

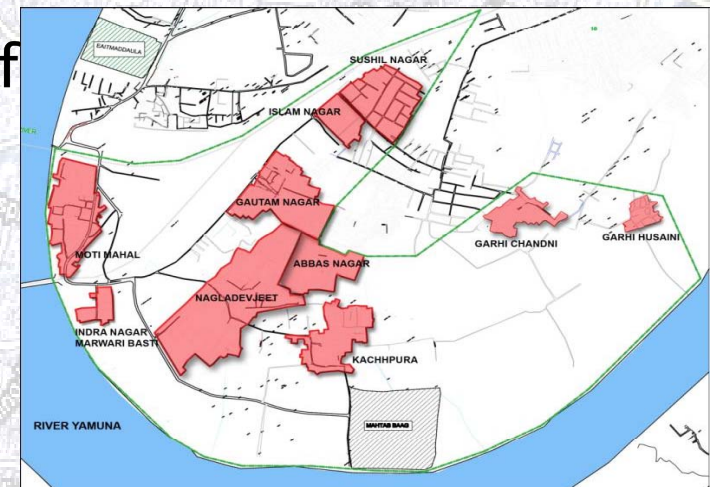
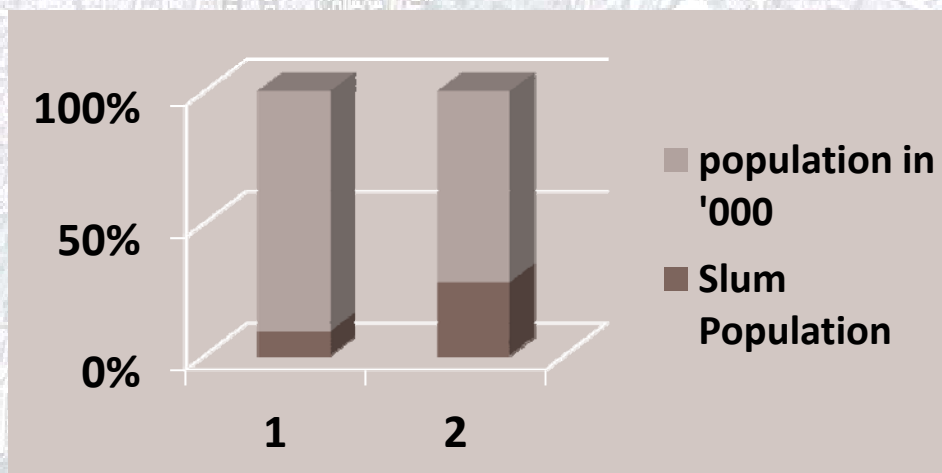
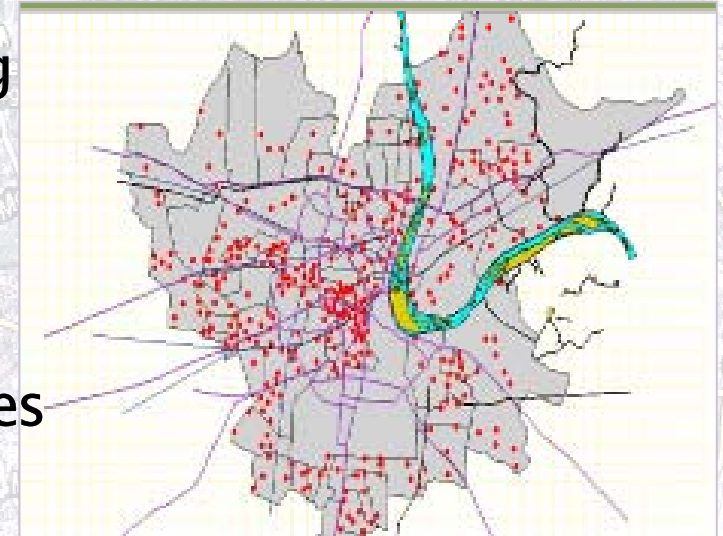
Re-Imagining Sanitation in Agra



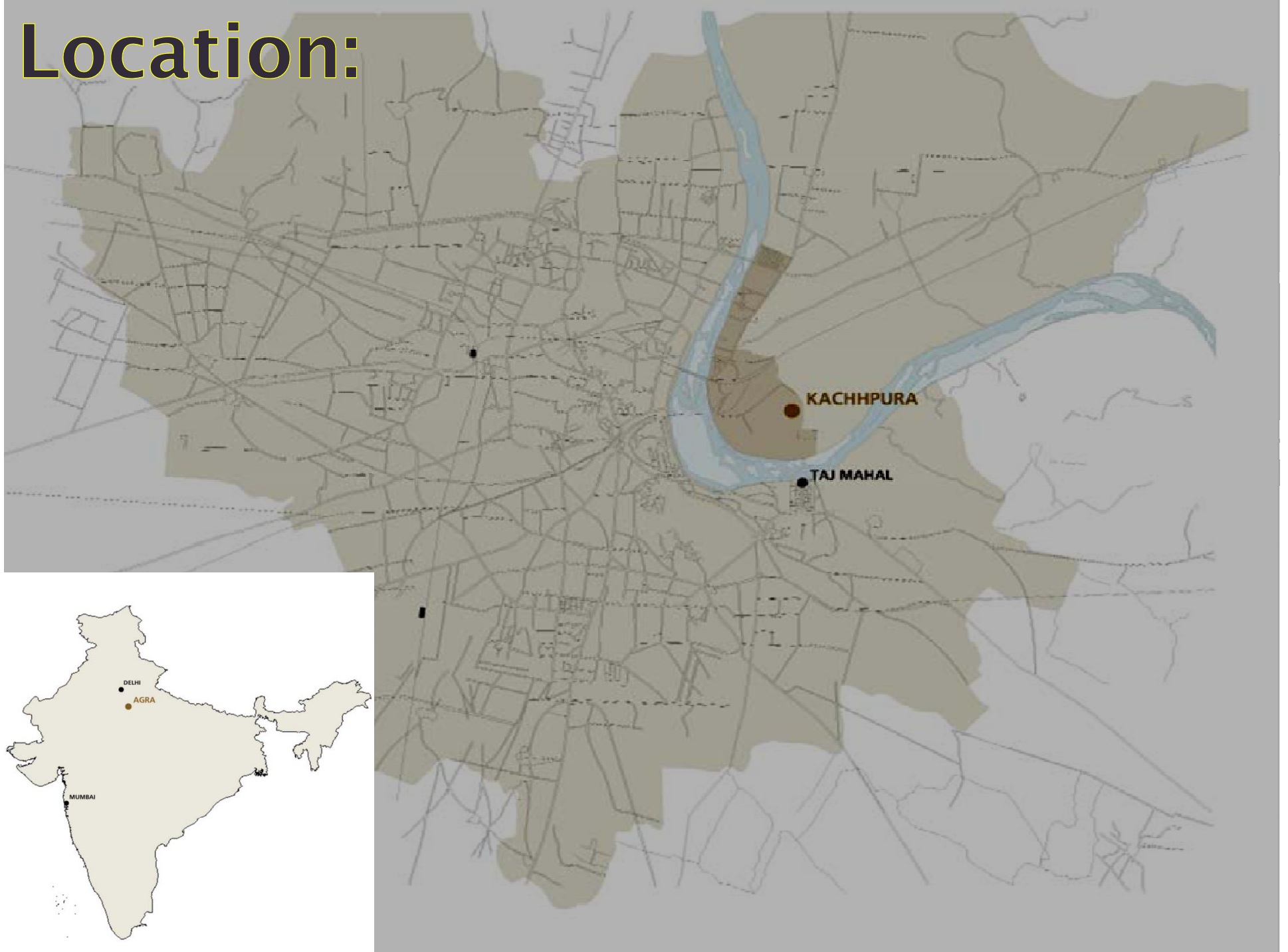
**DEWAT system in Kachhpura, Agra :
A joint initiative of CURE (NGO) and Agra Municipal Corporation**

Imagine Agra

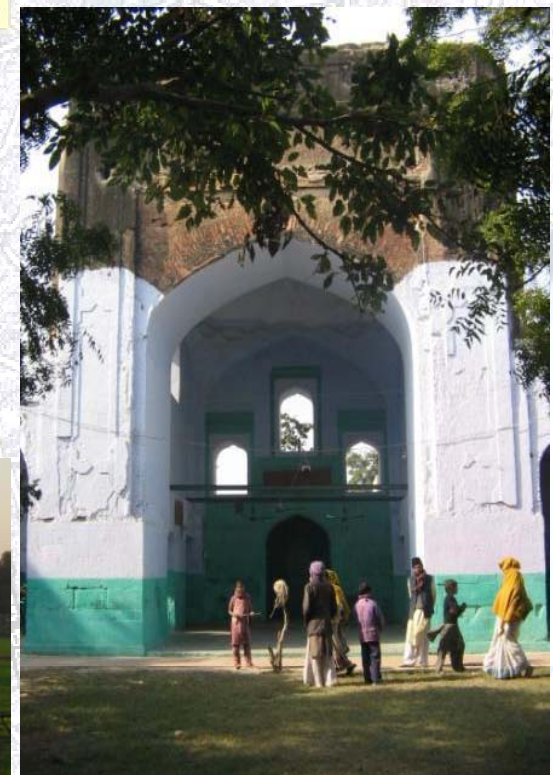
Rapidly growing city ; its population doubling every decade; (1.24 million to 2.47million)
Slums are growing even faster (252 in 2001 to 402 in 2010);
Environment is increasingly degrading;
Agra Municipal Corporation (ANN) is functionally and financially stymied , with roles dispersed across service providers;
Complex institutional arrangements with multiple tiers of authority;
Ineffective and inadequate service provision; especially to slums – remain on the margins of development



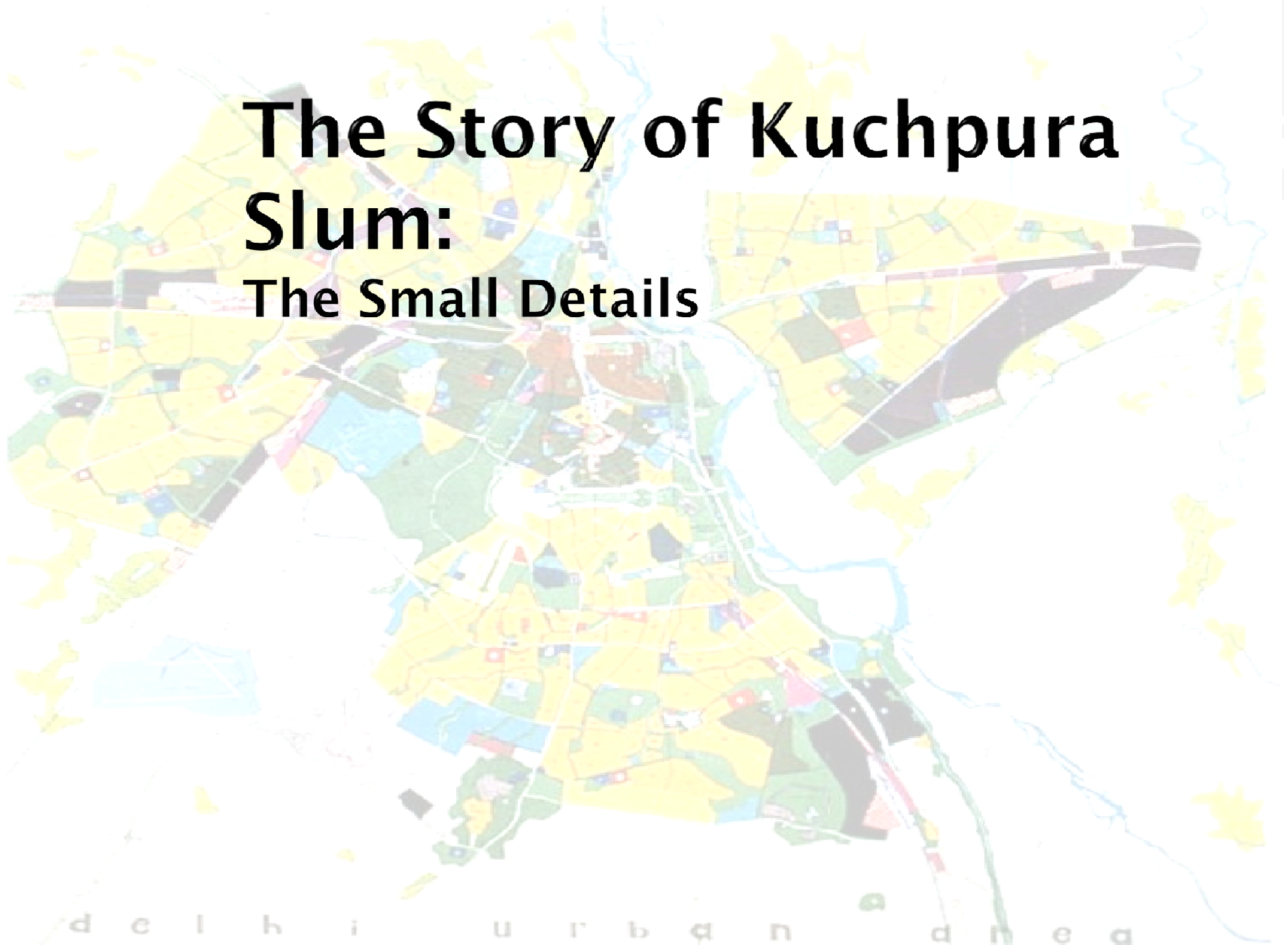
Location:



Mughal Heritage Walk @ Kachhpura



The Story of Kuchpura Slum: The Small Details



The Upgrading of Kachhpura ...

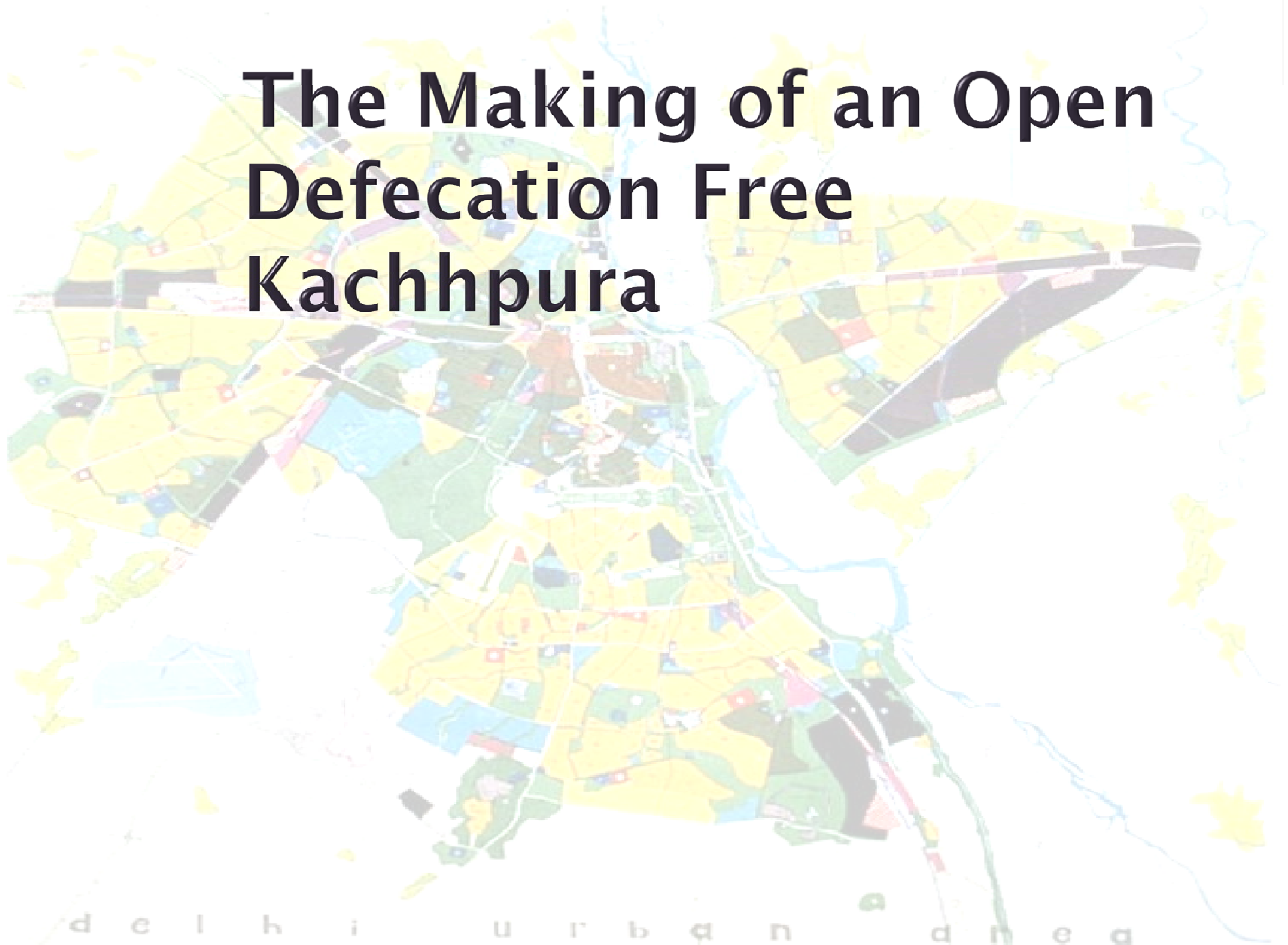
- Downgraded from historic settlement to notified slum
- Integrated with Agra's history - land contributed for Taj
- Urban - east fringe, on banks of River Yamuna
- Was disconnected from all municipal services

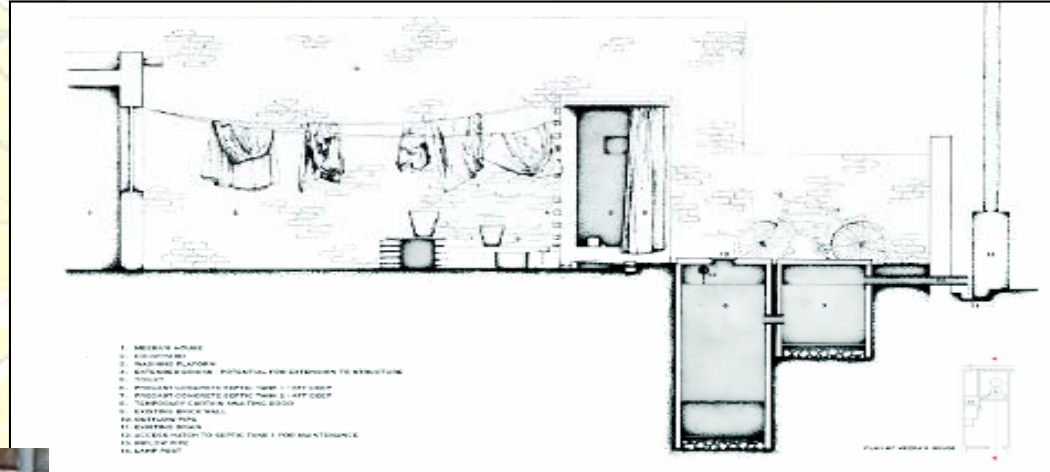


Kachhpura 'Un-upgraded'

- 448 HHs, 2352 people
- 85% defecated openly
- Edging a large open city drain carrying wastewater from upstream to Yamuna
- Open, brick-lined, informal drains carried HH wastewater and faecal matter
- Narrow brick-paved inner pathways
- No waste collection/disposal system
- Water from community stand posts
- Permanent /semi permanent housing

The Making of an Open Defecation Free Kachhpura





- Customized to spaces, improved technology, locally procured technical assistance, costs subsidized to affordability/ functionality with savings groups/livelihoods improving affordability
- **Impact:** Health improves - women/girls report feeling safe, health care costs drop from Rs700 to Rs100pm, number of sick /off days down, incomes and savings grow

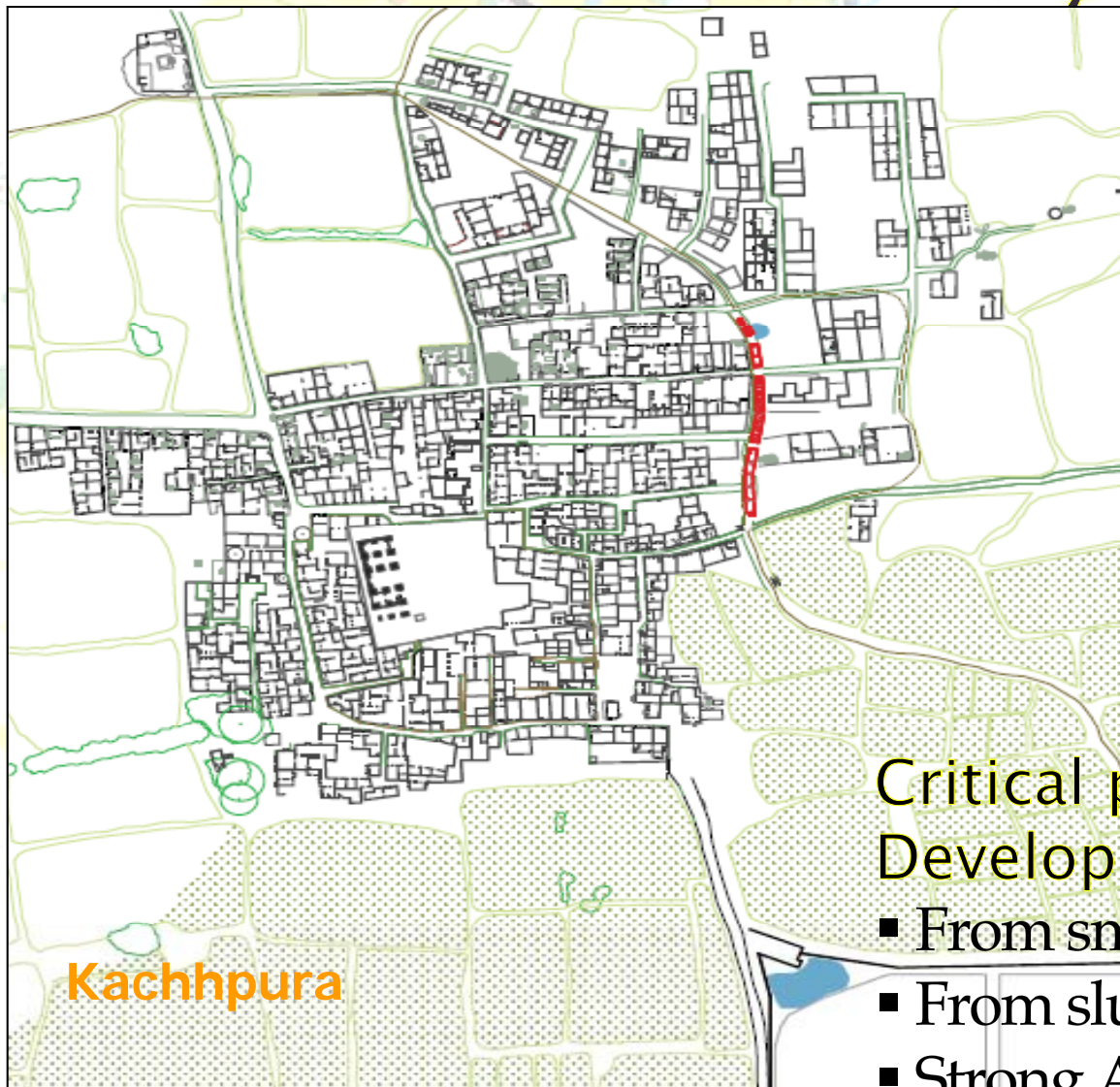
ZONE WISE POPULATION & SEWAGE GENERATION AS PER MASTER PLAN

S. No.	Zones covered	Population			Sewage Generation in (mld) Years			Present Status
		2010	2025	2040	2010	2025	2040	
I	North zone	192072	276450	367113	23	33	44	Partly covered under YAPII and JNNURM
II	West zone	419301	625656	844870	50	75	101	Partly covered under YAPII and JNNURM
III	Central zone	545931	616154	674729	66	74	80	Fully covered under JNNURM
IV	Tajganj zone	135444	192196	254041	16	23	31	Fully covered under JNNURM
V	South zone I	73885	131686	199975	9	16	24	Proposed under Agra Sewerage Phase-II
VI	South zone-II	225763	302929	374727	27	36	45	Partly covered under State Sector
VII	South zone-III	63384	70941	76881	11	14	14	Proposed under Agra Sewerage Phase-II
VIII	East zone	166554	245462	343280	20	29	41	Proposed under Agra Sewerage Phase-II
	Total	18,22,334	24,61,474	31,35,616	222	300	380	

OVER ALL POSITION OF STPs

S. No.	Sewerage Zone	Capacity of STPs (In MLD)			
		Existing & Executed	Under Const.	Proposed	Total
1	West Zone	40	36 By ADA to be completed in this year	-	76
2	North Zone	16	-	20	36
3	South III Zone	-	-	14	14
4	South II Zone	12	-	24	36
5	South I Zone	-	-	16	16
6	Central Zone	78	-	-	78
7	Taj Ganj Zone	-	24 JNNURM by June, 2013	-	24
8	East Zone	10	-	20	30
	Total	156	60	94	310

Decentralised Waste Water Treatment System Drains Networked: “First model for the City”



Beginning :

- SWM task force meeting
- Issues discussed on Solutions
- DEWAT Proposal
- Options for Findings, designing, implementation etc.
- Administrative support

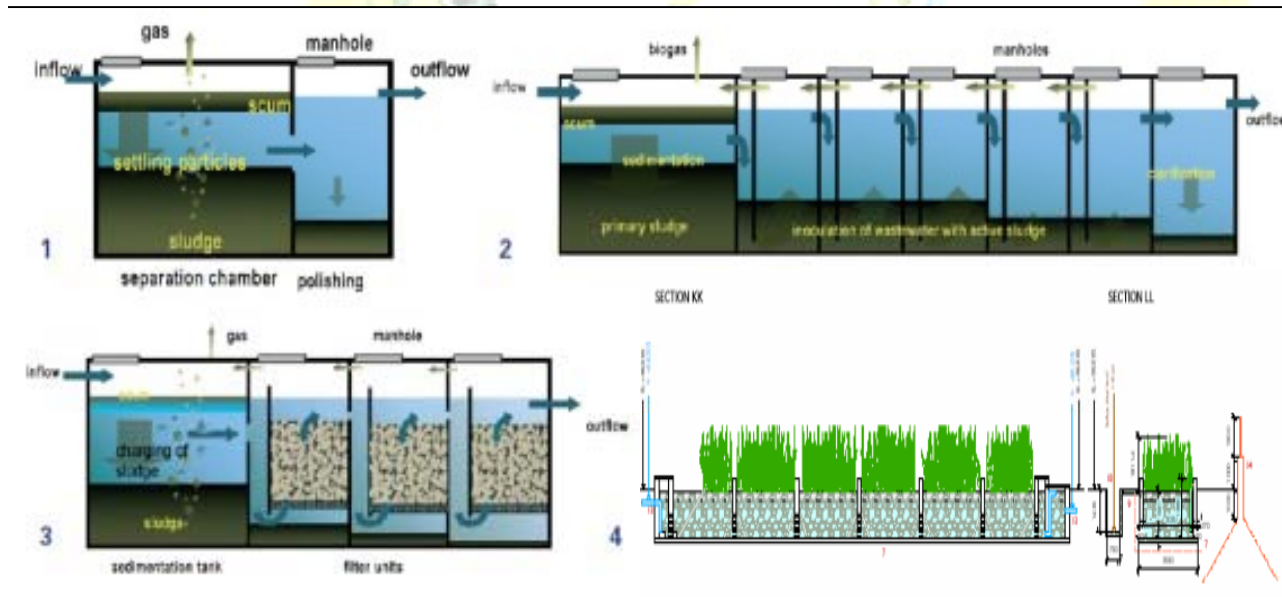
Critical point in Agra's Development

- From small to big
- From slum to city
- Strong ANN-CAP relationship

DEWAT in Kachhpura:

- Technical assistance from Vijay Vigyan foundation
- Site visit to Delhi : ANN
- DEWAT proposal developed/Submitted under Community Participation Fund, JNNURM
- No response from CPF sanctioning committee
- Shared the proposal with CURE through LMU-Water Trust
- Funding received for small system of 50 kl DEWAT
- Community meetings in Kachhpura
- Partnership with Architect consultant

DEWAT: System design



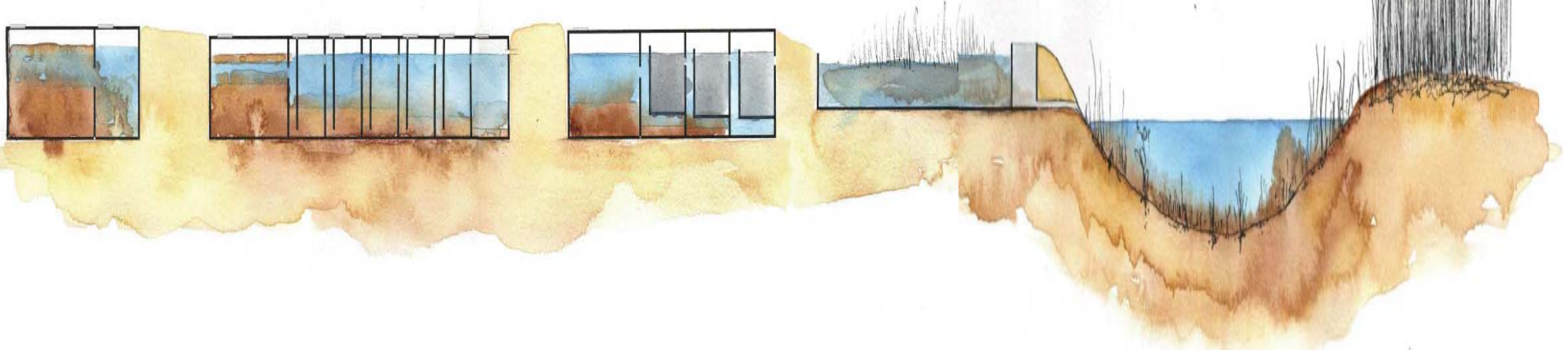
- Decentralized
- Natural-three-step bioremediation process;
- Treats 50kl, links 8 slums, reduces
- BOD from 250ppm to <30ppm
- Community monitoring
- Generates jobs in community

PRIMARY SETTLEMENT TANK

SECONDARY ANAEROBIC TREATMENT IN BAFFLED REACTORS

REED BED ROOT ZONE

POLISHING POND OR NATURAL WATERCOURSE



d e l h i u r b a n a n d a

PRINCIPLE AND COMPONENTS OF DEWAT

Simple natural treatment techniques applying bioremediation

1. Primary Treatment and Sedimentation in settling tank in Baffled septic tank.
2. Secondary anaerobic treatment in baffled reactors with filters.
3. Tertiary treatment – aerobic / anaerobic process in root zone treatment system

Advantages of DEWATS technology:

- treatment for domestic and less industrially polluted wastewater
- Low primary investment costs
- Non-dependence on energy and power requirement.
- Reliability and longevity as low-level technology and designs utilized.
- Tolerant towards inflow fluctuations and peak loadings
- Reliable and long-lasting construction design
- Expensive and sophisticated maintenance not required
- Low operation and maintenance costs are incurred.
- Spatial requirements adjusted through construction done underground.
- Resource recovery through wastewater re-uses and models for show casing.

Construction Process

Preconstruction

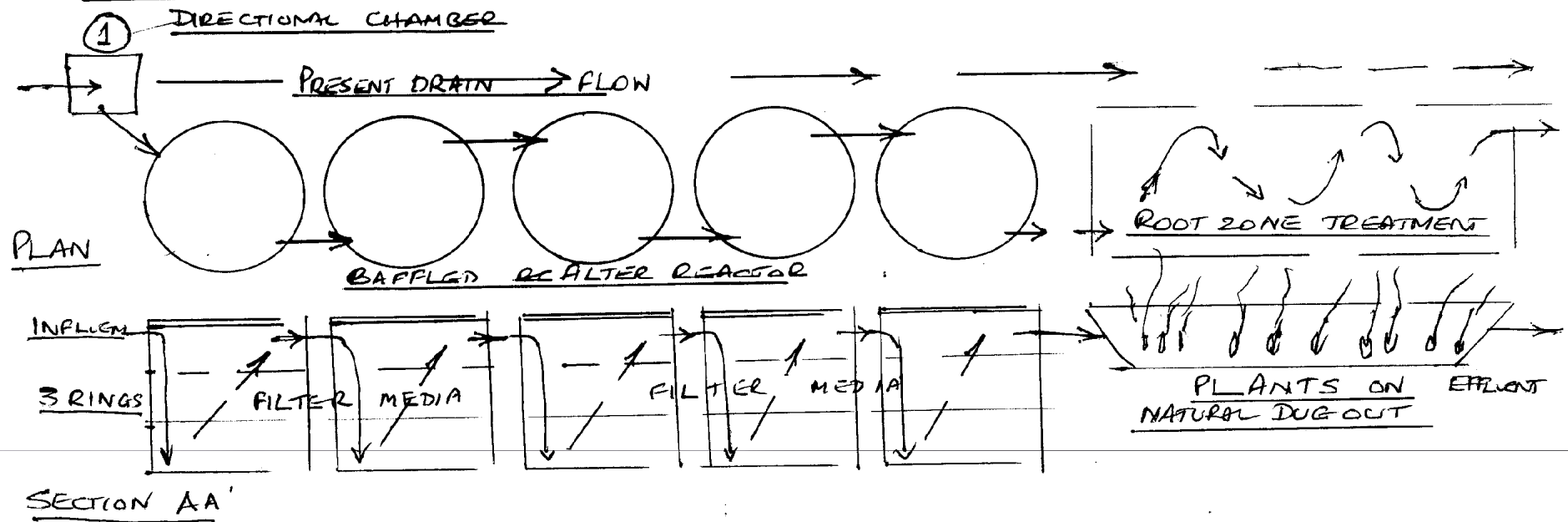
Selection of Site



- Site selected near Mehtab Bagh boundary
- ANN submits application (form Vii) to ASI for NOC
- Site survey and design development as per site
- Application rejected from ASI: Need to shift the site (100 mt away from Mehtab Bagh)

PR. 126: KUCCH PURA WWT PLANT LOCATION -

SYSTEM 2



DETAILS OF DEWATS PLANT — 20 KL/DAY AT — SYSTEM 2

QUANTITY OF INFLUENT / DESIGN INFLOW — 20 KL PER DAY
 QUALITY OF INFLUENT — 200 BOD
 QUANTITY OF EFFLUENT / DESIGN OUTFLOW — 16 KL PER DAY
 QUALITY OF EFFLUENT PROCESSED WATER — < 60 BOD (30 BOD)

COMPONENTS OF PLANT: ALL INTERNAL DIMENSIONS
 1. DIRECTIONAL CHAMBER $1\text{m} \times 1\text{m} \times 1\text{m}$ — 1 KL
 2. BAFFLED FILTER REACTOR 5 NOS. $1.2\text{dia} \times 3.6\text{deep}$ 18 KL
 3. ROOT ZONE TREATMENT $1\text{mW} \times 20\text{mL} \times 1.0\text{deep}$ 20 KL

RETENTION IN PLANT TOTAL 40 KL — 2 DAYS

LOCATION NEAR MEHTAB
 BAGH MOONLIGHT GARDEN
 ER. AJIT SESHADRI
 THE VIGYAN VIJAY FOUNDATION

AR. BASHABI DASGUPTA

Relocating the Site:

- DEWAT was redesigned
- Resubmitting NOC application, site visit by ASI, NOC provided
- Land approval from District collector (Nazool dept.)
- BOQ developed (DSR 2008-09)
- Dialogue with local community (getting panchayat approvals)



Linkages:

- ANN agreed on construction of CTC & M-E of DEWAT
- ASI agreed to use treated water for Mehtab Bagh
- Local community for supervising the construction work

Contracting:

- contractors were reluctant
- Labour contract given to local contractor
- Procurement of materials/quality check/site supervision by CURE
- Local labour was used in the construction to generate livelihoods among the poor.

DEWAT: System Design

Decentralized, natural-three-step bioremediation process;
Treats 50kl, links 8 slums, reduces BOD from 250ppm to
<30ppm

Community monitoring

Private sector funds; 25000USD

Generates jobs in community

Screen Chamber (1.0 m W × 1.1 m L × 1 m Deep)

Pre-process filter Chamber (2.0 m W × 2.5 m L × 2.5 m Deep)

Baffled Septic Tank (2.0 m W × 7.5 m L × 3.0 m Deep)

Baffled Filter Reactor Chamber (2.0 m W × 22.0 m L × 2.5 m Deep)

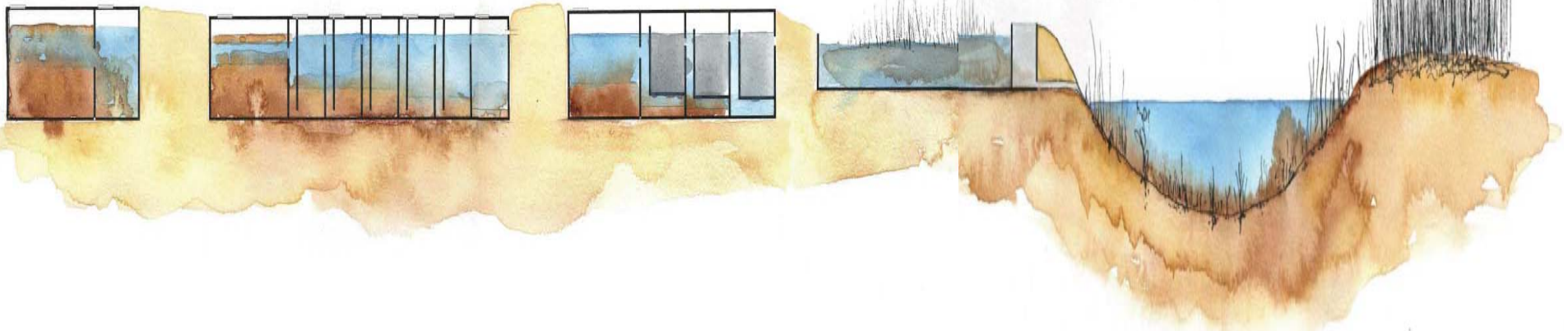
Root Zone Treatment Chamber (2.0 m W × 22.0 m L × 2.0 m Deep)

PRIMARY SETTLEMENT TANK

SECONDARY ANAEROBIC TREATMENT IN BAFFLED REACTORS

REED BED ROOT ZONE

POLISHING POND OR NATURAL WATERCOURSE



d e l h i u r b a n a n d e a

Construction

1. Land Survey (Labels) & Marking of Chambers :

Detailed land and topographic surveys

Chambers were marked with the help of bamboo, sticks and rope.



2. Constructing Temporary Drain

“U shaped”
alternate 50
meter drain

Site could get
dry and ready
for actual
construction.

ANN -JCB
machine



3. Digging out the Chambers :



d e l h i u r b a n d e a

4. Dressing of Chambers & Ramming of Earth



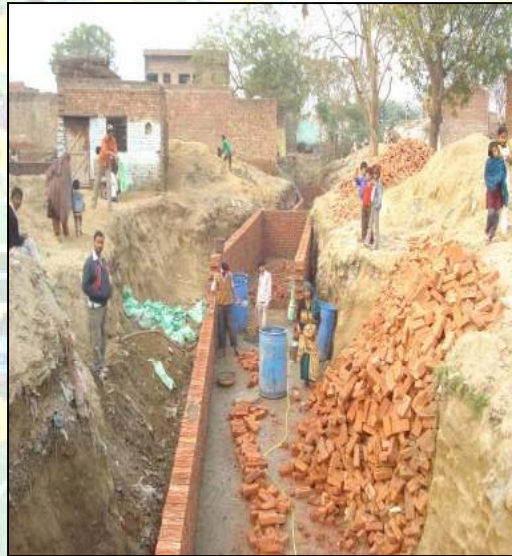
5. Brick Bats and Ramming



6. Base Concrete in Chambers



7. Constructing walls



8. Plastering on the Walls



9. Casting of RCC Slab



10. Fitting of Manhole



11. Filling of Filter media in root zone treatment chamber



12. Measuring water levels



13. Pipe Fitting (connecting chambers)



14. Plantation in Root Zone Treatment



Community Participation and Management through CURE:

Community Participation in :

- design development
- site selection
- construction process
- supervision
- area clean up
- child safety,
- safe guarding construction material/equipment,
- marking the area,
- discussing flooding issues, etc.



Community managed Operation & maintenance plan



Site Supervision



d e l h i u r b a n a n d e a

A faint, stylized map of the Delhi Urban Area serves as the background. It shows various colored regions representing different land uses or administrative zones, with a network of roads and water bodies. The text 'delhi urban area' is visible at the bottom of the map.

Contributors in technical expertise

- S. K. Tasgaonkar (Engineers from Delhi)
- P.C Rath (Chief Engineer, PH at Government of Orissa)
- Suresh Chand (Ex Engineer, Agra Nagar Nigam)
- Public Health Engineer (Project Implementation Unit, Agra Nagar Nigam)
- Junior Engineers (Agra Nagar Nigam)

Operation and maintenance



- Daily cleaning and separating solid wastes by a sweeper
- Chambers are cleaned/de-silted in every six months
- Ensure the system remains operational.
- Training for O& M

Outcome

- Cleaner environment in Kachhpura
- Reduced BOD level
- Paved street and a safe space for community activities /recreation.
- Storage tank to store the water
- Multiple use of clean water (irrigation, plantation, making houses etc)



Inlet



Outlet

OUTCOMES:

Technical details of water testing by
U.P. Pollution control board, Agra as on 31-05-12

Inlet	Colour	Odour	pH	TSS	BOD	COD
At inlet	Greyish	No specific	8.08	680	142	388
At outlet	Normal	Odorless	8.75	98	54	144

All parameters are expressed in mg/l except pH

Standards:

1. pH : 5.0-9.0
2. TSS : 100 mg/l
3. BOD : 30 mg/l
4. COD : 250 mg/l

Major Challenges faced:

- ASI regulation
- Land sanctioning
- Site supervision
- The incessant rains this monsoon led to heavy water logging
- Community dissatisfaction- initially
- Screening the garbage/polythene and prevention of silting inside the chambers.
- Upstream drains



7A



DRAIN UPSTREAM DEWAT CONDITION MAPPING

8A



9A



10A



11A



10B



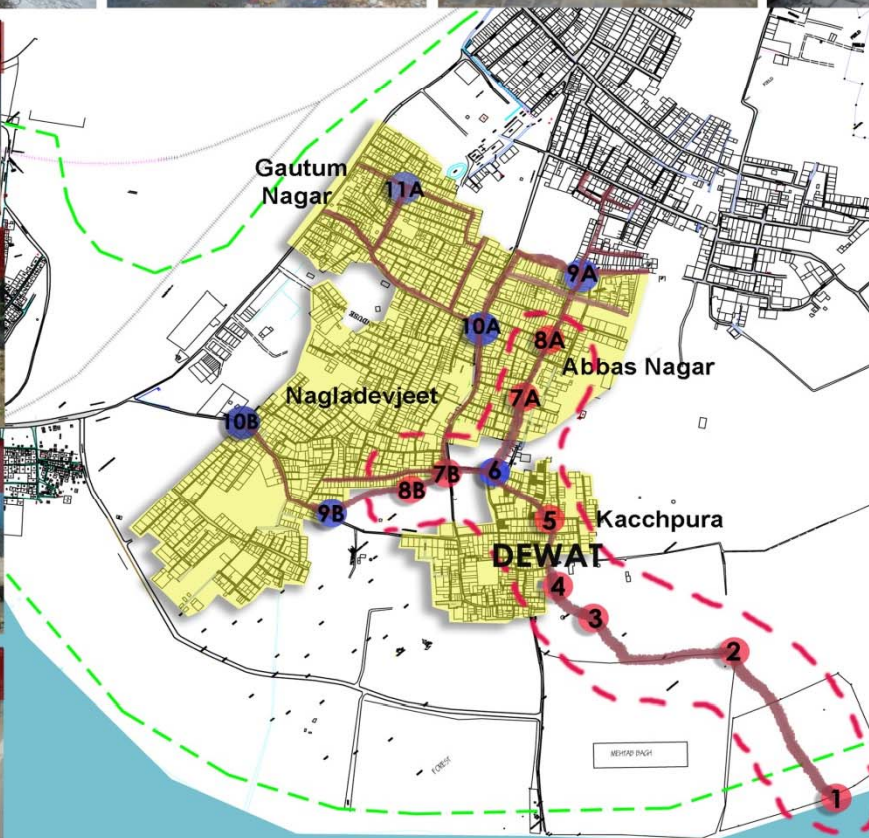
9B



8B



7B



DEWAT



1



6



5



4



3



2

DEWATS Plant Implemented near Taj Mahal in Agra

General

Posted by: Nivedita

Posted on : 15.04.10

<http://www.borda-cn.org/borda-sa/modules/news/article.php?storyid=319&PHPSESSID=e00d3b50db7b210456703744bedf191c>

DEWAT in News

Featured in :

- E Disha, April 10
- Metropolis Commission 2, Barcelona, Oct 10
- TERI : film on best practices in slums
- Delhi Slum Upgrading Workshop at NIUA on 27th August
- CSUP 1st newsletter

Written by Ajit Seshadri

BORDA Partner - The Vigyan Vijay Foundation



Agra under an ambitious JNNURM City Development Plan aims to build a 26 MLD sewage treatment plant in its Trans-Yamuna areas. In September 2008, Centre for Urban and Regional Excellence (CURE), a development NGO working with slum communities on Watsan issues, engaged The Vigyan Vijay Foundation (VVF) for implementing a wastewater recycling project with planned reuse of treated water for irrigation.

CURE, under its Cross-cutting Agra Programme had mobilized slum communities for sanitation improvements. In 2006, the Department of Architecture, London Metropolitan University and Water Trust UK, provided resources for a Decentralized Waste-water Treatment System (DEWATS). VVF assisted CURE in designing and building the DEWATS on a drain channel, bordering Kachpura settlement on the River Yamuna bank, off Mehtab Bagh and across the Taj Mahal. The DEWATS

ताज के पार्श्व में बनेगा सीवेज ट्रीटमेंट प्लांट

- 10 लाख रुपये का खर्च आएगा
- 9 लाख रुपये केंद्र सरकार देगी
- 1 लाख जनता से लिए जाएंगे
- 5 सेफ्टी टैंक बनाए जाएंगे पानी की सफाई को

वरिष्ठ संवाददाता, आगरा

ताजमहल के पार्श्व में स्थित कछपुरा में सीवेज ट्रीटमेंट प्लांट बनाया जाएगा। इसके लिए प्रस्ताव तैयार कर लिया गया है। पुरातत्व विभाग की ओर से भी अनुमति मिल गई है। प्लांट के लिए जिला प्रशासन भूमि उपलब्ध कराएगा। स्वच्छ किए गए पानी का इस्तेमाल सिंचाई के लिए किया जाएगा। इस पूरे सिस्टम पर 10 लाख रुपये का खर्च आएगा।

जेएनएनयूआरएम के तहत कम्युनिटी पार्टिशिपेशन फण्ड से इस बनाया जाना है। इसके तहत नौ लाख रुपये केंद्र सरकार देगी। एक लाख रुपये क्षेत्रीय जनता द्वारा दिए जाएंगे। कछपुरा क्षेत्र में गिरने वाले नालों के पानी को स्वच्छ करने के लिए डीसेंटलाइज्ड वेस्ट वाटर ट्रीटमेंट प्लांट (डीवास) बनाए जाने का निर्णय लिया गया। गंदे पानी को साफ करने के लिए नाले के पास ही पांच सेफ्टी टैंक बनाए जाएंगे। इन टैंकों में कई तरह के पत्थर, नारियल को जटाएँ तथा कुछ पौधों का भी इस्तेमाल किया जाएगा। सिस्टम के माध्यम से पानी को बहने की रफ्तार

को बढ़ाया जाएगा। यूएस एड द्वारा संचालित क्रॉस कॉटिंग प्रोग्राम के प्रतिनिधि मनोप कुमार ने बताया कि ये सिस्टम भूमिगत होगा। इसका पानी साफ होने के बाद पीने योग्य तो नहीं होगा। लेकिन सिंचाई जरूर की जा सकेगी। सिस्टम बनाने के बाद इसके ऊपर केना प्लाण्ट (विशेष तरह का हरा पौधा) लगाया जाएगा। जिससे सिस्टम का पता नहीं चलेगा और यहाँ पर हरियाली दिखाई देगी। यूएस एड द्वारा संचालित क्रॉस कॉटिंग प्रोग्राम ने इसका प्रस्ताव बनाकर केंद्रीय शहरी विकास मंत्रालय को भेजा गया। वहाँ से अनुमति मिलने के बाद नगर निगम द्वारा पुरातत्व विभाग से भी अनुमति दे दी गई।

यह स्मॉल सीवेज ट्रीटमेंट प्लांट है। संरक्षित स्मारक मेहताब बाग से 100 मीटर से अधिक की दूरी पर है। इसलिए इसके निर्माण में कोई रुकावट नहीं है। यहीं पर नगर निगम सामुदायिक शौचालय भी बनाएगा। इसमें भी इस पानी का इस्तेमाल होगा। सुरेश चंद्र, अधिशासी अभियंता नगर निगम

Water treatment plant to rid Yamuna of toxins

SUBHASH SAGAR SINGH/ HT PHOTO

It is designed by UK students and funded by an American body

Bhardwaj

A: Dewat, a decentralised wastewater treatment plant, soon come up near Mehtab Bagh to recharge the Yamuna water the impurity level of er. Mehtab Bagh and the ahal are located on the banks of the Yamuna. ed by UK students, the is being funded by a US-based NGO. ty has for long been blems of sewage water with the Jal Nigam, orks and Yamuna n officials not being k out a permanent

has a total of 395 ey are being used osal of sewage. d be done through

212 MLD sewage ie Yamuna daily drains. A drain una area pass- village Nagla achpura and

ops the waste into the Yamuna via Mehtab Bagh.



Bearing this problem in mind, the NGO, already in the last phase of the project, is developing this biological sewage treatment plant called Dewat.

"Throughout the year, the drain remains full of sewage and the water can be utilised. This was conceived by students of London Metropolitan University during their visit to Kachpura," said Project manager Rajesh Kumar of Cross Cutting Agra Programme (CCAP). "This is a low-cost decentralised wastewater treatment plant costing just Rs 8-7 lakh and its design and other technical aspects are being looked into in consultation with Nagar Nigam and ASI authorities."

CONTINUED ON PAGE

09

आगरा

6

कछपुरा नाले का पानी सीधे यमुना में जाने से रोका जाएगा

आगरा में लगेगा प्रदेश का दूसरा 'इयोट सिस्टम'

एएसआई ने दी मंजूरी, प्रशासनिक स्वीकृति की औपचारिकता भी पूरी नौ बसावटों का गंदा पानी यमुना में गिरने से रोकेगा 50 किलोमीटर का सिस्टम मेहताब बाग से सौ मीटर की दूरी पर पब्लिक टॉयलेट्स को भी मिली मंजूरी

आगरा, कसबला संवाददाता कछपुरा में बड़े नाले का उत्सर्जन सीधे यमुना में जाने से रोकने के लिए इयोट (डी सेंटलाइज्ड वेस्ट वाटर ट्रीटमेंट) सिस्टम अपनाया जाएगा। पुरातत्व विभाग की ओर से हेरिटेज ट्रेल प्रोजेक्ट के तहत इसके लिये अनायात मिल गई है। यह प्रोजेक्ट यूएस एड समर्थित है और निगम की सहायता से कैप के जरिये संचालित किया जाएगा। जिला प्रशासन परियोजना स्थल का निरीक्षण कर चुका है। लगभग 50 किलोमीटर क्षमता के इस सिस्टम से नाले के उस पानी को सीधे यमुना में जाने से रोका जायेगा, जो 300 कीओडी तक प्रदूषित होता है। इससे देशहरा घाट से एक किमी डाउन में नदी में प्रदूषण बढ़ता है।

विज्ञान फाउंडेशन के अजित सोमानी और केप दिल्ली के बी. गुप्ता ने मूल योजना और डिजाइन तैयार की है। इसमें स्कीन चेम्बरों और तीन सेंट्रल टैंकों सहित तीन चरणों में पानी के शोधन का इंतजाम होगा। पीने के अलावा इस पानी का किसी भी कार्य के लिये रियूज्ड संभव है। जैसे योजना के अनुसार आरंभ में शोधित पानी का उपयोग हरियाली के लिये ही मुख्यतः से किया जायेगा। बाद में सजल शौचालयों में भी इसका प्रयोग होगा।



स्थापित होने के बाद इसी तरह दिखेगा इयोट सिस्टम।

नगर आयुक्त आनंद वर्धन कछपुरा का निरीक्षण कर चुके हैं और उन्होंने इस प्रोजेक्ट की ईको फ्रेंडली होने के चलते उपयोगी माना है। अधिशासी अभियंता सुरेशचंद्र ने उम्मीद जताई है कि प्रोजेक्ट पर शीघ्र ही काम शुरू होगा।

उल्लेखनीय है कि प्रदेश में भरत के बाद यह दूसरा इयोट सिस्टम होगा, जहाँ एक पूर्व सैन्य अधिकारी सिंचाई के लिये इसका कई साल से कामयाब अनुभव देते हैं। उधर, कछपुरा में एएसआई सार्वजनिक शौचालय की चौहद्दी से सौ मीटर दूर ही स्थान चिह्नित करना होगा। जैसे कैप के प्रोजेक्ट के तहत 37 शौचालय बनाये जा चुके हैं, किंतु इनसे कुछ परिवारों की समस्या का ही समाधान हुआ है। व्यापक हल पब्लिक टॉयलेट से ही संभव है।

Overall impact

- Communities now inclined toward having individual toilet system
- People invest in their own toilets
- 2 CTC were constructed in CAP area
- ANN earmarked budget for sanitation
- PPP arrangements started
- DEWAT treats black water before discharging into Yamuna
- Reduced health care cost
- Visibly cleaner community
- Increased community participation in sanitation realities interventions
- ANN's capacity enhanced to implement community based sanitation projects
- Strong partnership with ANN & other service providers

Convergence with other Development Initiatives under JNNURM

City Sanitation Plan Development:

- Development of TORs for contract with support of CURE- USAID FIRE (D)
- ASCI contracted, supported with information
- MOUD releases 20 lakhs for CSP development
- DEWAT case study included in CSP Agra
- CSP recommends for 4 more DEWAT in the city

THANK YOU