encouraging faculty and students to work on something more than syllabi, it enriched the resources (equipment and consumable). The mentorship of an external faculty gave an opportunity to interact and think differently. This increased interest in students and encouraged many other students.

5. BENEFITS TO SOCIETY:

The poster presentation at the Innovation plaza helped the team to really convey the work in terms of benefit to society. Awareness was generated among the visitors on the toxic nature of nanoparticles.

6. FURTHER PLANS:

We would like to pursue this line of work and publish our results in a peer reviewed journal and are conducting the experiments. Certain experiments particularly on testing the efficacy of nanoparticles in binding to DNA need to be carried out.

MAHARAJA AGRASEN COLLEGE

Project Title: Measuring Environmental Footprint of University of Delhi and Transforming it into a Zero Impact University

Project Code: MAC-101



Students engaged in environmental carbon mitigation related activities in project MAC 101

1.Objective:

- In order to ensure a sustainable future at the colleges, the entire learning fraternity needs to assume responsibility for their actions and commit themselves to creating positive social and environmental change. It entails embracing a long-term perspective and a willingness to encourage a participatory problem-solving process. There is a rising interest among students attending colleges that practice, teach and support environmentally responsible choice.
- A baby step was taken by Maharaja Agrasencollege towards this vision to identify the activities that create measurable carbon footprint, quantify them that could be considered a baseline and further devise a pathway to consistently monitor the levels of emissions to track our greening effort.
- Hence the main objective of the study was to move the students away from peripheries of formal curriculum and develop a more committed vision to sustainability. We at Maharaja Agrasencollege believe that as educators it is our responsibility to sensitise our students about the damages our day to day activities are doing to the environment, so that our students are capable of implementing and understanding green practices where ever they go. The ripple effect of undertaking such an activity hence are expected to be much greater than just being confined to MAC.
- We felt that just by putting posters of appeal to conserve energy, water, fuel and paper were just not working. We had to initiate and create a new technique to make our students more responsive. Therefore we calculated our carbon footprint and mathematically showed our students the damage all of us together were doing to the environment. The figure did wonders and encouraged students to implement offsetting techniques to bring down the footprint figure.

2.Final Findings:

The activities of the college identified to be contributing towards carbon emissions were categorized under six heads-Electricity consumption, transportation, paper consumption, food consumption, water consumption, waste disposal. Emissions generated out of these activities essentially fall under scope 2 &3 categories. Emissions out of purchased electricity falls in the ambit of scope 2 while emissions due to transportation; paper, food, water consumption and the

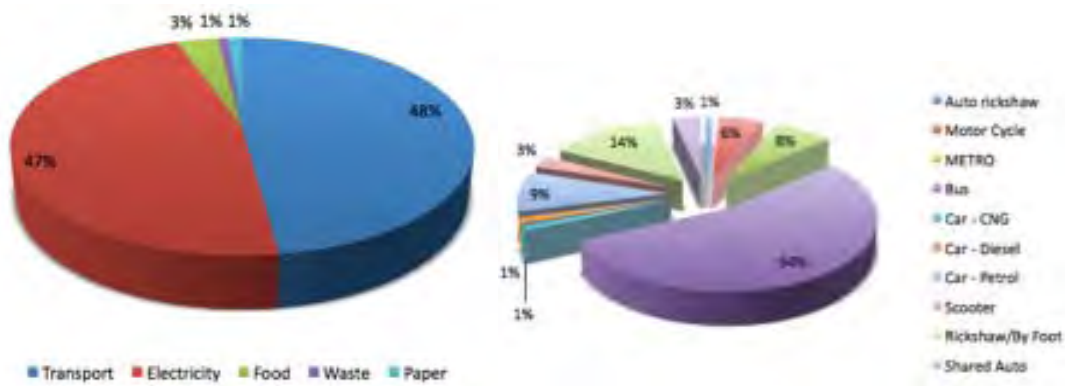
manner in which waste is disposed off falls under scope 3 indirect GHG emissions. None of the carbon emissions of the college come under the ambit of scope 1 since the college does not own any energy or transport resource. The source of emission consumed is multiplied by the relevant emission factor (as shown below) to get the relevant level of emissions.

| Scope | Emission category | Data Sources | Emission factor |
|-------|-----------------------|---|---|
| 1 | College Owned Sources | College owned vehicles: vehicles log books | As in transport |
| 2 | Energy Consumption | Meter Reading / Electricity Bills at three different points in time | .912 kgs CO ₂ /kwh |
| 3 | Transportation | Employee Commuting: By survey Total amount of Kms travelled (based on Pin Code distance analysis of NCR region) If commuting by public transport – DMRC, DTC Road distance chart. Age of the car/mileage to calculate fuel consumption Student Commuting: Same Method for Employee commuting. | By fuel type Petrol:2.296 kg CO ₂ /litre Diesel:2.653kg CO ₂ /litre CNG :2.25 Kg CO ₂ /kg LPG : 1.6 kg CO ₂ /kg |
| 3 | Paper Consumption | Paper purchased: College Office data Administrative Purposes: Office data for examination sheets, admission process, Info systems Paper consumption by students: Survey on total note books used by the student per paper per semester, paper used for photocopying of notes/readings and in assessments and tests. Data confirmed by inspection method | Office paper : 0.98 metric tonnes CO ₂ /short tonne 1 short tonne= 907 kgs |
| 3 | Food Habits | Cafeteria Data – Food Purchased, LPG usage, PET bottles by survey | LPG :2.983 kg CO ₂ /kg 500 ml plastic bottle : 240 gms CO ₂ 1litre = 360 gms |
| 3 | Waste disposal | Segregation of organic and inorganic waste. Quantity of waste generated by measuring weight/volume | Organic waste:0.9 tonnes CO ₂ /tonne Inorganic : 2.59 tonnes CO ₂ /tonne Mixed :0.07 kg CO ₂ /kg |

Maharaja Agrasen college emission details:

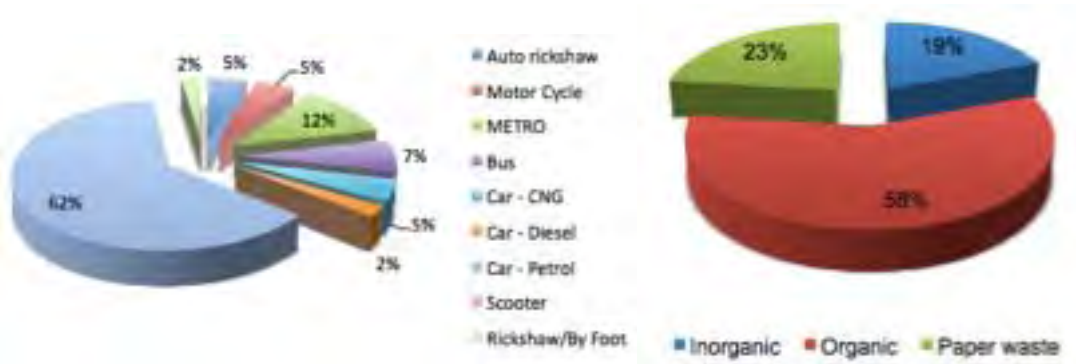
- The total to and fro distance travelled by MAC learning community each day equals 42236.94 km that is equivalent to the circumference of the earth. Annual footprint due to transportation aggregated to 480076.2 kg CO₂
- Total paper used in a semester was found to be 14,27,800 A4 size sheets. Weight of paper used per year was calculated as 10.64 tons. This amounted to felling of 170 trees every year (1 ton is equivalent to felling 17 trees). Annual Footprint of paper: $((10.64 \times 1000) / 907) \times .980 = 11496.36$ kg CO₂

- Av. electricity consumption in college was worked out to be 42840 Kwh/month(average of 3 months) Annual Footprint due to electricity usage was found to be $514080 \times .912 = 468841 \text{KgCO}_2$
- 50 LPG cylinders per month were used in the college canteen (19kg/cylinder). Annual Consumption being $950 \times 12 = 11400 \text{ kg}$. Annual Footprint in canteen was found to be: $11400 \times 2.983 = 34006.2 \text{ kg CO}_2$
- Waste generated in the college per day aggregated to 26 kg. Category wise annual mixed waste, organic waste, paper waste generated was found to be 1500 kg, 4500 kg and 1800 kg respectively. Hence, Annual footprint from waste was found to be 8655 kg CO_2
- Total footprint of Maharaja Agrasen College = $1003075 \text{ kg CO}_2 = 1003.07 \text{ tons}$.
- Per capita footprint of Maharaja Agrasen college = 517.049 kg CO_2



Carbon Map of MAC

Mode of Transport - Students



Mode of Transport – Teachers

Carbon Footprint - Waste

Shaheed Rajguru College of Applied Sciences for Women emission details:
 footprint : 122262.1 kgs CO₂

Transport

Electricity footprint : 42674.91 kgs CO₂

Paper footprint : 4689.30 kgs CO₂

Hindu College : Transport footprint : 347385.5 kgs CO₂

Paper footprint : 14229.9 kgs CO₂

Bhim Rao Ambedkar College : Transport footprint : 171161.1 kg CO₂

Paper footprint : 8957.22 kg CO₂

Transport and Electricity consumption seem to be the major contributors towards the carbon footprint of the University system. Clear policies and incentives in this direction can go a long way in curbing this footprint.

3.Learning for Students (200 words):

The project has created immense interest and sensitivity amongst students towards tracking their own contribution towards carbon footsteps.

- The pilot study was conducted in the home college hence emissions due to electricity usage is being monitored by students, administrative staff and faculty members by controlling the overuse of electrical gadgets and appliance.
- Sub-metering to monitor electricity consumption initiated by department of electronics faculty and students is underway at various utility centres in the college. Proposal for Solar panel installation has been approved by the college authorities. All these steps have gone a long way in keeping the sensitization effort amongst students alive.
- The students' awareness about technological interface to combat carbon emissions and naturally restrict emission levels has been enhanced.
- The recycling of paper already initiated by the college under the aegis of zero impact club has got further impetus thereby reducing the overall paper consumption in the college premises.

4.Benefits to College (100 words):

- The project has brought laurels to the college. The initiation of such projects both at academic level and implementation level has been one of the reasons for bringing the first prize to the college at Antardhavani University level event where in the efforts of all the colleges in various fields were show cased.
- Provision of waste segregation stations for biodegradable, non- biodegradable, PET bottles and electronic waste at the college campus has been initiated. Reducing cafeteria waste by donating excess food is another welcome step. Initiatives are being taken to encourage use of glasses/cups/containers in cafeteria made from recycled, biodegradable, or eco-friendly materials, and removing bottled water by installing water purifiers. Provisioning for recycling of electronic waste like batteries, cell phones, computers, and printer cartridges has already been initiated by the college.
- Facilitating programs that provide incentives for members of the campus community to reduce energy use. This would pave the way to conduct an energy audit of the institution i.e. Sections of the college to be monitored: - Laboratories, Library, Cafeteria, class rooms, Offices, Common spaces.
- Last but not the least the college has doubled its greening effort by reducing water consumption via effective water harvesting, reducing paper consumption. Installation of various energy efficiency and water conservation retrofits, such as lighting motion sensors or low-flow plumbing equipment, terrace gardening through programmed drip-irrigation method using PET bottles are underway that would enable us shrink CO₂ emissions.
- The college has a bi-cycle club the encourages students to save fuel especially if the have to travel short distances
- Paper reduction policy is in place wherein all deptt. messages, notices are put on the website. Students are encouraged to recycle practical notebooks etc.

5.Benefits to Society (100 words):

- The carbon footprint is one of the most important metrics that organizations should account for in their environmental, sustainability or ethical report that serves as an important metric for determining its environmental performance.
- Reductions in CO₂ emissions can hence be paired with financial benefits. For example, less CO₂ is emitted if less electricity is used resulting in lower electricity bills and if employees would use less paper less expenses on paper. Likewise all activities need to be identified resulting in carbon footprints. Furthermore, a lower CO₂ emission can result in a better image of the organization.
- This also emphasizes the Environmental Management System to be adopted not only by corporate houses but also in academic institutions. The Green Guide can only be developed when a baseline assessment of carbon emissions is done initially for further monitoring.
- Take this holistic approach to sustainability on college campus to different Universities.
- Offering a college website to facilitate involvement in campus sustainability initiatives and to educate the community.
- The project proved to be a fruitful learning experience for the students who are now confident to understand and implement green practices wherever they go after their graduation.

6. Further Plans (100 words):

- Simply put, sustainability has to do with reducing our footprint on the future. A sustainable campus program is next in agenda that addresses:
1) improving economic efficiency 2) protecting and restoring ecological systems, and 3) enhancing the well-being of all peoples, all of these components.
- The aim is to provide accessible information for other colleges to learn from each other's experiences and establish more effective sustainability policies that enhance students' academic experience and quality of life in ways that is truly worth appreciation.
- Developing a Green Code for the Delhi University is the desirable goal. A green audit for the constituent colleges is something that we would recommend.

MAHARAJA AGRASEN COLLEGE

Project Title: Redefining Curriculum: Integrating ICT for Innovation Eco-System

Project Code: MAC 102



Students and faculty engaged in product development under Innovation Project MAC-102

1.Objective (150 words):

In the last two academic years, in University of Delhi curricula have been tailored, modified, and shaped to fit the emerging needs of a changing society. In order to achieve the learning objectives of the new curricula, a major change in the pedagogical skills is the need of the hour. Stimulating innovation will be critical in finding better and more cost-effective ways to improve the quality of education available to the learning community. Maharaja Agrasen College has only begun to make this transformation through this project. To implement the new curriculum as intended and facilitate enhanced student-teacher interaction, it is essential to provide the undergraduates an opportunity to discuss, evaluate, interpret and comprehend the new content including ICT. In this research project, it is proposed that few pre-decided undergraduate level science practical designs shall be developed and packaged as complete products for use in real time situations. The appropriate ICT support with animations and applets shall be developed. This may reform B.Sc. to more practice-based courses.

2.Final Findings (300 words):

Teaching Aids Designed by Students: The team has developed few science practical designs for use in real time situations. Students have designed and developed a 'student e-kit', (comprising of reliable and highly cost effective and good for practice electronic devices made by the students themselves like power supplies and pulsars) and a solar training kit.

Automation of Physics Experiments: Project team has automated the experiments involving measurement of time period of an oscillation by using Programmable Event Counter – cum – Timer Circuit. The team has developed the hardware/software for the automation of various experiments in physics, namely Measurement of Elastic constants using - Searle's Experiment, Maxwell's needle, and Measurement of 'g' using 'Bar Pendulum, Kater's pendulum, and Free Fall. The automated circuit has built-in PC communication facility for data acquisition to facilitate further analysis. The team has also tried to innovate the design of the old hardware involved in the above mentioned experiments by designing a 'Mechanics Bar' on which all the 4 experiments can be performed.

Semester Scheduler: It can be programmed for odd and even semesters, where each semester can incorporate 20 programmable timer events each day which can be selected according to day of the week. The bell timings in the scheduler can be programmed as per the University calendar incorporating duration of classes, mid-semester break, examination time and vacations thus providing a much needed break to the administration from this type of mechanical work. The programmable semester scheduler has

been successfully installed at Maharaja Agrasen College and is an instant hit amongst the administrative staff.

Beyond the Class Room : eMaze - Nothing can be better than applying the concepts acquired in the classes to create new designs or games. The students designed /transformed (electronic version) the popular game of maze to make the experience of solving it more interesting.

Designing for Future Scientists

Pitara -Lab in Class Room: is a magic box designed to diffuse the sharp boundaries between the class and laboratory based on 'LIC', the Lab in Class room approach by transforming the traditional model of science instruction of a teacher lecturing a large group of students, transformed into one in which students play a more active role in learning by improving the comprehension of concepts and practical skills of physics among students. With the help of 'Pitara', teacher can demonstrate the various concepts of physics simultaneously while teaching them in the class itself rather than performing them separately in the laboratory.

3.Learning for Students (200 words):

By providing the students an opportunity to be involved in this research project along with a sound academic foundation has enabled them to develop independent critical thinking skills along with oral and written communication skills. This research process shall impact valuable learning objectives that have lasting influence as undergraduates prepare for professional service. By participating in this research project , the overall learning for the students include:

- development of skills to function more independently
- opportunity to put classroom knowledge into practice
- building of mentor relationships between faculty and students
- stimulation of creativity and sheer excitement that comes with critical thinking and intellectual activity
- ability to better understand research methodologies
- having tolerance for obstacles
- ability to communicate to a wide audience
- recognition by one's peers
- opportunity to earn stipend and academic credit
- enhance ability to grasp the philosophy of lifelong learning

4.Benefits to College (100 words):

Undergraduate research is a student-faculty collaboration to examine, create and share new knowledge or works in ways commensurate with practices in the discipline. By engaging in this research project, the college has been able to:

- connect with students and foster positive learning experiences
- generate student excitement and interest in a discipline
- aid students in contributing new knowledge to a field
- augmentation of the college's reputation
- admission/ recruitment of high quality students and faculty
- garner of extramural funding and recognition
- break down barriers between teaching and research by integrating both into the teacher-scholar concept
- foster professional growth and advancement amongst faculty
- recognition by one's internal and external peers for contributions to undergraduate education

- intellectual enhancement of the Undergraduate degree

5. Benefits to Society (100 words):

By participating in this innovation project, students have been exposed to a new approach towards problem solving in an effective and scientific manner. The teacher and the taught have experienced a paradigm shift in the pedagogical approach required to cater to the challenges of the society at large. There is no direct benefit to society from this project but the students researchers benefitted immensely, as today they feel that their leadership skills and leadership potential both have increased.

Management is a hands-on component of leadership. In this project almost everything was managed by the students, they were responsible for functions as planning, organizing and controlling. Today they can be seen using their leadership ability to inspire others to listen to and follow a vision; to innovate and drive peers towards new ideas and directions. The enhanced ability to persuade and influence, communicate and motivate, innovate and implement strategic vision, is one of the greatest benefit of this project to society.

6. Further Plans (100 words):

We plan to undertake more such laboratory automation and re-designing of experimental setups used in undergraduate and school level laboratories. The focus shall be on school level laboratories innovations. The team also plans to initiate one national level design competition to prospect, select and develop the innovative ideas. This will not be about creating a practical machine or a gadget but to set a challenge for young innovators, designers to harness their creativity and technical skills and to experience working as a team against challenging requirements.

MIRANDA HOUSE

Project Title: Inheriting Land, Endangering the Girl Child: Interrogating Land Productivity, Property Rights and Family Planning in Western Uttar Pradesh & Punjab

Project Code: MH 101



Women's Reproductive and Property rights

1. Objective (150 words):

The project interrogates land productivity, property rights and family planning in Western Uttar Pradesh and Punjab. These states have the highest economic development profile amongst the Indian states characterized primarily by high land productivity. There exists an imbalanced population structure in the form of a skewed sex ratio of children (Census 2001–2011) in this very area. It is often assumed that favourable land productivity determines equitable growth in all social units including nature of family composition. But to the contrary, this is an area with an imbalance as high productivity of land is corresponding to the unfavourable sex ratio resulting in unfavourable family composition.

This project is an attempt to explore this imbalance by two conceptual and ethnographic registers: (a) Property rights and attachment to land; (b) Decision making power of women with regard to their reproductive choices. The gendered aspects of attachment to land and relations to landed property are inextricably linked to family planning dynamics. This study aims to find the different roles and positions of women in these aspects.

2. Final Findings (300 words):

Our findings so far elaborate land inheritance through its *symbolic value*. Women respondents differ in their idea of land and its meaning from the male respondents. For the women respondents, social support and emotional value supersede the economic worth and security offered by landed property. There is lack of property inheritance rights for Women in both urban and rural areas of Western Uttar Pradesh irrespective of their class, caste, education and religion. Simultaneously, there is widespread knowledge about legal provisions of property inheritance rights for women.

In the districts with low child sex ratios the patriarchy has a very strong hold on the society so that no women wants to transgress the limits set for them by their individual families and society. Attachment to land is a result of its economic, emotional and symbolic value. Since land inheritance is socially acceptable only for the SONS, therefore family planning choices are usually exercised only in favour of sons endangering the girl child.

Land share is given to daughters as:

(a) In the form of expense for marriage (mostly as dowry arranged by selling off land instead of giving land per se); or as

(b) A portion of land but with an underlying expectation from them to not ever claim it. Claiming their share would mean damaging emotional ties with her brothers (natal family).

The response to land rights for women differs from place to place, corresponding to the child sex ratio in these areas. Where ever the CSR is high women do get a formal offer of the share of the land as property rights under the newly notified laws of inheritance after the HJFSA of 2005, though with the above mentioned expectation that of donating it to her natal family. In the low CSR areas, women have no property rights over land or even the house in their natal family. In her matrimonial family, it is most often her son who controls the land and decisions regarding its access and usage. Often, the matrimonial home is hostile to the women and thus she does not have any right over that property also. Thus women value themselves more if only they have sons. This is a universal phenomena is both of the states where field work was conducted.

The difference between Punjab and Western Uttar Pradesh is that in Punjab, there is an absolute silence over the property rights and reproductive choices of women, whereas, in Western Uttar Pradesh, there is talk and an immense debate on the same aspects. People are now pondering over these issues in Western Uttar Pradesh where instances of women inheriting land and exercising her reproductive choices are still found both in the rural and the urban areas. In Punjab it is a rare case to find women who actually exercise these rights. Tales of sex selective abortions and infant mortality of girls is very common. Any woman in both of these areas who does exercise her property inheritance rights with her natal family is usually marked in society as a “Bad Woman”.

3. Learning for Students (200 words):

This is primarily an initiative to train the young undergraduate students and expose them to the theoretical and methodological tools of research. This is an interdisciplinary social science research project involving students and faculty members from the Departments of Geography and Sociology, Miranda review House, Delhi University. In this innovation project the students involved learned to conduct research through secondary data analysis, primary data collection, sampling, rapid rural survey, review of literature, framing the questionnaire in a way that it includes open as well as close-ended questions. Workshops on administering questionnaire were conducted to help them understand the manner in which the survey is needed to be conducted in field. Moreover they were trained to make focus group discussions and to write narrations. Students learnt the software SPSS to analyse the primary data collected in the field. Most importantly they were taught to critically understand a real life issues and link it to theory and policy implications.

4. Benefits to College (100 words):

The greatest benefit that the project has given to the college is the infrastructure and the atmosphere to train the students. It has given them the exposure to different research techniques and fieldwork which adds enormous value to their future carrier growth and development. The innovation project in the true sense has helped the students and faculties to Innovate, Initiate capacity building among research students, inculcate research interests, instigate critical thinking, and infuse responsibility to understand social issues through real life experiences and interrogate and evaluate policy issues in country's development process.

5. Benefits to Society (100 words):

This project revolves around the issues of women's reproductive choices, perception of land and inheritance rights of women visa-a-vie the men, which are the emerging concerns in the present society.

This research along with inculcating research ideas and methods has also created awareness among the students. In fact the field visits have led to an indirect method of advocacy of this issue where respondents both male and female were sensitized with the questions, discussions, life histories, timelines and debates. Since respondents are not passive objects, this research has thrown open a series of new ideas and possibilities which people otherwise would not have pondered or discussed in their day to days life irrespective of their location in rural and urban areas.

6. Further Plans (100 words):

The further plan of this project is to extend it to more states with different landholding dynamics. A major project with this theme can bring out the comparison in a much better way given the size and diversity of the country. The results of the analysis in the two states of Punjab and western Uttar Pradesh show that space and place that matters with regard to decisions of women's reproductive choices and their land inheritance rights. It will be interesting to see how the different land size holding groups and regions with different types of cropping patterns differ in terms of their decisions on planning the gender of their families and giving property rights to their daughters and sons.

MIRANDA HOUSE

Project Title: Computational modelling of phyto regulatory profile of some nanoparticles.

Project Code: MH-102



In vitro promotory response of *Sorghum bicolor*, *Vigna radiata* and *Polypleurum stylosum* on MS medium supplemented with various concentrations of ZnO and SiO₂ nanoparticles.

1. Objective (150 words):

Nanoparticles (NPs) have existed in the environment via natural processes as well as anthropogenic activities. NPs have the ability to enter, transport within the cell, and alter the responses of the living organisms by virtue of their minute size. Literature survey indicates that their effects on plants are largely unknown.

The present study was undertaken to determine the effect of ZnO and SiO₂ nanoparticles on various parameters of seed germination and seedling biology of three different plants viz. *Sorghum bicolor*, *Vigna radiata*, and *Polypleurum stylosum*. *Sorghum bicolor* (jowar), family Poaceae is a cereal crop. *Vigna radiata* (mung bean), family Fabaceae is an important pulse crop of India and *Polypleurum stylosum* is a unique dicot plant of family Podostemaceae. The aim was to correlate the results with *in-silico* studies on nanoparticles specifically the band gaps and electronic properties. This will help us to understand the phyto regulatory profile of the studied NPs.

2. Final Findings (300 words):

Seeds of selected plants were grown under *in vitro* conditions on nutrient medium MS (Murashige and Skoog's medium, strength 1/20) with filter sterilized NPs (ZnO and SiO₂) at 10⁻⁴M, 10⁻⁵M, 10⁻⁶M and 10⁻⁷M concentration. MS basal served as the control.

Sorghum bicolor:

At 10⁻⁵M ZnO, growth was promoted as compared to control whereas other concentrations did not promote growth. Of the various concentrations of SiO₂ tried, incorporation of 10⁻⁷M improved the overall response as compared to basal medium.

Vigna radiata

Effect of both ZnO and SiO₂ NPs was studied. 10⁻⁶M ZnO NPs had a promotory effect on seed germination and seedling growth as compared to control. At other concentrations tried, the response was poor in terms of shoot growth and root laterals. When SiO₂ was added to MS medium, at 10⁻⁶ M, seed germination, root laterals and shoot length were enhanced whereas germination percentage and seedling growth was reduced at 10⁻⁴ M SiO₂.

Polypleurum stylosum

The plant body is thalloid, therefore observations were made on: percentage germination, emergence of radicle, and seedling establishment. Enhanced germination occurred at 10⁻⁵ and 10⁻⁶ M ZnO NPs as compared to control whereas 10⁻⁴ and 10⁻⁷ M concentrations inhibited germination as compared to basal medium.

Based on these preliminary observations, we conclude that these nanoparticles promote seedling growth at certain concentrations. For studying the structural aspects, the DFT calculations were carried out in DMol³ code for geometry optimization. The generalized gradient approximation (GGA) in the revised Perdew–Burke–Ernzerhof (RPBE) form was adopted in the calculations. All-electron and double numerical basis sets with d-functions (DND) were selected. The physiochemical properties such as particle size and distribution, shape, crystal structure, chemical composition, surface area etc. were measured and the correlation shows that they could be responsible for the phyto regulatory effect directly or indirectly.

3. Learning for Students (200 words):

Students have learnt a range of skills and subject matter during innovation project. They have analyzed and synthesized the information gathered and in this cooperative effort, they have themselves determined the direction the project would take. They have acquired general skills both in wet-lab and visual lab *i.e. in-silico* techniques. Specifically, the students learnt:

- a) Planning of experiments
- b) Preparation of Culture medium
- c) Plant tissue culture techniques
- d) Transfer of plants from lab to field
- e) Preparation of Nanoparticles
- f) Use of micropipettes and millipore filters
- g) Computational modeling of biostructures (Training Programme)
- h) Introduction to SEM and TEM techniques
- i) Microphotography
- j) Poster preparation and presentation

Additionally, it was an exercise in confidence building and interaction with scientific community. They learnt effective use of technology including use of spreadsheets, electronic publishing, databases, email, and forums for research and communication. Throughout the process, the teachers have acted as facilitators and advisors, guiding rather than directing. Project-based learning has also developed students' skills in areas of problem-solving, critical thinking, visualizing, and decision-making, cross-cultural understanding, and reasoning, as well as in written and oral communication. It has helped students build skills useful in a world where jobs are increasingly information and knowledge-based.

4. Benefits to College (100 words):

- A. **CAPACITY BUILDING AND INFRASTRUCTURE DEVELOPMENT:** It has helped in the infrastructure development in the college in terms of software purchased. The software is an asset, to be used by college faculty and students to engage in academic and research activities. This project has given the students and faculty of the college an opportunity to engage in interdisciplinary research. Interdisciplinary research has also widened the horizon of the concerned faculty.
- B. **CONTRIBUTION TO THE RESEARCH AND ACADEMIC LIFE OF THE COLLEGE:** Various research papers in International conferences were accepted and student teams of MH-102 won many inter-college poster presentation competitions.

5. Benefits to Society (100 words): Nanoparticles are being used as fillers, opacifiers, catalysts, semiconductors, cosmetics, microelectronics, and drug carriers. It is feared that they can generate potentially dangerous and undesirable consequences. This has led to extensive research in the area of nanotoxicology. The long term benefits of our project includes mapping out these harmful effects. This project does not throw light on these problems immediately but sets a perspective for

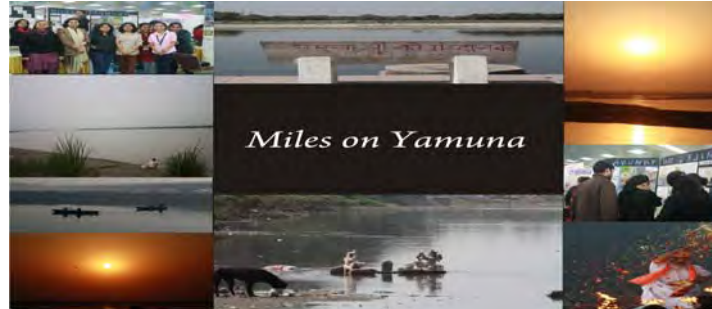
further extensive research. Our research has shown that nanoparticles increase crop productivity and therefore in the future the nanocomposites can possibly be used as ‘designer fertilizers’ for growth promotion.

6. Further Plans (100 words): Further plans include determination of the effect of some of the nanoparticles such as, Al_2O_3 , TiO_2 , and Carbon nanotubes on growth and development of three plant systems, viz. (a) *Polypleurum stylosum* (Podostemaceae) that has an evolutionary significance and occurs in an aquatic ecosystem, (b) *Sorghum bicolor* (Poaceae) and (c) *Vigna radiata* (Fabaceae) that are economically important and belong to terrestrial ecosystem. Special emphasis will be laid on understanding uptake, translocation, internalization and characterization of the NPs at cellular level. This will be demonstrated through the use of specific biomolecular linkers anchored on the surface of nanoparticles.

MIRANDA HOUSE

Project Title: Miles on the Yamuna, Team A

Project Code: MH-103



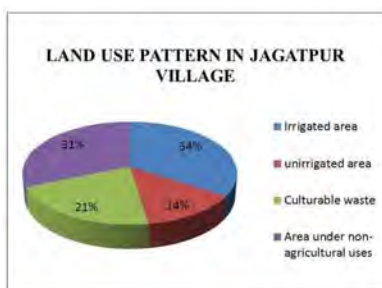
1. Objective (150 words):

Our ultimate goal is to find sustainable solutions to keep the Yamuna clean. It was clear to us from an initial survey of literature that in spite of significant intervention towards this from the state (both the executive and the judiciary) as well as from civil society, there has been no improvement in the state of the river over the last few decades. To this purpose, we undertook a detailed socio-economic survey of a 'village', Jagatpur, on the banks of the Yamuna, hoping to uncover some of the dynamics of the relation between the river and communities closest to it. We hoped to find, in Jagatpur, riparian practices that would lead us to an understanding of the kind of practices vis-à-vis the river that are symbiotic for both, the community as well as the river. Further, we hoped to explore the dynamics of two sets of forces: the need to preserve past practices of land-holding and land-use, and the pressures and opportunities generated by a burgeoning Delhi, both on the village and on the river.

2. Final Findings (300 words):

- a. The Geography of the village: Jagatpur village is an urban village located on the western bank of Yamuna river in North Delhi between 28°42'30'' N and 28°45'N Latitudes and 72°12'9''E and 72°14'49'' E at an elevation of 209 m above mean sea level. It occupies a geographical area of about 204.3 hectares in which 40% of the area is used for cultivation. The village has a history of frequent flooding as a result of which the village had to be relocated to its current place in 1952, explaining the grid pattern of the streets. This also places Jagatpur in a special category: the residential area of the village is not under 'lal dora' but registered as a Housing Society. A levee was constructed in 1978 to protect the settlement from the river floods. The village lies in the Zone 'o' as demarcated by the Delhi development authority. It lies in the rural urban fringe of the Metropolitan area of Delhi. Our visits reveal that Jagatpur lies between stage 3 and stage 4 of the transformation process from rural to urban. Jagatpur cannot be regarded as an 'urban' village as the village is still not connected with the city by proper public transport services. More importantly, agriculture and dairy farming remain the dominant occupations.

Migrants are not as numerous as one might expect on the basis of the location of the village – possibly because cattle rearing is space intensive.



b. Occupational Profile

Agriculture is the main occupation in Jagatpur. Jagatpur grows all kinds of vegetables, fruits, wheat, jowar and bajra. Animal husbandry is the other important occupation. Additionally, jobs in government service and commerce have become common as well. Often, both activities are combined in the same household, sometimes being carried out by the same person.

c. The demographic profile of the village is given below (table 1):

TABLE 1: DEMOGRAPHIC PROFILE OF JAGATPUR

| No. of households | Total population | | | 0-6 age population | | | SC population | | | ST population | | | Literates | | | Sex ratio | Literacy rate |
|-------------------|------------------|------|------|--------------------|-----|-----|---------------|-----|-----|---------------|---|---|-----------|------|------|-----------|---------------|
| | Total | M | F | Total | M | F | Total | M | F | Total | M | F | Total | M | F | | |
| 802 | 5385 | 2909 | 2476 | 896 | 515 | 381 | 272 | 155 | 117 | 0 | 0 | 0 | 3450 | 2114 | 1336 | 851 | 76.85 |

M=Male, F=Female

Source: Census 2001, delhi.gov.in

d. Water and Sanitation Facilities

River water is not used directly either for domestic use or for irrigation. Pumps and borewells are commonly used for both purposes. The Delhi Jal Board is responsible for potable water supply in the area, but supply is very erratic.

e. Relating to the River:

Since our project has focused on the river Yamuna, we have looked into the aspect of nature-culture dichotomy to understand the relationship that the village has with the river.

The relationship of the people with the river is a complex one. At one level it appears that the people have a minimal consciousness of dependency on the river for their daily needs and for agriculture. However, we also find that the river is considered to be superior and sacred. They subscribe to the pre-modern view that the river (as a part of nature) is mightier than man and should be feared. The river is an angry deity that has to be appeased. Yamuna is considered unmarried and every year she claims sacrifices during the monsoons of young unmarried men. On the one hand is the view that nature is mightier than man and it cannot be controlled at best it can be appeased. On the other

hand in direct contrast is the modern view that the river *can be* controlled, and even 'channelized' (as reflected in the Masterplans for Delhi).

The complexity of this relationship extends to the nature of land-holding and the very nature of kinship in the village. The possibility of flooding implies that risks inherent in agriculture are large for Jagatpur. In a traditional method for risk mitigation agricultural land is commonly owned. Cultivation, however, is individual. Plots are allocated on the basis of hereditary shares to the members of the Gujjar community through a complex, equally traditional practice of Batej. The survival of common property into this era of rising land prices and commercialization is something that took us by surprise. We have used Game Theory to explain its survival, and predict the conditions under which the system may collapse. Our FGDs also revealed that the 'batej' system, while crucial to risk mitigation, may dampen long term investment incentives in land.

f. Sociological Profile: River-Gender Parallelism:

The sociological profile of Jagatpur reveals the existence of entrenched patriarchy amongst all communities, especially amongst the Gujjars and the Muslims in the village. The census data supports these findings: the sex ratio for Jagatpur is lower than that for Delhi as a whole. The Child Sex Ratio is lower than the adult sex ratio, indicating continuing sex-selection and inferior status of women.

The people of Jagatpur treat the river as they treat their women. The river is revered as a female deity but the people are indifferent to her plight. The women of Jagatpur at one level are worshipped as Goddesses yet they are subject to a subordinate status and are subject to violence.

g. Conclusion: What we found remarkable about Jagatpur is the extent to which the Yamuna has been 'backgrounded' despite the fact that the very nature of economic and kinship relations in the village are contingent on the current profile of the river. It is interesting to speculate how a change in the profile of the river may change these relations in the village.

3. Learning for Students (200 words):

Apart from standard skills that students pick up in such projects in terms of writing, presenting and organizing seminars and exhibitions, the following are what our students have reported to us as significant learning outcomes:

1. Time management: Each student has reported that this is one of the most important lessons they have taken away since they had to balance an intensive academic schedule with an equally denuding project schedule, while continuing to juggle their extra-curricular activities in college.
2. Theory in practice: Students in each field were able to see the theoretical concepts at work in the real world. Thus Sociology students got to see (and draw up) kinship charts; Economics students saw a living example of an infinitely repeated game, and work out that the dominant strategy was to cooperate; Geography students witnessed a village transiting into an urban area, as well as getting a first-hand feel of the river and its ecosystem.
3. Interdisciplinary learning: Since all members participated in all FGDs and surveys, and all results were discussed with the entire group, a significant amount of inter-disciplinarity

emerged. Discussions with Team B of the project also exposed team members to methods of analysis in the pure sciences.

4. Breaking stereotypes, experiencing stereotypes: All our students have reported that the field surveys were eye-openers for them in several ways. Their notions of 'rural', gender, affluence and poverty, all had to be revised. They also had to reconcile seeming contradictions: the demand for a girls' college in Jagatpur from *Hukkah*-smoking grandmothers, advice that avoiding the male gaze was a girl's responsibility....They learnt to disengage themselves during FGDs and surveys in order to be able to report without bias what the respondent/s were saying.
5. Greater Environmental Awareness: Almost none of the participating students had actually seen the river before the project was launched. They are now ardent ambassadors for its revival.

4. Benefits to College (100 words):

1. Resource creation:
 - a. Equipment such as voice recorders, data drives, cameras which can be used later for similar projects.
 - b. Software – LPS – mapping software
 - c. Networking with other colleges, and institutes doing similar work, esp. TERI, TOXIC LINKS, etc.

5. Benefits to Society (100 words):

1. The project has helped highlight the importance of including the stakeholders in the preservation of the river. But the most important lesson we are trying to publicize is to push home a concrete perception of the stakes involved. If the relevance of the river is obscure to a community on the banks of the river and so intimately dependant on it, the challenge for the rest of the city is daunting indeed.
2. The project has helped the community understand the importance of the preservation of the river. They are aware of the need to stop the pollution of the river especially during the festive season when people come to the river for various rites and rituals. Special FGDs were held on the importance of the preservation of the Yamuna and the close link of the river with the riparian community of the Gujjars in Jagatpur.
3. During various focus group discussions we have tried to generate awareness about the rights of women. The FGDs ended up discussing in detail continuing the education of women for their upliftment and empowerment. Some of the FGDs also concentrated on the rights of women and the legal provisions like the Domestic Violence Act, the right to inherit property and the PCPNDT Act.

6. Further Plans (100 words):

In 2012-13 we undertook twin projects with a focus on issues of riparian communities so that the river can be revived through two levels of empirical work – scientific and social. The project was planned as a synergistic work informed by strong scientific and socio-economic evidence without alienation from ground realities. We further plan to continue that effort, by moving along the river. We hope to make this an ongoing effort, so that the data thus generated can be used to find coherent solutions for the stakeholders that are environmentally, economically and socially sustainable.

The 2012-13 projects twinned two interrelated investigations, carried out in tandem by a teams of ten students each, drawn from seemingly disparate academic streams. We studied the stretch of

the river between Palla Village, where the river enters Delhi, and Majnu – ka- Tila for development of research instruments and primary scientific study. The socio-economic study focussed on Jagatpur village. We now plan to put the apparatus, research instruments and methodology we developed in these projects to use to broaden our investigations towards finding sustainable solutions for rejuvenating the river. For the next phase we have submitted a proposal under the Innovations Project- More Miles on the Yamuna.

MIRANDA HOUSE

Project Title: Miles on the Yamuna

Project Code: MH-104

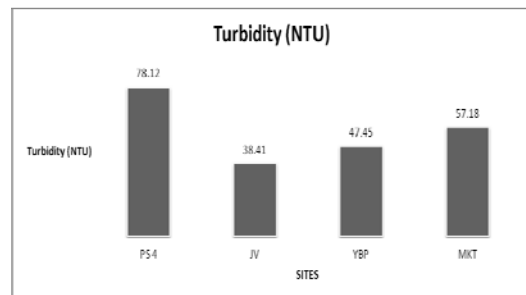
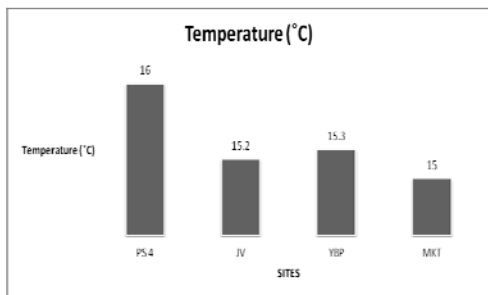
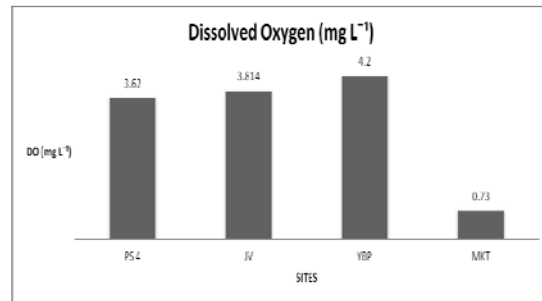
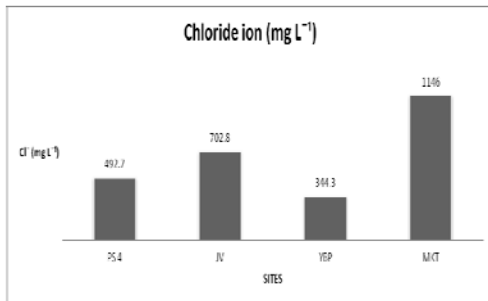


Team working on the bank of Yamuna

1. Objective (150 words):

The primary objective of the project has been to monitor the water quality of the river Yamuna at different locations in the NCT of Delhi and also the quality of the soil on the river banks. The first step was the familiarization with the river – and life on its banks – as it makes its way through Delhi after entering the city at Palla. The research methodology adopted included hands-on measurements of water quality parameters by using commercially available Vernier sensors and real-time data-acquisition system interfaced to computers. Water and soil quality was investigated for various parameters like Temperature, pH, Conductivity, Turbidity, Soil Moisture, Salinity, Chloride ions, Dissolved Oxygen (DO), coliform content and heavy metal content. The sites investigated included Palla Shank, Jagatpur Village, Yamuna Biodiversity Park, Majnu ka Tila, Wazirabad and Khajuri. The seasonal variation in water quality parameters was also studied.

2. Final Findings (300 words):



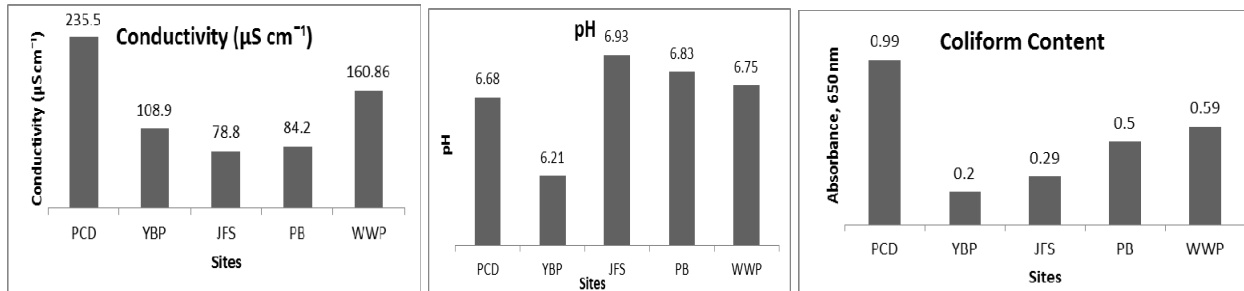
Key: PS – Palla Shank; JV – Jagatpur village ; YBP – Yamuna Biodiversity Park ; MKT – Majnu ka Tila

Majnu Ka Tila was found to be the most contaminated site as clear from the above data showing low DO and high values of Conductivity, Turbidity and Chloride ion concentration. It may probably be due to a combination of two factors: diversion of water to Wazirabad Water Treatment Plant and location of the Najafgarh drain opening close to the site, emptying sewage into the river. Most Probable Number (bacterial count) tests have shown that the samples from Wazirabad still water, Wazirabad flowing water and Majnu ka Tila were highly contaminated with more than 2500 bacterial cells per ml.

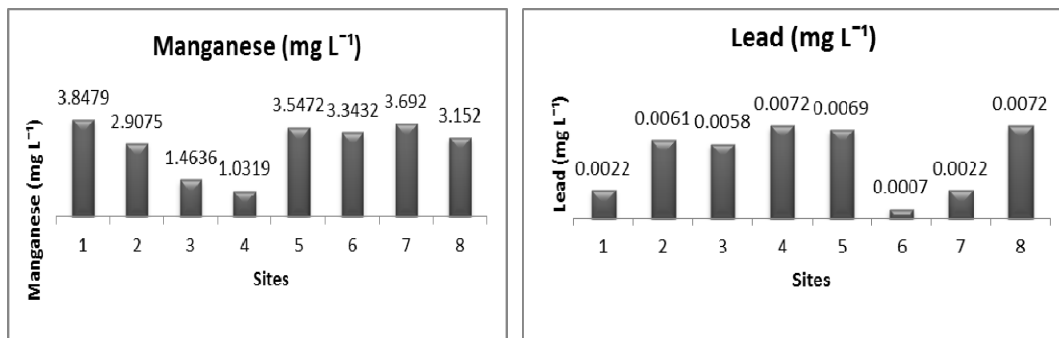
The effect of water volume on concentration of water pollutants can be seen by comparing the data for the water quality parameters in the dry season with that during the monsoon. For samples collected during the monsoon, the pollutant levels are found to be significantly lower.

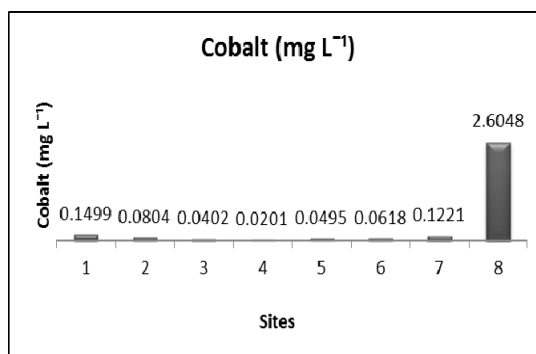
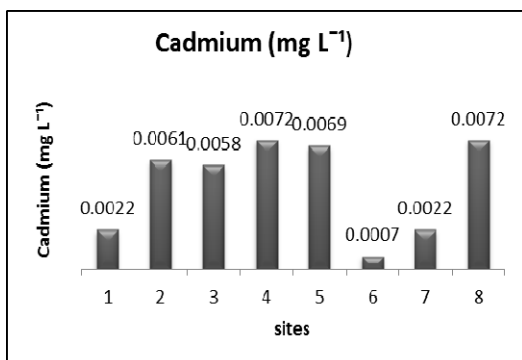
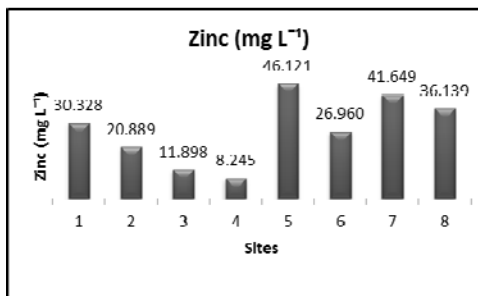
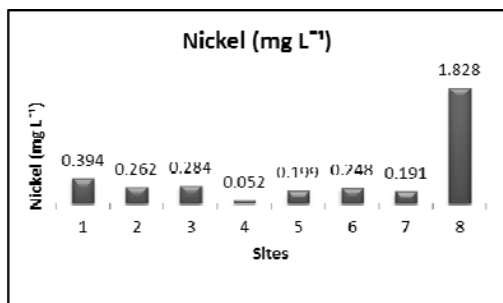
It can thus be concluded that (a) preventing untreated sewage and effluents from being dumped into the river would help to a great extent to bring back the smile on the river Yamuna and (b) increase in water volume reduces the pollution load hence if less water is diverted during the dry season, it will help.

Soil Quality Parameters:



Heavy Metals in Soil:

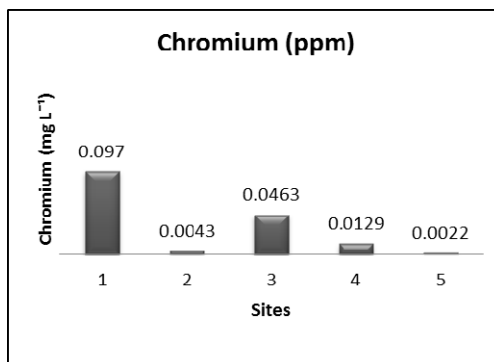
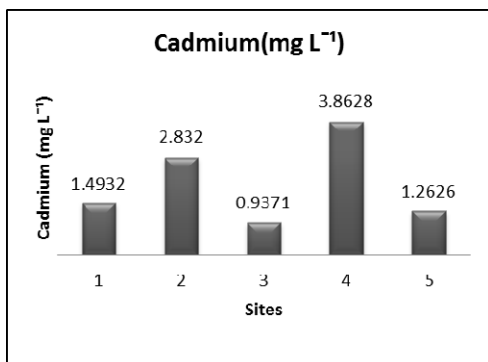


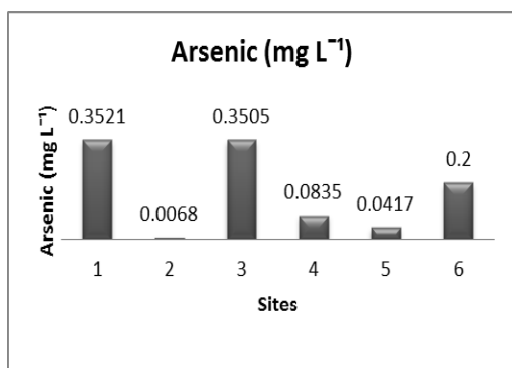
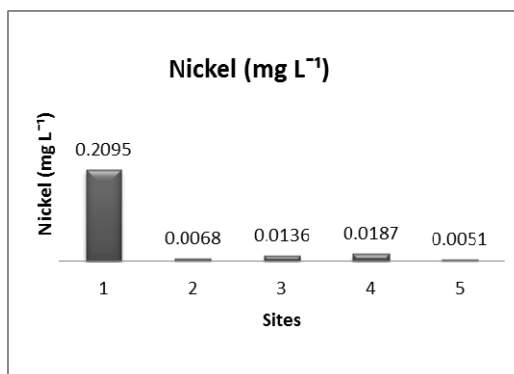
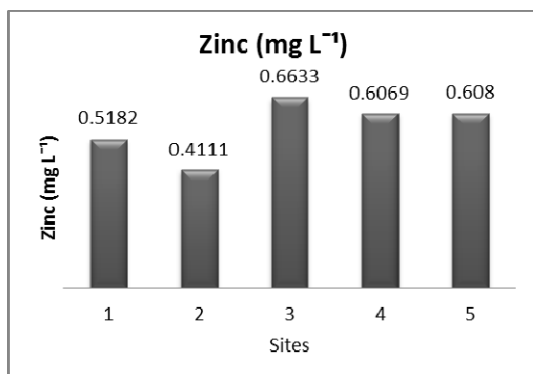
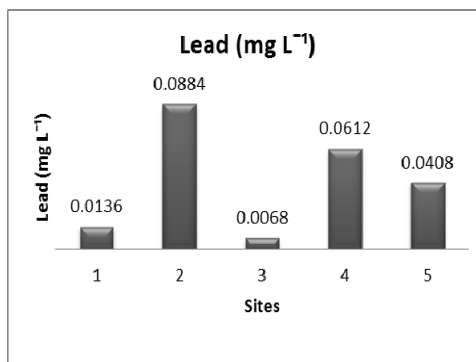
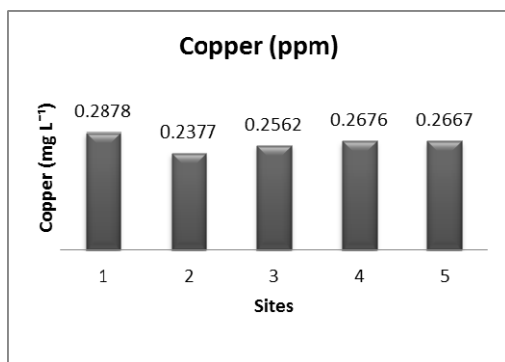


Key: 1. Palla village; 2. Palla check dam; 3. Jagatpur right; 4. YBP phase 2; 5.MKT; 6. Barrage; 7.Jagatpur; 8. MKT farm land

It can be seen that the soil samples are contaminated with Pb, Zn and Mn beyond the safe limits prescribed for these metals (Pb 0.05 ppm, Zn 5 ppm, Mn 0.1 ppm).

Heavy Metal Contamination in Vegetables:





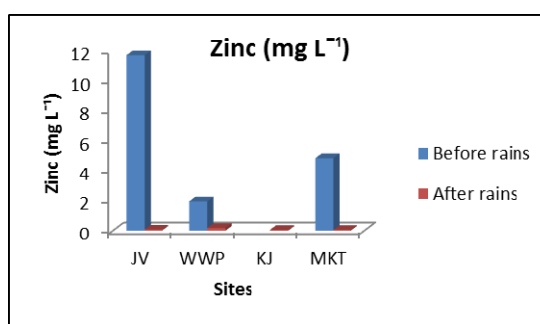
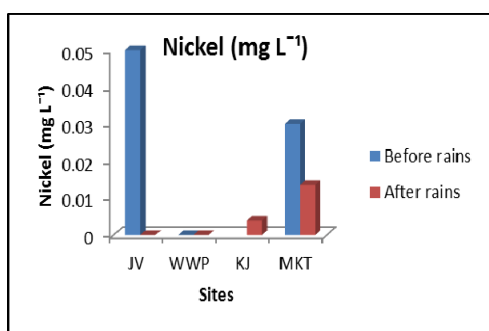
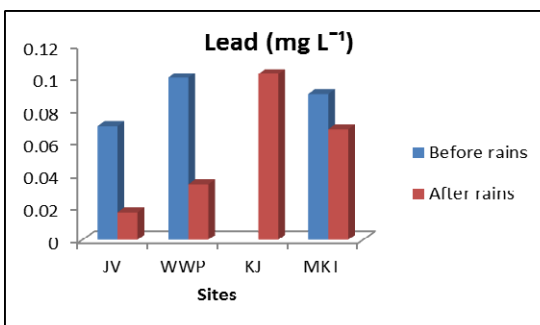
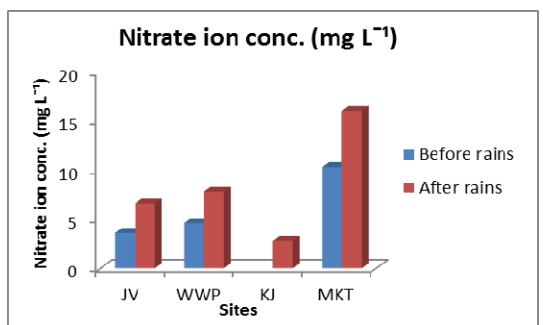
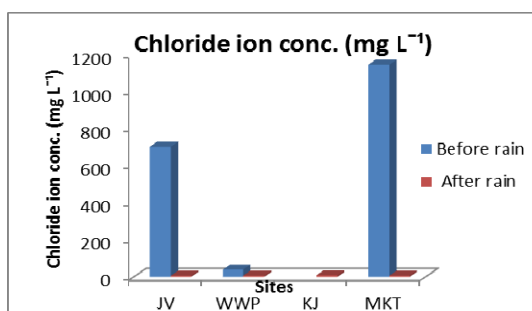
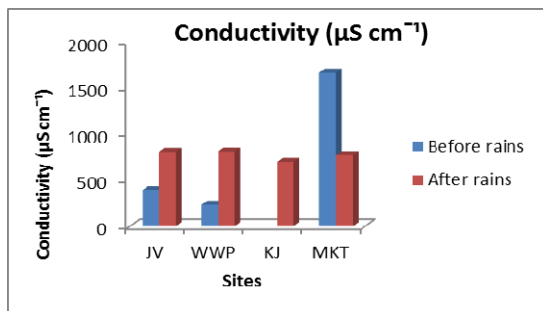
Key: 1. Turnip; 2. Spinach; 3. Bean; 4. Radish; 5. Cauliflower

For the above vegetables, Chromium, Arsenic and Cadmium were found to be in the toxic range. The high values of metal toxicity are due to the fact that the water used for irrigation as well as the soil itself is contaminated with corresponding metals as found during this study.

Seasonal variation in water quality:

| Parameter | Jagatpur | | Wazirabad | | Khajuri | | Majnu ka Tila | |
|--|--------------|-------------|--------------|-------------|--------------|-------------|---------------|-------------|
| | Before rains | After rains | Before rains | After rains | Before rains | After rains | Before rains | After rains |
| Conductivity ($\mu\text{S cm}^{-1}$) | 393.3 | 807.1 | 233.9 | 809.2 | ----- | 698.3 | 1666 | 770.3 |
| Chloride ion (mg L^{-1}) | 702.8 | 6.7 | 40 | 6.8 | ----- | 8.6 | 1146 | 7.1 |

| | | | | | | | | |
|-----------------------------------|-------|--------|------|--------|-------|--------|------|--------|
| Nitrate ion (mg L ⁻¹) | 3.6 | 6.6 | 4.6 | 7.8 | ----- | 2.8 | 10.3 | 16 |
| Pb (mg L ⁻¹) | 0.07 | 0.017 | 0.1 | 0.0341 | ----- | 0.1023 | 0.09 | 0.0682 |
| Ni (mg L ⁻¹) | 0.05 | 0 | 0 | 0 | ----- | 0.0037 | 0.03 | 0.0135 |
| Zn (mg L ⁻¹) | 11.69 | 0.0789 | 1.93 | 0.1831 | ----- | 0.0552 | 4.84 | 0.0578 |



Prior to rains, the water was found to be highly polluted, owing to high values of ion concentration, conductivity and heavy metal content. But tests conducted after the onset of the monsoon, leading to an increase in the volume of water in the Yamuna, showed improved results; most of the parameters now being within safety limits. (Conductivity: 50 - 1500 µS cm⁻¹, Chloride ion concentration: 1-100 mg/L, nitrate ion concentration: 10mg/L, lead: 0.05 mg/L zinc: 1 mg/L.)

A seasonal comparison could not be made between the vegetable samples for heavy metal content due to flooding of the Yamuna banks and consequent submergence of the agricultural land. The higher conductivity and nitrate content of some of the samples is probably due to heavy rains in the catchment area of the Yamuna upstream which caused higher run-off from agricultural land treated with chemical fertilisers.

The above data clearly suggests that allowing more water into the Yamuna, by limiting diversion for irrigation and industrial purposes would prove to be a major step in saving the water body. This would allow the river to self-rejuvenate naturally.

The pollution and encroachment of the river banks has also led to a decrease in the number of migratory birds in the last ten years. Bird species which are indicators of pollution have been spotted like Black-winged stilt and Purple Swamp Moorhen as they feed on the waste dumped on the banks. On the other hand species like Common Kingfisher, indicator of clean water, are rarely sighted. However, the major portion of Yamuna bank is still being used for cultivation of economically important crops like wheat (*Triticum aestivum*), maize (*Zea mays*), rice (*Oryza sativa*), radish (*Raphanus sativus*), watermelon (*Citrullus lanatus*), spinach (*Spinacia oleracea*) and turnip (*Brassica campestris*).

3. Learning for Students (200 words):

The project enabled undergraduates from across courses to work together and learn research methodology through the hands-on investigation process. It brought every student member of the team closer to the Yamuna, the lifeline of Delhi. While exploring the Yamuna's fate in Delhi, students experienced the real-world problems and challenges first hand. The project engaged students in real and thought provoking issues and trained them to think independently, formulate problems and draw conclusions.

From background research to handling equipment, from field visits to brainstorming meetings, from interactions with the twin project members and mentors to interactions with the riparian communities, the project helped us to develop the mindset and skill for critically examining issues. We had to start from designing the project and in the process of doing this, we got to hone our organizational skills and learn time management. The periodic requirement for report submission helped us to assess ourselves on time and improve the design of our project. The preparation and management of the *Antardhwani* Project Stall enhanced our communication and presentation skills. The two-day conference organized in collaboration with TERI for societal sensitization and awareness building on the Yamuna helped us to achieve our goals of bringing various stakeholders together on one platform, awakening interest and awareness on the topic in a section of young people and setting up productive collaborations.

The Yamuna Project has added to our self-confidence, motivated us to do rigorous fieldwork, enhanced our awareness about important environmental issues and increased our inclination and dedication towards research.

4. Benefits to College (100 words):

The Yamuna Project left the team of student researchers enriched with first hand experiences of an environmental issue which impacts society. The awareness and sensitivity acquired by the team diffused into their peer group as well. It helped the core team to widen their understanding of academic achievement and motivate other students to be part of future innovation projects. The enthusiasm and excitement of the project teams were communicated to other students through peer interactions, both structured and non-structured. It highlighted the role of the hands-on approach in education especially with respect to real-life issues and has inspired

another group of students to continue to study the problem beyond the term of the project. The project provided a platform for multidisciplinary interactions among students and mentors. It promoted originality, self-reliance, exchange of ideas and collaboration within and between groups of students and that cannot fail to benefit the institution.

5. Benefits to Society (100 words):

The team interacted with local people, including school students, living close to the Yamuna to make them aware of the impacts of their activities on Yamuna by showing them actual results of water and soil analysis. The report of the team's efforts published in a Hindi newspaper helped a number of people to understand the present degraded condition of the river and the heavy metal toxicity in vegetables grown with Yamuna water.

Through *Antardhwani*, the University Festival and *Rhythms Village*, the public seminar held in collaboration with TERI, people from different sectors of society gained awareness about water and soil quality parameters and the importance of preserving the Yamuna, the lifeline of Delhi.

6. Further Plans (100 words):

The remaining portion of the river Yamuna in Delhi can be mapped with respect to water and soil quality parameters, including their seasonal variations. A survey regarding people's feelings towards Yamuna and their perception of how it affects their lives can be conducted. Young people can be sensitized about the present situation of river Yamuna in Delhi, by conducting sensitization workshops with different schools and colleges of Delhi and NCR. The impact of pesticides on soil and water can also be studied. The impact of festival celebration on the water, such as immersion of idols after Durga Puja, can also be studied. The study of various health hazards affecting the riparian communities would also prove to be beneficial for society in general.

MOTILAL NEHRU COLLEGE

Project Title: Mining in National Capital Region: A Socio-Economic & Environmental Study
Project Code: MNC-101



Students of project team

1. SUMMARY

The teachers of Motilal Nehru College under the Innovation Project of University of Delhi conducted the investigations. Different sand and stone mining sites in Faridabad, the Yamuna banks of Western Uttar Pradesh, old Yamuna basin in Karnal, Kosi region and the Ganges basin are deposited with huge amount of good quality sand; and Mewat, Aandhi among many other sites of National Capital Region and nearby are the locations where stone mining is rampant. A major portion of stone mining in National Capital Region is carried out in the Aravali hills. Both the sand mining and stone mining have definite impact on surface configuration and topography of the land.

Our project's final outcome is based on the conjecture that the large construction activities in the National Capital Region has had more than just ecological ramifications, and therefore, should not be considered separate events. Rather they should be treated as an interconnected experience that resulted in mix social outcomes and health hazards.

Beginning 21st century, India has been witnessing a spurt in infrastructure sector. Our field research revealed that construction of high rise group housing and commercial complexes, growth of new private townships, adding more lanes to highways, expressways, flyovers, bridges, modernization of airports, metros, game villages, stadiums and construction of abodes by ordinary people has given ample impetus for mining large quantities of sand and stone in the form of badarpur.

Rivers are the major sources and suppliers of sand as they replenish themselves every year during four months of monsoon. Several protection groups and environmentalists are raising concern about sand mining of riverbeds. According to them, unregulated and illegal sand extraction might deepen the riverbed, erode riverbanks and prove dangerous to river ecology. In order to save River Yamuna and avoid any catastrophic affect on Delhi, the authorities have rightly acted to regulate sand extraction from Yamuna riverbed. But construction boom in Delhi and surrounding National Capital Region in the bordering states of Haryana and Uttar Pradesh has generated tremendous demand for additional and alternative sources of sand. Quarry dust to some extent is available in the region but its particle size is not suitable for concrete making. Therefore, additional sources of sand have to be found to save the construction industry from difficulties and to check rise in construction costs.

Our presumption is that the state apparatus sought to organize the system of illegal money through these mining activities. But apart from major revenue loss to the state the mining activities in National Capital Region in the light of the ban put by Court also led to severe drainage congestion and obstructed the natural flow of the Yamuna and transformed the region around the river from flood-dependent into a water-deficit, and this majorly affected life of the local population. Perhaps the social disparities widened

as result of the mining activities. The state instead of facilitating the rain deficit areas such as Mewat, preferred to promote mining activities. This has had huge ramifications on the society and economic structure. Disparity of income possibly has led to ever increasing involvement of the local youth in the criminal activities in Delhi and the NCR.

Footprints of miners don't stay on the stone and the sand they mined; yet they are imprinted on the environment. The hills and the rivers have permanent human footprints. Yamuna, now barely alive looks at us like a hopeless patient. Our eyes are fixed on the river and minds echo only one question: where has the water disappeared? And similar is the case with the Aravali hills, which was abode to many wild animals and forests in the past. Now the exposed stones and soil red in color give the look of nude and stripped hill ranges in Delhi, Haryana and Rajasthan. All this is witnessed because of the rampant stone and sand mining over the years in National Capital Region.

Sand is an important aggregate used in bulk in construction industry. Whereas the rivers are the major sources and suppliers of sand, the old hill ranges such as Aravallis are the source of stone and badarpur. Rivers all across India have been subject to extreme exploitation as they replenish themselves every year during four months of monsoon. In northern India, the major sand mining activities take place in the Ganges, specially in Bihar and Uttar Pradesh; River Sone and River Kosi in Bihar; River Chambal at Pipari Sand Mines and across Chambal Bridge, River Ravi and Beas in Punjab and River Yamuna in Haryana and Delhi. In southern states too sand mining is continuing in almost all the major rivers. River Godavari in Andhra Pradesh, River Tungbhadra; Rivers like Palar, Thamiraparani and Sankaraparani in Tamil Nadu, Cauvery in Karnataka and Bharathapuzha in Kerala are witness to sand mining in legal and illegal form for over decades.

Despite concerns raised by the environmentalists about sand mining of riverbeds, it is continuing in unabated form all over. It has been observed that this unregulated and illegal sand extraction has deepened the riverbed, eroded riverbanks and proved dangerous to river ecology. In line with this observation, the Delhi government came out with an order to save River Yamuna and avoid any catastrophic affect on Delhi. Today there are very strict regulations on sand extraction from Yamuna riverbed in Delhi. But river Yamuna flows beyond Delhi as well, in the geographical boundary of Uttar Pradesh and Haryana, a major part of which falls in National Capital Region (NCR) of Delhi. Technically speaking Government of Delhi does not have any say in this part of National Capital Region. At the same time, construction boom in Delhi and surrounding National Capital Region in the bordering states of Haryana and Uttar Pradesh has generated tremendous demand for additional and alternative sources of sand. And therefore, river Yamuna in Uttar Pradesh and Haryana has to bear the pressure. Quarry dust from the Aravali hills are also in huge demand in the region as it is considered as having very good mixing quality with cement. Despite a ban by the Honorable Supreme Court on sand mining and stone mining in the entire National Capital Region, it is continuing.

Inspite of ban on any mining activity in forest land envisaged in Forest Act, 1980, Government of Rajasthan granted nearly 400 leases of marble mines in and around Sariska Tiger Reserve. This mining activity caused havoc to the environment by way of deforestation, degradation of agricultural land, pastures and hydrology of the area resulting in loss of conventional employment and hence income of the local people. Air and noise pollution due to mining activity affected the health of the mine workers. Noise due to blasting accompanied by deforestation affected the habitat of the tiger and other wild animals in the Sariska Tiger Reserve (Chauhan 2001). Local people led by Tarun Bharat Sangh (NGO), went to the Supreme Court of India against this illegal mining activities which threatened to jeopardize the ecosystem of the Tiger Reserve and its inhabitants. The highest court ordered for closer of 262 mines falling within the buffer zones of the national park. Government of India consequently used notification declaring the entire Aravali region (in which also falls Bijolia) as an eco-sensitive area in general and banning mining activities in Sariska area in particular. Since then mining activities has come to a close but the mining lobby is still active to get the stay vacated and carry out mining illegally at some place. Political leadership of Rajasthan is also keen on reopening of the mines.

2. Major Findings

Our investigation have shown that the major environmental problems caused by stone mining activities in Mewat region. The soil samples from the Ghatashamsabad were collected and it was found that the soil is within optimum value with PH of 6.4 and but the humidity of the soil is also very less which makes it little bit difficult to grow crops. The villagers told us that the quality of soil has degraded over the years, making it difficult for them to grow and yield enough crops to run their lives smoothly. Moisture content and PH of soil plays a vital role in germination of seeds and growth of crop. Though there were no traces of any heavy metal found in the soil tested yet the organic matter of the soil is found to be affected due to addition of inorganic matters brought in by silts from the dumpers carrying loads of stones. These silt forms a coating on the soil and affects the soil life system, its salinity and crop productivity. The waste dumps of the mined rocks (consisting of sediments and small pieces of rocks) could be seen littered on the roadside which causes the reduction of moisture levels in soil as well as in air. There is no waste management techniques employed by the mining companies for environment health. The waste dumps also adds to the air, soil and water pollution. The growth of crops mainly depends upon the monsoons. There is shortage of water supply as well. The maximum and the minimum temperature in the village was found to be 3-4 degrees higher than the temperature in Delhi. The rise in temperature could be because of the loss of forest land, air pollution and absence of any stream or lakes in this region. Also gas emissions from vehicular movement and dust from the silts leads to rise in temperature. Another problem is the change in landscape and deforestation, which leads to the increased solar radiation exposure of the deforested land. The water sample collected shows the PH to be 7.5 and the dissolved oxygen is also found to be in permissible limits. Water collected does not contain any heavy metal impurity in this village. The salinity and hardness is also in optimum limit. The reason for the lack of contamination in water might be that since the material mined is sandstone, it generates dust particles composed only of "silica" which is not soluble and being heavy settles down at the bottom of water reservoirs like ponds, wells and mines and does not affect the portability. Also sample collected was from the pumped water where impurities might flow away. Secondly, these villages are located few Kms away from the mining site. There were no streams in and around the villages. So we can conclude that surface water is contaminated within permissible limits and the ground water level changes to lower level due to mining activities. Also there is shortage of water due to scanty rainfall, high temperature and lack of rain harvesting techniques. We could spot small pits and ponds filled with rainwater. These are also home to mosquitoes and microbes, which causes various diseases like Malaria, cholera, gastrorenities etc. This is confirmed with the health data we reported above. The age old Yamuna basin had been undated by river Yamuna from Delhi to Karnal. The Yamuna basin has thus huge amount of sand deposits lying below agricultural land. The extraction of minerals not only provides the building materials but also generate employment to the locals engaged directly in extraction of sand as well as indirectly in transportation and sale of mineral. Our study on the impact of sand mining on agriculture land in the districts of Haryana has revealed decrease in the yield of rice, sugarcane and other crops.

Similarly, Illegal and excessive sand mining in the riverbed of the Manjhawali has led to the depletion of groundwater levels and environmental degradation in the villages on the banks of the river Yamuna. They include the depletion of groundwater; lesser availability of water for industrial, agricultural and drinking purposes; destruction of agricultural land; loss of employment to farm workers; threat to livelihoods; human rights violations; and damage to roads and bridges. It is found that water of river Yamuna is highly contaminated with PH of 5.5 (acidic) and highly deficient of dissolved oxygen. The soil collected from the banks of river found to have PH of about 8.19(basic) and more saline than water with salinity of 1.1. The colour of the soil was greyish brown, thick blocky structure with sticky and clay texture. The high levels of contamination in soil and water leads to the various water- borne diseases like cholera etc. This is supported by the health data. Mining which leads to the removal of channel substrate, resuspension of streambed sediment, clearance of vegetation, and stockpiling on the streambed, will have ecological

impacts. These impacts may have an effect on the direct loss of stream reserve habitat, disturbances of species attached to streambed deposits.

Learning for Students

How students' routine college life became extraordinary, is what this project induced in it. Every Saturday morning, the day of our regular meeting, all of them came with a prepared mind. They were not burdened with their books and it was reduced to a small notepad. During every journey to field they fiercely discussed the objective and findings. They began to feel that there are many possibilities. This was something unusual for them since they could now think themselves and analyse. Looking back, they recall what all they have learnt in this one year. Knowledge that cannot be traded for, knowledge that no books could offer, but can only be achieved through experience. The three Project Investigators were just their guiding force and nothing was thrust upon them and their innovative ideas were given prime importance. We always tried to give them perpetual support. We gave them inputs and taught, trained and explained them various techniques of research. From framing a questionnaire to writing a report, their enthusiasm for research never came down. Their skill to collect data, interview people and collect information from secondary writings for research improved every quarter, and their presentation and writing skills also improved. By conducting continues seminars we were able to rediscover them. They could now experience in practice how interlinked all subjects are. They could now understand that without the historical knowledge it is impossible to understand the people and their minds. Without science one cannot protect the surroundings and without commerce they could find alternatives to enhance the economy of the study area. They also learnt to distinguish between the right and the wrong information and understood the power of unspoken words.

This one year was a saga full of exposure like never before. They felt the gap between the rural and the urban. Understood the intricacies of mining. It brought them face to face with the complex realities; that mining might be the only source of revenue for many. That people might not speak in fear of losing their livelihood and that people could mob around us for help. This project made them see what textbooks could not explain. It was an experience like never before and most importantly at this point in their evolving career.

3. Benefits to College

The college is benefited in every sense. First the research students from the three different fields inspired other students to be active in igniting their minds and improve their analytical and thinking skills. Also when the seminar was conducted on the research methodology, lecture by Professor David Soll enlightened the minds of all those students who took active participation in seminar. This gave the college students an exposure to international approach to research work. It was something that had never happened before in any university across India. At an undergraduate level the students could learn to think about a problem and then execute it keeping in mind the high quality research methods, which are followed worldwide. The Innovation Project has made a beginning of research culture in the college no doubt.

4. Benefits to Society

Society is always benefitted when we reach the grass root level of the makers of society. The college students are the future building blocks of our country since what they do is always reflected back to the upcoming generation. Engaging the students at undergraduate level in research activities is extremely beneficial. Since research having interdisciplinary flavor always provide better solution because it deals with the multiple problems the society is infected with. Research gives the exposure to the students about the various issues and problems in the society and the solution worked out on the observed data helps them contribute some positive inputs. When science and humanities go hand in hand with each other they

can do wonders to the society in terms of development, innovative solutions to the problems and upgrading the every strata of society.

5. Further Plans:

1. To work with some NGO in the studied area and provide innovative solution to their problems.
2. To find different techniques to improve the quality of water, soil and air in the studied area.
3. To help educate the women of the villages in computers/some skills like tailoring etc. so that they can earn on their own and thus could have an alternative means of subsistence other than mining.

RAJDHANI COLLEGE

Project Title: Study on the crucial changes in the Earth's atmospheric system during solar maxima phase using interdisciplinary approach

Project Code: RD-101



Project Investigators, Mentor, Principal & students of Rajdhani College at a regular seminar.

1. Objective (150 words):

Following were the objectives of our innovation project:

- (i) To investigate the change in the temperature of the Earth's atmosphere from solar minimum to solar maximum period.
- (ii) As it has been reported that there are increasing trends in the temperature during last two decades over different parts of the globe, however, this has to be examined in the light of natural variability of the geophysical parameters so that the misinterpretation can be avoided.
- (iii) The ground base observation like radiosonde and Radar are confined to the land region only, on the other hand, satellite measurements provide us information over land as well as over sea and oceans at a fine spatial-temporal resolution. Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC)/ Formosa Satellite Mission (COSMIC/FORMOSAT-3) proves to be an excellent satellite data for the current study. COSMIC is the first mission that uses 6 satellites together to increase the data quality and number of profiles over the globe.

2. Final Findings (300 words):

Influence of solar cycle on temperature changes is investigated using radio occultation measurements by COSMIC/FORMASAT-3. Observations from January 2007 to December 2012 comprising of 25, 92,325 numbers of occultations, almost uniformly spread over land and sea, have been used in this study. The focus of solar cycle influence has been examined over 60°N to 60°S geographic latitudes. The height level at which the solar cycle effect can be observed clearly in temperature could not be assessed. At different height level there are different atmospheric parameters which are also contributing to the temperature variability. But using the impressive data set from COSMIC satellite we are able to detect the effect of solar cycle in the temperature near surface at 2.5 km. A constant rise in the temperature structure along the solar cycle is observed. This change in the temperature structure shows a latitudinal variation with consistency in rise in temperature from solar minima to solar maxima. It is concluded that solar cycle induces

the changes in temperature by as much as 1.5°C , which is considerable amount of rise from climatic point of view.

In addition to the satellite data, we have also made use of NCEP model data over India and globe to examine the change in temperature over past 40 years, it has been confirmed that the rise in temperature is different at different location over the globe. Middle latitudes are found to be seen with rapid change in temperature in comparison to other regions of the globe. Preliminary analysis of trace gases also shows a rising trend, however that needs further analysis to distinguish the respective contribution to the overall change in temperature.

3. Learning for Students (200 words):

A team of students joined this project from the department of Physics, Electronics, and Mathematics. During summer of 2012, our team has started working by gathering information of data acquisition related with solar cycle change and satellite observations of temperature with high accuracy. Then, skillful analysis of the gathered and interpretation of the results were the main theme of the training part.

In the first phase students were trained on MATLAB and other mathematical software along with some other tools which are very well accepted by the scientific community. Over the period of project, students have learnt to work in a team, to give their respective inputs for the large project. In addition, skillful analysis of the data, its graphical presentation, making codes for the mathematical problems, and giving seminars were some of the key components for the learning part of the students.

Students have visited ARIES Nainital, Udaipur observatory, Mount Abu solar observatory, IIT Delhi, NPL New Delhi and some other places during the project. This has immensely helped them to come forward as a trained and confident man power for our society and specially for the scientific community.

They have been trained how to communicate their scientific results at different levels and by giving regular presentations in the lab made them more confident in comparison to their contemporaries.

4. Benefits to College (100 words):

The project was implemented in Rajdhani College as an interdisciplinary approach, involving faculty and students from Physics, Electronics and Mathematics subjects. This has certainly improved our understanding and the ability to work as a team. The most important benefit gained by the college is that the project enhanced our capacity building in terms of trained faculty and students. This new team so formed as a result of the project is ready to take up the next challenging problems of science. A new thinking is prevailing of doing research in collaboration among the different departments of the college. Thus emerging scientific awareness were made possible due to the support of the University.

5. Benefits to Society (100 words):

The project was carried out to bring the results of solar influence on the temperature of Earth's atmosphere. In the current scenario of changing climate, it is important to assess the actual contribution to it from different sources of geophysical events. The project team has taken this opportunity to compute the influence of solar system in terms of temperature using state of the art technology of satellites to provide scientific evidence to the society about this challenging problem. As it is known that climate issues are of prime importance from the policy makers point

of view. Our findings reveal that we have to be conscious to interpret the natural changes as a result of global warming.

6. Further Plans (100 words):

Having gained the good experience of the current project, faculties who worked together have a strong feeling to continue for the linked and desired studies which were not completed due to lack of many factors. Certainly we would go for the analysis of atmospheric trace gas which is observed globally using satellites. The change in the concentration of water vapors, CO₂ and other trace elements are of prime importance for assessing comparative contribution to the temperature and climate change in different seasons over India and globe vis-à-vis changes that may occur due to natural variability of solar and other geophysical events.

1. Objective (150 words):

Candidiasis is one of the most common forms of mycoses caused by *Candida* spp. especially *Candida albicans*. *Candida* is a dimorphic, opportunistic but otherwise commensal organism that turns pathogenic to cause serious infections resulting in high rates of morbidity and mortality, especially in immuno-compromised individuals. Limited therapeutic regimes and availability of fewer broad spectrum antifungal with minimum side effects pose a serious medical concern that needs to be addressed in the treatment of systemic fungal infections. Furthermore, emergence of drug resistant strains is posing an increasing threat to antifungal therapies. The search for novel antifungal, that are affordable, readily available and of acceptable quality has seen the advent of Medicinal plants as a rich source of antimicrobial agents. The use of these natural products or their synthetic derivatives as partner drugs might decrease dependence on conventional drugs and form an attractive alternative to anti-fungal medicines. In this study, *Candida albicans* was used as the test organism to assess the potency of few natural products on the pathogen.

2. Final Findings (300 words):

The students were individually trained in the basic methods of microbial culture, preparation of plant extracts and drug susceptibility testing using three different methodologies, namely toxicological end point determination by MIC, spot assay and filter disc diffusion assay. The preliminary findings using the plant extracts (mentioned in the project proposal) against *Candida albicans* strain CAF2-1 are encouraging. They are as follows:-

- I. The spot assay using the plant extracts prepared in 100% ethanol gave the following novel findings:-
 - a) The fruit-derived materials of *Piper longum* or Pippali had previously been used against six phytopathogenic fungi, namely *Pyricularia oryzae*, *Rhizoctonia solani*, *Botrytis cineria*, *Phytophthora infestans*, *Puccinia recondita*, and *Erysiphe graminis* and had shown effect only in case of *Puccinia recondite*. This is the first report of Pippali extract being used against *Candida albicans in vitro*. The results are quite promising.
 - b) The anti-fungal activity of *Aloe vera* leaf extract has been previously tested against *Aspergillus niger*, *Cryptococcus neoformans*, *Penicillium maneffei*, *Phythium sp.* and *Candida albicans* but the previous studies did not report any anti-fungicidal activity of *Aloe vera* against *Candida albicans*. However in our study encouraging results are obtained with *Aloe vera* leaf extract.
 - c) Anti-fungicidal property is also seen with roots of Ashwagandha- *Withania somnifera*.
- II. The growth curve obtained with various concentrations of Pippali showed marked inhibition of *Candida albicans*.
- III. GCMS-spectra recorded different peaks as per the composition of plant extracts, supported by the mass spectra results. The molecular ion peaks corresponded to the molecular weight of the components which are present in the extract. In the ethanolic extract of *Piper Longum* and *Aloe Vera*, 9 and 10 phytochemical compounds were identified respectively. However further validation needs to be done to identify the specific phytochemical constituent responsible for the anti-microbial activity.

3. Learning for Students (200 words):

- I. The students participating in this program belonged to different science disciplines and had a remarkably good interdisciplinary exposure. Their educational visits for learning the basic techniques to Advanced Instrumentation Research Facility (AIRF), a State of Art National Facility for Advanced Scientific Interdisciplinary Research at Jawaharlal Nehru University gave them a methodical introduction to scientific research at master's and doctoral level.

- II. The students have been trained independently with standard laboratory based microbiological techniques along with other techniques like rotavapor concentration of plant products, Gas Chromatography Mass Spectrometry etc. These would be of immense benefit for their career in pharmaceutical companies.
- III. Students participated in four conferences namely-1) International Conference on Interface between Chemistry and Environment (ICICE-2012)-13th-14th Dec 2012, Dept. of Chemistry, Ramjas College; 2) National Seminar on Current Environmental Challenges and Possible Solutions, Feb.15-16, 2013, Ramjas College: Won Consolation Prize in Poster Presentation; 3) Oral Presentation-Recent Trends in Innovative Research” organized by Sri Venkateswara College, 28th Feb – 2nd March, 2013; 4) National Conference on "Redefining Science Teaching: Future of Education" from 7-9 March, 2013, AND College.
- IV. Students visited DRDO laboratory DIBER- Defence Institute of Bio-Energy Research at Pithoragarh, Uttarakhand (24th July 2012- 27th July 2012). Their herbal garden consisted of about 140 different medicinal and aromatic plants and a well equipped laboratory engaged in Eco-friendly applications for Bio-energy resources. The project team also visited CSIR laboratory CIMAP- Central Institute of Medicinal and Aromatic Plants in Lucknow (5th April 2013- 7th April 2013). CIMAP is equipped with state-of-the-art multidisciplinary laboratories, ultra-modern instrumentation facilities and scientific expertise in agriculture, genetics, plant biotechnology, biochemistry, microbiology, bio energy, apart from development of herbal products. These visits further broadened the horizons of students.
- V. A one day symposium was organized in Ramjas College entitled, “Natural Products- Application in Human Welfare” on 27th June 2013 with lectures by three eminent personalities".

4. Benefits to College (100 words):

The Innovation project scheme was conceptualized by University of Delhi to provide opportunities of research at Undergraduate level to various colleges of the University. The programme was intended to help college teachers overcome a common challenge faced by them i.e. financial assistance for running a research set-up. This was met through the grant received under the scheme. The innovation Project RC101 was successful in setting up a microbiological laboratory in college premises and was able to purchase important instruments *viz. a viz.* orbital shaker cum incubator, vertical laminar flow hood, microscope with camera, weighing balance, pH meter, colorimeter etc. which can be further utilized by the college students upon completion of the programme. Further the programme provided an understanding of the theoretical, practical and transferable skills in interdisciplinary area of sciences, which would enhance the research and scholastic excellence of students and teachers with awareness about the latest development and knowledge of techniques. It also provided an excellent platform for College-University interaction with respect to knowledge exchange.

5. Benefits to Society (100 words):

Nature’s pharmacy includes hundreds of medicinal plants and herbs that can be used for healing and are unexplored. It’s a little known fact that roughly 40 percent of our prescription medicines come from plant extracts or their synthetic derivatives. Medicinal plants give us the ability to treat and cure many ailments including malaria, arthritis, diabetes, glaucoma, heart disease, thyroid disorders, skin conditions and many more. The research undertaken in this project is one such endeavor. In this study, *Candida albicans* has been used as the test organism to assess effective activity of medicinal plant extracts. In depth studies of potent compounds from the present study may also provide clue to their mechanism of action and might help to develop novel therapeutic strategies and identify new antifungal drug targets for MDR reversal in this organism. It will be

interesting to evaluate these derivatives as adjunct medicine or in combination with already known drugs to increase the efficacy by synergistic activity.

6. Further Plans (100 words):

The Innovation project scheme was a successful venture and provided opportunities of research at Undergraduate level to various colleges of the University. The Ramjas College innovation project RC101 gave encouraging experimental results. Of the seven medicinal plants selected for the study, three were found to show potent anti-fungal activity. Initial experiments involved culture maintenance, extraction of plant-derived extracts, growth curve studies, drug susceptibility techniques namely toxicological end point determination by MIC, spot assays and filter disc diffusion assay and others like GCMS, however these results can be further supplemented with further experiments. These include:-

- Flow cytometry analysis to evaluate the effect of test compounds on the physiology of yeast cells e.g. if these compounds initiate apoptosis or necrosis.
- Confocal scanning laser microscopy (CSLM) to evaluate the effect of test compounds on the architecture of yeast cells.
- Gas Chromatograph Mass Spectrometry to check the effect on the metabolome of the yeast cells.
- Further, determination and characterization of the secondary metabolite responsible for antifungal activity using HPLC and NMR techniques.
- Publication of the result in some journal of repute

RAM LAL ANAND COLLEGE

Project Title - Deconstructing farmers' suicides, unraveling paradoxes: Whispers from below.

Project Code - RLA-101



Vagaries of nature



Down but not out!!!



Explaining findings of the field trips to Hon'ble VC. at PRD Agriculture research Institute, Akola, Maharashtra Vidarbha).

1. Objective (150 words) :

Taking processes of classroom learning outside the environs of the institution and establishing a real interface with societal challenges at large, the project examined, apart from other facets, the causal dynamics of the phenomenon of farmers committing suicide in the context of agrarian crisis in large parts of India. The investigation spearheaded by young students proceeded at a micro level with intensive field visits to areas like Bundelkhand (UP & MP) and Vidarbha (Maharashtra) as they had hogged the limelight in recent time for frequent cases of farmers being forced to take their own lives. Adopting a combined approach, the stakeholders in the project to unravel the context focused on details of the local histories/historical narratives and the relevant gazetteers of pre-colonial and post-colonial India, vernacular press clippings, census data and also various economic surveys/inputs. To draw inference or conclusion based on quantified data, students were trained how to make use of computers and concepts of statistics and thereby, upgraded their skill-set as budding researchers.

2. Final Findings (300 words):

Salient Findings explicating phenomenon of peasants committing suicide in areas under study can be summarized as below:

- a) Asymmetrical distribution of land resources: Iniquitous distribution of landholdings in areas under investigation is a by-product of processes which evolved over centuries. Introduction of market dynamics in agrarian arrangements in 19th and first half of 20th century had led to further marginalization of rural poor. Even in post-colonial India all efforts to bring in land reforms has failed miserably thanks to concerted efforts made by a coalition of regressive social forces.

- b) Indebtedness: Genesis of rural indebtedness can be traced to processes located in pre-colonial times. But insufficiency of institutional sources of rural credit has forced rural poor to borrow from non-institutional sources pushing them deep in to debt trap.
- c) Inadequacy of effort to create ecologically viable water resources has made agriculture more susceptible to vagaries of nature.
- d) Need for more diversification of the livelihood sources in rural areas by promoting agro based subsidiary livelihood options like poultry, dairy, goatry etc.
- e) Governance deficit leading to poor delivery in core social sectors like education, food and health on the one hand and the rural infrastructure (irrigation, power, road connectivity) on the other has left peasants with little hope in the system.
- f) Regressive socio-cultural ethos/mindsets also pushed the hapless peasants (especially coming from the upper castes) to take the extreme step of ending their own lives.
- g) Urgent need to extend social security packages to small and marginal farmers to help tide them over crises emanating from crop failure or other natural calamities. Crop insurance for all crops with affordable premium operated at village panchayat level would act as much needed succor for a peasant grossly alienated from himself and society.
- h) Focus on capacity building of farmers for adoption of low cost sustainable farm technology like Pata or mixed cropping pattern and phad irrigation technique or diversion based irrigation being popularized by DILASHA, an NGO in Yavatmal district of Vidarbha in Maharashtra.
- i) Need for policy initiatives to support NGOs mandated for socializing with farmers to change the mindset, enhance social support, remove alcoholic tendency, resolve family disputes and help organizing marriages at low cost.

3. Learning for students (200 words):

Being the mainstays of a collaborative research activity with focus on societal outreach, the students (with societal-scholastic diversities) were enriched in myriad ways. Apart from their exposure to inter/cross disciplinary literature/concepts and nuances of field work based investigation, students also had ample opportunity to hone their inter-personal skills and demonstrate their leadership acumen. Confronted with realities of rural backwaters of India, students felt their conscience being pricked and were reminded of their duty to serve those who are less privileged/fortunate. Moreover during the process of the preparation of quarterly and final report students contributed their own inputs/arguments and in the process improved their capacities to analyse and articulate. Distribution of gadgets like tablets to students and handling of equipment like web-cam, OHP, HD camera, printer etc. by them on a regular basis helped students optimize their learning inputs and gain in self-belief. During the field work (spanning more than a fortnight) students learnt how to negotiate with different agencies and ways to maintain receipts of expenditure in a meticulous manner. They also learnt the art of division of work to improve the productivity of collectivity and supplement each other to harness their innate potential to the maximum.

4. Benefits to college (100 words):

Regular and intense engagement of stakeholders of the project that too on a daily basis in different activities like designing of questionnaire, periodic interaction with mentor, film show, group discussions etc. created a buzz in the college and added lustre to the academic setting of the college. Free learning material given to students in the form of gadgets and books and a stipend of rupees one thousand on a monthly basis inspired many students to become co-participants in activities being undertaken under the project. After the completion of project return of books, equipment etc purchased with project funds to college will benefit the future generation of students.

5. Benefits to society (100 words):

Selection of the research theme (agrarian distress) and field visits by students to rural hinterland of India helped establish a chord between rural have-nots and formal institutions of learning located in urban spaces. Visits by students with urban middle class origins to villages rekindled hope among villagers that urban dwellers with social conscience do care for them. Students too were sensitized of the nature and magnitude of problems faced by different segments of society. A socially aware and conscientious student in his future avatar as a policy planner or a political executive can leverage his insights to help create an egalitarian and humane society.

6. Further Plans (100 words):

Final findings of the project would be published in the form of a book to enable policy makers, activists and people at large to understand the facets of rural distress and consequent alienation among rural proletariat. Seeking funds from different agencies more social outreach programmes would be organized in future to consolidate the linkages between formal institutions of learning and social marginalities. Electronic scrolls would be put up in the most visible spots in the college to publicize the core findings of the project to sensitize young minds of why there is so much of turbulence in the rural/tribal hinterland of India.

RAM LAL ANAND COLLEGE

Project Title: Delineation of Groundwater Potential and Potable Quality in and around South Campus (University of Delhi) Ridge Area

Project Code: RLA 102



1. Objective:

Semi-arid regions of Delhi like South Delhi, with exposed quartzite ridge in places often experience acute shortage of drinking water. Hence, ground water is used extensively for drinking and other purposes in this region. The fast changing land use patterns of the area has considerably affected the infiltration capacity of soil resulting into dried aquifers. In addition, its overexploitation and chemical and biological contamination is a major concern of Indian regulatory agencies due to great risks to human health and drastic changes in aquifer conditions. Therefore, this study of ridge area in Delhi on groundwater potential, water movement through hard rock terrain to aquifers, and its physiochemical and microbiological quality assessment was designed to provide an important input about its potability, depletion levels and future aquifer recharge strategies.

2. Final Findings:

The resistivity survey at ten selected locations followed by structural field study of rock exposures at various places in the area provided significant information pertaining to the role of fractures in groundwater recharge in quartzitic ridge. The resistivity data analyzed so far is well indicative of the fact that trends of joints and fracture derived from the radial VES (using Anisotropy Polygons constructed from the plotting of apparent resistivity along four different azimuths) is in striking agreement with those determined from the field observations. There are three prominent joint sets which appear to be reasonably consistent over the area, striking along N-E, NW-SE and NNE-SSW directions. The fractures are either vertical or steeply dipping. Graphical interpretation of data has revealed an increase in intensity of fracturing with depths.

The trends which have been deciphered by the surface studies were found to be continuing beneath the surface when combined with the data produced by the resistivity survey. This suggests that the joints and fractures which are visible on the outcrops penetrate deep into the ground surface. Depth of groundwater table in this area has reached up to 150 feet and the joints penetrate up to 200 feet. So it can be concluded that the major factor behind the recharge of groundwater in South Campus area and its surrounding are these joints and fractures. Hence a due consideration of trends of joints and fractures in the quartzitic terrain before developing any rain water harvesting program would enhance the recharge capability to a greater extent.

Hydro-chemical analysis of sixteen ground water samples collected from the study area showed that the total dissolved solid (TDS), Hardness, Conductivity, Calcium, Magnesium, Sodium, Potassium, Carbonates, Bicarbonates, Chloride, Nitrate, Phosphate and Sulphate content

of 75% samples was well in the tolerable range according to the ISI standards for drinking water IS-10500-1991 as well as International standards. Levels of Hg, As, Cd, Pb, Ni, Mn and Zn in all water samples were below the maximum limits recommended by BIS and WHO.

Heterotrophic Count ranged from 20 to 2600 cfu/ml, whereas the total number of coliforms (Most Probable Number method) ranged from zero to 600 MPN/100 ml. The presence of thermo tolerant coliforms indicating fecal coliforms was also observed in about 25% of the samples. These samples were collected from parks where sewage water was used to water plants and from car service and washing centre where used water was allowed to recharge the aquifer. The samples collected from institutes and residential area were of good microbiological quality and potable.

3. Learning for Students:

Four students from the Department of Microbiology and six from the Department of Geology were enrolled to participate in this project. After initial few months of guidance they started independent planning and execution of research experiments, analysis of results and trouble shooting of failed experiments. All the students were required to involve in all interdisciplinary research objectives related to resistivity survey and physicochemical and microbiological quality assessment of groundwater. They worked in the field to collect resistivity data by using water resistivity meter to determine water potential and to identify the water movement to aquifers from studies on joints and fractures present in hard rocks. They are well versed and trained to carry out complete chemical analysis of ground water samples with good reproducibility. Similarly, all students learned to use microbiological techniques to check safety of drinking water. Above all this scientific learning, they were asked to correlate the data of resistivity, joints and fracture, and chemical and microbiological analysis and plan future strategies for designing aquifer recharge models to support rain water harvesting systems. Students improved their presentation skills by presenting their results during a seminar organized in the college in front of senior scientists and professors of this field and a large student community.

4. Benefits to College (100 words):

RLA college and its neighbors were facing acute shortage of water during summers as most of the wells dried. Even installation of rain water harvesting system in the college did not bring much relief though supported by a very large catchment area. This project was envisaged keeping this problem in mind so that a rain harvesting model could be designed for this area to maximize the recharge of aquifers along with diversion or blockage of flow of water during percolation. Resistivity survey in college and study of joint and fractures present in rocks located on North of the college building has provided enough data that can be transformed into a model to identify a new site for rainwater harvesting to recharge aquifers and for drilling of new wells to maximize the groundwater availability. Through this grant, college has been equipped with instruments like resistivity meter which is an important component of hydro-geological investigations.

5. Benefits to Society:

The residents in the area of this study use groundwater for drinking and other household purposes. It will be a great relief to all of them to know that the water consumed by them is safe to drink even without using any specific treatment/process. Another issue addressed through this study would be the demarcation of sites in the study area where drilling of wells could be more fruitful and economical in terms of groundwater yield and its continuous recharge.

6. Further Plans:

A seminar in the college was organized under the auspices of this project in which senior scientists from Ministry of Water Resources and Central Groundwater Control Board and IIT, Delhi were

invited. The findings of this project were applauded by all of them. On the basis of data presented during seminar, they encouraged us to apply for grants to Ministry of Water Resources through University for setting up a chemical and microbiological testing laboratory in the college for assessing ground water quality. Extension of this study to cover a larger hard rock area for survey of resistivity and groundwater quality through another project is also planned. Two research papers on the results generated from this study will be written and submitted for publication as soon as possible.

SATYAWATI (EVE)COLLEGE

Project Title: An Exploration of the Issues and Concerns of College-Going Young Adults through Interactive Theatre Activities

Project Code: ST(E)-101



Wide participation; strength of the project

1. Objective (150 words):

to develop a student-centred and student-friendly interactive platform.

- to identify the various pressures, complexes, and personality disorders of college students.
- to develop a research methodology that can incorporate elements of theatre techniques and other art forms such as photography, videography, literature, painting/sketching supplemented with questionnaires, readings and open discussions.
- to provide college teachers with a rich insight into the minds and personalities of students through the findings of the project, leading to a more productive academic association between them.
- acquisition of valuable technical, communication and academic skills by our students pertaining to the disciplines of theatre and education through the entire process of the project.
- to develop and present a play based on the real experiences/stories of college-going young adults, through interactive theatre workshops.
- to present the findings of the project at the seminar

2. Final Findings (300 words):

A.CRUCIAL ISSUES AND CONCERNS OF STUDENTS IDENTIFIED AT VARIOUS INTERACTIVE WORKSHOPS:

(i)The Security of Women: This issue springs from the imbalances in societal attitudes. There is a special need to sensitize males whose own pressures are manifested in the form of oppressive behaviour towards women and a strong urge to control the lives of others. Insecurity is confronted by women almost everywhere—at home; while commuting by bus/metro/autorickshaw/train; in markets; in and outside college campus; on the streets and in the virtual world of facebook/internet.

(ii) Student-Teacher Relationship: College as an exciting world of freedom, opportunities and growth; expectations of students about the role and vision of teachers; behaviour of teachers and students in and outside class-room.

(iii) Student-Student Relationship: Groupism among students; regionalism; lack of communication; relationship between the two sexes; gender discrimination; and peer pressure.

(iv) Generation Gap: Rigidity and non-acceptance of ideas of others; between parents/grandparents and students; between some teachers and students; conflict resulting from differing ideas/ideologies; building up bridges between generations.

(v) Identity Crisis among Students: Choosing a career; Pressure of competition within and beyond college; image-building; fears and complexes.

B. RELEVANCE OF OUR STUDENT-FRIENDLY INTERACTIVE PLATFORM:

There is a pressing need of a student-friendly platform for self-expression in all colleges. It should be a space for exploring possibilities, where everyone is a resource, not a liability. This platform must be non-intimidating, non-competitive, and non-judgmental. Here, participants should be free from the pressure of success or failure and wrong or right. Releasing pressures on this platform by sharing ideas and experiences through various activities helps to enhance the learning ability and coping with class-room pressures and various other challenges of life.

C. A script of the play 'SABHI PRASHNA ANIVARYA HAIN' based on the findings of the project.

3. Learning for Students (200 words):

The project was designed and executed in a manner to ensure that the students acquire valuable technical, academic and life skills as listed below:

TECHNICAL AND ACADEMIC SKILLS:

- *Still photography using an SLR camera
- *Videography
- *Developing questionnaires
- *Analyzing and interpreting data collected
- *Drawing inferences
- *Taking notes of seminars, discussions and improvisational performances.
- *Writing individually and collectively

THEATRICAL SKILLS

- *Designing and conducting sessions of a theatre workshop
- *Giving clear instructions
- *Listening purposefully
- *Communicating with a group/individuals
- *Making still images
- *Thought tracking in still images
- *Doing improvisations on the spot
- *Developing and writing stories/scripts for performance

*Using imagination creatively

MANAGEMENT AND LIFE SKILLS

*Time management

*Crisis management

*Team work

*Assimilating various points of view

*Tolerance of others' points of view

*Searching for reasons behind the behaviour of others

*Handling tasks in a responsible and efficient manner

*Identifying and overcoming own fears and complexes

*Exploring new ideas

*Learning from others

*Planning and organizing a seminar

*Making a presentation in a seminar

4. Benefits to College (100 words):

The project has offered an innovative and extremely valuable platform to students where they can share their ideas, experiences and problems in an uninhibited manner. The teachers play the role of facilitators and moderators of the proceedings of the interactive sessions. Students also acquire a number of technical, academic and life skills. Releasing pressures by sharing through various activities will enhance the learning ability of the students and they will be able to cope with class room pressures and various pressures of life in a more confident manner. They become sensitive to the issues and concerns of contemporary youth.

The project involved more than 50 students and a number of teachers actively. Hence an innovative approach in their teaching has been initiated while the students have developed an aptitude for learning through exploration.

5. Benefits to Society (100 words):

Presently higher education is going through a crucial phase of qualitative changes in order to meet the demands of national and international job markets and nation-building. The present project aims to streamline the vast resources of energy and creative potential of college students by providing them with an innovative platform for self expression and exploration of their own potential for growth by overcoming complexes and pressures. It also aims to develop life skills of the students alongside various technical skills, so that when they pass out of the college they will be valuable assets to society as well as sensitive human beings with analytical mindsets.

Through workshops the students have learned the value and need of providing space to others and respecting their individuality, which is a dire need of contemporary society.

6. Further Plans (100 words):

We plan to continue in our college the interactive platform designed by our project team. We aim to involve a large number of students and teachers in our interactive and participatory workshops. Audio-video footage of our activities will be carefully maintained and discussed/analyzed with experts from time to time. We will offer assistance and know-how to other colleges who are willing to offer such an interactive platform to their students.

We plan to explore further and implement in teaching the findings of our project.

SATYAWATI COLLEGE EVENING

Project Title: Emerging Gram Panchayat Leadership in Rajasthan: A comparative Study of Sri Ganganagar (SC), Alwar (General) and Banswada (ST).

Project Code: ST(E)-102



Project team with the Vice Chancellor Prof. Dinesh Singh during Antardhvani festival

1. Objective (150 words):

The broad objective of the project was to investigate the functioning of the gram panchayat leadership in three districts of Rajasthan viz. Sri Ganganagar (SC), Alwar (GEN) and Banswada (ST). The main objectives of the project were as follows:

- i. To examine the factors like caste, gender, level of education, occupation, family background and affiliation/loyalty to a specific political party which may affect the emergence of leadership at the grassroots level.
- ii. To investigate, whether provisions of reservation of seats at gram panchayat level based on caste and gender helped in any manner the process of emergence of leadership among the weaker sections of society including women.
- iii. To enquire, whether the leaders working at panchayat level encourage wider participation of people in planning for development from below for realizing the dream of *inclusive growth*.
- iv. Finally but more important objective was to provide the students an opportunity to carry out the work of field investigation and an exposure towards the difficulties/challenges usually beinSg faced in such activities.

2. Main Findings (300 words):

Important data were collected through questionnaire based field survey of the three districts of Rajasthan. Active interactions with the villagers across different caste, gender, religion and socio-economic status helped us understand different dimensions of the working the panchayati raj system.

The common rural masses were quite concerned about their deprivation from various schemes of public welfare and decision making process at the panchayat level. It created a sense of frustration in their mind which resulted into their reluctance to attend gram sabha. There were other reasons like dominance of the powerful in the representative bodies, the distance of the venue from their residence, lack of proper information/notice of meeting and attitude of panchayat representatives towards their problems which created a kind of indifference/apathy of the people to participate in the panchayat affairs particularly the grama sabha.

It was observed that number of women got reasonable degree of representation in the system but proxy sarpanchas were also rampant in the form of *sarpanchpati* (husband), *sarpanch dewar* (brother-in-law) or

sarpanch sasur (father-in-law) etc. Thus women were deprived from the real decision making process and their empowerment remains an objective to be realized. It was also observed during interactions with bureaucracy at the district level that they were largely evasive towards the questions related to malfunctioning of gram panchayats and usually protective towards the panchayat representatives (real or proxy).

Majority of the people who attended the meetings of gram sabha were guided mainly by their personal problems like inclusion of their names in BPL list or schemes like MNAREGA, etc. besides problem related to water and sanitations. It was unfortunate to note that rather than the issues of common good, deliberations in the Gram Panchayat centered around personal grievances which appears to normal given the socio-economic and educational level of the villagers. Normally women from rich and socially advanced family were indifferent to attend the gram sabha meetings. Fortunately, women from poor and socially backward families were more eager to participate in meeting of gram sabha.

3. Learning for Students (200 words):

This innovative project has been a source of great learning experience for the students. They learnt the technique of sharing their knowledge amongst themselves, with their teachers and experts. With the progress of the project they were exposed to nuances of research methodology.

Interactions with mentor and expert/s gave them insights to the limitations and strengths of research methodology in general and its application in real life situations. They were exposed to diverse socio-economic realities of the three district of rajasthan. Field-trips have been eye-opener for most of them. Even though few students had rural background, but the deprivation visible in the villages has been very illuminating. Since research questions focused on the nature, significance and limitations of participatory governance, students could see the gap between law on paper and its actual implementation at local levels. They were aghast to note that despite constitutional equality, numerous methods of discrimination is rampant in the society. It was the first experience of all the participant students to remain in such a close contact with their teachers to share their feelings, experiences and receive valuable inputs regarding the project work. On several occasions in the field, the students applied some innovative ideas to get the information revealed from the villagers which otherwise was difficult to decipher.

4. Benefits to College (100 words):

The project is beneficial not only for the students and teachers but also for the college as an institution. The award of the project in the name of the college (students and faculties) and its successful completion has sent an important message among the students and teachers that research should be an important component of overall academic pursuit even at the undergraduate level.

The name of college under the University of Delhi was spread in media, among the public and bureaucrats. Further, the ANTARDHWANI festival of the University was also represented by our College and it drew significant amount of attention from other colleges and general public which demonstrated the academic potential and strength of the College.

5. Benefits to Society (100 words):

The findings of the study are very relevant for the social thinkers, policy makers, government and academicians. Interactions of villagers with students helped in spreading the awareness about various government sponsored programs and benefits they derive from it. Students took initiative to share with locals the methods and processes of securing benefits of numerous schemes of social welfare through participatory governance, i.e., participation in deliberations of Gram Panchayats.

A very important benefit to society can be seen in the fact that these students became carrier of ideas and significance of participatory governance to the far flung areas of India. .

6. Further Plans (100 words):

The future plans related to the project can be envisaged for the students as well as faculty members. The students related to the project are planning to devote their time to welfare of the society in general and oppressed sections of society in particular. They would also make use of knowledge experiences gained during the work for their future studies.

Teachers are planning to publish the findings of the project with due institutional support so that the findings of the project could be disseminated to the society at large. The equipments purchased under the project would be used to during the teaching learning process.

SHYAM LAL COLLEGE

Project Title: “साप्ताहिक बाजार: रोज का संघर्ष” (खुली अर्थव्यवस्था में साप्ताहिक बाजारों का सामाजिक-सांस्कृतिक-आर्थिक और मनोवैज्ञानिक अध्ययन एवं उसकी प्रासंगिकता)

Project Code: SLC – 101



सीलमपुर (वीरबाजार) का विहंगम दृश्य
(प्रत्यक्षदर्शियों के अनुसार यहां 50,000 -1,00,000 लोग हर सप्ताह बाजार में खरीददारी के लिए आते हैं)

1. Objective (150 words):

- क. भारत में बाजार के विकास के विविध चरणों का ऐतिहासिक विश्लेषण ताकि इसके सापेक्ष हाट और बाजार की स्थिति का सम्यक विश्लेषण किया जा सके।
- ख. साप्ताहिक बाजार के विविध पहलुओं का अध्ययन एवं सर्वेक्षण।
- ग. इस अध्ययन एवं सर्वेक्षण के आधार पर साप्ताहिक बाजार के विविध पहलुओं पर छात्रों के सहयोग से इस बाजार का साहित्य विकसित करना।
- घ. इस बाजार के ऊपर डाक्यूमेंट्री फिल्म के रूप में डिजिटल डेटा तैयार करना।
- ड. सर्वे के अंतिम निष्कर्षों के विश्लेषण के आधार पर नीति-निर्धारकों की सुविधा के लिए जरूरी प्रस्तावों का संकलन

2. Final Findings (300 words):

- क. बाजारों के विकास के ऐतिहासिक प्रक्रिया को दर्शाने के लिए “बाजार : इतिहास और संस्कृति” नामक पुस्तक का लेखन इस इनोवेशन प्रोजेक्ट के अंतर्गत किया गया।
- ख. साप्ताहिक बाजार के विविध पहलुओं पर साहित्य निर्माण के लक्ष्य को ध्यान में रखकर दूसरी पुस्तक “साप्ताहिक बाजार : रंग – बहुरंग” लिखा गया।
- ग. अध्ययन से यह पता चला कि साप्ताहिक बाजार पारंपरिक एवं औपनिवेशिक हाट बाजारों का ही विकसित और परिवर्तित रूप है जो आधुनिक समाज का एक अवशिष्ट अंग होकर भी आधुनिक समाज विशेषकर अधिनस्थों को बड़े पैमाने पर जीविकोपार्जन का साधन उपलब्ध करवा रहा है। यद्यपि सरकार अपनी नीतियों द्वारा इस बाजार को औपचारिक स्वरूप प्रदान करने को तत्पर है परंतु इसकी रोजगार प्रदायणी

क्षमता एवं आमदनी के निचले स्तर की जरूरत की राजनीतिक परिस्थिति के कारण किसी तरह के गुणात्मक पुनर्निर्माण की स्थिति से बचकर निकलने की चेष्टा करती रही है।

- घ. इस बाजार में भागीदार वेंडरों की अलग-अलग श्रेणी है जिसमें कुछ नवागंतुक हैं तो कुछ 20 वर्षों से अधिक समय से रोजगार अर्जित कर रहे हैं।
- ङ. इस बाजार में भागीदार ज्यादातर वेंडर्स 15 से 20 प्रतिशत लाभ के रूप में कमाते हैं, वहीं कुछ ऐसे वेंडर्स भी हैं जिनका लाभ लागत का 30 प्रतिशत है।
- च. सर्वे के मुताबिक 12 से 15 प्रतिशत वेंडर्स की आय 15000 से अधिक है।
- छ. इस बाजार से भागीदार वेंडरों को इतनी आय प्राप्त हो जाती है जिससे उनमें से ज्यादातर 6000 से 10,000 रुपये का मासिक खर्च आसानी से उठा पाते हैं। कुछ वेंडरों की मासिक खर्च तो 15000 रुपये से अधिक है।

3. Learning for Students (200 words):

- क. शोध छात्रों द्वारा साप्ताहिक बाजार पर शोध-आलेख तैयार किया गया जो पुस्तकाकार रूप में “साप्ताहिक बाजार : रंग – बहुरंग” नाम से प्रकाशित हुई। दिल्ली विश्वविद्यालय के बी.ए. के छात्रों को शोध लेखक होने का गौरव प्राप्त हुआ। विश्वविद्यालय के इतिहास में यह एक अनोखी पहल है।
- ख. शोध छात्रों ने तकनीकी प्रशिक्षण में कुशलता एवं दक्षता हासिल की (वर्ड्स, एक्सेल, पावर प्वाइंट, फोटोग्राफी, डोक्यूमेंट्री फिल्म निर्माण प्रविधि सीखा)।
- ग. शोध छात्रों ने “पावर प्वाइंट प्रेजेंटेशन” बनाना सीखा और साप्ताहिक बाजार पर प्रेजेंटेशन तैयार कर विश्वविद्यालय को हाफयर्ली रिपोर्ट के साथ उसकी सॉफ्ट एवं हार्डकॉपी भेजा।
- घ. शोध छात्रों द्वारा सेमिनार प्रेजेंटेशन किया गया जिससे उनकी अभिव्यक्ति कौशल में संवृद्धि हुई।
- ङ. शोध-छात्र पुस्तकीय एवं सिलेबस के सैद्धांतिक ज्ञान से बाहर निकलकर बाजार एवं समाज से सीधे जुड़े और व्यावहारिक ज्ञान अर्जित किया।
- च. छात्रों ने शोध की बारीकी एवं पद्धति को जाना। इस क्रम में वे तथ्यों, आंकड़ों, साक्षात्कारों, विवरणों आदि के संचयन, निरीक्षण, परीक्षण एवं उसके आधार पर निष्कर्ष निकालने की पद्धति को सीखा।
- छ. शोध छात्रों में एक कुशल, प्रशिक्षित, योग्य, तकनीकी रूप से दक्ष एवं सैद्धांतिक एवं व्यवहारिक गुणों से युक्त शोधार्थी के गुण विकसित हुए जो आगे चलकर उन्हें उच्च कोटि का शोधार्थी बनाएगा।
- ज. इस शोध के माध्यम से छात्रों ने बाजार के मेकेनिज्म को जाना – समझा।
- झ. भारत के विशाल असंगठित क्षेत्र, उसकी कार्य – पद्धति, रोजगार क्षमता, विशेषताएं एवं खामियों को जाना।

4. Benefits to College (100 words):

- क. कॉलेज को शोध-केंद्र की नई संभावनाओं के रूप में विकसित करने की कोशिश इस प्रोजेक्ट के माध्यम से की गई।
- ख. इस इनोवेशन प्रोजेक्ट के माध्यम से कॉलेज के अन्य प्राध्यापकों में शोध के प्रति जागरूकता पैदा की गई। शोधों के प्रति उनमें स्वाभाविक आकर्षण पनपा और लोगों में इससे जुड़ने एवं काम करने की

भावना पनपी। यही वजह है कि आगामी प्रस्तावित प्रोजेक्ट (2013 – 14) के लिए पांच आवेदन पत्र श्यामलाल कॉलेज से विश्वविद्यालय को भेजे गए।

- ग. सेमिनारों एवं वर्कशॉप के माध्यम से कॉलेज के अन्य प्राध्यापकों एवं छात्रों का ज्ञान संवर्द्धन हुआ जिससे कॉलेज के एकेडेमिक्स ग्राफ को ऊंचा उठाया गया। श्यामलाल कॉलेज के इतिहास में एक कैलेंडर वर्ष में सभी विभागों ने जितने सेमिनार आयोजित नहीं करा पाए उससे ज्यादा सेमिनार सिर्फ इस प्रोजेक्ट के तहत किए गए।
- घ. कॉलेज में एक्यूपमेंट की खरीद से कॉलेज एवं प्राध्यापक तकनीकी रूप से समृद्ध एवं दक्ष हुए। एक किस्म से दोनों एम्पावर हुए।
- ड. सर्वे के दौरान जब बाजार में आम लोगों से मिले तो उन्हें जानकर हैरानी हुई कि श्यामलाल कॉलेज “साप्ताहिक बाजार” पर रिसर्च कर रहा है और उनकी स्टीरियोटाइप धारणा कॉलेज के बारे में काफी बदली। यहां तक की एम.सी.डी. के अधिकारियों ने कॉलेज के इस शोध को अवलोकनार्थ मांग की ताकि नई नीतियां बनाने में मदद मिल सके। यह कॉलेज की छवि के लिए बड़ा अवसर है।

5. Benefits to Society (100 words):

- क. साप्ताहिक बाजार सरीखे अनौपचारिक क्षेत्र पर हुए संभवतः पहले विशद अध्ययन से कुछ उन अनछुए एवं महत्वपूर्ण तथ्यों की जानकारी सामने आयी है, जिनका लाभ उठाकर इस बाजार के अर्थशास्त्र को और अधिक मजबूत किया जा सकता है, जिसका अंतिम परिणाम न्यायशील समाज की स्थापना में सामने आ सकेगा।
- ख. इस अध्ययन में साप्ताहिक बाजार से संबंधित तथ्यों को सर्वे तथा फील्डवर्क द्वारा पहली बार सामने लाने का प्रयास किया गया है जो नीति निर्धारकों के लिए महत्वपूर्ण स्रोत हो सकता है।
- ग. इस अध्ययन द्वारा हवाई संपत्ति निर्माण के कुछ महत्वपूर्ण सूत्र प्राप्त हुए हैं जो गरीब, वंचित, बेसहारा लोगों को भी संपत्ति संबंधी सपने दिखा सकते हैं और उसे साकार कर सकते हैं।
- घ. इस अध्ययन से यह भी स्पष्ट हुआ है कि सस्ते रोजगार दिलाने में असंगठित क्षेत्र का यह बाजार महत्वपूर्ण भूमिका निभा सकता है।

6. Further Plans (100 words):

“साप्ताहिक बाजार : रोज का संघर्ष” नाम से साप्ताहिक बाजार के विविध आयामों को समझाने के लिए हम एक तीसरी पुस्तक लिखने का विचार कर रहे हैं। जिसमें न केवल इस बाजार पर किए गए निष्कर्षों का विश्लेषण किया जाएगा बल्कि इस बाजार के भविष्य में पुनर्निर्माण के संभावित मॉडल पर विचार किया जाएगा तथा जरूरी अनुसंधान भी की जाएंगी जिससे नीति – निर्धारकों को सहायता प्राप्त हो सके।

SHYAM LAL COLLEGE (EVENING)

Project Title: आदिवासी महिलाओं द्वारा वन संरक्षण : जमुना दुहू के प्रयासों के संदर्भ में
Project Code: SLC (Eve.)-102



दिल्ली विश्वविद्यालय अन्वेषण परियोजना, कोड-101
श्याम लाल कॉलेज सांध्य, दिल्ली विश्वविद्यालय



प्रो. एम.पी. सिंह



पर्यवेक्षणक

प्रस्तुत शोध विषय "आदिवासी महिलाओं द्वारा वन संरक्षण : जमुना दुहू के प्रयासों के संदर्भ में" मेरे दिशा-निर्देशन में लिखा जा रहा है। इस शोध में सतत विकास एवं पारिस्थितिकीय नारीवाद की सैद्धांतिक पृष्ठभूमि को ध्यान esa रखते हुए जमुना दुहू द्वारा गठित वन संरक्षण समिति के प्रयासों का समकालीन विश्लेषण किया गया है और यह शोध अपने-आप में एक अनूठा प्रयास है जो झारखण्ड के आदिवासी जीवन संतालों के विशेष संदर्भ में, वन संरक्षण समिति में जमुना के पारिस्थितिकीय प्रयास, भारतीय वन अधिकार कानून का समीक्षात्मक विवेचन व मूल्यांकन करता है।

इसके साथ ही नक्सल प्रभावित क्षेत्रा होने के बावजूद इनके द्वारा किए गए फील्ड-वर्क में मैं इनके साहस की प्रशंसा करता हूँ। इस शोध में नवीनता, रोचकता व सजीवता को बनाए रखने हेतु 20 मिनट की डॉक्यूमेंट्री फिल्म "Be Victorious in Such Difficulties: Lady Tarzon Jamuna Tuddu" का निर्माण किया जा चुका है जिसके उपरान्त यह शोध जमीनी वास्तविकता को भी प्रदर्शित करेगा। अब तक रिपोर्ट के सभी भागों पर लेखन कार्य किया जा चुका है।

मैं अपनी तरफ से शोध समूह के सदस्यों और विद्यार्थियों को शुभकामनाएँ देता हूँ।

प्रो. महेन्द्र प्रसाद सिंह
राजनीति विज्ञान विभाग
दिल्ली विश्वविद्यालय

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रीतिश भारद्वाज



अश्विनी जस्रल



रामरूप मीणा

प्रस्तुत शोध में जमुना द्वारा गठित वन संरक्षण समिति की कार्यप्रणालियों का समीक्षात्मक विवेचन करते हुए इनके प्रयासों की झलक को पारिस्थितिकीय नारीवाद और सतत् विकास की सैधांतिक मान्यताओं के संदर्भ में खोजने का प्रयास किया गया है। इस शोध हेतु मुतुरखम गाँव व वन में फील्डवर्क के साथ ही समिति की गतिविधियों से संबंधित मौलिक दस्तावेजों का विश्लेषण करते हुए दिल्ली विश्वविद्यालय, जे.एन.यू., जामिया, इत्यादि विश्वविद्यालयों के अनेक विशेषज्ञों से भी विचार-विमर्श किया गया है और इसमें हमारे सभी विद्यार्थियों का प्रशंसनीय योगदान रहा है। 'कथनी के बजाय करनी' पर जोर देते हुए जमुना दुहू ने निःस्वार्थ अदम्य साहस का परिचय देते हुए पर्यावरण संरक्षण में अपना असाधारण योगदान दिया है। अतः इस प्रकार के स्थानीय स्तर पर किए गए प्रयासों को हमें पर्यावरण संरक्षण में सबसे अधिक महत्व देना चाहिए और ऐसे लोगों को प्रोत्साहन और पहचान मिलनी चाहिए जो आज हाथिए पर होने के बावजूद देश के पर्यावरण संरक्षण में अपना अमूल्य योगदान दे रहे हैं।

प्रस्तुत शोध में झारखंड राज्य के पूर्वी सिंहभूम जिले में अवस्थित मुतुरखम गाँव को एक आदर्श

पारिस्थितिकीय गाँव Model Ecological Village) के रूप में प्रस्तुत करने का प्रयास किया गया है। प्रस्तुत शोध में सतत् विकास की अवधारणा, इसके आधारभूत सिद्धान्तों जैसे पर्यावरण सुरक्षा, पारिस्थितिकीय सन्तुलन और आर्थिक दक्षता 3-E Environment al Protection,



Economic Efficiency & Ecological Balance) के संदर्भ में जमुना दुहू के निःस्वार्थ प्रयासों और असाधारण साहस पर गौर करते हुए इनकी अगुवाई में स्थापित वन संरक्षण समिति द्वारा पर्यावरण के क्षेत्र में किए गए अतुलनीय योगदान का समीक्षात्मक विवेचन किया गया है।

शोध के पहले भाग पर्यावरणीय चिन्तन: अतीत एवम् वर्तमान - में अतीत काल में पर्यावरण पर हुए चिन्तन विशेष रूप से पौराणिक ग्रन्थों व हिन्दी साहित्य पर गौर करते हुए वर्तमान समय में पर्यावरणीय और आधुनिक पर्यावरणीय आन्दोलनों पर गौर किया गया है। भाग दो में जमुना दुहू द्वारा गठित वन संरक्षण समिति में संथाली आदिवासी महिलाओं की भूमिका का पारिस्थितिकीय नारीवाद व सतत् विकास की सैद्धान्तिक पृष्ठभूमि में समीक्षात्मक विवेचन व मूल्यांकन किया गया है और इसका शीर्षक है - "आदिवासी महिलाओं द्वारा वन संरक्षण : जमुना दुहू के प्रयासों के संदर्भ में।" प्रस्तुत रिपोर्ट में इन्हीं दो भागों पर विशेष चिन्तन करते हुए इनका संक्षिप्त विवरण दिया जा है। इसके अतिरिक्त हम अपने शोध को फस्तक के रूप में भी प्रकाशित करने जा रहे हैं जिसमें विशेष अध्यायों का वर्णन है जैसे - अध्याय-१ 'सारखण्ड में आदिवासी जीवन : संथालों के विशेष संदर्भ में', अध्याय-२ 'पर्यावरणीय चिन्तन: अतीत एवम् वर्तमान', अध्याय-३ 'आदिवासी महिलाओं द्वारा वन संरक्षण : जमुना दुहू के प्रयासों के संदर्भ में', अध्याय-४ 'जल, जंगल, जमीन पर आदिवासी अधिकार : समीक्षात्मक विवेचन', अध्याय-५ 'मूल्यांकन' इत्यादि।

प्रस्तुत शोध पर लिखित इन सभी भागों के साथ ही जमुना के प्रयासों, पर्यावरणीय व स्थानीय विकास कार्यों को डॉक्यूमेंट्री फिल्म "Be Victories in Such Difficulties: Lady Tarzon Jamuna Tuddu" में भी दर्शाया गया है। (सीडी संलग्न)

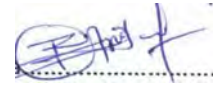
इस शोध हेतु हम अपने दिल्ली विश्वविद्यालय के प्रति बहुत आभारी हैं जिसने इस प्रकार की अन्वेषण परियोजना का आरम्भ किया। साथ ही इसके लिए हम शोध पर्यवेक्षक के दिशा-निर्देशन हेतु उनके प्रति भी अपनी कृतज्ञता ज्ञापित करते हैं।



रिषि भारद्वाज
राजनीति विज्ञान विभाग



अश्विनी जससल
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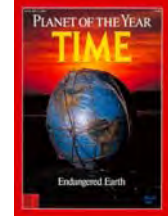


रामरूप मीणा
हिन्दी विभाग

भाग-1
पर्यावरणीय चिन्तन : अतीत एवं वर्तमान
Environmental Concern: Past & Present)

वर्तमान समय में पर्यावरण मुद्दों की चर्चा का एक विशेष महत्व है। आज मीडिया के माध्यम से भविष्य में होने वाले यु

के लिए जल की संभावना को एक प्रमुख कारण बताया जा रहा है। देश में बंधों की स्थिति या जल, जंगल, जमीन पर आदिवासियों की खबरें भी प्रसारित होती रहती हैं। दो दशक पहले ऐसा लगा था कि पर्यावरण एक ऐसा विचार है जिसका समय आ गया है जैसा कि 1989 में 'टाइम' मैगजीन ने अपने कवर पेज पर फरुष या महिला की जगह पृथ्वी को The Planet of the Year के रूप में दर्शाया। आज भी एक आलोचनात्मक मुद्दा है चाहे इसे क्षेत्रीय, राष्ट्रीय या अंतर्राष्ट्रीय संदर्भ में देखा जाए। पर्यावरण मुद्दों के सामने आने का क्या कारण है? 'पारिस्थितिकीय' से क्या अभिप्राय है? प्रकृति और मनुष्य आपसी संबंधों को ध्यान में रखकर और संस्कृत व हिन्दी साहित्य में इनके वर्णन पर गौर करते हुए समकालीन समय में जलवायु परिवर्तन के "हास के साथ-साथ पारिस्थितिकीय संतुलन के महत्व को भी उजागर किया गया है।



'टाइम' मैगजीन, 1989

ऐसा किसी पर्यावरण से जुड़े के

पर्यावरण से तात्पर्य है - वह वातावरण जिससे संपूर्ण जगत या ब्रह्माण्ड घिरा हुआ है दूसरे शब्दों में संपूर्ण पृथ्वी एक आवरण से आवृत है जो इसे परिचालित भी करता है और स्वयं इससे प्रभावित भी होता है। पर्यावरण अंग्रेजी शब्द "Environment" का अनुवाद है जो दो शब्द अर्थात् 'Environ' व 'ment' से मिलकर बना है जिसका अर्थ आवृत करना है, Encircle or all around) अर्थात् "जो चारों ओर से घेरे हुए है" वह पर्यावरण है। संपूर्ण पृथ्वी वायुमंडल से आवृत है, इसी प्रकार धातलीय जीव स्थल, जल, वायु एवं इनके घटकों से आवृत है। संपूर्ण जीवमंडल जैविक व अजैविक घटकों द्वारा आवृत है। वृहत रूप से यह स्थलमण्डल (Lithosphere) जलमंडल (Hydrosphere) वायुमंडल (Atmosphere) से संबंधित है और यही भौगोलिक पर्यावरण का मूल है।

धरती की पारिस्थितिकीय (Ecology) पर मनुष्य का प्रभाव स्वयं मनुष्य जितना ही प्राचीन है। पारिस्थितिकीय तंत्र (Eco system) अंग्रेजी के दो शब्दों से मिलकर बना है। जिसमें 'Eco' का अभिप्राय 'चारों ओर के प्राकृतिक पर्यावरण' से है, उसके 'System' से अभिप्राय एक तंत्र या व्यवस्था से है। संपूर्ण पृथ्वी अर्थात् स्थल, जल एवं वायुमण्डल और इस पर निवास करने वाले जीव एक विशिष्ट चक्रण अथवा प्रणाली या तंत्र में परिचालित होते रहते हैं तथा प्रकृति या पर्यावरण के साथ अभूतपूर्व सामंजस्य स्थापित करके न केवल अपने को अस्तित्व में रखते हैं, अपितु पर्यावरण को भी स्वचालित करते हैं। इस प्रकार रचना एवं कार्य दृष्टि से जीव समुदाय एवं वातावरण एक तंत्र के रूप में कार्य करते हैं, जिसको पारिस्थितिकीय तंत्र कहा जाता है। दूसरे शब्दों में, पारिस्थितिकीय तंत्र एक अंतःक्रियात्मक व अंतःनिर्भर समिश्र (Interacting and interdependent complex) प्राकृतिक व्यवस्था है।

पारिस्थितिकीय के अध्ययन को यदि अतीत काल में देखा जाए तो अरस्तू, हिप्पोक्रेटीज और अन्य ग्रीक दार्शनिकों के लेखों में इसे पढ़ा जा सकता है। जीव और उनके पर्यावरण के मध्य परस्पर संबंधों का सर्वप्रथम ईसा पूर्व चौथी शताब्दी में अरस्तू के मित्र 'थियोप्रेफस्टस' ने किया था। इसी वजह से थियोप्रेफस्टस को 'पारिस्थितिकीय विज्ञान का पितामह' माना जाता है, तो वही 1869 में जन्तुशास्त्री 'अर्नेस्टीकेल' ने सर्वप्रथम इकोलॉजी (Ecology) शब्द का प्रयोग किया। 'अर्नेस्टीकेल' अनुसार 'पारिस्थितिकीय विज्ञान प्राणी जगत और उसके कार्बनिक और अकार्बनिक संपूर्ण संबंधों अनुसंधान है और इसी तरह जीव-पर्यावरण संबंधों को विविध नामों से संबोधित किया। जैसे पी.वी. चेह (1846-1903) ने इसे "Geobioceonosis" कहा, तो वही 1877 'कार्ल मोबियस' ने "Bicochosis" कहा। इसी तरह १८८७ में एच.ए. फोरबिस द्वारा इसे Microcosm कहा



वर्णन के का डोकू इसे गया,

तो वही 1939 में थियनेमान ने इसे 'Biosystem' शब्द से संबोधित किया परन्तु सर्वसुचीकार्य शब्द "Ecosystem" को माना गया।

पारिस्थितिकीय की उत्पत्ति कैसे तो जीव वैज्ञानिकों द्वारा हुई और आरंभ में इसका केवल शैक्षिक महत्व था किन्तु अब यह महत्वपूर्ण समाज-उपयोगी विज्ञान के रूप में उभरा है जैसे-जैसे विज्ञान की प्रगति हुई और औद्योगिक प्रगति आई, जनसंख्या बढ़ी और लोगों में उपभोक्तावादी संस्कृति का प्रचलन बढ़ा जैसे-जैसे प्राकृतिक संसाधनों का अधिक दोहन होने लगा और पारिस्थितिकीय तंत्र का संतुलन डगमगाने लगा। ऐसे क्रियाकलापों के फलस्वरूप हमारा पर्यावरण जहरीला होने लगा जिसके फलस्वरूप मानव की उत्तमजीविता पर संकट के बादल मंडराने लगे। प्रबुद्ध वैज्ञानिकों ने भी चेताया कि अगर समय रहते पारिस्थितिकीय संतुलन का गड़बड़ाता संतुलन संभाला न गया तो जीव-जंतुओं व पादपों के साथ मानव जीवन भी संकट में पड़ जाएगा। यही कारण है कि वर्तमान में वैज्ञानिकों की रुचि व्यावहारिक पारिस्थितिकीय (Applied Ecology) में है जिसके अंतर्गत समस्त जैविक समुदाय के संपूर्ण समाज का अध्ययन किया जाता है और विश्लेषण करके उन तरीकों की खोज की जाती है जिससे हमारी धरती जीवों के रहने लायक बेहतर बनी रहे क्योंकि संपूर्ण ब्रह्माण्ड में जीवों के रहने लायक केवल यही एक स्थान है। इसी कारण कई बार इस स्थिति पर्यावरण असंतुलन को इस ग्रह के लिए 'दार्निंग प्वाइंट' कहा गया है।

आज के दौर में पर्यावरणीय चिंतन कई रूपों में हमारे सामने आता है। जैसे पर्यावरणीय सुरक्षा, प्राकृतिक संसाधनों का "ह्रास, प्रदूषण और जैव-विविधता का खत्म होना, भूमण्डलीय तापन आदि पर्यावरण से जुड़े प्रमुख समकालीन मुद्दों के रूप में सामने आए हैं। अतीत में भी इन समस्याओं का सामना करने की कोशिश की जाती रही है, जैसे वन संरक्षण के बारे में कानून बनाए गए कि कौन और कब जंगलों का उपयोग कर सकता है? वेनिस, जर्मनी, प्रफांस हर जगह इस तरह के नियम बनाए गए। भारत में मौर्य शासकों ने 3200 साल पहले हाथियों का शिकार करने पर दंड का प्रावधान किया।

पिछली दो सदियों में इन सवालों को नया आयाम मिला है कि विशिष्ट संसाधनों पर किसका अधिकार होना चाहिए और क्यों होना चाहिए? समकालीन समय में इस बारे में चिंता प्रकट की गई है कि संसाधनों के उपयोग करने के तरीकों से विश्व प्रभावित भी होता है। प्रारंभिक प्रेफच और ब्रिटिश वैज्ञानिकों ने हिन्द महासागर क्षेत्र में पेड़ों की कटाई, फराने पेड़ों के पूरी तरह खत्म होने और पानी की फन: पूर्ति के बीच जुड़ाव पर विचार किया। भारत में सन् 1864 में वन विभाग का गठन किया गया। दक्षिण इस विभाग के माध्यम से जंगल के महत्वपूर्ण और रणनीतिक आर्थिक संसाधन अर्थात् लकड़ी पर कब्जा करने कोशिश की गई।

बीसवीं सदी में दो बड़े विश्व युद्ध हुए (1914-18 व 1939-45) और इन दोनों विश्व युद्धों के पश्चात् संवृद्धि के अभूतपूर्व दौर की शुरुआत हुई। इस संदर्भ में इतिहासकार जॉन मर्कनील ने यह आंकलन किया है कि लोगों ने पिछले 100 सालों में जितना उर्जा का प्रयोग किया है, इनके पूर्वजों ने उतनी उर्जा का प्रयोग पिछले 10,000 सालों में भी नहीं किया। 1960 का दशक आते-आते इसके संकेत मिलने लगे थे कि जिस प्रकार धरती के संसाधनों का प्रयोग किया जा रहा है उसमें बहुत सारे तरीके ठीक नहीं हैं। इसी संदर्भ में समुद्री जीव वैज्ञानिक स्मेल कार्सन की किताब *साइलेंट स्प्रिंग* के प्रकाशन ने महत्वपूर्ण भूमिका निभाई इसमें कार्सन ने पेट्रोसाइट के बहुत ज्यादा इस्तेमाल के नकारात्मक प्रभावों की ओर ध्यान दिलाया।

आज सार्वजनिक रूप से इन विषयों पर भी चर्चा होने लगी है कि परमाणु परीक्षण के बाद होने वाले रेडियोएक्टिव रिसाव से कैसे निपटा जाए? जैसा कि हाल ही में जापान में आई सुनामी के कारण परमाणु संयंत्रों का संकट गहराया था। वही दूसरी ओर 'बैरी कॉमोनर' Barry Commoner) के विचार भी बहुत प्रमुख हैं इन्होंने इस बात पर जोर दिया कि केवल मात्रा तकनीक के माध्यम से ही पारिस्थितिकीय की समस्या को हल नहीं किया जा सकता है।

विकासशील देशों में भी ऐसे विचारक रहे हैं जो इस तरह के खतरों के बारे में जागरूक करते रहे हैं। महात्मा गाँधी ऐसे शुरुआती विचारक थे जिन्होंने इस बात पर जोर दिया कि हमारी जीवनशैली ऐसी होनी चाहिये कि प्राकृतिक संसाधनों का बहुत ज्यादा दोहन न हो। स्वीडनराथ टैगोर ने इस बात पर बहुत जोर दिया कि प्रकृति के साथ सुसंगत तरीके से जीवन जीने के लिए यह जरूरी है कि ग्रामीण कुटीर उद्योगों को अपनाया जाए। वही एक सदी पहले क्युबा के राष्ट्रपति 'जोस मारती' ने इस बात की चिंता व्यक्त की थी कि पृथ्वी पर मनुष्य की जनसंख्या बहुत बढ़ रही है। जब 1960-70 के दशक में पश्चिमी देशों में कॉमोनर और कॉरसन के विचारों पर चर्चा होने लगी थी उसी दौरान भारत में भी पर्यावरणीय आंदोलन की शुरुआत हुई और

इस संदर्भ में प्रसिद्ध पर्यावरणविद 'माधव गाडगिल' ने भी बहुत सारे पर्यावरणीय बिंदुओं की ओर इशारा किया है। इसी दौरान हिमालय के पश्चिमी भाग में ग्रामीणों ने जंगलों पर ठेकेदारों के अधिकारों पर सवाल उठाया क्योंकि अंगू (Ash) चमरख (Hornbeam) और बलूत (Oak) जैसे पेड़ ग्रामीण लोगों की जीविका के आधार थे। झारखंड में भी लकड़ी माफिया और आदिवासियों के बीच में झड़पें हुईं। यहाँ आदिवासियों ने साल और सागवान के वृक्षों को बचाने का प्रयास किया। भारत के पश्चिमी घाट पर गोआ में जौरी, चलियार नदी के किनारे बसे मातूर और केरल में औद्योगिक प्रदूषण के खिलाफ आंदोलन हुए।

1970 के दशक से बड़े बांधों की प्रासंगिकता और इनके कारण वन व ग्रामीण क्षेत्रों के जलमग्न होने का मुद्दा सामने आया। साइलेंट वैली केरल और तमिलनाडु के मोयर में विरोध के कारण बाँध बनाने की योजना को छोड़ दिया गया। 1980 के दशक के प्रारंभ में विकास के एक ऐसे नए मॉडल को पेश करने की कोशिश की गई जिसमें पारिस्थितिकी और समानता दोनों को ही समान महत्व दिया गया।

आज बहुत कम लोग इस बात को महसूस कर पाते हैं कि 1982 की 'द स्टेट ऑफ इंडियाज : द फर्स्ट सिटीजन रिपोर्ट' कितनी महत्वपूर्ण और एनवायरमेंट पर दूरगामी प्रभाव डालने वाली थी जिसमें अनिल अग्रवाल की बहुत महत्वपूर्ण भूमिका थी। अनिल अग्रवाल ने बैरी कॉमनर की तरह 'रिडक्शनिज्म' (Reductionism) सिद्धान्त का खंडन किया। 'रिडक्शनिज्म' का अर्थ है कि किसी समस्या को पूर्णतः में न देखकर सिर्फ उसके कुछ पहलुओं पर नजर डालना। इस रिपोर्ट में धनी वर्गों के पारिस्थितिकीय अपव्यय की तुलना में निर्धनों की सूझबूझ के साथ संसाधनों का उपयोग करने की प्रवृत्ति पर जोर दिया। यह विकास के बहुत से वैकल्पिक मॉडलों में से एक मॉडल के रूप में सामने आया।

इसी प्रकार विकसित व विकासशील देशों के बीच की वैचारिक भिन्नता आज भी जगजाहिर है। पर्यावरण के बारे में संयुक्त राष्ट्र द्वारा आयोजित सम्मेलनों में यह वैचारिक भिन्नता कई बार देखने को मिली, जैसे स्टॉकहोम सम्मेलन (1972), रियो दि जेनेरो (1992), जोहान्सबर्ग (2002) और कानकुन सम्मेलन (2011) में हुआ। पिछले तीन दशकों में केवल मांद्रियल समझौता ही सफलता हासिल कर पाया है जिसमें ओजोन परत के क्षरण को रोकने के लिए तकनीकी हस्तान्तरण के बारे में सहमति बन पाई है, क्योंकि क्लोरोफ्लूरोकार्बन में कटौती करने की तकनीकी जानकारी को बांटना जरूरी था परंतु आज के समय में कार्बनडाइऑक्साइड का सबसे अधिक उत्सर्जन होता है। कार्बनडाइऑक्साइड की कटौती को लेकर अभी तक कोई समझौता नहीं हो पाया है। वास्तव में इस दौरान पर्यावरण के मुद्दों पर एक तरह की आम सहमति उभर कर सामने आई लेकिन कुछ अपवादों को छोड़कर यह सहमति प्रभावशाली रूप धारण नहीं कर पाई।

जहाँ तक भारत की पारिस्थितिकी का प्रश्न है यहाँ प्रवालभित्तियों से लेकर बर्फ से ढकी जगह मिलती है। यहाँ एक ओर शुष्क थार रेगिस्तान है तो दूसरी ओर आर्द्र पश्चिमी घाट। यहाँ होने वाली वर्षा के कारण न सिर्फ घना जंगल है बल्कि 400 से ज्यादा स्तनधारी जीव यहाँ पाए जाते हैं और लाखों लोग यहाँ रहते हैं जिनकी धार्मिक तथा सांस्कृतिक विभिन्नता अनेकता में एकता को प्रदर्शित करती है। यहाँ 45,000 से ज्यादा वनस्पतियाँ पाई जाती हैं और धरती की हर 10 वनस्पति में से एक वनस्पति यहाँ पाई जाती है। जहाँ चीन में सिर्फ दस प्रतिशत जमीन ही खेती के लायक है वही दूसरी ओर भारत के आधे से ज्यादा हिस्से पर खेती की जा सकती है। दरअसल, भारत में आधुनिक पारिस्थितिकीय विभिन्नता के जितने सारे आयाम उपलब्ध हैं उतने दूसरे देश में उपलब्ध नहीं हैं। स्टॉकहोम सम्मेलन के समय देश की 70 प्रतिशत जनसंख्या खेती में लगी हुई थी। कारखानों का एक मजबूत आधार भी मौजूद था स्टॉकहोम सम्मेलन के दो साल बाद भारत 'परमाणु क्लब' में शामिल हुआ और इसने अपना पहला उपग्रह आर्यभट्ट छोड़ा।

वास्तव में ऐसे बहुत कम समाज हैं जहाँ पर्यावरण के मामले पर सरकार द्वारा इतनी सक्रियता से कदम उठाए गए हों। भारत में 1973 में 'प्रोजेक्ट टाइगर' की शुरुआत की गई, जो कि उस समय विश्व में वन्य जीवों के संरक्षण की सबसे बड़ी योजना थी। इसके तहत जल्दी ही बहुत से क्षेत्रों में रिजर्वों की स्थापना की गई। सन् 1972 में संसद ने वन्य जीव संरक्षण अधिनियम पारित किया और 1980 में संसद ने वन संरक्षण अधिनियम भी पारित किया। इसी वर्ष नवम्बर माह में केन्द्र सरकार ने पर्यावरण विभाग की स्थापना की जिसे आज एक अलग मंत्रालय बना दिया गया है। यहाँ पर यह प्रश्न उठना स्वाभाविक है कि यदि ये नीतियाँ प्रभावशाली थीं, तब इस दौर में पर्यावरण के मुद्दों पर इतना ज्यादा संघर्ष क्यों था?

द्विअसल, जिस प्रकार अंतर्राष्ट्रीय स्तर पर विकसित तथा विकासशील देशों के बीच पर्यावरण के संबंध में वैचारिक भिन्नता है ठीक उसी तरह से भारतीय समाज में भी इस बात पर मत विभाजन है कि कौन-सा पर्यावरणीय मुद्दा महत्वपूर्ण है। 1980 के दशक में जमीनी स्तर पर कई पर्यावरणीय आंदोलन सामने आए। जंगल के समुदायों ने मिश्रित जंगलों को खत्म कर उनकी जगह एक ही तरह के पेड़ लगाने की वन विभाग की नीति के खिलाफ आंदोलन चलाया। वैज्ञानिक प्रमाणों से भी यह बात साबित हुई है कि मिश्रित जंगलों को साफ कर एक ही तरह के पेड़ लगाने की नीति सही नहीं है। केरल में 'साइलेंट वैली परियोजना' पर भी स्थानीय लोगों के आंदोलन के कारण ही रोक लगी। हिमालय के तराई के इलाकों और देश के कई भागों में आदिवासियों द्वारा चलाए जा रहे आंदोलनों ने वन नीति को एक नई दिशा में अग्रसर करने में महत्वपूर्ण भूमिका निभाई और इसकी चर्चा रिपोर्ट के तीसरे भाग में की गई है।

वनो के प्रति भारतीय ऐतिहासिक एवं साहित्यिक दृष्टिकोण

यह सर्वविदित है कि पृथ्वी के जिस प्राकृतिक आवरण की गोद में मानव जीवन पलता है, वह पर्यावरण ही है। प्रकृति के आँचल में मौजूद जल, जीव, हवा, पर्वत आदि के साथ ही वन या पेड़-पौधे इस पर्यावरण के प्रमुख घटक हैं। सदियों से इस पर्यावरण के प्रति भारत के लोगों का बदलता हुआ रवैया प्राचीन इतिहास व साहित्य के माध्यम से समझा जा सकता है। ऐसे में देश की वन-सम्पदा के प्रति लोगों का यह बदलता दृष्टिकोण प्राचीन संस्कृत, प्राकृत, तमिल, जैन तथा बौद्ध साहित्य के साथ ही अन्य भाषाओं के साहित्य में बखूबी झलकता है। सामान्यतः यह भी पाया गया है कि मौखिक परम्परा में वनों के प्रति सहाबुद्धि अधिक रही है। हालाँकि आदिम समाज-व्यवस्था में मनुष्य की वनों से गहन नजदीकी थी लेकिन धीरे-धीरे शिक्षित समाज-व्यवस्था की जीवनशैली में व्यापक बदलाव के चलते परवर्ती काल में वनों से दूरी बढ़ती गई। वैसे सभी युगों में यह बदलाव समान गति से नहीं हुआ है। आरम्भ में इसकी गति धीमी थी लेकिन जैसे-जैसे जमीन व अन्य चीजों की माँग बढ़ी ठीक वैसे ही तथाकथित विकास के नाम पर हुए आविष्कारों और औद्योगिकरण ने इस प्राकृतिक संयोजन को बुरी तरह बिगाड़ दिया। अपने इलाके को विस्तृत करने की चाह में लोगों द्वारा वनों को तीव्रता से साफ किया गया जिसकी वजह से कुछ इलाकों में तो वहाँ का पारिस्थितिकी संतुलन ही बदल गया। उदाहरणार्थ ऐतिहासिक दृष्टि से देखा जाए तो इतिहासकार रोमिला थापर के अनुसार सिंधु-घाटी के पतन के पीछे एक मुख्य वजह पर्यावरण की बर्बादी को न रोक पाना ही है। संभवतः पर्यावरण के इस महत्व को महसूस करते ही आगे चलकर आधुनिक युग के औपनिवेशिक दौर में प्रकृति व मनुष्य के परस्परिक संबंध को हिन्दी साहित्य में छायावादी दृष्टिकोण से पेश किया गया। इसी प्रकार कुछ प्रांतीय साहित्य भी पारिस्थितिकी और संस्कृति के बीच अंतर्संबंध को प्रकट करते हैं। जैसे ईस्वी सदी के शुरू में रचित तमिल संगम साहित्य में पारिस्थितिकी इलाकों का ख्याल तमिल भाषा में तिर के नाम से विस्तृत रूप में प्रस्तुत किया गया है जो कि प्राचीन दृष्टिकोण का एक बेहतर उदाहरण है।

प्राचीन वैदिक साहित्य तथा रामायण व महाभारत में भी ग्राम व अरण्य का फर्क मौजूद है। महाभारत के किस्सों में वन और वन्य जीवन को उजाड़ने का चित्रण मिलता है। जिस प्रकार दुष्यंत और शकुन्तला के कथा-प्रसंग में दुष्यंत द्वारा शिकार करने की क्रिया के तहत जंगल के जानवरों को अंधधुंध मौत केघाट उतार देना एवं पेड़ों की तबाही करना एक प्रकार से प्रकृति से ही जंग है। उसी प्रकार पाण्डवों को प्राप्त ओढ़ राज्य की राजधानी इन्द्रप्रस्थ को बसाने के लिए वनों को जला देने की घटना भी बस्ती के लोगों द्वारा प्रकृति पर अपना शक्ति-प्रदर्शन करना ही है जिसमें वनों पर ग्राम के लोगों को विजयी घोषित किया जाता है। जाहिर है कि ग्रामवासी लोग वन के निवासियों से भिन्न हैं। वे वन को जंगली आवास मानकर उस पर नियंत्रण चाहते हैं जबकि वनवासियों के लिए वन उनका प्राकृतिक आवास है जहाँ वे कन्द, मूल, फल खाकर व जंगली जानवरों का शिकार कर अपना जीवनयापन करते हैं। यदि ग्रामवासियों की कोई सभ्यता वनवासियों के प्राकृतिक आवास को नष्ट करती है तो वे ऐसी सभ्यता के विरोधी हैं। ध्यातव्य है कि सभ्यता का विकास वनों को उजाड़ता रहा है फिर भी वन कई रूपों में स्वीकार्य रहे हैं। आदिवासी समाज में तो प्रत्येक जाति का अपने गौत्र के मुताबिक फल-वृक्ष होता है जिसकी वे 'धराड़ी' व 'सरना' जैसी प्रथाओं के तहत पूजा करते हैं तथा वनों को संरक्षण प्रदान करते हैं।

देखा जाए तो वनों को पूजने की परम्परा प्राचीनकाल से ही चली आ रही है। वैदिक पूजा विधि में प्रयुक्त होने वाले पात्र खास पेड़ों की लकड़ी से ही निर्मित होते थे जिससे यह स्पष्ट अनुभव होता है कि उनके अनुष्ठान में वनों का महत्व गहराई से जुड़ा है। ऐसे खास पेड़ों की श्रेणी में पीपल, बरगद व साल का भी जिक्र होता रहा है। खास पेड़ों को पूजने की रीति में 'पीपल' के पेड़ को यह पूज्य पद लम्बे अरसे से प्राप्त है जिसका साक्ष्य सिन्धु-घाटी की मुद्राओं पर भी अंकित है और आज यह हिन्दू व मुसलमानों के बीच भी पूज्य रूप में स्वीकार्य है। इस पेड़ का बौद्ध धर्म से भी गहरा नाता है। अतः जैन और बौद्ध

साहित्य में भी वनों की पवित्रता का जिग्रफ मिलता है। जैन व बौद्ध मठ इन वनों की रक्षा करते थे। ऐसे पवित्रा वनों या पूजनीय पेड़ों को 'चैत्य' के नाम से फकारा जाता था। बोधगया में बोधि-वृक्ष के पास खुदाई के दौरान जिस चबूतरे के साक्ष्य मिले हैं उसे मौर्यकालीन माना गया है। इसी प्रकार पेड़ों को उर्वरता का प्रतीक मानकर उसकी पूजा अथवा उपासना करने की विधि निम्न स्तर के नागरिकों जैसे कृषक, पशुपालक आदि में अत्यन्त प्रचलित रही है। प्राचीन भारतीय कहानियों में भी कुछ पेड़ों का देवी-देवताओं से संबन्ध स्थापित कर उनकी पवित्रता एवं जादूगरी को मानवीकरण रूप में रोचकता के साथ प्रस्तुत किया गया है। ऐसे में वन देवता के आधार पर मानव के मन में प्रकृति के प्रति आदर एवं सहानुभूति मौजूद थी।

आश्रम व्यवस्था के अन्तर्गत संन्यासी जीवन मानव और वन के बीच बढ़ते हुए संबंध को दर्शाता है। संन्यासी और देशनिकालों के वन में जा बसने से लोगों के मन में वनों के प्रति भय कम हुआ और वह वनों के सम्पर्क में रहना ज्यादा श्रेयस्कर समझने लगा। उदाहरणार्थ साहित्यिक रचनाओं में कालिदास के 'अभिज्ञानशातुफन्तलम्' की कथा इस द्विभाजन को उभारती है जहाँ एक ओर दुष्यंत जंगल के जानवरों का शिकार करने जाते हैं वहाँ वनश्रम की शान्ति, सौम्यता और प्रकृति शतुफन्तला के मन को खूब भाती है क्योंकि वन्य प्रकृति में पौधे और हिरण भी शकुन्तला को अपने पास बुलाते नजर आते हैं। उसे वन्य प्रकृति में एक नवीन जीवन का अहसास होता है। वस्तुतः साहित्यिक रचनाएँ हमें लोगों की भावनाओं का अंदाज देती हैं।

हालाँकि प्राचीन काल से ही साहित्य में प्रकृति-चित्रण किसी-न-किसी रूप में मौजूद रहा है लेकिन साहित्य में पहले प्रकृति का चित्रण किसी कथा-प्रसंग अथवा मानवीय क्रिया की पृष्ठभूमि के रूप में ही किया जाता रहा है। जैसे कालिदास के 'कुमारसंभव' के आरम्भिक कथा-प्रसंग में हिमालय का विस्तृत वर्णन है और 'मेघदूत' में मेघ विरह-निवेदन के 'दूत' रूप में प्रस्तुत किया गया है। इसी तरह हिन्दी साहित्य के भक्ति तथा रीतिकालीन कवियों द्वारा भी प्रकृति को गौण स्थान ही दिया गया है। क्योंकि साहित्य के प्राचीन आचार्यों की दृष्टि में वन, उपवन आदि नायक या नायिका की चेष्टाओं को चित्रित करने वाले 'शृंगार' के उद्दीपन मात्रा हैं। इसलिए हिन्दी के मध्यकालीन कवियों ने प्रकृति के महत्व पर अधिक ध्यान नहीं दिया। लेकिन जब हिन्दी के आधुनिक छायावादी कवि यह कहते हैं कि उन्हें कविता करने की प्रेरणा ही प्रकृति से मिली, तो यह प्रश्न उठना स्वाभाविक है कि आखिर प्रकृति की कौन-सी शक्ति ने आधुनिक कवियों को अपनी ओर आकृष्ट किया। जाहिर है कि छायावादी काव्य प्रवृत्ति के शुरु होते ही वन या प्रकृति पर छायावादी रंग चढ़ गया और हिन्दी साहित्य में यह छायावादी प्रवृत्ति तब आरम्भ होती है जब सभ्यता के विकासक्रम के दौरान आधुनिक कवि यह महसूस करता है कि प्रकृति पर भौतिक संस्कृति विजय पा रही है और इस भौतिक संस्कृति में उसकी वैयक्तिक स्वाधीनता खतरे में पड़ रही है। तब इसी क्रम में आधुनिक कवि की भावना सामाजिक स्वाधीनता और वैयक्तिक विकास की आकांक्षा के प्रयास में प्रकृति-प्रेम के रूप में प्रकट हुई। प्राकृतिक स्वच्छन्द वातावरण में उन्हें स्वयं की मुक्ति व निर्बाध स्वच्छन्दता के दर्शन हुए और तब इस प्रकृति-प्रेम से ही राष्ट्रीय जागरण के उस दौर में उठने अपनी कविताओं द्वारा जनता में देश-प्रेम की भावना उत्पन्न की। देश-प्रेम का आरंभ प्रकृति-प्रेम से किस तरह होता है, इसे समझते हुए हिन्दी साहित्य के मर्मज्ञ आलोचक आचार्य रामचंद्र शुक्ल ने भी यही लिखा है कि 'यदि किसी को अपने देश से प्रेम है तो उसे अपने देश के मनुष्य, पशु, पक्षी, लता, गुल्म, पेड़, पत्ते, कण, पर्वत, नदी, निर्झर सबसे प्रेम होगा, सबको वह चाह भी दृष्टि से देखेगा, सबकी सुध करके विदेश में आँसू बहायेगा।' एक प्रकार से यह प्रकृति एवं मनुष्य के पारस्परिक समन्वय को प्रकट करने वाली आधुनिक साहित्यिक दृष्टि ही है।

वस्तुतः साहित्य ऐसी अन्तःदृष्टि है जो देखता भी है और दिखाता भी है। साहित्य की आँखों से हम समाज को देखते हैं तो दूसरी ओर समाज की आँखों से हम साहित्य को देखते हैं। इसमें भले ही पारस्परिक विरोधाभास प्रतीत हो लेकिन इससे साहित्यिक व सामाजिक दृष्टिकोण अलीभाँति स्पष्ट हो जाता है। समाज का निर्माण स्त्री और फरण के सहयोग से हुआ है। यहाँ ध्यातव्य है कि नारी दुनिया की लगभग आधी आबादी का हिस्सा है लेकिन उसकी भागीदारी को आज भी दायम दर्जे का ही माना जाता है जबकि आधुनिक परिदृश्य में नारी का स्वरूप बदल रहा है। आज की नारी जीवन के विभिन्न क्रियाक्षेत्रों के साथ ही पर्यावरण संरक्षण में भी अपनी सक्रिय भूमिका निभा रही है। ऐसे में आज जब नारी जीवन के हर क्षेत्र में दृढ़ता से आगे बढ़ रही है, तो इस पर्यावरण या वन-संरक्षण के क्षेत्र में भी उसकी अगुआई की सखा जरूरत है। इस संदर्भ में झारखण्ड की संथाली आदिवासी महिला जमुना दुर्ग की भूमिका सराहनीय है जिसने सुतुरखम के जंगल में वनों की अवैध कटाई पर रोक लगाकर वन-सम्पदा के महत्व को उजागर कर दिखाया है। ऐसे में हिन्दी साहित्य समाज की स्त्रियों को प्रकृति अथवा पर्यावरण के बीच कितनी स्थितियों के साथ देखता और स्वीकार करता है इसे जानने के लिए सर्वप्रथम हिन्दी साहित्य में वर्णित स्त्री की स्थिति का अवलोकन करना होगा।

जाहिर है कि हिन्दी साहित्य के 100 वर्षों में स्त्री के अस्तित्व का धारदार संघर्ष स्पष्ट दिखाई देता है। स्त्री-आजादी की लड़ाई साहित्य ने तटस्थ-भाव से स्त्री के हमकदम होकर लड़ी है जिसका परिणाम है कि आज स्त्री कमोबेश कुछ प्रतिशत में अपनी स्त्रीता के साथ समाज में उपस्थित है। हिन्दी साहित्य में स्त्री-विमर्श के अनेक सोपानों के अन्तर्गत नारी के विभिन्न क्षेत्रों में योगदान को लेकर निरन्तर चर्चा होती रही है। इस क्रम में लेखकों और लेखिकाओं द्वारा लिखे गये साहित्य में स्त्री के चित्रांकन का विश्लेषण नितांत अपरिहार्य है। हिन्दी साहित्यकारों को इस दिशा में अवश्य लेखनी चलानी चाहिए ताकि नारी को पर्यावरण से जुड़े बहुमूल्य तथ्यों के प्रति जागृत कर 'पर्यावरण-नैतिकता' का पाठ समस्त जगत् को पढ़ाया जा सके और उन्हें समाज का भरपूर सहयोग और संबल मिल सके। इस क्रम में हिन्दी लेखिका इन्दिरा गोस्वामी का उपन्यास 'अहिरन' छतीसगढ़ की अबोहवा को अपने कथ्य में समेटते हुए अहिरन नदी के निर्माणाधीन बाँध के माध्यम से प्राकृतिक सौन्दर्य के साथ मानव श्रम को जोड़कर स्त्री के मर्म को उद्घाटित करता है। श्रम के आलोक में घुला उसका रूप स्त्री का सहज-निर्मल आधुनिक रूप है। परम्परागत स्त्री से अलग, इस उपन्यास की स्त्री अपनी आन्तरिक और सामाजिक क्षमताओं के दर्प से उज्वल है। यह आज की स्त्री का बदला हुआ रूप है क्योंकि यह सब उसकी मुक्ति की आकांक्षा से प्रेरित है जो सदियों से निरन्तर चल रहे उसके मुक्ति-संघर्ष की स्वाभाविक परिणति है। ऐसे में जो प्रकृति पहले साहित्य में स्त्री के शृंगारिक चित्रण में प्रयुक्त होती थी, अब उसी प्रकृति के बीच आधुनिक स्त्री अपनी वैयक्तिक स्वाधीनता का सपना लेकर आगे बढ़ती है। अपनी इसी मुक्ति की अभिलाषा से प्रेरित होकर आधुनिक परिदृश्य में नारी ने प्रकृति अथवा पर्यावरण संरक्षण का दामन थाम लिया है। जिस तरह प्रकृति में निर्बाध स्वच्छन्दता है, उसी प्रकार की स्वाधीनता वह स्वयं भी चाहती है। प्राकृतिक उपादानों को वह अपने जीवन-निर्वाह के संसाधनों के रूप में उपयोग करना चाहती है। ऐसे में उसने प्राकृतिक वनों को बचाने का संकल्प ले लिया है। इस संदर्भ में सुतुरखम गाँव की वन संरक्षण समिति की आदिवासी स्त्रियों का प्रयास महत्वपूर्ण है जो आधुनिक समाज में स्त्री की बदलती हुई स्थिति पर प्रकाश डालता है। इसकी सार्थक अभिव्यक्ति हमें आदिवासी साहित्य में देखने को मिलती है। ऐसे में अब यह सिर्फ सरकारी और गैर सरकारी संगठनों के मंचों पर ही बहस का विषय नहीं होना चाहिए कि हमारे समाज में स्त्रियों की बदली हुई स्थिति कैसी है बल्कि साहित्य को भी इस दृष्टि से देखना चाहिए।

आज भूमण्डलीकरण का दौर है। यह भूमण्डलीकरण मनुष्य के समस्त संबंधों को ताक पर रखकर जो विकास के सूत्रा अपना रहा है वह पर्यावरण के संतुलन को बिगाड़ रहा है। इसमें अर्थतंत्र और पारिस्थितिकी तंत्र में टकराव है जो पर्यावरण संकट को उभार रहा है। प्रकृति के साथ हमारा रिश्ता सांस्कृतिक मनोभूमि का है इसलिए साहित्य के अंतर्गत कविता में पर्यावरण या प्रकृति मानवीय व्यवहार का हिस्सा बनकर आती है जहाँ प्रकृति के साथ एक सहचर्य स्थापित होता दिखाई देता है। जैसे हिन्दी में नागार्जुन, केदारनाथ अग्रवाल, गिरिजाकुमार माथुर, भवानीप्रसाद मिश्र, एकांत श्रीवास्तव, पंकज चतुर्वेदी आदि की कविता में यह पर्यावरण चितन मौजूद है। इनकी कविताओं में एक गाँव है, लोक है जहाँ प्राकृतिक सौन्दर्य का अत्यन्त मोहक वातावरण है। हालाँकि यह ठीक है कि यहाँ कवि किसी समाज सुधारक अथवा पर्यावरणविद् की मुद्रा में नहीं है लेकिन वह पर्यावरण आन्दोलनकर्ताओं को एक संबल देता है, सहारा देता है और सम्मान देता है। इस तरह साहित्य में भी पर्यावरण चितन स्पष्ट उभरकर सामने आता रहा है।

वनों के प्रति भारतीयों का बदलता दृष्टिकोण इतिहास के माध्यम से भी देखा जा सकता है। उदाहरणार्थ भारतीय इतिहासकार रोमिला थापर ने स्पष्ट किया है कि प्राचीन भारतीय दार्शनिक कौटिल्य ने अपने ग्रंथ 'अर्थशास्त्र' में वन संपदा को महत्व देते हुए कहा कि बिना सरकारी अनुमति के वन के किसी भी भाग की कटाई निषेध होनी चाहिए। उन्होंने वन पदार्थों और साफ की गई जमीन पर होने वाली खेती, दोनों से मिलने वाले राजस्व पर नियंत्रण रखने का समर्थन किया। सम्राट अशोक को अपने प्रशासन द्वारा बनाए गए राजमार्गों पर बहुत गर्व था जिसके दोनों तरफ बड़े-बड़े छायादार पेड़ लगे थे और थोड़ी-थोड़ी दूर पर कुएँ भी खुदवाए गए थे। चौथी ई. के बाद राजस्व बढ़ाने के लिए और शायद बढ़ती हुई आबादी की जरूरतों को पूरा करने के लिए खेती का विस्तार होने लगा तभी वनों पर इसका दबाव बढ़ने लगा।

गुप्तकाल के शिलालेख में वनों में रहने वाली जातियों पर हिंसा का जिक्र मिलता है। जिसमें इन वनवासियों को काबू में करने की जरूरत का भी वर्णन है चूँकि यह शिलालेख तत्कालीन सरकारी फरमान थे इसलिये वनवासियों को काबू में लाया गया। इनके वन-संसाधनों पर कब्जा किया गया और इन्हें नीची जाति का दर्जा देकर शहर के हाथिये पर या वनों में दूसरी जगह बसाया गया क्योंकि दखलाल वनों से गुजारा करने वालों को हाथिये पर लाने का यही एक तरीका था।

भारतीय उपमहाद्वीप के कई भागों में वनवासियों के कई कुलों की उत्पत्ति के बारे में कई कथाएँ देखने को मिलती हैं। ब्राह्मणों से जुड़ी कुछ ऐसी कथाएँ हैं जिनमें वनवासी के प्रति उनकी उपेक्षा साफ नजर आती है जिसमें राजा पृथु की कथा काफी प्रभावशाली है जिसमें कहा गया कि - वेना, जो इनके पहले राजा थे, ब्राह्मणों का निरादर करने की वजह से मर डाले गए। राजा के न होने से राज्य में खलबली मच गई और व्यवस्था के टूटने का खतरा नजर आने लगा। इसलिए ब्राह्मणों ने वेना की बाईं जांघ को मथा, जिससे एक नाटा, काले रंग का आदमी निकला। उसे निषाद का नाम देकर वन में भेज दिया गया और इसी नाम से वनवासी पहचाने जाने लगे। फिर उन्होंने वेना की दाहिनी बाँह को मथा और उससे एक लम्बा, चौड़ा, गोरा और सुन्दर आदमी निकला जिसे राजा बना दिया गया। खेती और पशुपालन करने का श्रेय इन्हीं को जाता है। इससे पृथ्वी इतनी प्रसन्न हुई कि उनको अपना ही नाम प्रदान कर दिया और वे पृथु कहलाए। उस समय वनों में आश्रम बनाना एक सामान्य बात थी पर वनवासियों का मिलना अलग बात थी। आश्रम की जिन्दगी को भले ही बहुत लुभावने रंग में प्रस्तुत किया गया हो पर वनवासियों को समाज के दायरे से अलग रखा गया। आज तक यही माना जाता रहा है कि यह 'पिछड़े' हैं और इन्हें हिन्दू समाज में सम्मिलित करने की आवश्यकता है।

वस्तुतः देखा जाए तो वनों में रहने वाले ही वन के सबसे करीब होते हैं और दूसरों की तुलना में ज्यादा मिलनसार भी। इसी तथ्य को ध्यान में रखते हुए फसलक का प्रथम अध्याय - झारखण्ड में आदिवासी जीवन : संथालों के विशेष संदर्भ में - आदिवासियों के इतिहास, लोक संस्कृति, कला, धर्म, रीति-रिवाज और प्रकृति-प्रेम पर दृष्टिपात करने के साथ ही इनके साहित्य को उसके वास्तविक रूप में दर्शाता है।

भाग-2

आदिवासी महिलाओं द्वारा वन संरक्षण : जमुना दुद्धू के प्रयासों के संदर्भ में

Forest Conservation by Tribal Women: An Effort by Jamuna Tuddu)

विश्व की 1-3 अरब गरीब आबादी में से 70 प्रतिशत महिलाएं हैं। वह दुनिया की खाद्य सामग्री का 50 प्रतिशत उत्पादन करती हैं जबकि बदले में उन्हें मात्रा 10 प्रतिशत आय प्राप्त होती है। महिलाएं फरुषों की अपेक्षा कम संसाधनों का उपयोग करती हैं और फरुषों की तुलना में उन संसाधनों पर उनका स्वामित्व भी कम है। यहाँ तक की जिस सम्पत्ति पर उनका स्वामित्व भी होता है, प्रायः उसका रखरखाव और नियंत्रण भी परिवार के फरुषों के पास होता है। भारतीय अर्थव्यवस्था में ग्रामीण क्षेत्रों का योगदान 72-18 प्रतिशत है। भारतीय संविधान द्वारा जेकर के आधार पर समानता दिए जाने के बावजूद महिलाएं सामाजिक-आर्थिक सूचकांक के प्रत्येक समूह में फरुषों की अपेक्षा पीछे छूटी हुई हैं। महिलाओं और फरुषों के कार्य समय की तुलना करने पर यह ज्ञात होता है कि महिलाओं के काम के घंटे फरुषों की तुलना में ज्यादा होते हैं, विशेषकर ग्रामीण क्षेत्रों के संदर्भ में यह एक बड़ा सत्य है।

महिलाओं की यह अधीनता सामान्य तौर पर श्रम के लिंग आधारित विभाजन द्वारा प्रकट होती है। आमतौर पर महिलाएं भोजन बनाने, ईंधन और पानी इकट्ठा करने, बच्चों की देखभाल और घर के बाहर के जो काम वे कर सकती हैं उसके

लिये भी उन पर जिम्मेदारी डाल दी जाती है। उनकी शारीरिक, गतिविधियों जैसे - पर्दा पर लगाई गई पाबंदियों में उनकी अधीनता प्रकट होती है और यह अधीनता ग्रामीण परिवारों के अलग-अलग वर्गों में अलग-अलग प्रकार की होती है।

आठवें दशक के अंत में पर्यावरण की स्थिति पर जारी दूसरी नागरिक रिपोर्ट सीएसई रिपोर्ट इशारा करती है कि -

संभवतः ग्रामीण निर्धन स्त्रियों को छोड़कर कोई अन्य समूह पर्यावरण के विनाश से इतना प्रभावित नहीं है। उनके प्रत्येक दिन की शुरुआत सूर्यास्त के साथ ही ईंधन, चारा तथा पानी की तलाश यात्रा से होती है। इससे कोई अंतर नहीं पड़ता कि स्त्रियाँ बूढ़ी, जवान या गर्भवती हैं, रोजमर्रा की दुष्कर घरेलू ज़रूरतों उन्हें पूरी ही करनी पड़ती है। वनस्पतिक स्थितियाँ जैसे-जैसे बिगड़ती जाती हैं, इन गरीब महिलाओं की ईंधन तलाश यात्रा और अधिक लंबी होती जाती है। गरीब और पर्यावरण विनाश में जकड़ी इन गरीब ग्रामीण महिलाओं की मेहनत की दाद देनी होगी। द सेकंड सिटीजन रिपोर्ट आन द एनवायरमेंट, 1987)

अंतर्राष्ट्रीय श्रम संगठन ILO) की 1979 की रिपोर्ट के अनुसार समस्त भारत में यदि महिलाओं की वास्तविक आर्थिक गतिविधियों का कुल लेखा-जोखा किया जाए तो पता चलता है कि बाजार और गैर बाजार अर्थव्यवस्था में महिलाओं के काम के घंटे ज्यादा हैं, खासकर ग्रामीण भारत में। भारत सरकार ने सन् 1952 में ही पर्यावरण को वनस्पतिक रूप से सन्तुलित करने के उद्देश्य से भारत के भौगोलिक भू-भाग के 33 प्रतिशत क्षेत्रों में वन लगाने का लक्ष्य रखा था। बी.बी. बोहरा, 1985)

सातवीं पंचवर्षीय योजना के प्रारम्भ में सरकार ने इसे दोहराते हुए कहा - देश के भौगोलिक भू-भाग के 33 प्रतिशत क्षेत्रों में वन लगाने के कार्य को उच्च प्राथमिकता दी जाएगी जो कि वर्तमान में मात्रा 23 प्रतिशत है। जिन क्षेत्रों में अभी तक यह लक्ष्य प्राप्त नहीं किया जा सकता है, उनमें वृक्षारोपण कार्यक्रम को सघन बनाया जाएगा... 'द एग्रोवू द सेवेंथ प्लान' से उद्धृत, 1985) दूसरे शब्दों में, यह लक्ष्य अभी तक प्राप्त नहीं किया जा सका।

वर्तमान में भारत वृषण वर्षा का दसवाँ हिस्सा ही उपयोग करता है, बड़े क्षेत्रों में जल सारणी घटी है, उच्च तकनीक वाली परियोजनाएँ जैसे - बाँध, जलाशय एवं नहर व्यवस्था - जिस पर सरकार ने अधिक बल दिया है - भी पर्याप्त सिंचाई या बाढ़ एवं सूखे की स्थिति जो कि भारत में गरीबों को हर साल प्रभावित करती है, से निपटने में कामगर साबित नहीं हुई है और इसके फलस्वरूप स्त्रियों की स्थिति और अधिक दयनीय हुई है। ग्रामीण स्त्रियों को ईंधन, चारा और पानी की खोज में अधिक समय लगाकर ज्यादा दूर तक भटकना पड़ता है। कई बार तो 2 से 8 किलोमीटर तक पैदल चलना पड़ता है जिससे न केवल उन्हें मजदूरी के लिये बल्कि प्रतिदिन सामान्यतः 14-15 घंटे काम करना पड़ता है। यही स्थिति मुतुरखम गाँव, बेडाद्रिह टोला, ब्लॉक चावुफलिया, पूर्वी सिंहभूम, झारखंड में फील्डवर्क के दौरान देखने को मिला।

रिपोर्ट के इस भाग को लिखने का उद्देश्य झारखंड के पूर्वी सिंहभूम जिला के चावुफलिया ब्लॉक में अवस्थित मुतुरखम वन में मुतुरखम गाँव की आदिवासी महिलाओं द्वारा वन संरक्षण के क्षेत्र में किए गए अतुलनीय योगदान का सतत् विकास और पारिस्थितिकीय नारीवाद की सैद्धांतिक पृष्ठभूमि में समीक्षात्मक विवेचन करना है। प्रस्तुत भाग में जमुना दुइडू संथाली आदिवासी द्वारा गठित वन संरक्षण समिति के गठन, इसकी कार्यप्रणाली और इसके द्वारा किए गए स्थानीय वन संरक्षण के प्रयासों के साथ-साथ जमुना दुइडू के मुतुरखम गाँव में किए गए जन कल्याणकारी कार्यों का भी विवेचन किया गया है।

सम्बन्धित विकास एवं पर्यावरणीय नारीवाद का सैद्धांतिक विवेचन

Theoretical Discussion of Sustainable Development and Ecological Feminism

विकास की धारणा का एक नकारात्मक बिन्दु यह है कि इसकी तुलना प्रायः संवृद्धि के साथ की जाती है। संवृद्धि व्यक्ति के लिये समृद्धि लाती है और इस समृद्धि में अधिसंरचना, परिवहन और संचार को सुनिश्चित करती है। परन्तु यह मनुष्य की बहुआयामी आवश्यकताओं की भी अनदेखी करती है। विकास एक बहुमुखी अवधारणा है, जिसको सांस्कृतिक रूप से अनुकूल, सामाजिक रूप से न्यायपूर्ण, पर्यावरणिक रूप से जीवनक्षम तथा राजनैतिक रूप से सहभागितामूलक होना आवश्यक है। प्रारम्भ

में विकास की अवधारणा व्यक्ति और पर्यावरण के बीच सम्बन्धों का परीक्षण नहीं करती थी जबकि वास्तविकता यह है कि मनुष्य का संबंध अनेक चीजों से है और ये सभी चीजें अन्तः सम्बन्धित होती हैं।

अभी हाल ही में भारतीय प्रधानमंत्री मनमोहन सिंह ने ग्रीन नेशनल एकाउंटिंग की अन्तर्राष्ट्रीय कार्यशाला के आयोजन में पर्यावरण के प्रति गम्भीर चिन्ता व्यक्त करते हुए कहा कि -

"हमारा आर्थिक विकास प्राकृतिक संसाधनों के इष्टतम (optimal) उपयोग पर आधारित होना चाहिये और ऐसा विकास पर्यावरणीय रूप से सम्पोषित होना चाहिये। चूंकि हमारी अर्थव्यवस्था ने तीव्र विकास की क्षमता हासिल कर ली है, जिसकी वजह से कई नई चुनौतियाँ हमारे सामने हैं, जैसे सीमित प्राकृतिक संसाधन, घटता वन इत्यादि। ऐसे में हमें यह निर्णय लेना होगा कि किस प्रकार हम सीमित संसाधनों का इष्टतम उपयोग कर सकते हैं। अन्तर्राष्ट्रीय स्तर पर उपजाऊ भूमि की कमी, बढ़ता मरुस्थलीकरण, घटता वन क्षेत्र, स्वच्छ जल की उपलब्धता का अभाव और जैव विविधता का अत्यधिक की वजह से पर्यावरणीय देखने को मिल रहा है। इसलिये आज विकास को सम्पोषित विकास के अनुरूप होना चाहिए।" पी.टी.आई., अप्रैल 05, 2013)

1980 के दशक के अंत तक सम्पोषित विकास का विचार प्रसिद्ध नहीं हुआ था परन्तु इस दशक के दौरान ऐसे अनेक प्रमाण देखने को मिले जिससे वैश्विक स्तर पर मानवीय क्रियाओं का पर्यावरण पर नकारात्मक प्रभाव पड़ रहा है, जिसके फलस्वरूप वैश्विक ताप की समस्या आज जगजाहिर है।

सम्पोषित विकास का एक अवधारणा के रूप में विकास सबसे पहले 1987 में ब्रन्टलैंड रिपोर्ट के प्रकाशन के साथ हुआ। इस रिपोर्ट में कहा गया है कि विकास हमारी आज की जरूरतों को पूरा करे, साथ ही यह आगे आने वाली पीढ़ियों की जरूरतों को भी अनदेखा न करता हो। आयोग का कहना है कि, सम्पोषित विकास सामंजस्य में स्थायित्व लाना नहीं है, अपितु यह एक परिवर्तन की प्रक्रिया है जिसमें संसाधनों का दोहन, निवेश की दिशा, तकनीकी विकास की स्थिति तथा संस्थात्मक परिवर्तनों को वर्तमान के साथ-साथ भावी समय की आवश्यकताओं के भी अनुकूल बनाया जा सके ब्रन्टलैंड रिपोर्ट, 1987)। यह आर्थिक विकास में उन्नति की होड़ के प्रति विश्व को सचेत करता है, ताकि दीर्घकालीन विकास तो हो परन्तु प्राकृतिक संसाधनों की समाप्ति या पर्यावरण को क्षति पहुँचाए बिना।

अगस्त-सितम्बर 2002 में दक्षिण अफ्रीका के जोहान्सबर्ग में सम्पोषित विकास पर संयुक्त राष्ट्र सम्मेलन का आयोजन किया गया। 1992 के रियो डि जिनेरो ब्राजील में आयोजित पृथ्वी सम्मेलन के क्रम में इसे 'पृथ्वी द्वितीय' भी कहा जाता है। इस सम्मेलन का मुख्य विषय था - पर्यावरण सुरक्षा के साथ टिकाऊ विकास को प्राप्त करना। सम्मेलन में तत्कालीन महासचिव कोफी अन्नान द्वारा सुझाए गए 5 क्षेत्रों को सम्पोषित विकास के मुख्य विषय के रूप में अपनाते हुए व्यापक रूप से विचार विमर्श किया गया। कोफी अन्नान द्वारा सुझाए गए पाँच क्षेत्र इस प्रकार हैं - जल (Water) उर्जा (Energy) स्वास्थ्य (Health) कृषि (Agriculture) तथा जैव विविधता (Bio-Diversity)। इन पाँचों क्षेत्रों को WEHAB भी कहा जाता है। सम्पोषित विकास के मार्गदर्शक सिद्धान्तों में निम्न तरीकों पर गौर किया जाता है -

- i) उत्पादन के क्षेत्र में पारिस्थितिकी मित्रवत प्रौद्योगिकी (Eco-Friendly TechnQue) को अपनाया जाए।
- ii) समग्र जीवन चक्र पर प्रबन्धन भूमण्डलीय आधार पर किया जाये ताकि संसाधन संरक्षण को एक प्रभावशाली दिशा दी जा सके।
- iii) परियोजना मूल्यांकन की प्रक्रिया में जिन तीन 'E' पर विशेष ध्यान दिया जाए, वे हैं - पर्यावरणीय सुरक्षा (Environmental Protection), पारिस्थितिकीय संतुलन (Ecological Balance) व आर्थिक दक्षता (Economic Efficiency)।
- iv) उत्पादन का विकेन्द्रीकरण करके इन क्षेत्रों में जन भागीदारी बढ़ायी जाए।

- v) पारिस्थितिकी साक्षरता (Eco-Literacy) को प्रभावशाली वैश्विक आन्दोलन की तरह चलाया जाए, जिससे हर व्यक्ति पारिस्थितिकी के संरक्षण में सहयोग करने लगे।
- vi) विश्व के सभी राष्ट्रों द्वारा पर्यावरण के सम्बन्ध में वैश्विक संस्थाओं, संघियों व प्रोटोकालों को पूर्ण मान्यता दी जाए व उनका पूर्णरूपेण अनुपालन हो।

जहाँ तक पर्यावरण नारीवाद (Eco-Feminism) की अवधारणा का प्रश्न है तो यह अवधारणा आज पर्यावरणवादियों के मध्य बहुत प्रख्यात है। यह अवधारणा नारी पर्यावरणवादियों द्वारा प्रभावित है। इनका मानना है कि आज जैड के इर्द-गिर्द जो राजनीति और असमानता है वह पर्यावरण से बहुत नजदीकी से जुड़ी हुई है। नारी पर्यावरणवादी इस बात की पड़ताल करते हैं कि किस प्रकार आर्थिक प्रक्रिया, सामाजिक व्यवहार और राजनैतिक सम्बन्ध जैड आधारित असमानता को बढ़ावा देने में सहायक है।

पर्यावरण नारीवाद या पारिस्थितिकीय नारीवाद (Eco-Feminism or Ecological Feminism) शब्दावली का प्रयोग सर्वप्रथम 1974 में फ्रैंकोइस डी ओबान (Francoise d' Eaubonne) ने किया। इस दर्शन के अनुसार, स्त्रियों के शोषण की सामाजिक, मानसिकता सीधे तौर पर प्रकृति के शोषण की सामाजिक मानसिकता से जुड़ी हुई है। पर्यावरण नारीवादियों द्वारा मुख्य तर्क दिया जाता है कि ऐतिहासिक रूप से भूमि पर फर्रों के आधिपत्य ने ही पितृसत्ता (Patriarchy) को जन्म दिया है और अत्यधिक चराई (overgrazing) लोगों के शोषण व भूमि के अनैतिक प्रयोग हेतु संस्कृति मुख्य रूप से उत्तरदायी है। इन दोनों की वजह से ही भूमि व जीवों को मात्रा आर्थिक साधन माना जाता है। ऐसे बहुत सारे पर्यावरण नारीवादी हैं जिनका यह मानना है कि पर्यावरण ने स्त्रियों के विकास में योगदान दिया है और इसके साथ यह भी तर्क दिया गया है कि स्त्री और प्रकृति के सम्बन्धों को पितृसत्ता के शोषणकारी इतिहास में भी देखा जा सकता है क्योंकि ये दोनों ही नारीजातीय हैं। पुरुष इन दोनों को निम्न मानता है ताकि वे पुरुष की भौतिक आवश्यकताओं की पूर्ति करते रहें। इस सिद्धान्त के समर्थकों में वन्दना शिवा, बीना अग्रवाल के नाम मुख्य हैं। पर्यावरण नारीवादियों का यह भी कहना है कि जो विशेषताएँ एक स्त्री में होती हैं जैसे साहस, संयम व सहनशीलता, कसृणा, ममता व पालन यह सभी विशेषताएँ प्रकृति में भी दृष्टिगोचर होती हैं। इन सकारात्मक सम्बन्धों को स्त्री और प्रकृति के सम्बन्धों में ढूँढा जा सकता है।



फ्रैंकोइस डी ओबान

वन्दना शिवा (1989) का मानना है कि स्त्रियों का प्रकृति अथवा पर्यावरण के साथ एक गहरा सम्बन्ध होता है जिसे इनके मध्य रोजमर्रा की होने वाली क्रियाओं में देखा जा सकता है। संक्षेप में कहा जा सकता है कि जहाँ सम्प्रेषित विकास प्राकृतिक संसाधनों के ऐसे इष्टतम उपयोग के तरीकों पर बल देता है जिससे प्राकृतिक संसाधनों का प्रयोग आने वाली भारी पीढ़ियाँ भी कर सके और स्वच्छ पर्यावरण उन्हें भी दिया जा सके। वही दूसरी ओर पर्यावरण नारीवाद पर्यावरण संरक्षण में स्त्रियों की भूमिका को मुख्य मानते हुए दोनों के मध्य कुछ समानताओं को देखते हैं। रिपोर्ट के प्रस्तुत भाग में इन दोनों सैद्धांतिक अवधारणाओं की पृष्ठभूमि में जमुना दुइहू के पर्यावरण संरक्षण के प्रयासों की समीक्षात्मक विवेचना की गई है क्योंकि अब तक किसी भी विश्वविद्यालय में पर्यावरण संरक्षण में आदिवासी महिलाओं के योगदान पर कोई शोध नहीं किया गया है।

इस अन्वेषण प्रोजेक्ट "आदिवासी महिलाओं द्वारा वन संरक्षण: जमुना दुइहू के प्रयासों के विशेष संदर्भ में", में आदिवासी महिलाओं संथाली आदिवासी: झारखंड द्वारा वन संरक्षण के क्षेत्र में दिए उनके अदम्य साहस व अथक प्रयासों की समीक्षात्मक विवेचना की गई है। इसके साथ ही अन्य पर्यावरणीय आन्दोलनों में महिलाओं की भूमिका को भी ध्यान में रखा गया है। इस रिपोर्ट हेतु झारखंड राज्य के पूर्वी सिंहभूम जिले के चाकुलिया ब्लॉक के बेड़ाडीह टोला चावुफलिया ब्लॉक में पाँच टोले आते हैं जिसमें गनैडी, जोजीडी, गुडियाडी, मुतुरडी मुतुरखम गाँव के बेड़ाडीह टोला अन्य चार टोले - गुनैडी, जोजीडी, गुडियाडी, मुतराडीह को अध्ययन क्षेत्र के रूप में लिया गया है। यहाँ पर संथाली आदिवासी महिला जमुना दुइहू द्वारा मुतुरखम वन की सुरक्षा हेतु स्थापित वन संरक्षण समिति की कार्यवाहियों का पर्यावरणीय नारीवाद के संदर्भ में समीक्षात्मक अध्ययन किया गया है।

मुतुरखम वन झारखंड में गँची हवाई अड्डे से लगभग 250 किमी. उत्तर पूर्व दिशा में पश्चिमी बंगाल व उड़ीसा की सीमा पर अवस्थित 23,60,500 हेक्टेयर का समृद्ध वन क्षेत्र है। यह वन 12 वर्ष पहले तक लकड़ी माफियाओं का सबसे व्यस्त कार्यक्षेत्र हुआ करता था। यहाँ के हालात राज्य के दूसरे क्षेत्रों से अलग नहीं थे, जिसका 50 फीसदी क्षेत्र पिछले 11 वर्षों में अवैध कटाई की भेंट चढ़ चुका था। हमारे पहले फील्ड सर्वे के दौरान जून, 2012 में घाटशिला से, गँची से लगभग 200 किमी उत्तर-पूर्व की ओर आगे सभी झाड़वरो ने जाने से मना कर दिया जिसका कारण इस क्षेत्र का नक्सल प्रभावित होना है परन्तु सौभाग्यवश हमें मुतुरखम गाँव तक पहुँचने में सफलता प्राप्त हुई।



संथाली आदिवासी जमुना

सन् 1999 में मुतुरखम के जंगल माफियाओं की

मुलाकात 32 वर्षीय संथाली आदिवासी महिला जमुना दुइहू (जमुना दुइहू) के पश्चिमी बंगाल स्तर पर लेडी टार्जन के नाम से विख्यात हैदर से हुई। जमुना दुइहू संथाली जनजाति की एक छोटे कद की मजबूत महिला है, जिसने सिर्फ 8वीं कक्षा तक पढ़ाई की है। जमुना ने आज से 19 वर्ष पहले सन् 1994 में 'वन संरक्षण समिति' का गठन किया और वन विभाग से 2003 में इसको पंजीकृत भी करवाया। प्रारम्भ में इसमें महिला सदस्यों की संख्या 25 थी जो आज बढ़कर लगभग 70 सदस्य हो गई है जिसमें सबसे छोटी 13 वर्षीय बहामयी दुइहू है और सबसे बुजुर्ग मालती दुइहू (70 वर्ष) है। समिति की महिलाएं पिछले 11 वर्षों से तीन समूहों में मुतुरखम के जंगल में गश्त लगाती हैं जिसमें पुफछ फण्ड सदस्य भी इनको सहयोग देते हैं। इनकी समिति के लोग गैर-कानूनी तरीके से लकड़ी की कटाई करने वालों को वन विभाग को झोप देते हैं। किसी समय पूर्वी सिंहभूम जिले के 50 हेक्टेयर में फैले जंगलों को वन माफियाओं ने बंजर बना दिया था। अब यहाँ 3 लाख से ज्यादा पेड़ हैं



जिसमें विशेष रूप से साल, वैफदू, बबूल के पेड़ लगे हैं, जबकि

वन संरक्षण समिति की आदिवासी महिलाएँ

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वर्ष पहले दो पेड़ों के बीच 24-25 फीट का फासला हुआ करता था सर्वे द्वारा एकत्रित आंकड़ा)। जमुना की इस पारिस्थितिकीय नारीवादी पहल का ही यह नतीजा है कि अब यहाँ कई जंगली जानवरों जैसे जंगली सुअर, खरगोश, अजगर, साँपों और हाथियों ने इसे अपना घर बना लिया है। वैसे मुतुरखम वन में आया परिवर्तन पर्यावरणीय अर्थशास्त्रा से भी प्रेरित था क्योंकि इस क्षेत्रा की जमुना व अन्य महिलाओं के पास पर्याप्त जलावन भी नहीं था, गर्मियों के दिनों में कहीं वृक्षों की छाया तक नहीं होती थी व जानवरों के लिए चारे की पर्याप्त उपलब्धता का अभाव था। 15 किलोमीटर के दायरे में भूमिगत जल स्तर गिरता जा रहा था। जिसके परिणामस्वरूप आदिवासी महिलाओं की स्थिति और अधिक मुश्किल होती जा रही थी क्योंकि जलावन लकड़ी व पशुओं के लिये चारे हेतु बहुत दूर तक जाना होता था जिसके फलस्वरूप उन्हें प्रतिदिन 15-16 घंटे घर के अवैधानिक कार्यों को देना होता था।



देवकी जैन

नारीवादी अर्थशास्त्री और सामाजिक विज्ञान विशेषज्ञ देवकी जैन इंस्टिट्यूट ऑफ सोशल स्टडी ट्रस्ट) और वीना मजूमदार सेंटर फॉर विमेन डेवलपमेंट स्टडी) इत्यादि ने महिलाओं के अवैतनिक काम को काम न मानने का मुद्दा उठाया। उन्होने तर्क दिया है कि ऐसी परिभाषा अपर्याप्त है जिसमें अवैतनिक काम को काम न माना जाए। घर का काम और बच्चों की परवरिश समाज के लिये आवश्यक काम



वीना मजूमदार



होते हुए भी इनका कोई आर्थिक मूल्यांकन नहीं किया गया है। इसके कारण महिलाओं, खासकर ग्रहणियों की स्थिति कमजोर पड़ती जाती है और यही सबवृफ़ख इन आदिवासी महिलाओं के साथ भी हुआ।



सिंदरा खाल

आदिवासी बहुल बेड़ाडीह टोला, आजादी के 65 साल बाद और झारखंड राज्य गठन के 11 साल बाद भी पेयजल की समस्या से ग्रस्त था। चापानल हैण्ड पम्प) की बात तो दूर गाँव में एक बुंफआ तक नहीं था। अब तक यहाँ के आदिवासी सिंदरा खाल में एकत्रित जलाशय के नजदीक मिट्टी खोदकर गड्ढा बनाना और फिर जलाशय से रिस कर आये जल को पीने हेतु उपयोग में लाना का पानी पीने को मजबूर थे। गाँव तक जाने के लिये सड़क नहीं थी और न ही आज तक कोई अस्पताल बना है। मुतुरखम गांव में स्क्वॉल के साथ-साथ बिजली की व्यवस्था भी नहीं थी। इस पृष्ठभूमि में यह किसी के लिये भी अनुमान लगाना असम्भव नहीं होगा कि कितनी कष्टकारी परिस्थितियों में इन्होंने अब तक का समय निकाला होगा? दूषित पेयजल का इन आदिवासियों के स्वास्थ्य पर कितना बुरा असर रहा होगा? इन आघरभूत आवश्यकताओं के अभाव में स्वच्छ पेयजल, स्वास्थ्य सुविधाओं का अभाव, प्राथमिक शिक्षा का अभाव, सड़क का अभाव इत्यादि आदिवासी महिलाओं का जीवन कितना कष्टकारी रहा होगा। आरम्भ में जमुना परिवार के भरण-पोषण हेतु पत्थर तराशकर मूर्ति बनाने का काम किया करती थी। हालांकि 2 वर्ष पहले इन्होंने घर में हर्बल ब्यूटी पार्लर का काम शुरू कर दिया है जिससे प्रतिदिन 50 से 60 रुपये तक की आय इनको होती है।

मुतुरखम में प्रतिदिन सुबह के छः बजे वन संरक्षण समिति की ज्यादातर महिलाएं, जमुना के घर के बाहर अपने-अपने पारंपरिक हथियारों के साथ एकत्रित होकर तीन समूहों में तीन भिन्न-भिन्न दिशाओं से वन में गश्त के लिए प्रवेश करती हैं। जमुना का कहना है कि -

"आज यदि कोई भी पेड़ काटते पकड़ा जाता है तो उस पर 40१ रुपये का जुर्माना लगाकर वन विभाग के हवाले कर दिया जाता है और यह रकम समिति के कोष में जमा कर दी जाती है और इसका इस्तेमाल संगठन की बेहतरी के लिये किया जाता है।"

लकड़ी की अवैध कटाई करने वाले माफिया से जुड़ने के बुजुर्ग महिलाएं तराई वाले क्षेत्रों में बुफत्तों के साथ निगरानी करती हैं। इस मुहिम में जुड़ने वाली महिलाएं कहती हैं कि इस काम से खेती या घरेलू जिम्मेदारियों पर कोई प्रभाव नहीं पड़ता है। गाँव के रामेश्वर दुइडू का कहना है कि "पूरा गाँव जमुना की समिति का हो गया है।" आज वन विभाग ने मुतुरखम को आदर्श गाँव रेंजर सिंह के कार्यकाल में के रूप में गोद ले लिया था। अभी ज्यादा नहीं बीता जब केरल के पापुफड़ जिले में जनजातीय अधिकारों के



साल की पत्तियों से प्लेट बनाती आदिवासी

आवाज उठाने वाली सिस्टर वालसा जॉन को बुफल्हाड़ी से मार दिया गया था। इसके बावजूद जमुना निडर होकर जंगल में अन्य महिलाओं के साथ गश्त लगाती आ रही जिन महिलाओं के पास बुफख वर्ष पहले गुजर-बसर करने का कोई जरिया नहीं था, वे भी हाथ से चलने वाली मशीन की मदद से साल की पत्तियों की प्लेट बनाकर

जमुना को प्राप्त 'हिन्दुस्तान टाइम्स गुप्त अवार्ड'

लिये हैं। दुइडू उनकी मुखिया कर्जदार ए.के. समय लिये

है। अब

सालाना 15 से 18 हजार कमा लेती है। झारखण्ड राज्य सरकार जमुना की अगुवाई वाली इस समिति के प्रयासों को नकद पुरस्कार के जरिये झारखण्ड स्थापना दिवस के अवसर पर सम्मानित कर चुकी है। इसके साथ ही हिन्दुस्तान टाइम्स गुप्त की तरफ से सर्वेक्षण के पश्चात् राष्ट्रीय स्तर पर देश में दिए गए अपने अतुलनीय योगदान हेतु जमुना दुइडू को देश की 25 असाधारण हस्तियों में शामिल करते हुए तत्कालीन पर्यावरण मंत्री जयराम रमेश के हाथों फरम्वृफत किया गया। इन 25 असाधारण हस्तियों में प्रथम पाँच असाधारण हस्तियों में भी इन्हें शामिल करते हुए फरम्वृफत किया गया। अभी हाल ही में

फिलिप, ग्रेफील्ड कम्पनी मोदी ग्रुप द्वारा भी इन्हें 2012 के 'सामाजिक बहादुरी Social Bravery Award) से भी नवाजा गया।



पुरस्कार”

**जमुना द्वारा सम्पोषित पर्यावरणीय नारीवादी प्रयास
Sustainable Eco-Feminist Efforts by Jamuna Tuddu)**

1. सम्पोषित विकास प्रकृति के साथ मानव का सहयोग, सहचर्य Symbiosis) उसके प्रति श्रद्धा व सम्मान की भावना पर आधारित है। इस भावना की पहचान मुतुरखम गाँव की आदिवासी महिलाओं के पर्व व त्यौहारों गोमह पर्व, जानताह पर्व, सोहराय पर्व व सकरात पर्वद्ध, इनके प्रकृति धर्म सरना-आदिवासियों का अपना धर्म 'सरना' है जो प्रकृति का धर्म है। वे पेड़ों और अपने पूर्वजों की पूजा करता है। इनका बोंगा देवताह इनका मित्रा है, जो आकाश में नहीं विचरता बल्कि इसकी जड़ें धरती में हैं। इनका प्रकृति के साथ सहचर्य इतना ज्यादा है कि इनके टोटम गोत्राद्ध पेड़, पौधे या जीवों के नाम पर होते हैं। आदिवासी स्वयं को हिन्दू, मुसलमान या ईसाई कहकर अपना परिचय नहीं देता बल्कि 'तुम कौन हो' पूछे जाने पर वह कहेगा - "मैं आदिवासी हूँ।"

जिस प्रकार आज देश के वनों के अस्तित्व को खतरा है ठीक उसी प्रकार इनका अस्तित्व भी संकट में है। आदिवासी की पहचान और नाम छीनकर उसे 'वनवासी' घोषित किया जा रहा है वह भूल जाए कि वह इस देश का मूल निवासी यानी आदिवासी है। आदिवासियों को भारत सरकार ने मूल निवासी के रूप में स्वीकार नहीं है क्योंकि यदि सरकार इन्हें मूल निवासी स्वीकार करती है तो अंतर्राष्ट्रीय प्रावधानों के अनुसार इन्हें वुफष विशिष्ट अधिकार जिनमें आत्मनिर्णय का अधिकार भी सम्मिलित है, इन्हें प्रदान करना पड़ेगा। के पूजा स्थल को मुतुरखम गाँव में जाहेर थान कहा जाता है जहाँ ग्रामीण लोग प्रकृति पूजा करते हैं। यह वृक्षों के प्रति इनका अगाध प्रेम ही है कि ये सभी महिलाएँ रक्षा बन्धन के त्यौहार में वृक्षों को राखी बाँधे हुए उनकी रक्षा की जिम्मेवारी स्वयं पर लेती हैं।



जमुना की अगुआई में पेड़ों को राखी बाँधती आदिवासी महिलाएँ

ताकि
किया
प्रकृति
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2. सम्पोषित विकास पर संयुक्त राष्ट्र सम्मेलन 2002) में इसके पाँच विषयों पर व्यापक विचार-विमर्श हुआ ये क्षेत्रा थे - जल, उफर्जा, स्वास्थ्य, और जैव विविधता। इन विषयों को WEHAB Water, Energy, Health, Agriculture and Bio-Diversity) कहा जाता है। इस अंतर्राष्ट्रीय सम्मेलन व इसके विषयों के अनभिन्न जमुना ने गाँव में की सुविधा हेतु पानी की टंकी हेतु अपनी पैतृक सम्पत्ति का दान किया टंकी का निर्माण कर घर-घर पानी की आपूर्ति की। पहले सभी ग्रामीण आदिवासी सिंदरा खाल का स्वच्छ जल पीने को मजबूर थे। बाद में के प्रयासों और ग्रामीण आदिवासियों के श्रमदान से यहाँ कुँ का निर्माण हो पाया।



मुतुरखम गाँव में निर्मित पानी की टंकी

मुख्य
कृषि
पेयजल
और
जमुना
सम्भव

3. सम्पोषित विकास की परियोजना मूल्यांकन में जिन तीन 'E' Environment Protection, Ecological Balance and Economic Efficiency) पर जोर दिया जाना चाहिये इन उद्देश्यों का त्रिफयान्वयन हमें वन संरक्षण समिति की मुतुरखमद्ध रणनीतियों में देखने को मिला। पर्यावरण संरक्षण के क्षेत्रा में इन्होंने बंजर बन चुके 23,60,500 हेक्टेयर के क्षेत्रा को वृक्षों से हरा-भरा कर



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आज

भी सतत् रूप से इनकी लकड़ी माफियाओं से रक्षा कर रही है। वृक्षारोपण से इस क्षेत्रा का पारिस्थितिकीय सन्तुलन तो सुधरा ही है साथ ही वनों की सघनता से स्वच्छ वायु, मृदा अपरदन (Soil Erosion)] जल संचयन (Water Harvesting)] हेतु तालाबों के निर्माण से भूमिगत जल में वृद्धि इत्यादि का भी विकास हुआ है।

स्वच्छ पेयजल की उपलब्धता, कुएँ का निर्माण, गाँव में सड़कों के निर्माण, प्रावृफतिक संसाधनों की प्रचुरता से इनकी आर्थिक दृष्टता का भी विकास हुआ है। आज आदिवासी महिलाओं को इन सभी आधारभूत आवश्यकताओं के लिये 4 से 6 कि.मी. नहीं जाना पड़ता। डाक्यूमेंट्री में यह सब दर्शाया गया है)

सुतुरखम गाँव में पेयजल हेतु कुओं

4. सम्पोषित विकास में वर्तमान पीढ़ी अपनी आवश्यकताओं की पूर्ति वाली पीढ़ियों की आवश्यकताओं की पूर्ति को बिना नुकसान पहुँचाये करती है। यदि इन आदिवासी महिलाओं के वन संरक्षण के प्रयासों, स्वच्छ जल की उपलब्धता, गर्भवती महिलाओं की सहायता हेतु 5 आदिवासी महिलाओं को प्रशिक्षण, बच्चों के लिये स्तूपल की स्थापना हेतु जमुना द्वारा अपनी पैतृक सम्पत्ति का दान किया गया। अर्थात् जो आधारभूत सुविधाएँ इनके पास सरकारी तंत्रा के द्वारा वर्ष 2010 तक नहीं पहुँचीं। उनकी बागडोर इन्होंने स्वयं संभाली। दूसरे शब्दों में अपनी वर्तमान आवश्यकताओं के साथ-साथ आने वाली भावी पीढ़ियों के लिये एक सुखद भविष्य की नींव स्थापित कर डाली है।

5. जहाँ तक पर्यावरणीय नारीवाद की सैद्धान्तिक मान्यताओं का संदर्भ है इसमें स्त्री एवम् प्रकृति दोनों समान विशेषताओं साहस, संयम व सहनशीलता, ममता पालन इत्यादि) को देखते हुए स्त्री की प्रकृति से सहबद्धता को तलाशा जाता है। यदि जमुना दुइडू के संरक्षण के प्रयासों पर गौर किया जाए तो यह तथ्य उजागर हो जाता है कि कितनी सहबता और सहजीविता इन आदिवासी महिलाओं और वृक्षों के मध्य वृक्षों को अपना भाई मानकर उन्हें राखी बाँधना, उनकी करते हुए और अधिक वृक्षारोपण पर ध्यान देना इनके संयम व सहनशीलता और ममता व पालन को है। जमुना के सुतुरखम संरक्षण के साहस से प्रेरित होकर बेड़ाईह टोला के साथ अवस्थित बर्डी टोला की आदिवासी महिला चंपा रानी मुर्म ने कांटाबनी वन सुरक्षा समिति सुतुरखम वन सुरक्षा समिति से प्रेरित और सलाह लेकर का गठन किया।



जमुना से प्रेरित कांटाबनी वन सुरक्षा समिति

में व

वन स्वयं

है।

रक्षा साहस, दर्शाता

6. जमुना ने आदिवासी महिलाओं के सशक्तिकरण व आत्मनिर्भरता का विकास किया है। इसके लिये की अगुवाई में वन विभाग द्वारा समिति को साल के जेट बनाने वाली मशीनें उपलब्ध करवाई गई पिछले वर्ष से ही सुतुरखम की आदिवासी महिलाएं गेदे के फूलों की खेती कर स्वावलंबी बनने हेतु कार्यरत है।



जमुना के सहयोग से राई कार्य में प्रशिक्षित पाँच आदिवासी महिलाएँ

उनमें जमुना पत्नी से है और

पाँच उड़ीसा कोई



अस्पताल नहीं है।



जमुना के निर्देशन में 'पौधा लाडली योजना का शुभारम्भ करती आदिवासी महिलाएँ

जमुना द्वारा दिए गए भू-दान पर निर्मित बेड़ाडीह स्कूल भवन

8. जमुना के निर्देशन में समिति ने बालिका संरक्षण हेतु एक अनोखी योजना 'पौधा लाडली योजना' का शुभारम्भ किया है, जिसमें यह निर्णय लिया गया है कि गाँव में बेटी के जन्म पर वह परिवार समिति के सहयोग से 16 मूल्यवान वृक्षों सागवान, अकाशिया, गम्हार इत्यादि का रोपण करेगा और बालिका के 16 वर्ष के होने पर इनमें से 10 वृक्षों को बेचने का अधिकार बालिका को समिति द्वारा दिया जाएगा उच्च शिक्षा, विवाह, स्वास्थ्य और अन्य आधर पर। गाँव में कोई विद्यालय न होने की वजह से बेड़ाडीह टोला जमुना का आवासीय टोला के बच्चे स्वीकृत नहीं जाते थे परन्तु जमुना द्वारा स्वीकृत के भवन, निर्माण हेतु अपनी पैतृक सम्पत्ति दान में दी और इस गाँव के बच्चों हेतु मुफ्त शिक्षा का प्रसार आरम्भ किया गया।

10. आदिवासी महिलाओं को पेयजल की उपलब्धता, कुएँ के निर्माण और के निर्णय निर्माण में अधिकतम सहभागिता दिए जाने से आज इन आदिवासी महिलाओं का शारीरिक व बौद्धिक विकास सम्भव हो पाया है। द्वारा ही पहली बार इस गाँव में हर्बल ब्यूटी पार्लर भी खोला गया है।



समिति जमुना

11. इस प्रोजेक्ट के सर्वेक्षण के दौरान मुत्तुरखम वन संरक्षण समिति की कार्यवाहियों से जुड़े मौलिक दस्तावेजों को



जमुना द्वारा खोला गया महिला ब्यूटी

देखा गया तब यह स्पष्ट हो गया कि इसमें महिलाओं की सहभागिता फरकों से बहुत अधिक है। इस तथ्य को निम्न तालिका से पहचाना जा सकता है-

मुख्य वन संरक्षण समिति की कार्यवाहियों से
रू-ब-रू होते प्रोजेक्ट सर्वेक्षक

मुख्य वन संरक्षण समिति के सदस्य

| प्रक्रम सं. | महिला सदस्य | फरक सदस्य | स्थानी आदिवासियों के उपनाम |
|-------------|-------------------------|----------------------------|----------------------------|
| 1. | जमुना दुइहू, अध्यक्ष | मान सिंह दुइहू | दुइहू |
| 2. | मालती दुइहू, उपाध्यक्ष | विजय कुमार सिंह, पदेन सचिव | हेम्ब्रम |
| 3. | चारू चरण दुइहू, सह सचिव | गंगाधर दुइहू | हॉसदा |
| 4. | जानी दुइहू, सदस्य | सिधेश्वर दुइहू | किन्कु |
| 5. | जोसना दुइहू, सदस्य | गंगानाथ दुइहू | सेनेन |
| 6. | मालावती दुइहू, सदस्य | तुलाराम हॉसदा | नरके |
| 7. | सूगी दुइहू, सदस्य | आलादी सेनेन | माण्डी |
| 8. | माया दुइहू, सदस्य | उमान माण्डी | हेम्ब्रम |
| 9. | सालगे दुइहू, सदस्य | रामचन्द्र इन्दु | हॉसदा |
| 10. | चितामनी दुइहू, सदस्य | | |
| 11. | सलमा दुइहू, सदस्य | | |
| 12. | शिमाल दुइहू, सदस्य | | |
| 13. | बहामयी दुइहू, सदस्य | | |
| 14. | जाना दुइहू, सदस्य | | |
| 15. | सुतामनी दुइहू, सदस्य | | |
| 16. | सनातनी दुइहू, सदस्य | | |
| 17. | बाओरा दुइहू, सदस्य | | |
| 18. | कपरा दुइहू, सदस्य | | |
| 19. | जाउफना दुइहू, सदस्य | | |
| 20. | मायनो दुइहू, सदस्य | | |
| 21. | सालगे दुइहू, सदस्य | | |

| | | | |
|-----|---------------------------|--|--|
| 22. | सुगीर दुइइ, सदन्य | | |
| 23. | जितराई दुइइ, सदन्य | | |
| 24. | हीरामनी, सदन्य | | |
| 25. | फितु हेम्ब्रम, सदन्य | | |
| 26. | कादम्बरी हेम्ब्रम, सदन्य | | |
| 27. | मिडू ह, सदन्येम्ब्रम | | |
| 28. | सीमती, सदन्य | | |
| 29. | सारावली हाँसदा, सदन्य | | |
| 30. | बालही, सदन्य हाँसदा | | |
| 31. | बालही हाँसदा, सदन्य | | |
| 32. | चुन्नी रानी हाँसदा, सदन्य | | |
| 33. | जाउना हाँसदा, सदन्य | | |
| 34. | दमुमनी हाँसदा, सदन्य | | |
| 35. | डुमना फिक्कु, सदन्य | | |
| 36. | सुम्मी फिक्कु, सदन्य | | |
| 37. | आलदी सोरेन, सदन्य | | |
| 38. | काजल मुर्म, सदन्य | | |
| 39. | सरस्वती मुर्म, सदन्य | | |

नेट: *समिति की ज्यादातर बैठकों में सम्मिलित होने वाले गाँव के आदिवासी स्त्री व पुरुष।*

12. यहाँ जमुना के सम्पोषित पर्यावरणीय नारीवादी प्रयासों को हमारे प्रोजेक्ट के विद्यार्थियों ने मौलिक हिन्दी कविता के माध्यम से वर्णित किया है, जैसे -

नारी और प्रकृति

*सदियों से जो दबायी हुई है, पितृसत्ता के अत्याचार की मार खाई हुई है।
नारीवाद से बनी वो स्वाभिमानी, बात नहीं मानी है ये फरानी।
आओ सुनाए झरखण्ड की कहानी।*

*प्रण लेकर जंगल को बचाया।
जमुना दुइ ने यह पाठ पढ़ाया।
शक्ति की वह बन गई निशानी।
आओ सुने झरखण्ड की कहानी।*

झरखण्ड जो था हरा भरा, सुंदर थी जिसकी धरा।

संकट के बादल है छाए, काटी सारी वसुन्धरा।
महिला हो या प्रकृति दोनों है ममता और करुणा की निशानी।
उनके अत्याचारों की है अपनी एक अलग कहानी।

काटे जंगल और बागान, बंजर हुए झरखण्ड उद्यान।
प्रकृति पर यह कैसे कर डाला, जीवन अपने हाथों से अपना नरक बनाया।
महिलाओं को गुस्सा आया थामी सुधरने की कमान।
लगाओ जुमाना जो काटे खेत-खलिहान।
जुमनि से जो पैसा आया लगे पेड़-पौधे, बने विद्यालय हुआ सड़क निर्माण।
जन-जन का हुआ कल्याण, झरखण्ड फिर से बना उद्यान।

एकता रानी

उठ जाग मुसाफिर जाग
इस निद्रा को अब तू त्याग।
देर हो गई अब अगर तो यह सब हमको सहना होगा।
स्वस्थ व्यक्ति की धारणा को स्वप्न बनकर ही रहना होगा।

शिवानी

देखो-देखो झरखण्ड की जमुना दुहू को देखो।
इसने मुतुरखम को बचाया, लकड़ी माफियाओं से बचाया।
इसने वृक्षों को लगाया, झरखण्ड को स्वच्छ बनाया।

प्रियंका

यदि भारतीय स्वतन्त्रता संग्राम में आदिवासी महिलाओं के योगदान को देखा जाए तो यह इसमें कभी पीछे नहीं रही। रोहतासगढ़ में तीन बार तुर्क सेना पर हमला हुआ था जिसमें तीनों बार 'सिनगी दर्ई' और 'कइली दर्ई' के नेतृत्व में औरतों ने मुकाबला करके उन्हें पछाड़ा। संथाल विद्रोह में सिधु-कान्हू और चांद भैरव की दो बहनों 'पूफलो' और 'धनो' ने अंग्रेजों से मुकाबला किया और अंग्रेजों के इक्कीस सिपाहियों को मौत के घाट उतार डाला। झरखण्ड की 'देवमती' उर्फ 'बंघनी', 'माकी' औरतें भी बलिदान का प्रतीक हैं। इनके अलावा चम्पी, नागी, साली, थिग्गी, लेम्बु, मकी वे आदिवासी महिलाएं हैं जिन्होंने आदिवासी विद्रोहों में महत्वपूर्ण भूमिका निभाई।

वास्तव में सम्पोषित विकास और पर्यावरणीय नारीवाद की ज्यादातर मान्यताओं का अनुकरण हमें जमुना द्वारा निर्देशित व गठित वन संरक्षण समिति की व्यावहारिक कार्यप्रणालियों में देखने को मिलता है। चूंकि विकास की मुख्य धारा से दूर बिना किसी सरकारी सहायता के इन सभी आदिवासी महिलाओं के प्रयास सराहनीय हैं और जब तक स्थानीय समुदायों को वन संरक्षण हेतु प्रेरणा, प्रोत्साहन और पहचान नहीं मिलेगी तब तक वन संरक्षण के क्षेत्र में व्यापक सफलता प्राप्त नहीं हो सकेगी। सम्पोषित विकास और पारिस्थितिकीय नारीवाद के सैद्धान्तिक ज्ञान से अनभिज्ञ इन आदिवासी महिलाओं के स्व-प्रेरित प्रयास प्रशंसनीय हैं और पर्यावरण संरक्षण अतुलनीय हैं।



■ आदिवासी महिलाओं के जंगल बचाने के प्रयास पर

डॉक्यूमेंटरी फिल्म की शूटिंग शुरू

दिल्ली विश्वविद्यालय के श्याम लाल कॉलेज के प्रोफेसर सितेश मारवाड़ा के नेतृत्व में बना रहीं है 25 मिलों की डॉक्यूमेंटरी फिल्म

- डिजिट ऑट के शिवा दावु के निर्देशन में बना रही फिल्म
- बेदाहल की वसुध की अट्याक जंगल टूट के नेतृत्व में महिलाओं ने मुद्ररखन साल जंगल की की है रक्षा

प्रतिनिधि ■ चाकुलिया

गांव में की जा रही है डॉक्यूमेंट फिल्म की शूटिंग.

छोटी | एनए वर

अध्याय 1 : वैश्वीकरण, उपभोग संस्कृति और बचपन

अध्याय 2 : दिल्ली में बाजार और ब्रांड की अवधारणा और बचपन

अध्याय 3 : तकनीकी क्रांति, विज्ञापन और बचपन

अध्याय 4 : वैश्विक संस्कृति शिक्षा और प्रतिस्पर्धा

अध्याय 5 : उपभोग संस्कृति, बाजार और बचपन : दिल्ली के विशेष संदर्भ में

अध्याय 6 : उपभोग संस्कृति, बाजार और बचपन : मुम्बई के विशेष संदर्भ में

वर्तमान में बाजार ने समूची जीवन शैली को प्रभावित किया है। धर्म, राजनीति, शिक्षा व्यापार आदि सबका बाजार नियंत्रता बन बैठा है। विकसित समाज से लेकर सुदूर गांव के जन-सामान्य तक सबका नीति-निर्धारक तत्त्व बाजार ही है। बाजार से उत्पन्न मूल्य पैसा, प्रसिद्धि व प्रतिष्ठा की जिदोजहद ने पिछले सारे जीवन मूल्यों में भारी उलट फेर किया है। इस क्रम में बचपन बाजार से कैसे अछूता रह सकता है। आज बाजार बचपन के हर कोण जैसे खान-पान, आचार-विचार, व्यवहार, शिक्षा व सोच सबको प्रभावित कर रहा है। बचपन पर बाजार के प्रभाव को लेकर दो ध्रुवांतों सकारात्मक व नकारात्मक में से किसी एक पहलू के पक्ष या विपक्ष में राय कायम करने से बात नहीं बनेगी। भारतीय पृष्ठभूमि में बचपन पर पड़ने वाले वैश्विक बाजार व उपभोग संस्कृति के हरेक पक्ष को जांचना-परखना आवश्यक है। बचपन में आने वाले परिवर्तनों से संबंधित जिज्ञासा इस शोध की पृष्ठभूमि बनी। सर्वेक्षण, अवलोकन इसका आधार बना और प्राप्त निष्कर्षों व सुझावों के साथ ये पुस्तक रूप में पाठकों के समक्ष है।

2. Final Findings (300 words):

प्रस्तुत शोध के मूल उद्देश्य के अनुरूप कुछ महत्त्वपूर्ण परिकल्पनाओं का गठन किया गया और इन परिकल्पनाओं के आधार पर प्रश्नावली को पांच भागों में विभक्त करते हुए बच्चों के खान-पान, खेल-कूद, मनोरंजन, शिक्षा-दीक्षा, जीवन-शैली आदि से संबंधित प्रश्नों के उत्तर प्राप्त करने का प्रयास किया गया है।

1. वैश्वीकरण के युग में बच्चों के पालन-पोषण में प्रयुक्त उत्पादों से बच्चों के शारीरिक, मानसिक एवं सामाजिक विकास में कोई परिवर्तन नहीं आया है।
2. वैश्वीकरण के फलस्वरूप बच्चों में भोग-विलास की प्रवृत्ति बढ़ी है।
3. विपणनकर्त्ताओं द्वारा बाल श्रम व अन्य नैतिक-संवैधानिक मान्यताओं का अनुपालन नहीं किया जा रहा है।
4. विज्ञापन उद्योग द्वारा बच्चों का भावनात्मक शोषण किया जा रहा है।

इन परिकल्पनाओं के आधार पर दिल्ली और मुम्बई महानगरों से प्राप्त सांख्यिकीय विश्लेषण के निष्कर्षों को इस प्रकार कहा जा सकता है।

पहली परिकल्पना से सम्बंधित प्रश्नों के सांख्यिकीय विश्लेषण से स्पष्ट हुआ है कि वैश्वीकरण का बच्चों के शारीरिक एवं मानसिक विकास पर तो सकारात्मक प्रभाव पड़ा है किन्तु सामाजिक एवं नैतिक पहलू पर

इसके नकारात्मक प्रभाव पाए गए हैं ।

यदि सांख्यिकीय भाषा में कहें तो चूँकि सभी घटकों के $P\text{-value} < 0.05$ हैं, अतः (H0) कि वैश्वीकरण के युग में बच्चों के पालन-पोषण में प्रयुक्त उत्पादों से बच्चों के शारीरिक, मानसिक व सामाजिक विकास में कोई परिवर्तन नहीं आया है, अस्वीकृत हो गया और वैकल्पिक परिकल्पना H1: “वैश्वीकरण के युग में बच्चों के पालन-पोषण में प्रयुक्त उत्पादों से बच्चों के शारीरिक, मानसिक व सामाजिक विकास में सकारात्मक परिवर्तन आया है” साधारण रूप से स्वीकृत हो गई।

दूसरी परिकल्पना से सम्बंधित प्रश्नों के सांख्यिकीय विश्लेषण से स्पष्ट हुआ है कि वैश्वीकरण के कारण बच्चों में भोग-विलास एवं उपभोग की प्रवृत्ति बढ़ी है । यदि सांख्यिकीय भाषा में कहें तो चूँकि इस परिकल्पना से सम्बंधित घटकों के $P\text{-value} < 0.05$ हैं, अतः (H01) कि उपभोग संस्कृति के फलस्वरूप बच्चों में भोग-विलास की प्रवृत्ति नहीं बढ़ी है, अस्वीकृत हो गई और वैकल्पिक परिकल्पना H2: “उपभोग संस्कृति के फलस्वरूप भोग-विलास की प्रवृत्ति बढ़ी है” स्वीकृत हो गई ।

तीसरी परिकल्पना से सम्बंधित प्रश्नों के सांख्यिकीय विश्लेषण से जो निष्कर्ष सामने आए हैं उनके अनुसार भारत में कार्य करने वाले अधिकांश निगम बाल मजदूरी पर रोक तथा पर्यावरण की सुरक्षा इत्यादि जैसे कानूनी प्रावधानों के अनुसार कार्य नहीं करते । यदि सांख्यिकीय भाषा में कहें तो चूँकि इस परिकल्पना से सम्बंधित घटकों के $P\text{-value} > 0.05$ हैं, अतः H3: “विपणनकर्त्ताओं द्वारा बाल श्रम व अन्य नैतिक-संवैधानिक मान्यताओं का अनुपालन नहीं किया जा रहा है” स्वीकृत हो गया।

चौथी परिकल्पना से सम्बंधित प्रश्नों के सांख्यिकीय विश्लेषण से स्पष्ट करता है कि विज्ञापन उद्योग द्वारा बच्चों का प्रयोग भावनात्मक शोषण हेतु किया जा रहा है और आधुनिक विज्ञापन बच्चों की भावनाओं के साथ खिलवाड़ करते हैं तथा उन्हें बाध्य करते हैं कि वे अपने अभिभावकों को खाद्य तथा खेल सामग्री खरीदने के लिए मनाएं।

यदि सांख्यिकीय भाषा में कहें तो चूँकि इस परिकल्पना से सम्बंधित घटकों के $P\text{-value} > 0.05$ हैं, अतः (H01) कि “विज्ञापन उद्योग द्वारा बच्चों का प्रयोग भावनात्मक शोषण हेतु नहीं किया जा रहा है” अस्वीकृत हो गया और वैकल्पिक परिकल्पना H4: विज्ञापन उद्योग द्वारा बच्चों का प्रयोग भावनात्मक शोषण हेतु किया जा रहा है, स्वीकृत हो गई ।

सर्वेक्षण के माध्यम से इन प्रश्नों के उत्तर (कारण) प्राप्त करने के साथ-साथ हमने यह भी जानने का प्रयास किया कि उपभोग संस्कृति एवं बाजारवाद के इस युग में बचपन के व्यवहार को निर्धारित एवं निर्देशित करने वाले विभिन्न घटकों में से कौन सा घटक ज्यादा प्रभावशाली है ताकि उन घटकों को चिन्हित किया जा सके और यदि उनके प्रभाव नकारात्मक हों तो सुधारात्मक कदम उठाये जा सकें. इस उद्देश्य के लिए प्रिंसिपल कम्पोनेन्ट एनालिसिस सहारा लिया गया ।

उपरोक्त आंकड़ों के विश्लेषण के आधार पर निष्कर्ष रूप में हम यह कह सकते हैं कि प्रिंसिपल कॉम्पोनेन्ट के रूप में चिन्हित घटकों एवं उपघटकों के दो प्रमुख वर्गों में से पहला वर्ग अर्थात् आधुनिक तकनीक, सूचना एवं संचार क्रांति, नवीन उत्पाद, विज्ञापन आदि सामने आया जोकि इस बात की पुष्टि करता है कि उपभोग संस्कृति एवं बाजारवाद के संवाहक के रूप में ये भारतीय बचपन को महत्वपूर्ण रूप से प्रभावित कर रहे हैं। सांख्यिकीय रूप में कहें तो यह

घटक कुल विचलन के कारणों की महत्वपूर्ण रूप से (60% अथवा ज्यादा) व्याख्या कर रहा है।

दिल्ली और मुंबई की तुलना अगर बचपन के संदर्भ में करें तो दोनों महानगरों के बचपन में कोई खास वैषम्य नजर नहीं आता, यह इस शोध हेतु रचित परिकल्पनाओं की सत्यता के परीक्षण के द्वारा भी सिद्ध होता है, लेकिन चूंकि हर शहर की बनावट व संस्कार के साथ वहां के जीवन में पर्याप्त विविधताएं दृष्टिगत होती हैं और इस आधार पर अगर देखें तो दोनों महानगरों के कुछ दिलचस्प पहलू सामने आते हैं:-

- जब अभिभावकों से यह पूछा गया कि वर्तमान पीढ़ी पर वैश्वीकरण का क्या प्रभाव है, तो दिल्ली में अधिकांश उत्तरदाताओं ने भारतीय संस्कृति के विकृतिकरण के लिए इसे जिम्मेदार ठहराया, वही मुम्बई ने इसे सकारात्मक माना। इसका अर्थ यह लगाया जा सकता है कि दिल्ली में वैश्वीकरण का प्रभाव तीव्र व नुकीला है, सभवतः इसी कारण अभिभावक इसे लेकर अधिक गंभीर व सशक्त दिखाई दिए।
- दिल्ली व मुम्बई में 1-14 वर्ष के बच्चों की खान-पान की आदतों की अगर तुलना करें तो मुम्बई के अभिभावक एकमत से ये मानते हैं कि उनके बच्चों को फॉस्ट फूड खाने की आदत पहले-पहल स्कूल से पडी। यह देखा गया कि मुंबई के बच्चों में दिल्ली के बच्चों की तुलना में मोटापे की समस्या कम है। दिल्ली की सड़कों पर गाड़ियां और बच्चों में मोटापे की समस्या तेजी से बढ़ रही हैं। ये सम्पन्नता का सूचक कहा जा सकता है, लेकिन सभवतः यही कारण है कि वैश्वीकरण के प्रभावों को लेकर दिल्ली के लोग मुम्बई की तुलना में अधिक संदेहास्पद स्थिति में पाए गए।
- वैश्वीकरण के फलस्वरूप बदले शिक्षा-तंत्र और उसके बाजारीकरण को लेकर दोनों महानगरों में कमोवेश एक स्थिति है लेकिन मुम्बई हॉबी क्लासिज को लेकर अधिक सकारात्मक है, और लगभग बहुमत में इस मत को स्वीकार करता है कि हॉबी क्लासिज बच्चों की प्रतिभा को निखारने में मददगार सिद्ध होती हैं। इसी मानसिकता के चलते किसी भी रीयलिटी शो में मुम्बई को बहुत प्रोत्साहन मिलता है। निजी स्कूलों व ट्यूशन सेंटर को लेकर दिल्ली-मुम्बई में लगभग समान स्थिति है।
- टेलीविजन और विज्ञापन को लेकर एक मत से दिल्ली और मुम्बई स्वीकार करते हैं कि बच्चों के विकास में इनकी महती भूमिका है और इसके सकारात्मक और नकारात्मक प्रभाव बचपन पर पड़ रहे हैं। पर अगर तुलनात्मक रूप से देखा जाए तो दिल्ली का बचपन ऐनीमेशन फिल्म, वीडियो गेम्स और बाजार की गिरफ्त में अधिक है। मुम्बई में ऑउटडोर गेम्स, हॉबी क्लासिज, रीयलिटी शो आदि का बचपन पर ज्यादा प्रभाव है। बाल-श्रम व मजदूरी के आकड़ों की तुलना करें तो मुम्बई में दिल्ली की तुलना में बाल-श्रम की दरें अधिक हैं। दिल्ली और मुम्बई के बाजारों व निर्माण कार्यों में बच्चों की स्थिति को जांचने का प्रयास जब शोध टीम ने किया तो अनेक ऐसे बाल-मजदूर मिले जो शोषण की चक्की में लगातार पिस रहे थे। वर्तमान में पैसा, प्रसिद्धि और प्रतिष्ठा को हासिल करने के लिए हर संभव प्रयत्न ही सर्वोपरि हो गया है। अधिकतम लाभ, अधिकतम साधनों के अर्जन के साथ अधिकतम भोग इस युग का सबसे बड़ा आदर्श बन चुका है। बचपन भी इन सबसे अछूता नहीं रह गया है। संक्षेप में कहा जा सकता है बाजारवाद और उपभोग संस्कृति के कारण 'संतोषम् परम सुखम्' जैसे नैतिक मूल्यों व संस्कारों पर आधारित मूल्य व्यवस्था को आज एक पुराने ढाँचे की संज्ञा जा रही है जो दिनोंदिन ढह रहा है और इसके स्थान पर जो नये जीवन-मूल्य बन रहे हैं, उसमें पृष्ठभूमि का नितांत अभाव है। इन्हीं स्थितियों में बचपन भी बन-बिगड़ रहा है।

3. Learning for Students (200 words):

इस शोध योजना का प्रथम उद्देश्य विद्यार्थियों को सामाजिक स्थितियों के प्रति जागरूक, बचपन के प्रति संवेदनशील और भारतीय संस्कृति के अनुरूप बनाना था। बचपन पर उपभोग संस्कृति और बाजार का प्रभाव आकलन करने हेतु किए गए सर्वेक्षण के दौरान विद्यार्थी समूह अनेक तथ्यों व सत्यों से परींचित हुआ जिनकी या तो वे उपेक्षा करते रहे थे या फिर जानबूझकर बचपन को केवल थोड़ी देर का मनोरंजन समझ कर गोद में उठा वापस जमीन पर छोड़ देते थे। इस शोध योजना के दौरान जब बाजार के भीषण रूप का बाल- मजदूरों के जीवन पर ज्वलंत प्रभाव देखा तो बचपन को बचाने की एक सार्थक कोशिश वैयक्तिक व सामाजिक स्तर दोनों पर विद्यार्थी करते दिखाई दिए। बचपन पर होते अन्याय के विरुद्ध सार्थक कदम उठाने को प्रतिबद्ध हुए।

शोध योजना के दौरान वर्ष भर विद्यार्थी समूह विभिन्न तरह की गतिविधियों में संलग्न रहा। प्रश्नावली के द्वारा विभिन्न परिवारों की उन सामाजिक, आर्थिक परिस्थितियों व विविध जीवन शैलियों के साथ बचपन के विषय में उनके आचार-विचार से उनका परिचय हुआ। विभिन्न वक्तव्यों में विशेषज्ञों के द्वारा सवाल-जबाब के क्रम में उनकी टेलीविजन व विज्ञापन आदि की व्यावहारिक समझ को और विकसित व परिपक्व होने का अवसर मिला। विभिन्न स्कूलों व बाजारों में बचपन की स्थितियों का जायजा लेने के क्रम में विद्यार्थियों में सामाजिक सरोकारों के विस्तार के साथ उनकी शोध के लिए आवश्यक तार्किक समझ को भी एक विस्तृत आयाम दिया जो भविष्य में उनके अकादमिक जीवन में महत्त्वपूर्ण सिद्ध होगी।

विद्यार्थियों द्वारा विषय से संबंधित एक वेब पेज ' बचपन की खोज' का निर्माण और साल भर उसे सुचारू रूप से चलाना तथा समय-समय पर विषय से संबंधित अपनी पावर प्वाइंट प्रस्तुति देना इस बात का प्रमाण है कि कम्प्यूटर संबंधी तकनीक पर इस दौरान उन्होंने दक्षता हासिल कर ली थी।

'इनोवेशन प्लाजा' के दौरान अपने विषय की महत्ता से विभिन्न लोगों को अवगत कराना व स्थितियों पर बेबाक टिप्पणी करना आदि कार्यों ने जो उनके भीतर विश्वास व ऊर्जा का संचार किया वह इनोवेशन टीम ने स्वयं अनुभव किया। विद्यार्थियों ने स्वीकार किया कि तीन सालों के विद्यार्थी जीवन में यह उनके लिए स्वर्णिम अवसर था जब उन्होंने अपनी क्षमताओं को स्वयं पहचाना। इस रूप में यह इनोवेशन प्रोजेक्ट समस्त टीम की बड़ी उपलब्धि रहा।

4. Benefits to College (100 words):

इनोवेशन प्रोजेक्ट के दौरान कॉलेज विभिन्न गतिविधियों का साक्षी व विभिन्न सरगर्मियों का हिस्सा बना रहा। विविध व्याख्यानो का आयोजन, सर्वेक्षण के अनुभवों की चर्चा, बचपन के संदर्भ में विभिन्न सहकर्मियों की राय, दिल्ली और मुम्बई महानगरों के अनुभव, सर्वेक्षण व साक्षात्कार के दौरान होने वाले अनुभवों को सांझा करने, इनोवेशन प्लाजा की तैयारियों में बढ़चढ़कर पूरे कॉलेज का एकजूट होकर कार्य करने आदि में यह कहा जा सकता है कि एक ऐसा उत्साहपूर्ण अकादमिक माहौल बना जिसमें सार्थक व सक्रिय योगदान समाज व शिक्षा जगत को देना बहुत दुष्कर नहीं रह गया था। इसी के चलते एक वर्ष के निर्धारित समय में दिल्ली व मुम्बई महानगरों से दो हजार उत्तरदाताओं की प्रतिक्रिया को सर्वेक्षण के द्वारा प्राप्त करना, विभिन्न स्कूलों में जाकर बच्चों के खान-पान व जीवन-शैली संबंधी तथ्यों का

एकत्रीकरण करना तथा दिल्ली और मुंबई के बाजारों का बचपन के संदर्भ में निरीक्षण-परीक्षण करना तथा इन सबसे प्राप्त तथ्यों व आकड़ों को सांख्यिकीय कसौटी पर कसने के साथ सारणियों व ग्राफों द्वारा व्यक्त निष्कर्षों व प्रमुख सुझावों के साथ कम समय में इस पुस्तक के प्रकाशन की समुचित व्यवस्था अदि सब संभव हो पाया। कॉलेज में शोध के अनुरूप वातावरण बनाने व सहयोग की परंपरा विकसित करने में यह प्रोजेक्ट बहुत कारगर सिद्ध हुए हैं यह निसंकोच रूप से कहा जा सकता है।

5. Benefits to Society (100 words):

बचपन के संदर्भ में परिकल्पनाओं के समीक्ष्य आलोक में उपभोग-संस्कृति व बाजारवाद के नकारात्मक प्रभावों से बचपन को बचाने के लिए निम्नलिखित सुझाव दिए जा सकते हैं। ये सुझाव सिर्फ अभिभावकों तक ही सीमित नहीं हैं बल्कि विज्ञापनदाता, सरकार, विद्यालयों, लोकतंत्र के चौथे स्तम्भ मीडिया एवं जनसाधारण के लिए भी हैं। इन सुझावों से ही इस शोध की व्यावहारिक उपादेयता व महत्त्व समाज के लिए लाभदायक सिद्ध हो सकता है।

अभिभावकों के लिए सुझाव: प्रस्तुत शोध के अंतर्गत प्राप्त सूचनाओं एवं आंकड़ों के विश्लेषण के आधार पर अभिभावकों (माता-पिता) को निम्न सुझाव दिए जा सकते हैं :

- ❖ टेलीविजन व विज्ञापन देखने के दौरान बच्चों के साथ समय व्यतीत करें : ताकि यदि बच्चा किसी गलत विज्ञापन/कार्यक्रम से प्रभावित हो रहा हो तो उसकी सोच को तत्काल परिष्कृत किया जा सके। बच्चों को टेलीविजन देखने के दौरान कभी भी अकेला न छोड़ें और न ही टेलीविजन को बच्चों को व्यस्त रखने के विकल्प के रूप में लें। संसाधनों के साथ बच्चों को माता-पिता के समय की भी आवश्यकता है हमें इसकी महत्ता को समझना होगा।
- ❖ विज्ञापनों द्वारा दी जा रही जानकारी व उत्पादों के विषय में उन्हें शिक्षित करने का प्रयास करना और उनकी शंका (यदि कोई हो तो) उसका समुचित समाधान करना : यहाँ ध्यातव्य है कि सामान्यतः यह पाया गया है कि अभिभावक बच्चों की पूरी बात नहीं सुनते और अपनी राय को उन पर थोपने का प्रयास करते हैं, जोकि समस्या का सही हल नहीं है। बच्चे की शंका व सवालों का जवाब तार्किक ढंग से दिया जाना चाहिए ताकि वे यह विश्वास कर सकें कि जो उनके अभिभावक कह रहे हैं वह सच है।
- ❖ अभिभावकों के अनुशासन की प्रवृत्ति टेलीविजन देखने के समय के साथ-साथ चैनल व कार्यक्रम निर्धारित करने की प्रक्रिया टेलीविजन के बच्चों पर पड़ने वाले नकारात्मक प्रभाव को कम करने में सहायक हो सकती है।
- ❖ प्रदर्शन प्रभाव के बाल-मन पर पड़ने वाले नकारात्मक प्रभावों को यथा-संभव कम करने के लिए अभिभावकों को चाहिए की अपने बच्चों की हर ज़िद पूरी न करें लेकिन साथ ही बच्चे को मना करते समय शांतिपूर्ण ढंग से उसकी भावना का सम्मान करते हुए तार्किक ढंग से समझाने का प्रयास करें। स्मरण रहे, बच्चों को कभी भी डरा-धमकाकर या मारकर अपनी बात ना मनवायें। आपका इस तरह का व्यवहार बच्चे की मनो-दशा को पूरे जीवन के लिए कुंठित व अभिभावकों के विरुद्ध बना देता है।

- ❖ बच्चों के खान-पान एवं पौष्टिक आहार की प्राथमिक जिम्मेदारी अभिभावकों की है जोकि कामकाजी माता-पिताओं की दशा में दुगुनी हो जाती है। अभिभावकों को चाहिए कि वे यह सुनिश्चित करें कि बच्चे को (खासकर स्कूल जाने वाले) गैर-पौष्टिक एवं जंक-फूड की आदत ना लग जाये।
- ❖ जहाँ तक बात बच्चों के स्वास्थ्य की है तो अभिभावकों की जिम्मेदारी है कि वे यह सुनिश्चित करें की आधुनिक मनोरंजन साधनों (विडियो गेम्स, मोबाइल गेम्स इत्यादि) के कारण बच्चा आउटडोर गेम्स से वंचित न रह जाये। बच्चे के संतुलित शारीरिक विकास के लिए आउटडोर गेम्स अत्यावश्यक हैं।
- ❖ यदि बच्चा हॉबी-क्लासेज में रुचि नहीं लेता तो प्रदर्शन प्रभाव के दबाव में बच्चों पर हॉबी-क्लासेज का बोझ ना डालें।
- ❖ अपनी कक्षा में सर्वाधिक अंक लाने पर बच्चे को उसकी मनपसंद वस्तु देने जैसे प्रलोभन का इस्तेमाल कदापि नहीं करना चाहिए। बच्चे को सकारात्मक रूप से समझकर पढाई में उसकी रुचि उत्पन्न करनी चाहिए। यदि बच्चा किसी विषय से भाग रहा हो तो उसकी समस्या को जानने का प्रयास करना चाहिए और उसका समाधान करना चाहिए।
- ❖ यह पाया गया कि कोचिंग क्लासेज को वर्तमान शिक्षा व्यवस्था के एक आवश्यक अंग के रूप में देखा जाने लगा है। इन क्लासेज के समय का खास ध्यान रखा जाना चाहिए क्योंकि यह देखा गया कि अधिकांशतः बच्चों के स्कूल से आने व कोचिंग क्लासेज के समय के बीच बहुत कम अंतर रखा गया जोकि ठीक नहीं है। आंकड़े बताते हैं की अधिकांश बच्चे इन क्लासेज को एक बोझ /मानसिक तनाव की तरह लेते हैं।

विज्ञापनदाताओं एवं विपणनकर्ताओं के लिए सुझाव:

- ❖ विज्ञापनदाताओं एवं विपणनकर्ताओं को चाहिए कि वे बच्चों का प्रयोग कम से कम उन उत्पादों के विज्ञापन में न करें जो बच्चों के स्वास्थ्य के लिए अच्छे नहीं हैं।
- ❖ विपणनकर्ता का अस्तित्व हमारे इस समाज से ही है जिससे वह उत्पादन के साधनों को प्राप्त करता है और उसे उत्पाद रूप में परिवर्तित करके पुनः समाज को ही प्रस्तुत करता है। ऐसी स्थिति में उसका यह नैतिक कर्तव्य बन जाता है कि वह समाज के भविष्य को (बचपन) क्षति न पहुंचाए। उससे आशा की जाती है कि बच्चों (जोकि देश का भविष्य हैं) को अपने बाज़ार के महज एक घटक और अपनी लाभधर्मिता को सिद्ध करने के एक साधन के रूप में न देखे वरन कोई भी ऐसा विज्ञापन या उत्पाद प्रस्तुत न करें जो बच्चों के शारीरिक अथवा मानसिक विकास के लिए हानिकारक हो।
- ❖ यहाँ यह कहना अतिशयोक्तिपूर्ण नहीं होगा कि यदि विपणनकर्ता उपरोक्त कर्तव्य का पालन करते हैं तो उनके इस कार्य को भी कॉर्पोरेट सोशल रेस्पॉन्सिबिलिटी (CSR) के दायरे में रखा जाना चाहिए।

विद्यालयों के लिए सुझाव : चूँकि बच्चा अपने दैनिक समय का एक महत्त्वपूर्ण भाग स्कूल में व्यतीत करता है अतः इस परिप्रेक्ष्य में विद्यालयों की भूमिका को नकारा नहीं जा सकता। विद्यालयों को चाहिए कि :

- ❖ उनकी कैंटीन में कोई भी ऐसा खाद्य पदार्थ/पेय न रखे जाएँ जो गैर-पौष्टिक हों अथवा जंक-फूड की श्रेणी में आते हों। प्राथमिक सर्वेक्षण में पाया गया अधिकांश स्कूल इस बात का ध्यान नहीं रखते हैं।

- ❖ विद्यालय के बाहर/आस-पास भी गैर-पौष्टिक अथवा जंक-फूड की श्रेणी में आने वाले खाद्य पदार्थों की बिक्री पर रोक लगायें ताकि बच्चा इनसे दूर रहे।
- ❖ अति-उपभोगवाद /बाजारवाद के दुष्प्रभावों से अबोध बाल-मन को बचाने हेतु उन्हें शिक्षित करने के लिए नैतिक-शिक्षा जैसे विषयों का बच्चों के पाठ्यक्रम में अनिवार्य-रूप से समावेश करें।
- ❖ बच्चों के पठन-पाठन के साथ खेल एवं को-करीकुलर गतिविधियों को पर्याप्त महत्व दें ताकि बच्चों का समग्र विकास हो सके।

लोकतंत्र के चौथे स्तम्भ- मीडिया के लिए सुझाव: उपभोग संस्कृति एवं बाजारवाद के दुष्प्रभावों से बचपन को बचाने के लिए मीडिया को निम्न ज़िम्मेदारी सौंपी जा सकती है :

- ❖ मीडिया को चाहिए कि यदि कोई भी विपणनकर्ता बच्चों को अपने बाज़ार के महज एक घटक और अपनी लाभधर्मिता को सिद्ध करने के एक साधन के रूप में लेते हुए पाया जाता है तो उसके इस कृत्य को उजागर करें ताकि जन-मानस जागरूक हो सकें और अपने बच्चों को इस प्रकार के उत्पादों एवं विज्ञापनों के दुष्प्रभावों से बचा सकें।
- ❖ यदि विद्यालय अपनी ज़िम्मेदारी पूरी ना करें तो इस बात को भी अभिभावकों के संज्ञान में लाया जाए ताकि विद्यालयों की भी जवाबदेही सुनिश्चित हो सके।
- ❖ मीडिया को स्वयं को भी अनुशासित करना होगा और अपने द्वारा दिए जाने वाले विज्ञापनों में भी अश्लीलता/अभद्रता को समाप्त करना होगा।

सरकार के लिए सुझाव: अंत में सरकार के लिए निम्न सुझाव दिए जा सकते हैं :

- ❖ ऐसे उत्पादों की बिक्री पर प्रतिबन्ध लगा दिया जाए जो बच्चों के स्वास्थ्य के लिए अच्छे नहीं हैं।
- ❖ उन विज्ञापनों व कार्यक्रमों पर अंकुश लगाये जाएँ जो खुलेपन के नाम पर अभद्रता और अश्लीलता को आश्रय दे रहे हैं।(यद्यपि कि ASCI इस क्षेत्र में प्रभावी रूप से कार्यरत है किन्तु स्थिति को देखते हुए इसके प्रयास पर्याप्त नहीं हैं।)
- ❖ बाल-श्रम व अपराध के हर रूप का विरोध किया जाए और इस पर अंकुश लगाने के लिए वर्तमान मशीनरी को और सक्षम बनाया जाये।
- ❖ उन सरकारी व गैर सरकारी संस्थाओं को व्यापक जन-समर्थन मिलने की आवश्यकता है जो बचपन को बेहतर बनाने की दिशा में पहल कर रहे हैं।
- ❖ यदि विपणनकर्ता बचपन के प्रति अपने कर्तव्य का समुचित तरीके से पालन करते हैं और लाभधर्मिता के लिए उनका भावनात्मक शोषण नहीं करते तो उनके इस कार्य को भी कॉर्पोरेट सोशल रेस्पॉसिबिलिटी (CSR) के दायरे में रखा जाना चाहिए, और उन्हें इसके लिए कुछ क्रेडिट भी दिया जाना चाहिए, ताकि उनकी सहभागिता सुनिश्चित की जा सके।

उपरोक्त तथ्यों एवं वास्तविकताओं के अलोक में हम कह सकते हैं कि अब वाद-विवाद का विषय यह नहीं है कि भारतीय परिप्रेक्ष्य में वैश्वीकरण व इससे उत्पन्न उपभोगवाद व बाजारवाद अच्छे हैं अथवा बुरे, वैश्वीकरण का निर्णय हमारे लिए सही था अथवा गलतवास्तविकता यह है कि हम अतिवादी व एकल

होकर नहीं चल सकते। वैश्वीकरण की अनेकों बुराइयों के बावजूद इसके लाभों (खासकर विभिन्न देशों के बढ़ते एकीकरण, सूचना व संचार क्रांति, वैश्विक शोध व विकास के लाभ आदि) को नकारा नहीं जा सकता। आवश्यकता मध्य-मार्ग की है। यदि हम सब मिलकर २१वीं सदी के बचपन के समक्ष आने वाली चुनौतियों को समझने का प्रयास करें और अबोध बचपन के मन-मस्तिष्क को उपभोगवाद व बाजारवाद जैसे झंझावातों से बचाने हेतु उपरोक्त सुझावों को लागू कर सकें तो निश्चित रूप से बचपन को वैश्वीकरण के नकारात्मक प्रभावों से बचा सकेंगे और एक स्वस्थ, सुसंस्कृत एवं शिक्षित राष्ट्र का निर्माण कर सकेंगे।

6. Further Plans (100 words):

आज बच्चों के जीवन का ऐसा कोई भी पक्ष नहीं है, जिस पर बाजार की पकड़ न हो। वैश्वीकृत भारत में बढ़ते हुए उपभोगवाद ने एक तरफ जहां बच्चों में तार्किक निर्णय लेने की क्षमता का विकास करते हुए बेहतर जीवन शैली प्रदान करने का दावा किया है वहीं दूसरी तरफ इस परिवर्तन के कारण भारत ही नहीं बल्कि वैश्विक-पटल पर बच्चों में उत्तेजना, क्रोध, हिंसा, अवसाद, अशांति, व अव्यवस्था जैसे मानसिक विकार तेजी से बढ़े हैं। इस शोध की पृष्ठभूमि में बाल-मनोविज्ञान का अध्ययन करते हुए बच्चों के स्वाभाव में आए परिवर्तनों की जांच की जा सकती है। बाल हिंसा व बाल-अपराध का आंकड़ा दिनोंदिन बढ़ता जा रहा है उसके लिए उत्तरदायी कारणों व परिस्थितियों की खोज भारत में बचपन को बचाने की मुहिम में सहायक सिद्ध हो सकती है।

किसी भी समाज में बच्चों, वृद्धों व महिलाओं के अधिकारों की सुरक्षा व उनके जीवनयापन की स्थितियां उसके स्वस्थ होने के साथ प्रगति के भी मानक होते हैं। अकादमिक जगत में इन विषयों पर व्यवहारिक दृष्टिकोण अपनाते हुए भारतीय समाज की वास्तविक स्थितियों को शोध के माध्यम से सबके समक्ष लाने की आवश्यकता है। इनके संबंधित विभिन्न मुद्दों से पर अनेक कार्य हो रहे हैं, लेकिन बच्चों, स्त्रियों व वृद्धों की सुरक्षा के साथ सम्मानजनक जीवन की प्राप्ति के अभी बहुत कुछ करना बाकी है। इसके अतिरिक्त अगामी योजनाओं में इस शोध का अंग्रेजी संस्करण तैयार करने की योजना है ताकि इस विषय पर और अधिक पाठकों की पहुंच संभव हो सके, साथ ही दिल्ली और मुंबई के अतिरिक्त और महानगरों के बचपन व गांव और शहरों के बचपन की स्थितियों को भी भविष्य में शोध योजना के माध्यम से उजागर किया जा सकता है।

SHYAMA PRASAD MUKHERJEE COLLEGE FOR WOMEN

Project Title: GENDERING DALIT MIGRATION AND ITS SOCIO CULTURAL IMPACT

Project Code: SPM 101



Students Interface with Dalit migrant

1.Objective (150 words):

The aim of the study is to understand the gendered process of migration and its socio-cultural impact. The scale of the ongoing Dalit migration is large. As this sort of migration fragments the household because it comes to straddle both the village and the city, the focus would be on the Dalit migrant in the metropolis of Delhi, and on such family members as wives, children, parents, and others left behind in the household in the 'catchment' area, the rural end of the household located in the district Azamgarh of eastern Uttar Pradesh. While some of the changes experienced by such family members of the migrants as the wives, have been pointed out by existing studies, the articulation of gender norms in the household has received only a small amount of attention, at least in South Asia. It will be our focus along with its serious implications for women's role as well as access to resources.

We would also take this opportunity to explore the different ways in which migrants participate in the urban environment, evolve a support system, and the problems they face, together with understanding the impact of migration on labour in the village and on the caste system.

We carried out the fieldwork in the Subzi Mandi at Azadpur and the Chandra Shekhar basti in Wazirpur industrial area, where our respondents/the case studies were identified on the basis of our survey. We pursued our enquiry down to their villages such as Osti, Sonwara, and Utni in district Azamgarh to get the answers. We carefully framed the questions in order to capture the changes in the food habits, lifestyle and the experience of caste and caste mobility and occupational diversification from the respondents.

2. Final Findings (300 words):

Labour

Dalit migrant labour continuously replenishes the informal sector in the city, for instance Azadpur Sabzi Mandi, which receives its supply of Dalit migrant labour from the Azamgarh district of Uttar Pradesh. There is a sort of village based network, which facilitates it.

Our case studies reflect segmentation among Dalit migrants in the Subzi Mandi. Some have really done well for themselves. They came as labour, moved on to become a retail vendor, and then labour contractor or transporter. Most, however, belong to the category of a retail vendor, like that of Ram Awadh Pasi, our respondent.

As a result of circular migration of the Dalits, the generic labour force so to say, there is a shrinking of locally available labour. Most dalits no longer work on the field of traditional land lords. Most of them complained, for instance in Rudri, of shortage of labour and said that to procure local labour in the village has become difficult and the wages were going up.

Women have gained somewhat from it. The launch of the government schemes in recent years such as the NAREGA has pushed up the wages. The private employers such as the upper caste landlords now have to pay comparable wages to get their labour.

Caste

Caste has always been linked with occupation. Dalits movement into non-caste occupations has undermined cast.

Remittances reduce the dependence on local landlords and enhance the bargaining power of the Dalit household, to render compliance to the caste rules or caste-specific role, difficult.

Food, which served as a metaphor for cultural hierarchies, has also undergone an enormous change. Earlier the food primarily consisted of carbohydrates in form of jaggery, now it consists of proteins and nutrients in the form of pulses, wheat and seasonal and green vegetables, like peas, spinach, tomato, brinjal, etc.

Changes in the grooming and dress of men, women and children are an assertion of social aspiration. They may have been influenced by the changing fashion that reaches them television or the urban contact of the family, but now they do it because they have the resources. The older girls now wear salwar kameez and young girls' frocks, and women sarees, and most of them wear chappals or slippers. Men are no longer in dhotis (cloth draped around their waist) but wear trousers/jeans and T-shirt throughout the day.

Education

As a result of an upward trend in their income/resources there is less of need for each and every member of the family to seek employment for their upkeep, so the children, both male and female, go to school rather than work on the fields. We noticed a mushrooming up of private schools, and the number of Siksha mitra or teacher on a contractual basis has gone up and if they do not deliver they are removed.

Women's Status

Migration reconstructed the material basis of the Dalit household, and the significance of the migrant's income, which compensates for irregular agricultural production on smallholdings, and allows the families to retain assets and to improve their status in the village society. It is counterpoised to the negligible participation of both women and Dalit elders in the gendered process of labour migration, to disturb the age and sex hierarchies, which in turn leads to the strengthening of patriarchal interests, with serious implications for women's productive role as well as access to resources.