

Social Vulnerability and Wastewater Related Risks: A Case Study of Delhi/India



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COMMON NEWS HEADLINES DELHI TIMES Clogged drains, mounds of silt, broken roads worry RWAs

New Delhi: The rain gods who have showered in a placid way over Delhi in the past few days have now turned into a deluge. The rain has been so heavy that it has caused a lot of trouble for the city's residents. The drains are clogged with silt and broken roads are everywhere. The rain has also caused a lot of damage to the city's infrastructure.



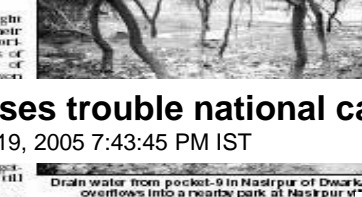
'Monsoon may arrive next week'
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Dwarka woes overflow, but drains missing

New Delhi: Nearly eight years after moving into their Delhi Development Authority (DDA) flats, residents of pocket-9 in Nasipur of Dwarka are not too happy. The drains are missing and the sewage is overflowing into a nearby park. The residents are complaining to the DDA but no action has been taken.



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Sewage flows from Lajpat Nagar taps

New Delhi: If the ongoing sewerage crisis in the city is not enough, its contamination has surfaced to aggravate residents' woes. After having faced a week-long water crisis recently, many residents of D-Block, Lajpat Nagar-II say that they have been getting sewage water in their taps. The water is very foul and has a strong smell of sewage.

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Cholera cases trouble national capital:-

New Delhi | May 19, 2005 7:43:45 PM IST
The city's health department has reported a sharp rise in cholera cases in the capital. The cases are concentrated in the slum areas of the city. The health department has advised the residents to drink clean water and eat clean food. The cases are a serious concern for the city's health.

Area	Number of cholera cases
Connaught Place	10
Kirti Nagar	15
Mayapuri	20
Okhla	25
Patel Nagar	30
Pragati	35
Shalimar Bagh	40
South Delhi	45
West Delhi	50
North Delhi	55
East Delhi	60
Central Delhi	65
South West Delhi	70
North West Delhi	75
South East Delhi	80
North East Delhi	85
Central West Delhi	90
Central East Delhi	95
South Central Delhi	100

Drain turns death pit for 5-year-old

Delhi: A 5-year-old girl and her two siblings fell into an overflowing drain in a slum area of the city. The girl was seriously injured and was taken to a hospital. The incident has caused a lot of concern among the residents of the area. The drains are overflowing with sewage and the area is very dirty.



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City's slum clusters are worst hit

New Delhi: The city's health department has reported that the slum clusters are the worst hit by cholera. The cases are concentrated in the slum areas of the city. The health department has advised the residents to drink clean water and eat clean food. The cases are a serious concern for the city's health.



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Two girls die after falling into pit at E Delhi

New Delhi: Two minor girls died after falling into a construction site pit in East Delhi. The girls were playing near the site and fell into a deep pit. The incident has caused a lot of concern among the residents of the area. The construction site is not properly fenced and the area is very dirty.



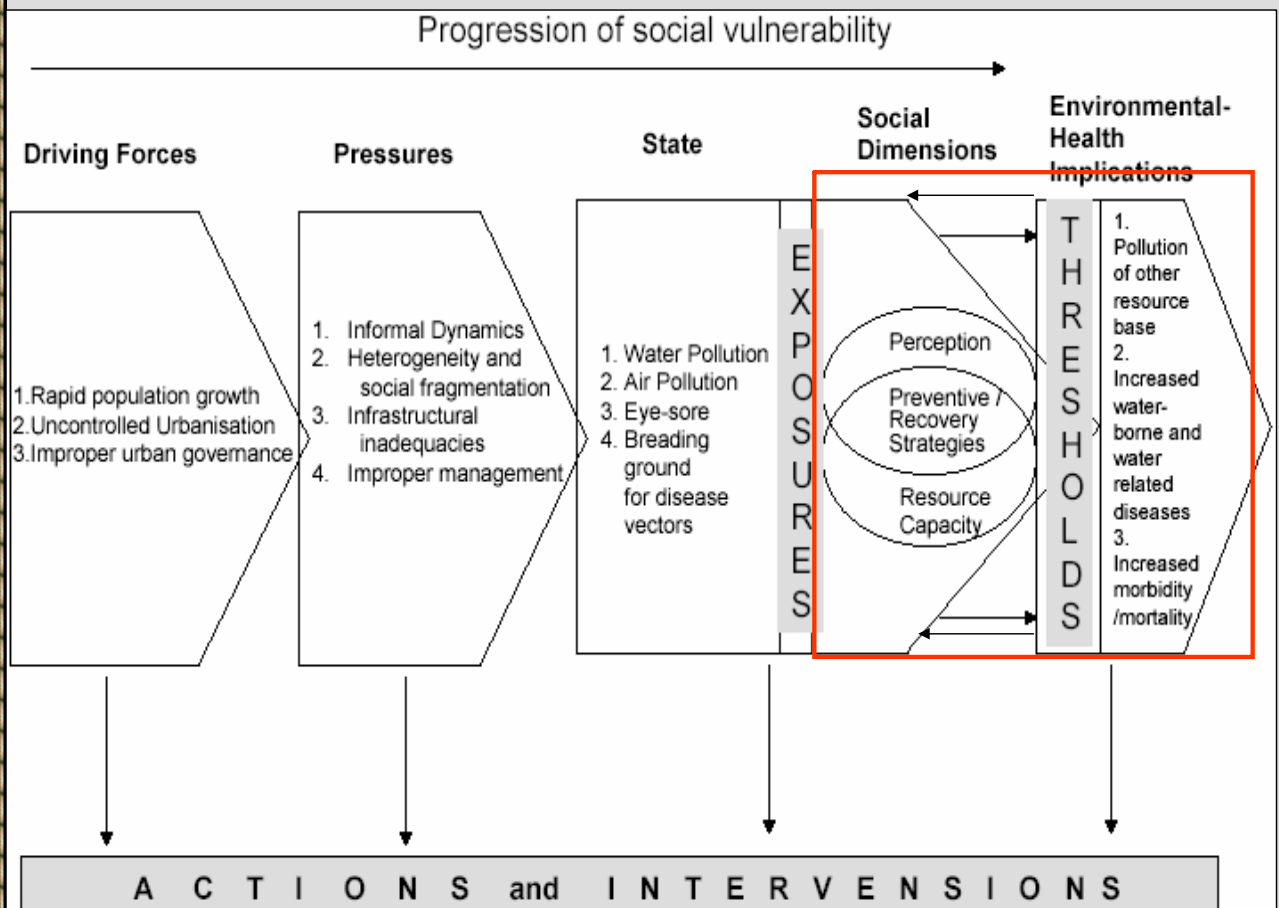
Major Aim :

This study is positioned at the nexus of two broad topics namely, **unruly urbanisation** led **infrastructure stress** and **environmental-health implications**. Under this backdrop it aims at analysing wastewater risks and **social vulnerability** of different groups due to changes in the physical, socio-economical, infrastructural and institutional environments of the city.

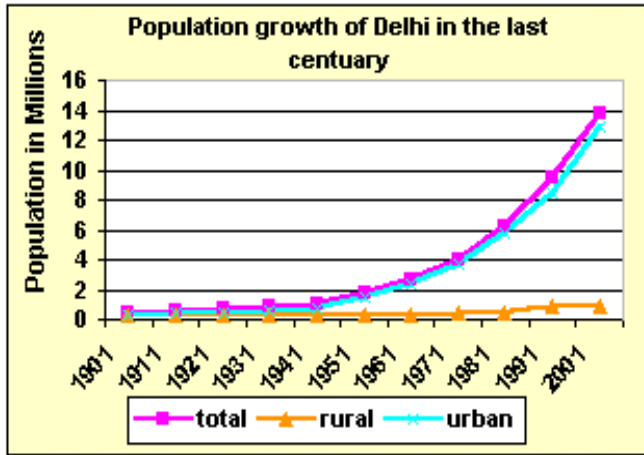
DPSEEA Model (David Briggs for WHO)

Double Structure of Vulnerability (H.G. Bohle)

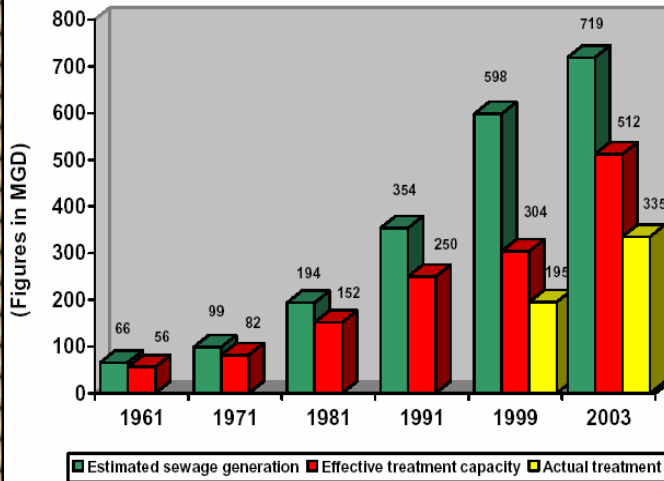
Conceptual Framework



Unruly Urbanisation and Infrastructural Stress



- Population of the city has been constantly growing at a high rate, reaching 15.3 mil. in 2005.
- There is high rate of in-migration from neighboring states.
- Frequent violation of master plan and developmental norms.
- Infrastructural upgradation has not kept pace with growing population.

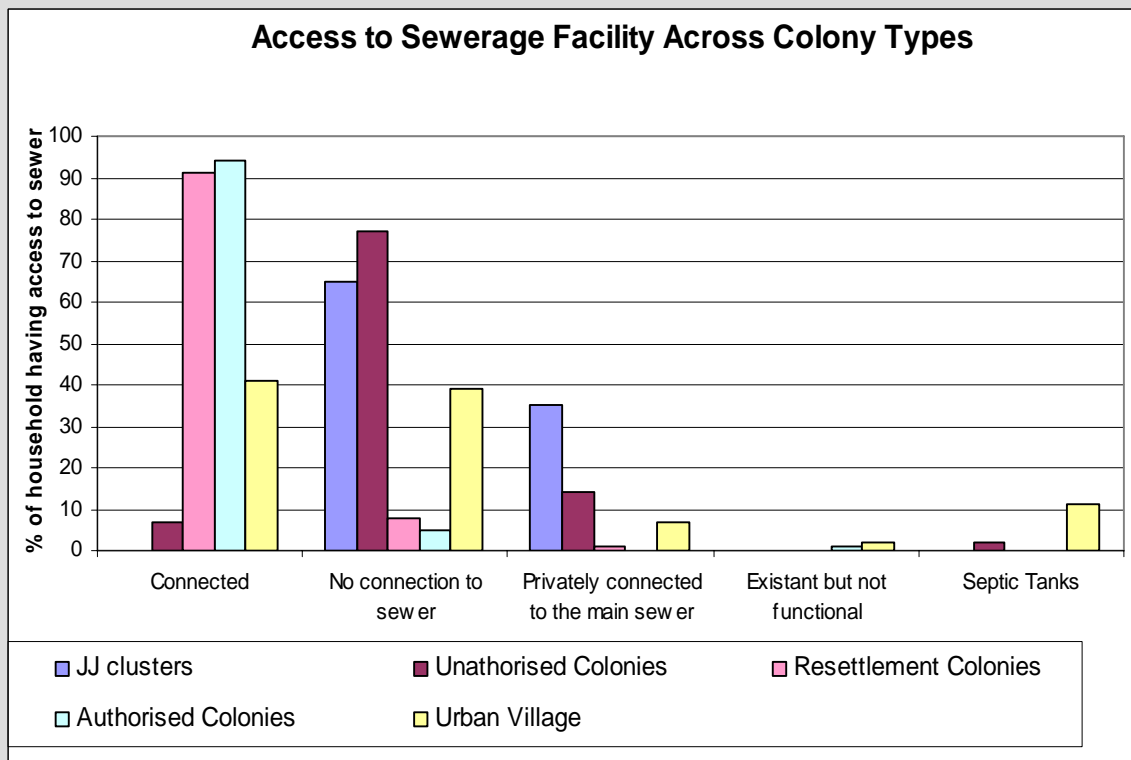


(Figures of actual sewage treatment not available prior to 1999)

Type of Settlement	Estimated population in lakh in 2000	% of total population
JJ Clusters	20.72	14.8
Slum Designated Areas	26.64	19.1
Unauthorised Colonies	7.40	5.3
JJ Resettlement Colonies	17.76	12.7
Rural Villages	7.40	5.3
Regularised-Unauthorised Colonies	17.76	12.7
Urban Villages	8.88	6.4
Planned Colonies	33.08	23.7
Total	139.64	100.00

*1 lakh= 100,000

Status of Sewer Connection



The sewerage services as per present policy are not being provided in unauthorized colonies and JJ Clusters. Large areas under informal settlement remain unconnected and unserved.

Route of Exposures



Domestic wastewater diverted to cess pools as well as covered tank which is emptied manually when filled up. These are unlined wastewater collection and disposal points. They along with the unlined open drains carrying wastewater serve as a source of groundwater pollution as the household wastewater along with the pollutants percolates down to contaminate the ground water over time. These are also source for bad odour, and favourable breeding for disease vectors like mosquitoes and flies.



The poor flow in tap is accentuated by attaching hand pump. Freshwater pipelines often running close to wastewater drains and channels are affected by the intake of contaminated wastewater into the freshwater system due to frequent decrease in pressure causing numerous leakages and further mixing wastewater with the fresh water resulting in contaminated water supply to the end users.

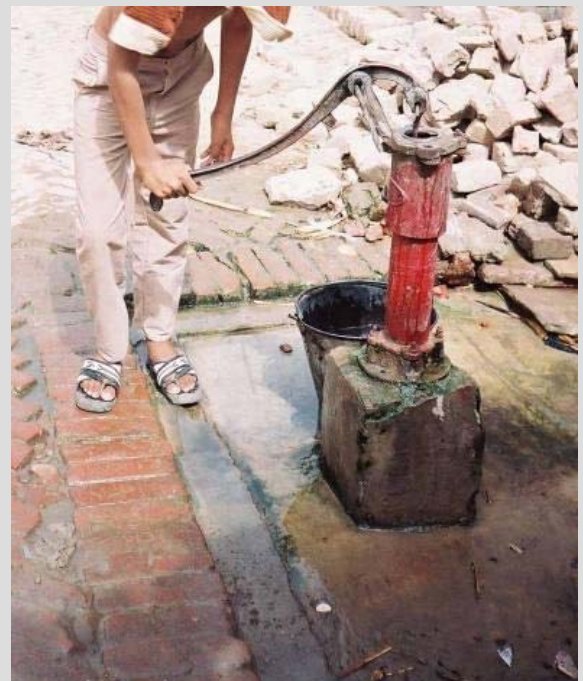


Cess pools forming conducive breeding Ground for disease carrying vectors



Direct Physical Exposure to wastewater

Cont....



Red Hand pump indicating unsafe water

Household Exposure

The factors taken into consideration for analysing wastewater exposure have been categorized as follows:

[1] Demographic characteristics of the communities

- ✦ Age composition
- ✦ Sex composition
- ✦ Family size

[2] Status of settlement and infrastructure

- ✦ Type of house
- ✦ Kind of colony
- ✦ Period of stay
- ✦ Connection to the sewer network

[3] Drinking water sources and consumption habits

- ✦ Source of drinking water
- ✦ Drinking water purification habit
- ✦ Sewage and fresh water mixing

[4] Direct contact with raw sewage

- ✦ Nearness to open drain/canal
- ✦ Frequency of drains overflowing
- ✦ Physical contact with wastewater
- ✦ Open defecation and public washing

Perception and Resource Capacity

Factors influencing Perception and Resource Capacity have been categorized as follows:

[1] Socio-Economic Status of the communities

- ✦ Gender Role
- ✦ Educational Status
- ✦ Economic Status

[2] Knowledge and Awareness

- ✦ Nature of Problem
- ✦ Earlier experience
- ✦ Knowledge of impact severity
- ✦ Available mitigation options

[3] Role of Social Capital

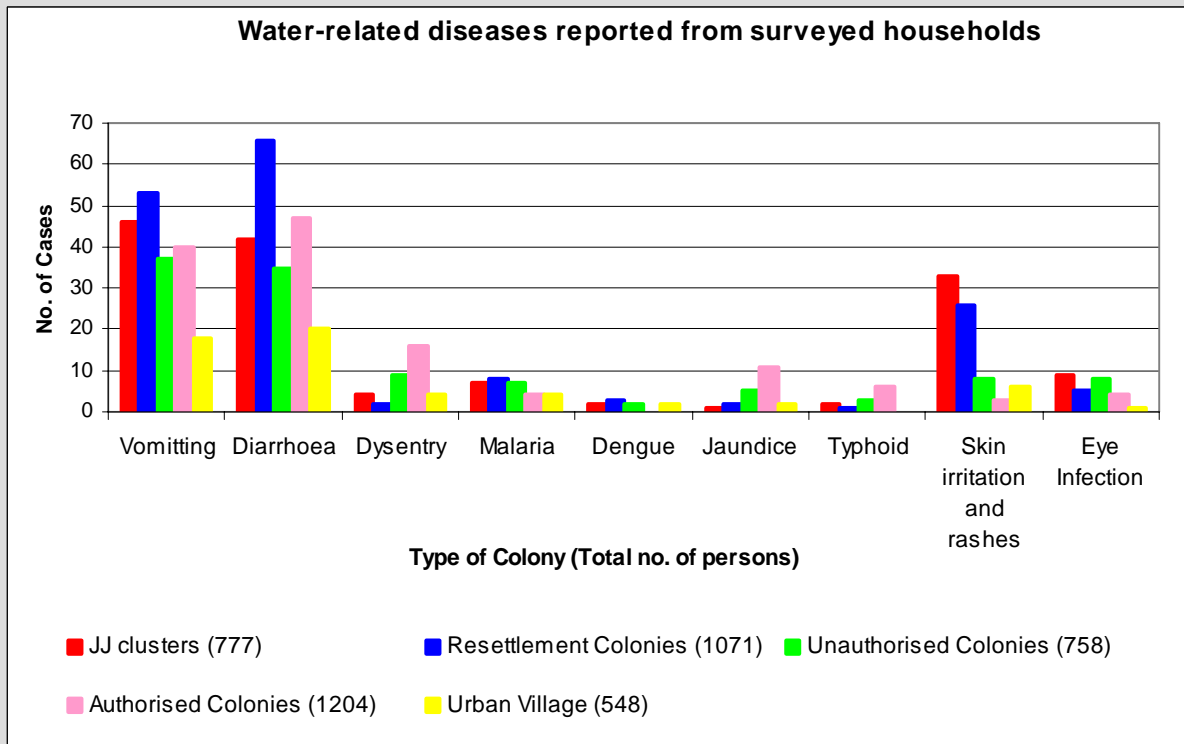
- ✦ Existence of People's Group
- ✦ Effectiveness of Social Networking
- ✦ Constraints to Community Participation

[4] Institutional and Political Economy

- ✦ Level of Institutional Accessibility
- ✦ Institutional sensitivity
- ✦ Constraints upon self help

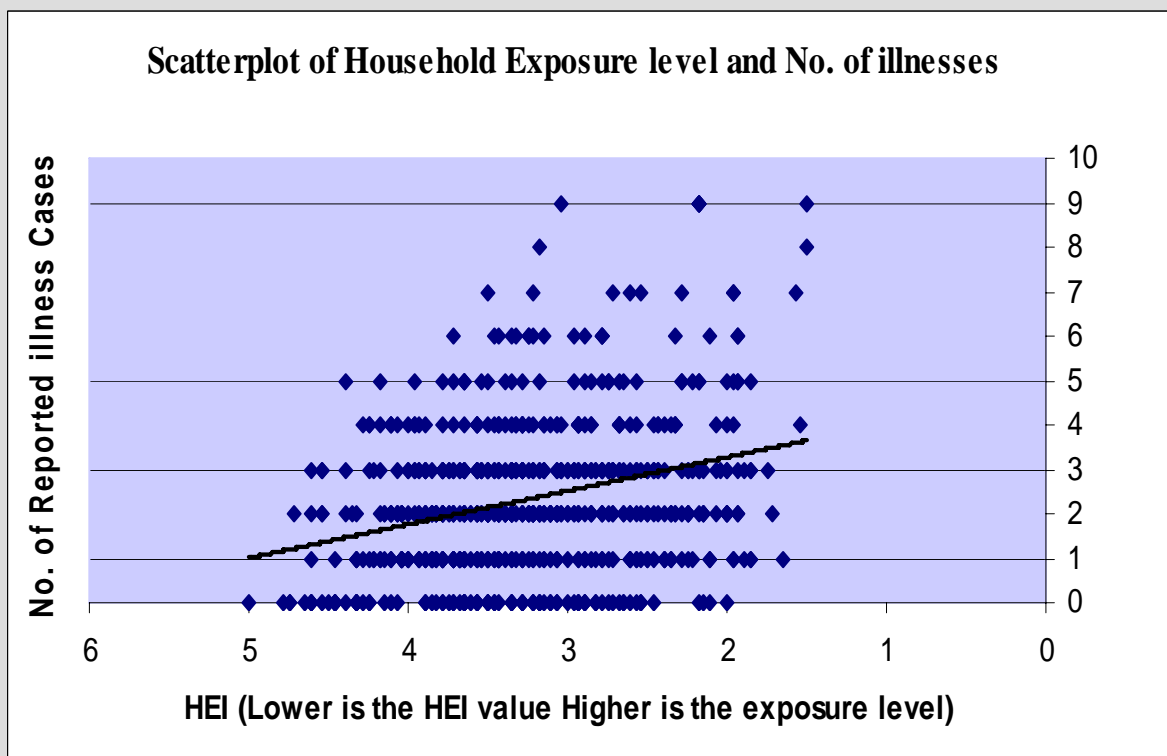
Profile of Diseases in the Study Area

- ✦ Total incidences of water borne diseases are highest followed by the skin diseases, conjunctivitis and malaria in the study area.



Source: Household Survey, 2005-06

Exposure-Morbidity Relationship



Pearson's (r) = 0.30

Source: Household Survey 2005-2006

Conclusion:

Exposure is influenced by PAR

People's Perception of Risk.

Awareness of its severity (Experience and Knowledge)

Make Resource Capacity Functional

Mould their Responses taking to various

Preventive and Recovery Measures

SECURED → VULNERABLE

Actions and Interventions:

Making the system more shock absorbant: How?

Point of Interventions/Action: Where and When?

Explicitly defining Actions: What?



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