Project Naav

This Project attempts to provide an integrated strategy involving conventional sanitary engineering interventions and unconventional environmental phytoremediation techniques to revive a stretch of the River Sahibi

Team and Institutional Details:

Kunwar Raj
BMS (3rd year)
SSCBS,
University of Delhi

Aditi Sangar
B.Tech
Electronics and Telecommunication
(3rd year)
IGDTUW

Shreeya Nangia
Economics (H)
(3rd year)
JMC,
University Of Delhi

Saksham Grover
B.Tech
Chemical Engineering
USCT, GGSIPU

Shriya Dargan
BMS (3rd year)
SSCBS,
University of Delhi

MENTOR:

Dr. Neetu Rani

Asst. Prof. USEM

GGS IP University

Najafgarh Drain

Population **686875**

355778

331103

Households

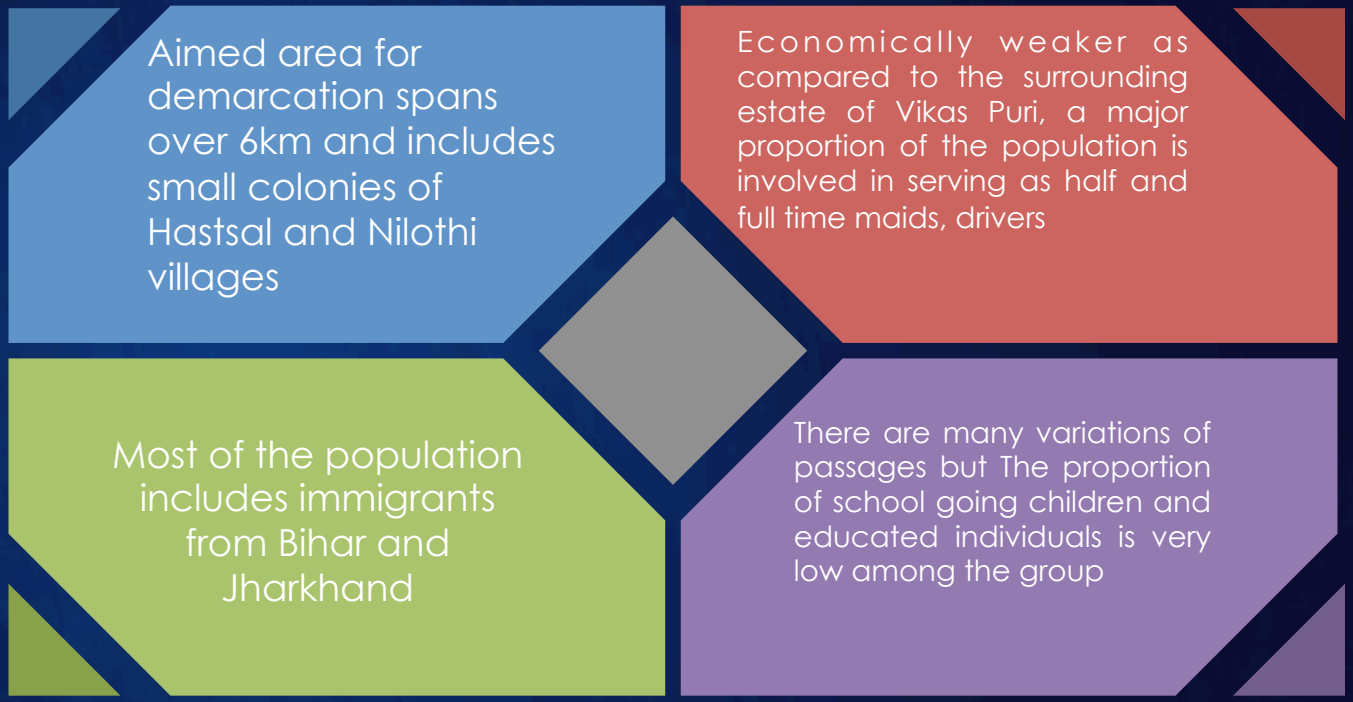
14,000

Backward Community Households

4,000

*Source: Census of India, 2011

Rationale And Context :



Literature Survey

- Presence of Pb, Cr, As, Cu
- Main Cause : Anthropogenic

- Poor water quality, high BOD, solid wastes
- Industrial and Agricultural Effluents

- Defunct Sewage Treatment Plants
- Industrial Discharge without waste treatment

Stakeholders

MCD, DJB

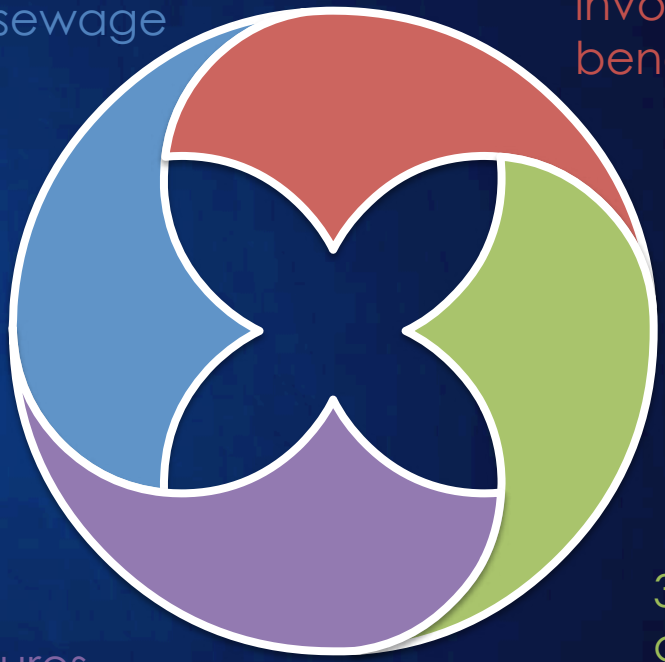
Communities/
Households

NGO'S,
Government

Objectives Of The Project

1) To monitor industrial discharge for untreated sewage

2) To encourage community involvement for long term benefits



4) To improve water quality using unconventional measures

3) To create awareness about importance of proper sanitation

Detailed Methodology

Earmarking areas which are unfit for use and encouraging the industries , RWAs , Malls etc. to establish decentralised sewage treatment plants

Adopting eco-sanitatio approach by linking it to Swacch Bharat Abhiyan and involving the local community, NGOs.

Using waste stabilization ponds and wetlands , in combination and providing wastewater treatment by phytoremediation and Root Zone Treatment Systems

Sustainability Of The Project

Awareness Campaigns

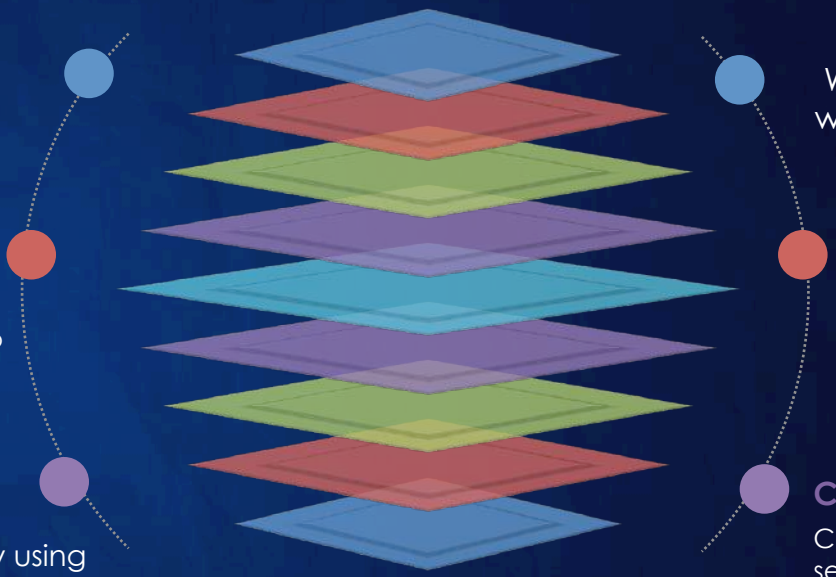
Awareness campaigns which aim at improvement of sanitation habits will help achieve a reduction on open defecation

Monitoring

Monitoring the industrial waste being discharged directly into the drain will help achieve a reduction in the presence of heavy metals

Improving Water Quality

Improvement in water quality using phytoremediation has long term benefits



Waste Stabilisation Ponds

Waste stabilization ponds and wetlands to treat wastewater

Modern Techniques

Modern techniques like Biosanitizers and DEWAT systems to be incorporated for future use

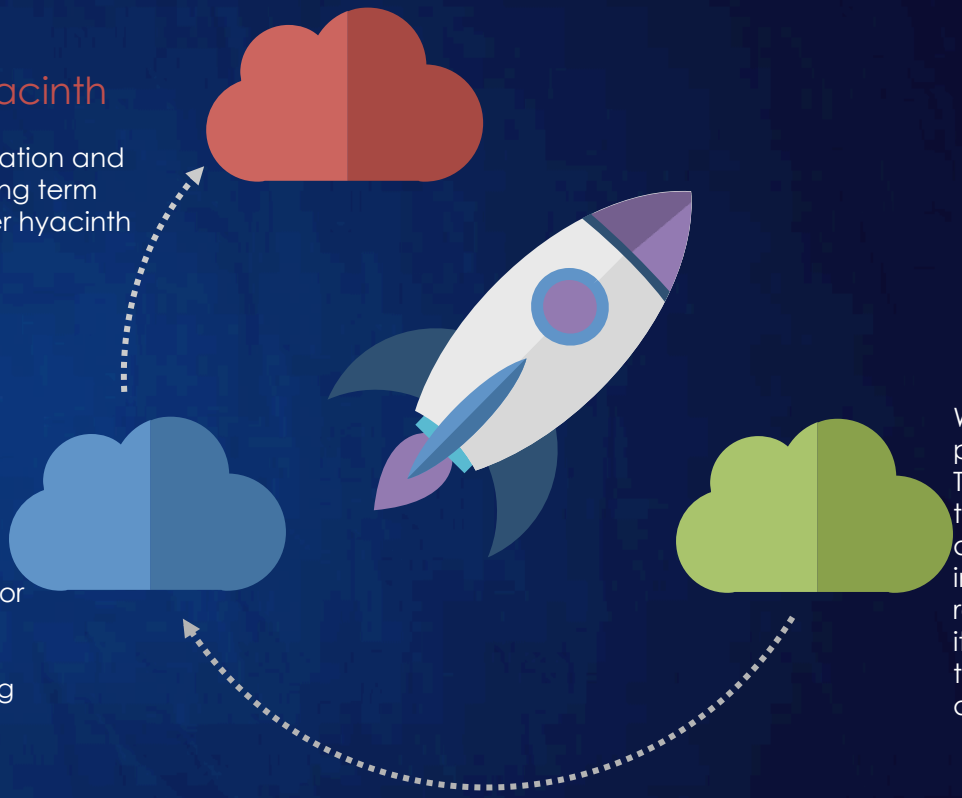
Community Involvement

Community involvement helps create a sense of responsibility, much required as a long term benefit for preservation of biosphere

Innovations Of The Project

Duckweed and Water hyacinth

Immediate measures include restoration and improvement in water quality for long term benefits using duckweed and water hyacinth



Intelligent Systems

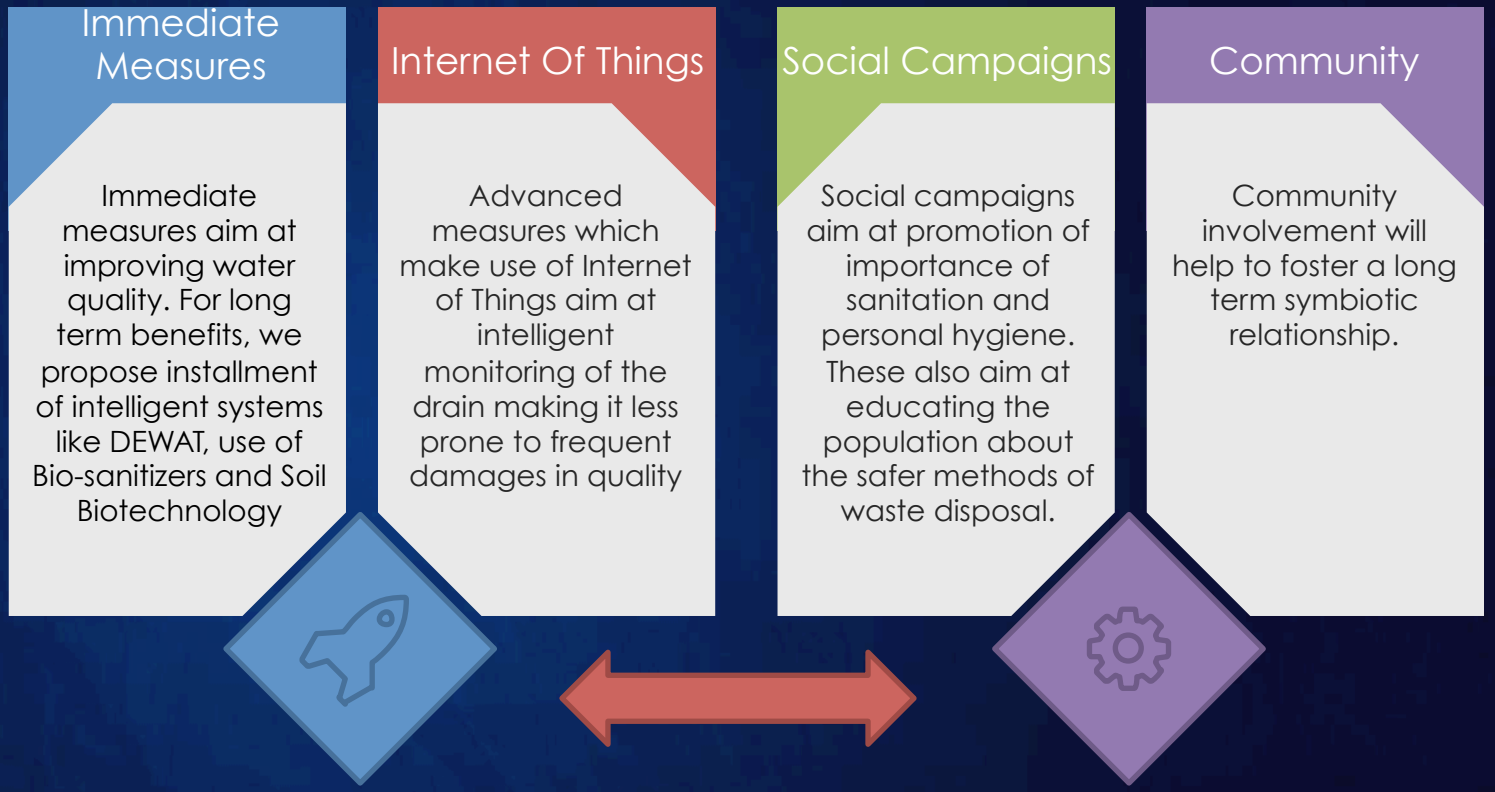
Installing intelligent systems like Decentralized wastewater treatment using modern techniques like DEWAT, Soil biotechnology and bio sanitizers for promising long term benefits. These systems need to be inculcated in the day to day so that load on the existing system can reduce and an efficient management system can be put into place.

Internet Of Things

With the advent of technology, we plan to incorporate IoT (Internet of Things) for real time monitoring of the area under surveillance. Water quality meters with micro controller interfacing can be used to upload real time data to the server, making it easier for the government bodies to monitor water quality and take appropriate measures on site.

Outcomes And Impact

Linkages With Improved Water Sanitation



Cost Benefit Analysis

Population Affected (Approximation)	686875
Delhi Population Density (2011 Census Report)	19625/sq. km
Area Covered in our research	35 sq. km
Population Affected	686875
Avg. no of people in each household	5
No. of school going children	2
No. of people in working age group	2
No. of elderly	1

Resource Plan with Cost Estimation:

Cost Estimation

S.No	INTERVENTIONS	Cost of Procurement	Cost of Installation	Cost of Maintenance	Units	Total (Rupees)	Source
1	Road Markers	200	20	NA	400	88000	Market Suppliers
2	Basic Sanitation (affordable toilets)	2000	1000		50	150000	Approximation
	Sanitation Awareness Campaign (Instruction as to operation and maintenance)					5000	Approximation
3	Planting Duckweed	Rs 1000/kg	NA	NA	0.1kg/m2	500000	Market Suppliers
4	Creation of Wetland (Root Zone Treatment Plant)					500000	Approximation
5	Marketing and Community Involvement					25000	Approximation
	Investment Cost					**1268000**	
	Recurrent Cost (Annualized)					70000	Estimation
	Cost Per Capita (For First Year of Program)	1.846041856					

BENEFIT ANALYSIS

01 VALUE OF DEATHS AVOIDED
6 Million Rupees

Patient Expenses Avoided Due To Avoided Illness
140 Million Rupees
02

03 Value of productive days gained of those with avoided illness
6 Million Rupees

Annual value of time savings due to access to water and sanitation
91 Million Rupees
04

05 Value of days of school attendance gained of those with avoided illness
50,000 Days

Estimating Value of Avoided Deaths

Age of the Person at Time of Death	Years Ahead	No of working days in 1 year	Minimum Wage Rate	Discounting Factor (0.10)	Present Value of Future Earnings
19	41	240	250	0.0200863	49412.29387
20	40	240	250	0.02209493	53027.82757
21	39	240	250	0.02430442	56872.34506
22	38	240	250	0.02673486	60955.48779
23	37	240	250	0.02940835	65286.5356
24	36	240	250	0.03234918	69874.2381
25	35	240	250	0.0355841	74726.61575
26	34	240	250	0.03914251	79850.72654
27	33	240	250	0.04305676	85252.39334
28	32	240	250	0.04736244	90935.88623
29	31	240	250	0.05209868	96903.55376
30	30	240	250	0.05730855	103155.3959
31	29	240	250	0.06303941	109688.571
32	28	240	250	0.06934335	116496.8272
33	27	240	250	0.07627768	123569.8488
34	26	240	250	0.08390545	130892.5065
35	25	240	250	0.092296	138443.9973
36	24	240	250	0.1015256	146196.8611
37	23	240	250	0.11167816	154115.8578
38	22	240	250	0.12284597	162156.6851
39	21	240	250	0.13513057	170264.5194
40	20	240	250	0.14864363	178372.3536
41	19	240	250	0.16350799	186399.1095
42	18	240	250	0.17985879	194247.4931
43	17	240	250	0.19784467	201801.5623
44	16	240	250	0.21762914	208923.9704
45	15	240	250	0.23939205	215452.8444
46	14	240	250	0.26333125	221198.2536
47	13	240	250	0.28966438	225938.2162
48	12	240	250	0.31863082	229414.1888
49	11	240	250	0.3504939	231325.9737
50	10	240	250	0.38554329	231325.9737
51	9	240	250	0.42409762	229012.7139
52	8	240	250	0.46650738	223923.5425
53	7	240	250	0.51315812	215526.4097
54	6	240	250	0.56447393	203210.6148
55	5	240	250	0.62092132	186276.3969
56	4	240	250	0.68301346	163923.2293
57	3	240	250	0.7513148	135236.6642
58	2	240	250	0.82644628	99173.55372
59	1	240	250	0.90909091	54545.45455

Population reached through the programme	19625 inhabitants/ sq.km* 35 sq.km=686875
2) School attendance days gained due to less diarrhoeal illness	**Column1**
No. of children reached through the program	275140
Children incidence rate	0.0602
Avg recovery time (children)	3 days
No. of children affected	275140*0.0602= 16563.8
Child mortality rate due to diarhoea	0.000185
School days gained on an average	275140*0.0602*3 = 49690
3) Value of (adult) productive days gained	**Column1**
Adult incidence rate	0.0291
Avg recovery time (adults)	2 days
Minimum Wage Rate	Rs. 250
Loss due to Illness (=0.0291*2*250*411735)	5990744.25
4) Annual Value of Time Savings	
Average time reqd. to collect safe water	0.5hrs
No. of people working population	274490
Minimum Wage Rate	250
Monetary value of time savings per day	274490*{250*0.5/9} =3812361
Annual Value of Time Savings	240*3812361 =91496660
5) Patient expenses avoided due to avoided illness	
Doctor Consultation Expense	Rs. 150
No. of Visits Reqd. (Child)	1.5
Child Incidence Rate	0.0602
Transportation Charges	Rs. 30
Expenses (children)	150*1.5*0.0602*30 = 406.35
No. Children Influenced	275140
Expenses Saved (children)	406.35*275140 = 111803139
Adult Incidence Rate	0.0291
No. of Visits Reqd. (Adult)	0.5
Expenses (Adult)	150*0.0291*.5*30= 65.475
Expenses Saved (adult)	65.475*411735 = 26958349
Patient Expenses Avoided Annually	111803139+26958349 =138761488
Sum of Economic Benefits	159875199

Benefits	Values (INR)
Patient expenses avoided due to avoided illness	138761488
Value of deaths avoided	5973307
Annual value of time savings due to access to water and sanitation	91496660
Value of productive days gained of those with avoided illness	5990744.25
Value of days of school attendance gained of those with avoided illness	49690.284 days
Benefit/Cost Ratio	159875199/1268000 = 126.08

Due to concerns regarding large scale applicability of data collected through means of primary research and quantitative data collection techniques across the chosen territorial field, sensitivity analysis has not shown reliable results. The obtained cost benefit ratio of 126.08 takes into account the best case scenario. Anyhow, it goes on to prove the viability and feasibility of the project and the long term benefits it will impart to the community at large.

Conclusion

As per the proposed plans:

We plan to achieve short as well as long term goals

The short term goals include immediate improvement in water quality and spread of awareness through social campaigns

The long term goals include regular monitoring of the drain and real time management through authority as well as community involvement, fostering stronger bonds for a symbiotic relationship

Thank you