ENVIRONMENTAL RISK ASSESSMENT OF THE INHABITANTS IN INFORMAL SETTLEMENTS IN THE CITY

MAMTA PATWARDHAN

RESEARCHER

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Mumbai Slums

Rapid Urbanization

Rural-urban Migration

Economic Opportunity

Demand & Supply Gap

Natural Disasters

Colonialism and Segregation

World Risk Index

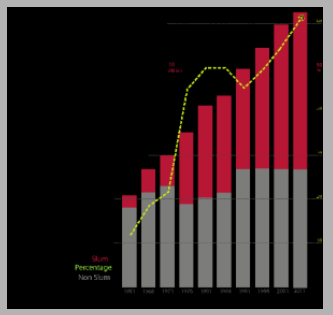
Indicators

Susceptibility

Exposure

Coping Capacities

Adaptive Capacities



P.K. Das - **Claiming Participation in Urban Planning and Design as a Right-;** Slums & open spaces mapping (in red) carried out by Nivara Hakk and this author in the year 2012, is the first comprehensive viewing of the slums occupied areas

Susceptibility

Consequences of megacity growth

water supply problems

sprawling slums

explosive population growth

poverty and prevalence of informal economy

lack of clean water and

disease epidemics sanitation

transport gridlock overcrowding

lack of green space

urban funding crisis

visual and noise pollution

pollution of air and water

sprawling suburbs and exurbs

large eco-footprints gating and segregation

Mumbai

Population
20,748,395

Slum Population
70 %

Location
Near pipelines and rivers

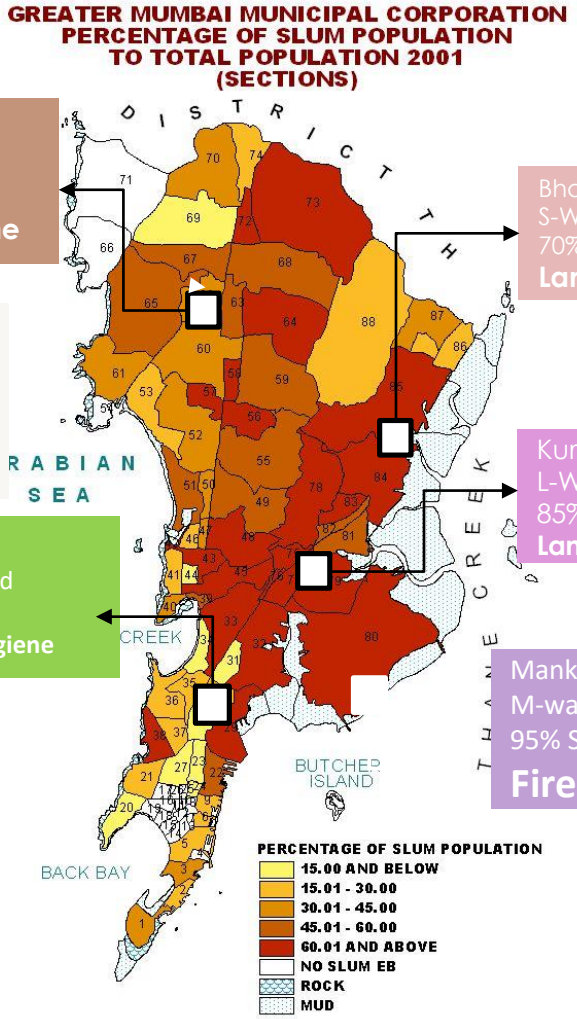
Water
550 million gallons bought per day

Sanitation
Majority defecate in the open

Garbage produced
7000 tonnes per day

Mumbai Slums

World Risk Index



Dindoshi
P-North
70% Slums
Health & Hygiene

Morarji Nagar
etc.
Along Mithi River
70% Slums **Floods**

Dharavi
G-North Ward
70% Slums
Health & Hygiene

Bhandup
S-Ward
70% Slums
Landslide

Kurla
L-Ward
85% Slums
Landslide

Mankhurd
M-ward
95% Slums
Fire

Ref: Census India Map

Indicators

Susceptibility

Exposure

Coping Capacities

Adaptive Capacities

BUILDING INCLUSIVE URBAN COMMUNITIES
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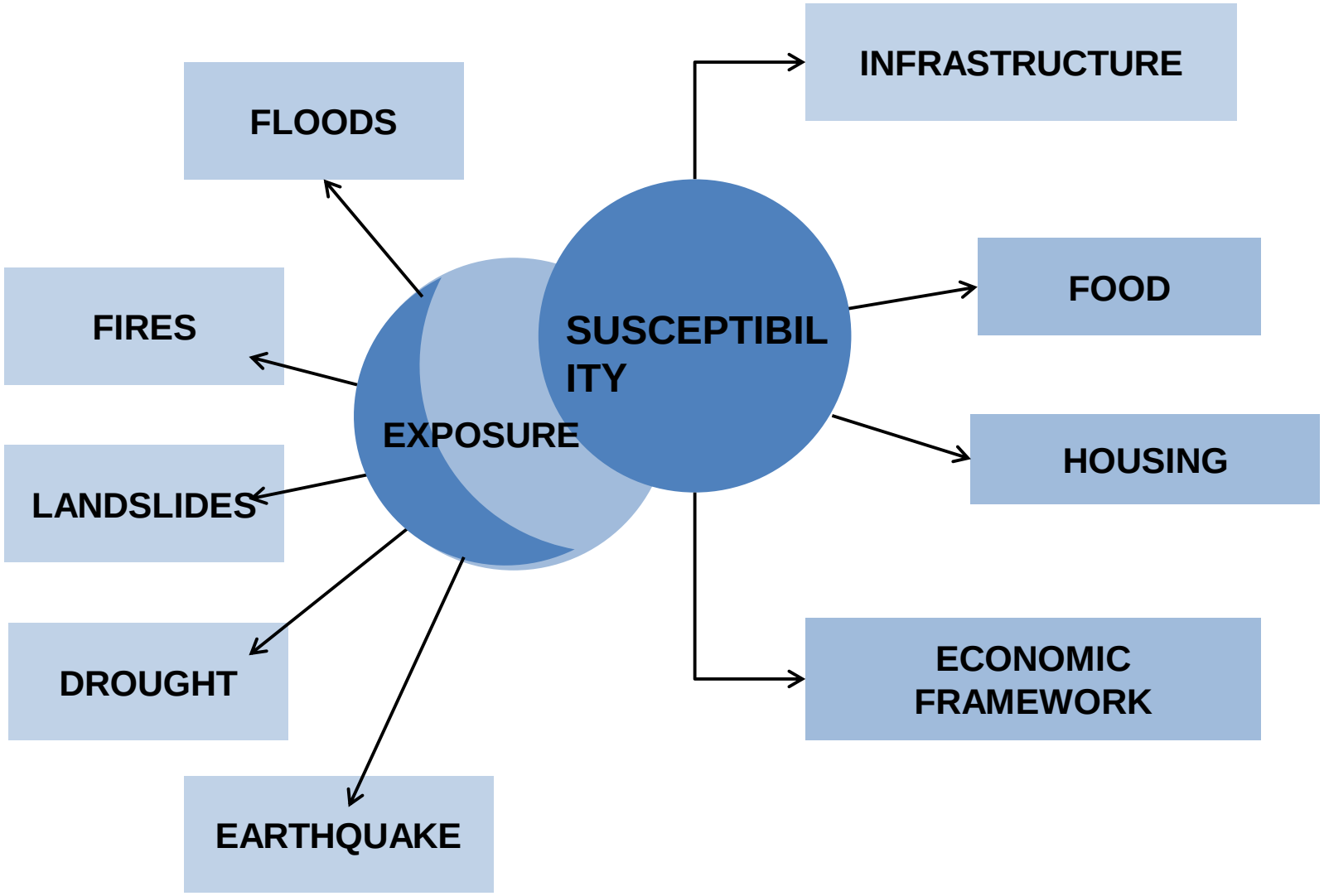
THE RISK CONTEXT, INCLUDING HAZARDS AND VULNERABILITY, IN MARGINAL SETTLEMENTS IN THE CITY



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Exposure

Natural Disasters

- Flooding
- Extreme Rainfall Events
- Flood -prone areas
- Inland Flooding

flood diagram: this mapping and analysis shows areas flooding on an annual basis due to monsoons. the sites outlined in red are government housing sites; over half of the sites shown flood annually.

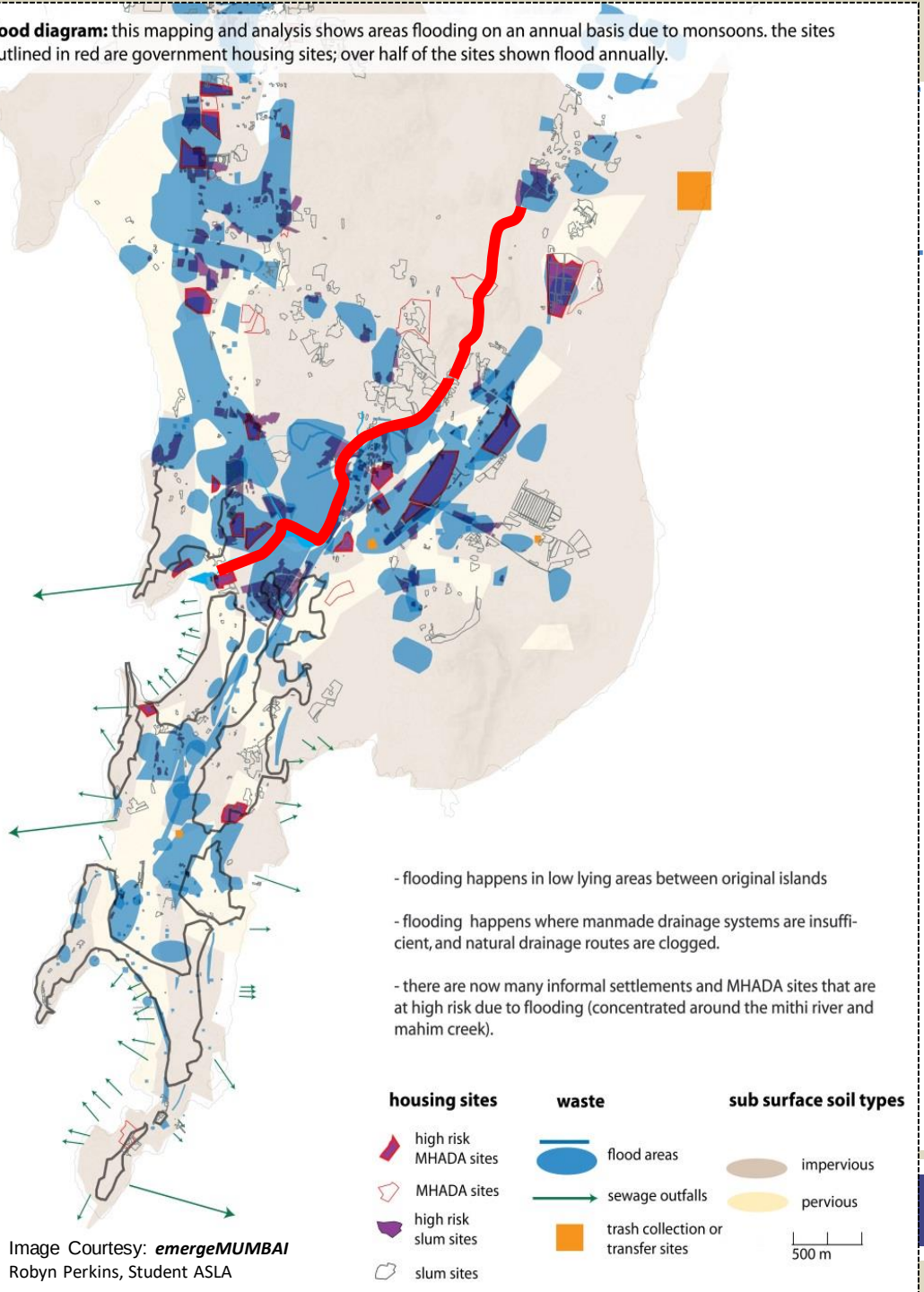

Image Courtesy: ***emergeMUMBAI***
Robyn Perkins, Student ASLA

Mumbai Floods 26th July

Water-borne diseases

Diarrhoea
Typhoid
Leptospirosis

Vector-borne diseases

Malaria
Dengue
Chikungunya

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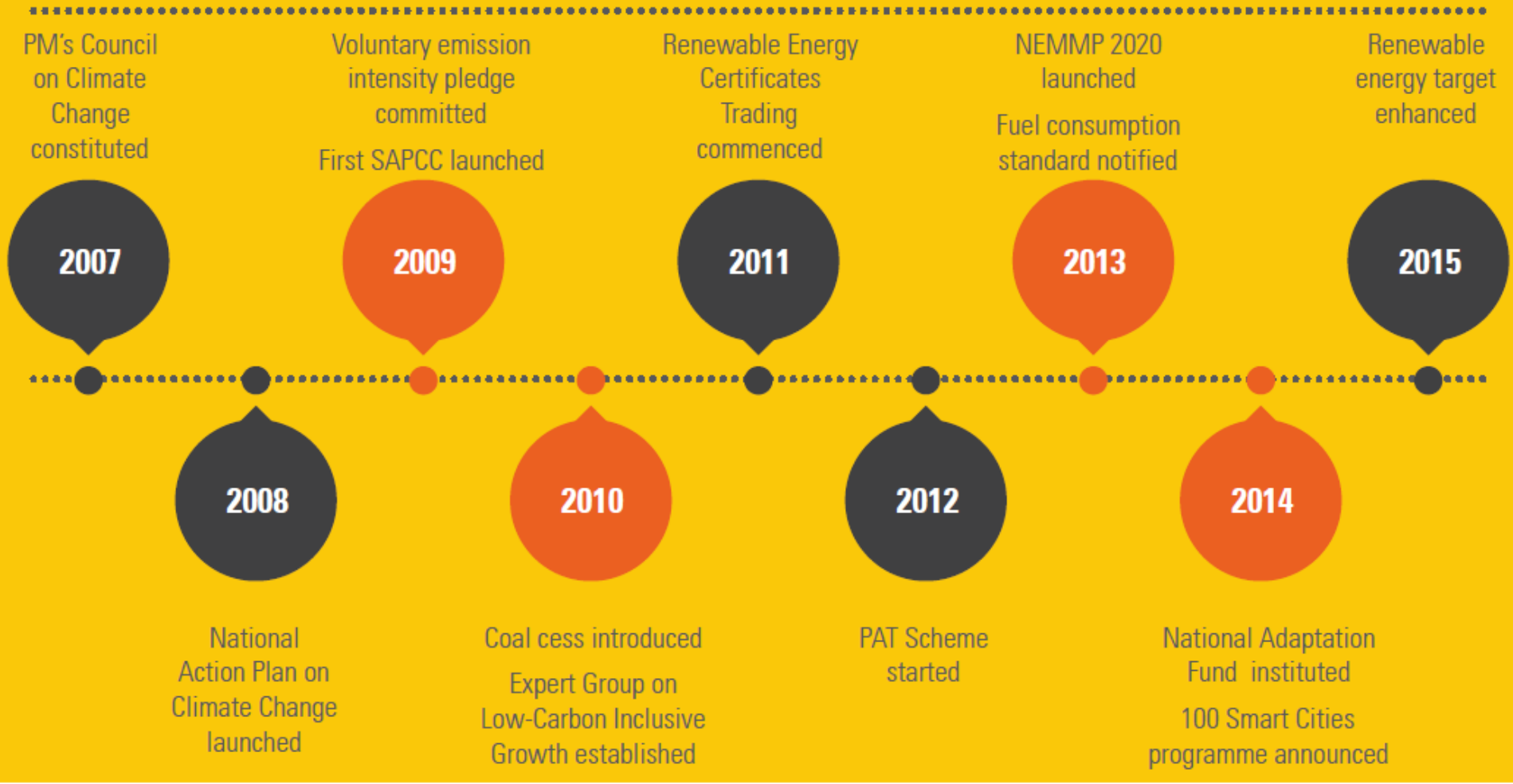
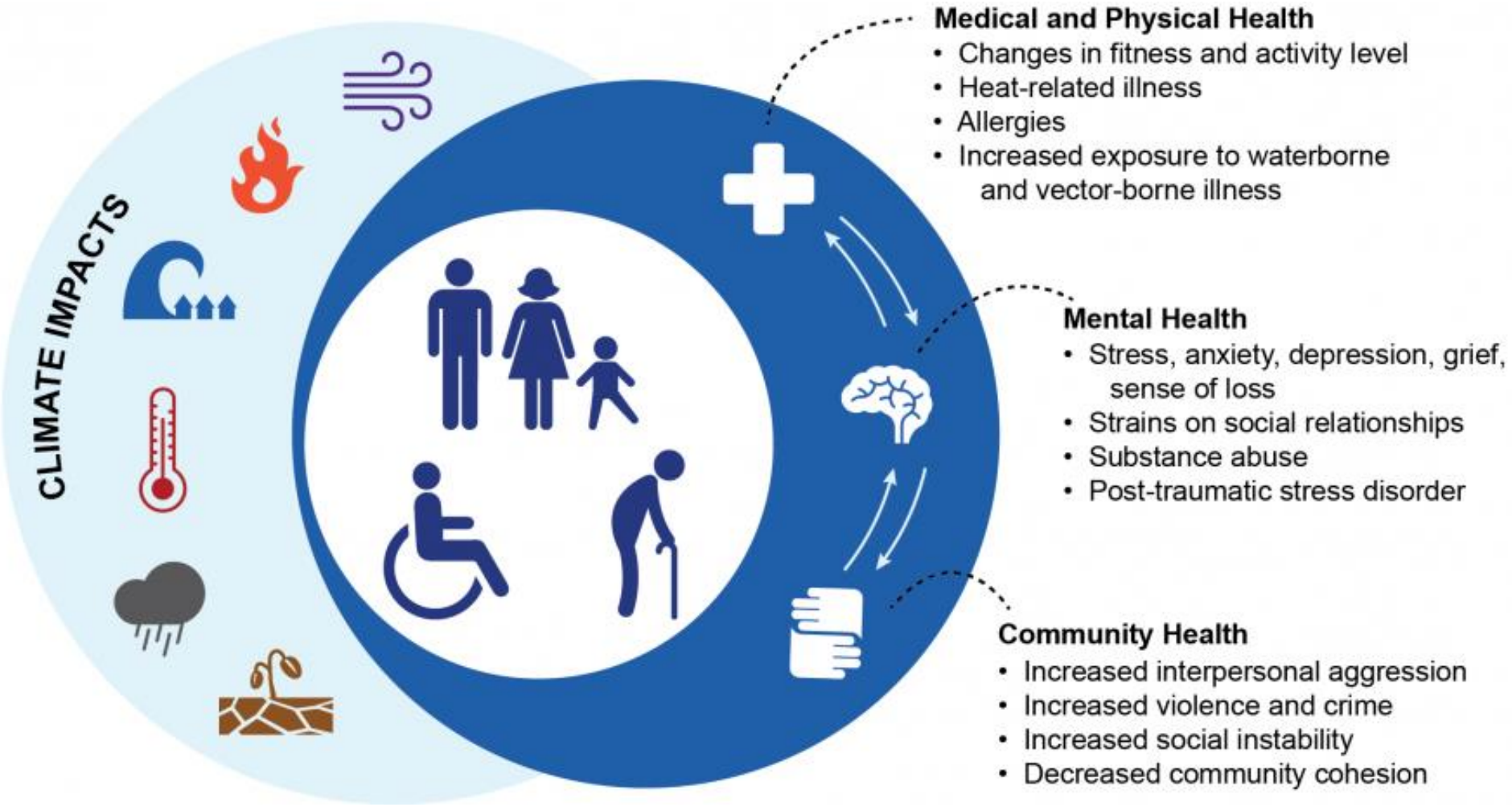
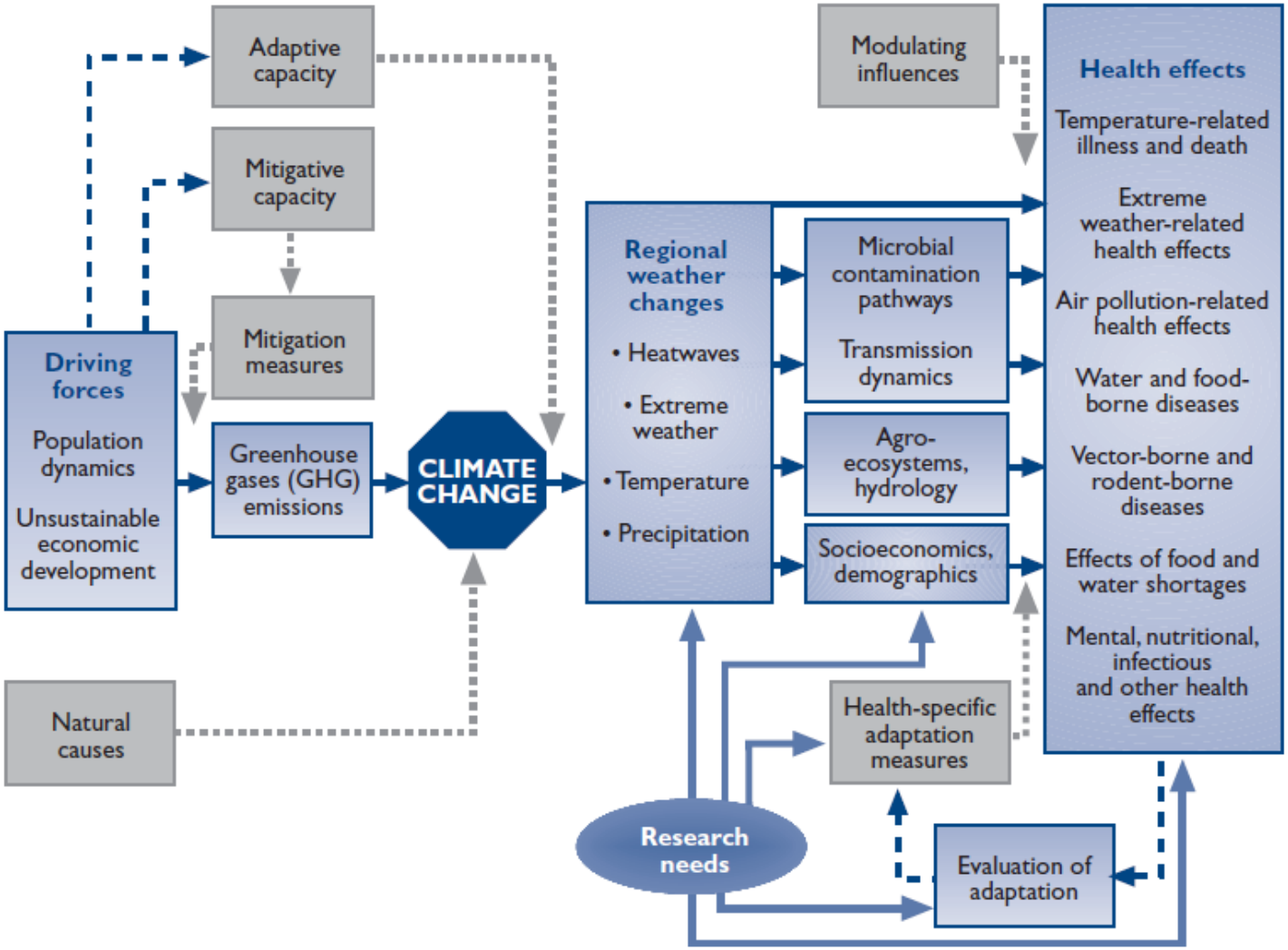
Timeline of India's Climate Change Actions



Adverse Impacts



https://health2016.globalchange.gov/



Climate change and health: pathway from driving forces, through exposures to potential health impact. Lines under research represent input required by the health sector.

Source: Adopted from reference

Health issues identified by the Prime Minister's National Action Plan on Climate Change in India:

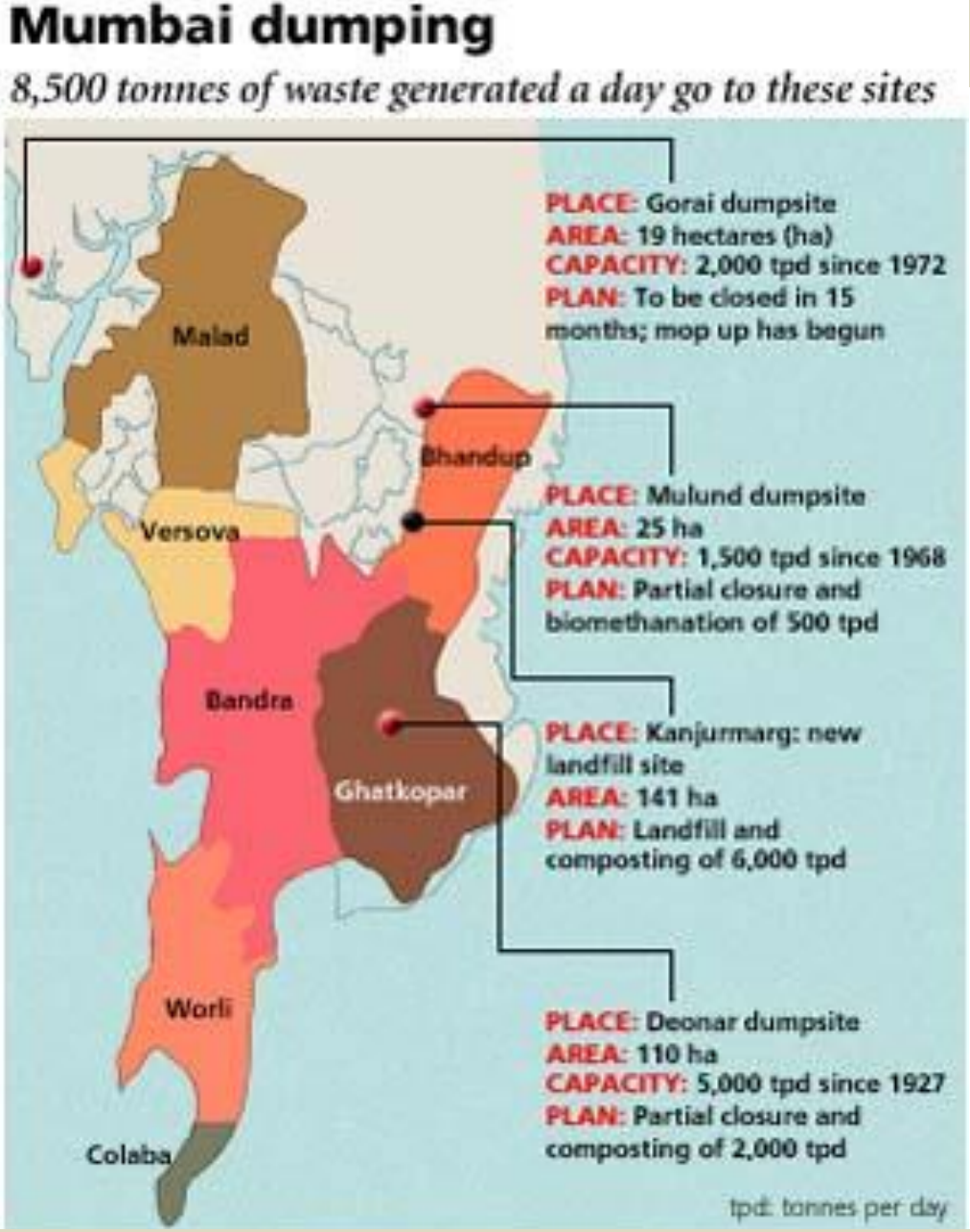
- **Assessment of increased burden of disease** due to climate change
- Providing **high-resolution weather and climate data** to study the regional pattern of diseases
- Development of a **high-resolution health impact model** at the state level
- **GIS mapping of access routes** to health facilities in areas prone to climatic extremes
- **Prioritization of geographic areas** based on epidemiological data and the extent of vulnerability to adverse impacts of climate change
- **Ecological study of air pollutants and pollen** (as the triggers of asthma and respiratory diseases) and how they are affected by climate change
- Studies on the **response of disease vectors** to climate change
- Enhanced provision of primary, secondary and tertiary health care facilities and **implementation of public health measures**, including vector control, sanitation, and clean drinking water supply.

(source: http://www.pmindia.nic.in)

Environment Risk

Deonar : A Case study

- Large garbage mounds
- Absence of waste management
- Absence of secure base lining
- Leachate penetration in ground water
- Poisonous gases released



Ref: : DownToEarth-31052007

Deonar Dumping Ground

1927: Opening of Dumping ground

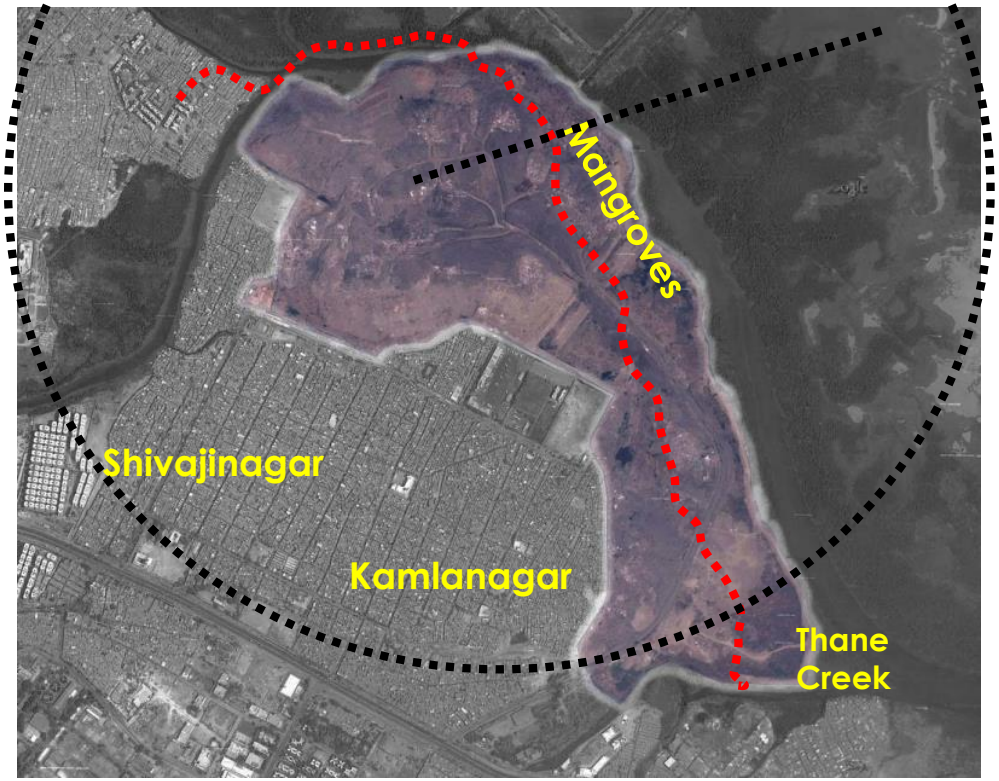
Area: 132 Hectares

Max. Height: 40 m

Shivajinagar Population: 2,60,000

No. of Ragpickers: 3000
(of which 1000 have BMC Licenses)

2008: BMC was to reduce garbage



High Flood Zone

Impact of Pollution 8-10 Km radius

Ref: URBAN REFUSE RECYCLING PROJECT(deonar dumping ground)

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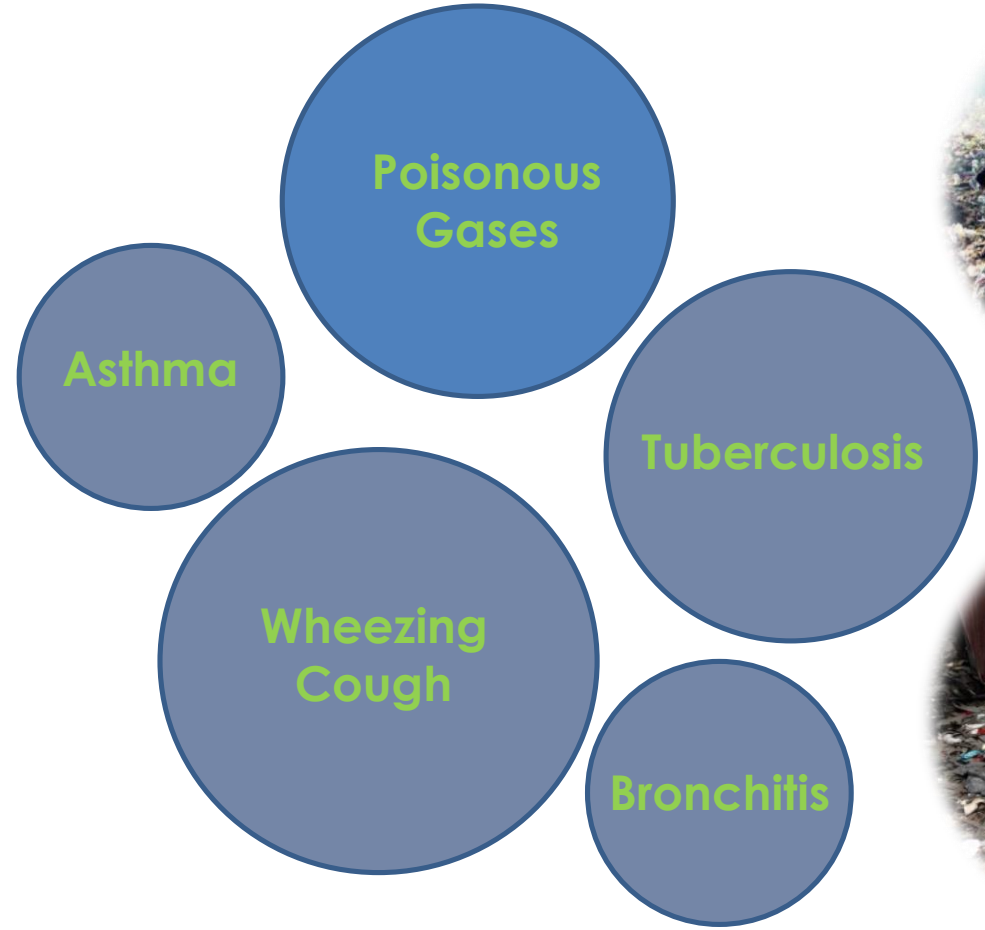
Hazardous Location

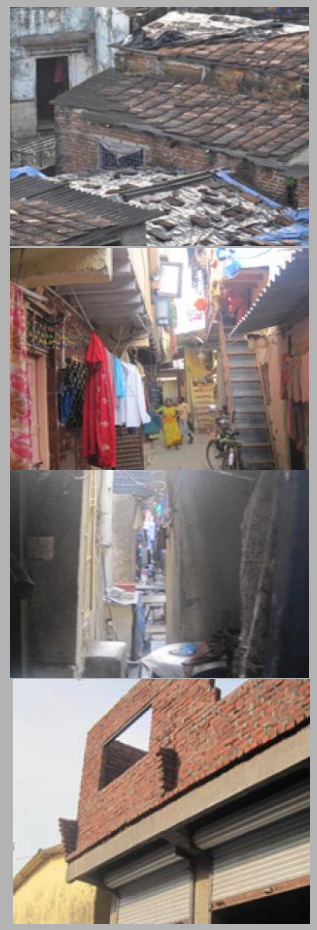
- The choice of geographically hazardous locations arises out of the **insecurity of tenure of the migrant homes**.
- The **proximity to their place of livelihood** determines the location of their residence. -DUMPYARD
- The **consequences** are monstrous.
- In the case of Deonar, living adjacent to the dump yard has been the cause of innumerable **respiratory complaints** that is direct impact of the toxicity levels in the atmosphere. Uncontrolled dumpsites result in emission of **Volatile Organic Compounds** (VOCs) that are **potential carcinogens** and also contribute to **ozone formation** that leads to climate change.

Ref: Phone Screenshot by Deonar citizen, Madhumathy Rastogi

Health Hazards

Deonar Settlements

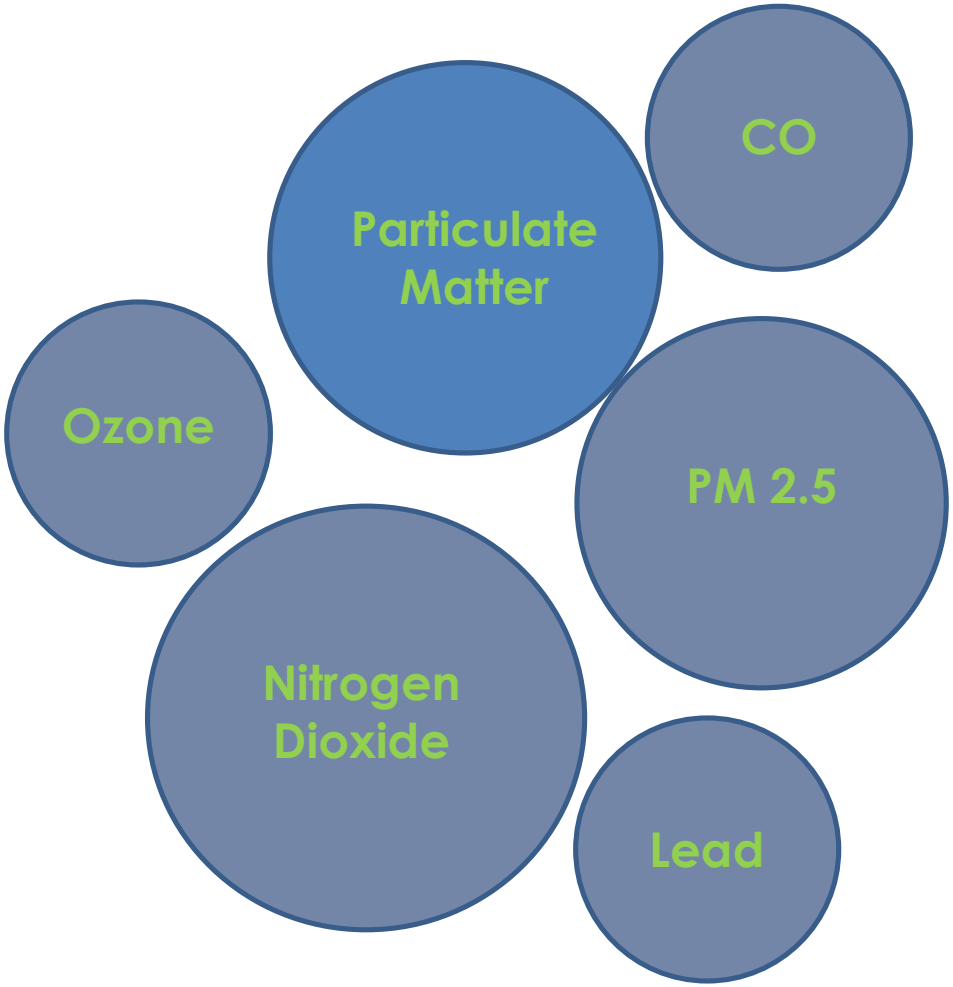




Ref: URBAN REFUSE RECYCLING PROJECT(deonar dumping ground)

Pollutants

Pollution Agents



Adverse Impacts

Ozone

Reduce lung function

PM 2.5

Lung cancer

Premature Death

Lead

Affects most systems

Nitrogen Dioxide

Respiratory Diseases

CO

Reduces oxygen Supply to brain

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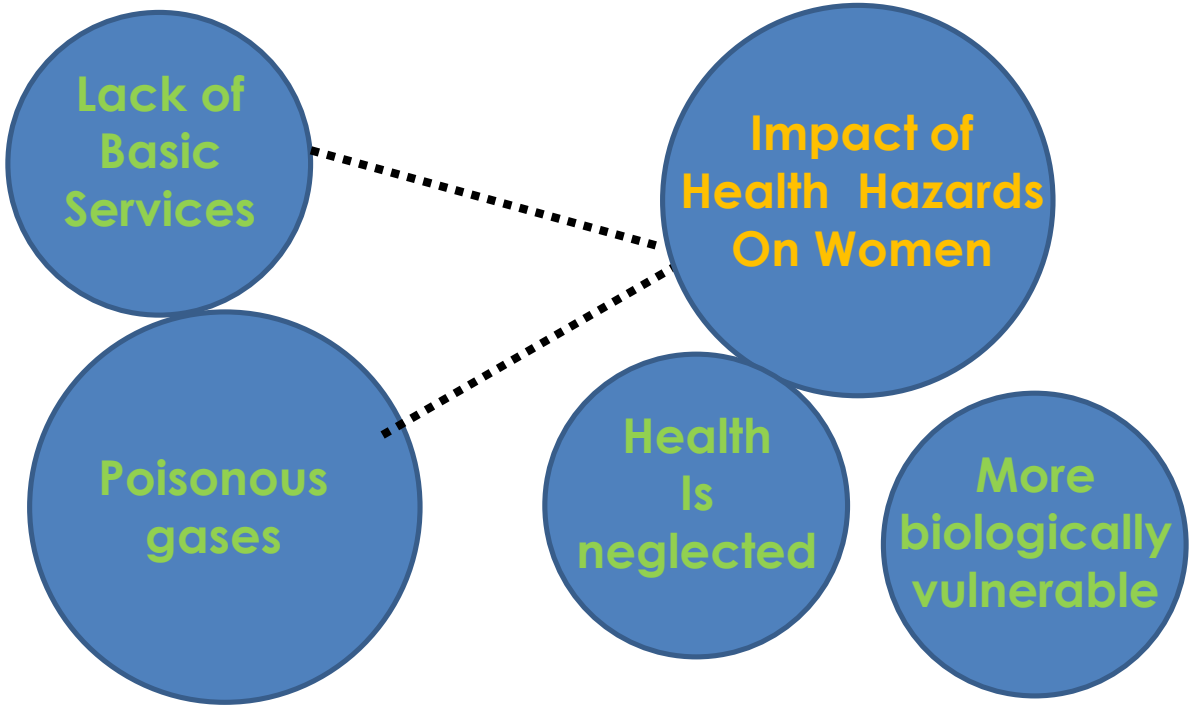
Research on Women

Adverse Health Impacts



Research Objects:

Studying Health hazards caused by the pollutants and lack of basic services, and studying their impact on women.

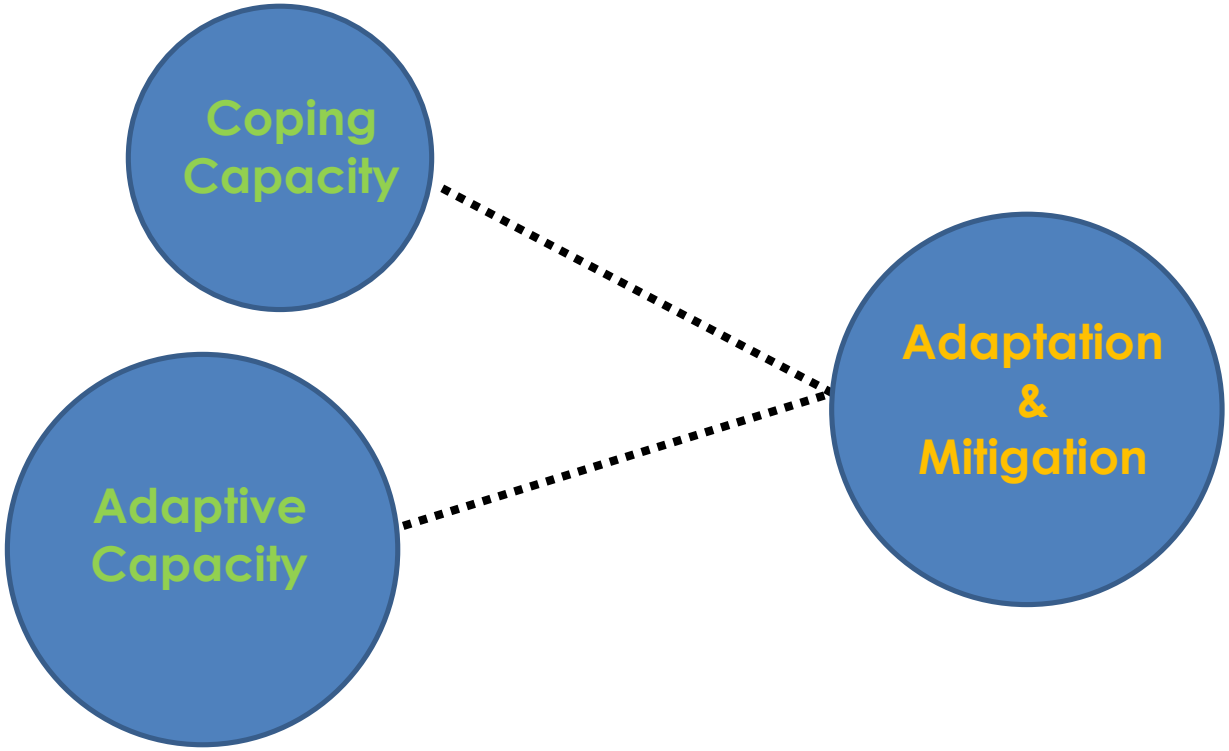
New Mothers

Pregnant Women

Menstruation issues

Curriculum

Study of Adverse Health Impacts on the Vulnerable Group



Outline

Risk Assessment

Risk-Based Land Use Planning

Urban Upgrading

Adaptive Capacities

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Economic conditions - Irregular employment, poor access to loans

Social conditions - Widespread alcoholism, gender inequity, poor educational status

Living environment - Poor access to safe water supply and sanitation facilities, overcrowding, poor housing and insecure land tenure

Access and use of public health care services - Lack of access to ICDS and primary health care services poor quality of health care

Hidden/Unlisted slums - Many slums are not notified in official records and remain outside the purview of civic and health services

Negotiating capacity Lack of organized community collective efforts in slums

Research Questions

1. What are people's past and current risk reduction and adaptation practices? (How people deal with natural hazards?)

2. Are people's local risk reduction and adaptation practices related to health? If yes, how ?

3. In which ways do existing health problems inhibit people' risk reduction and adaptation practices? (E.g., how do they inhibit them from preparing for, responding to and recovering from natural hazards (or: extreme rainfall events)? (health natural hazard)

4. In which ways do natural hazards (or: extreme rainfall events) contribute to further exacerbation of health risks/problems? (natural hazard health)

5. What role does the lack of basic services play in exacerbating disaster and health risks, respectively

Analytical Framework

The **urban poor** endure the effects of changing weather patterns and natural hazards

(as per UN_HABITAT, World Bank, etc.)

Building resilience by means of **upgradation** using **design and planning methods.**

Disasters are seen as products of the interaction between natural hazards and societies' vulnerability to those hazards, which is represented by

DISASTER RISK = HAZARD * VULNERABILITY

Including elements of vulnerability that relate to the phases before, during and after a potential disaster

DISASTER RISK =
HAZARD * VULNERABILITY * INSUFFICIENT RESPONSE
PREPAREDNESS * INSUFFICIENT RECOVERY
PREPAREDNESS

Terms

Hazard:

A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. (UNISDR, 2009)

(impact of climate change factors that aggravate the health issues arising out of lack of basic services and environment)

Vulnerability:

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. (UNISDR, 2009)

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Terms

Exposure:

People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses. (UNISDR, 2009)

Resilience:

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner- (UNISDR, 2011.)

RISK = HEALTH HAZARD * EXPOSURE * VULNERABILITY

Health Hazard= impact of lack of basic services; insecure tenure; unmanaged locations on people and environment – level of planning

Vulnerability = the circumstances of the community that make it susceptible to the adverse impacts of the hazard

Exposure = Cohort group, property present in the hazard zones that are subject to potential losses or damage

Adaptive capacity = ability of the system to adjust to the hazard to moderate potential damage or cope with the consequence

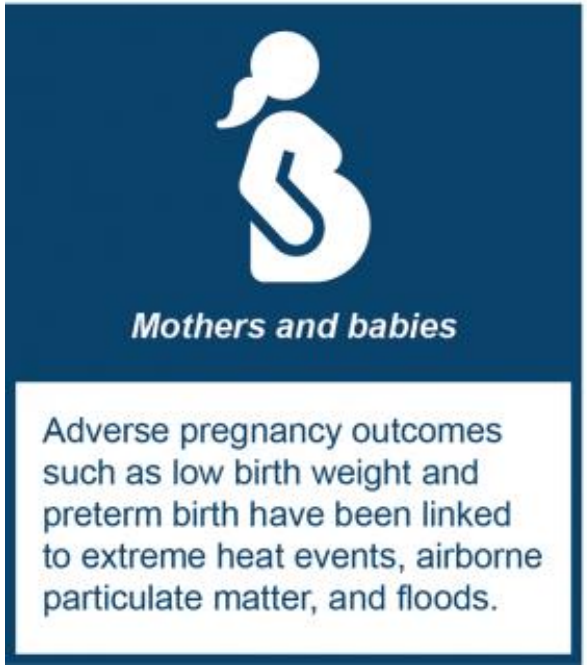
Methodology

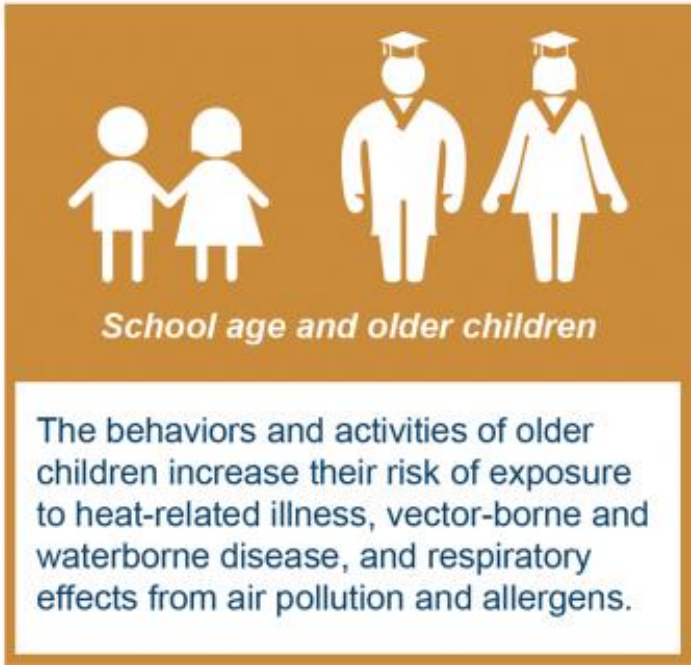
The four core elements of any risk assessment methodology must include:

- *Hazard identification*
- *Exposure analysis*
- *Vulnerability analysis*
- *Risk analysis*

Vulnerability to the Health impact

Vulnerability to the health impact of Climate Changes at Different Life Stages





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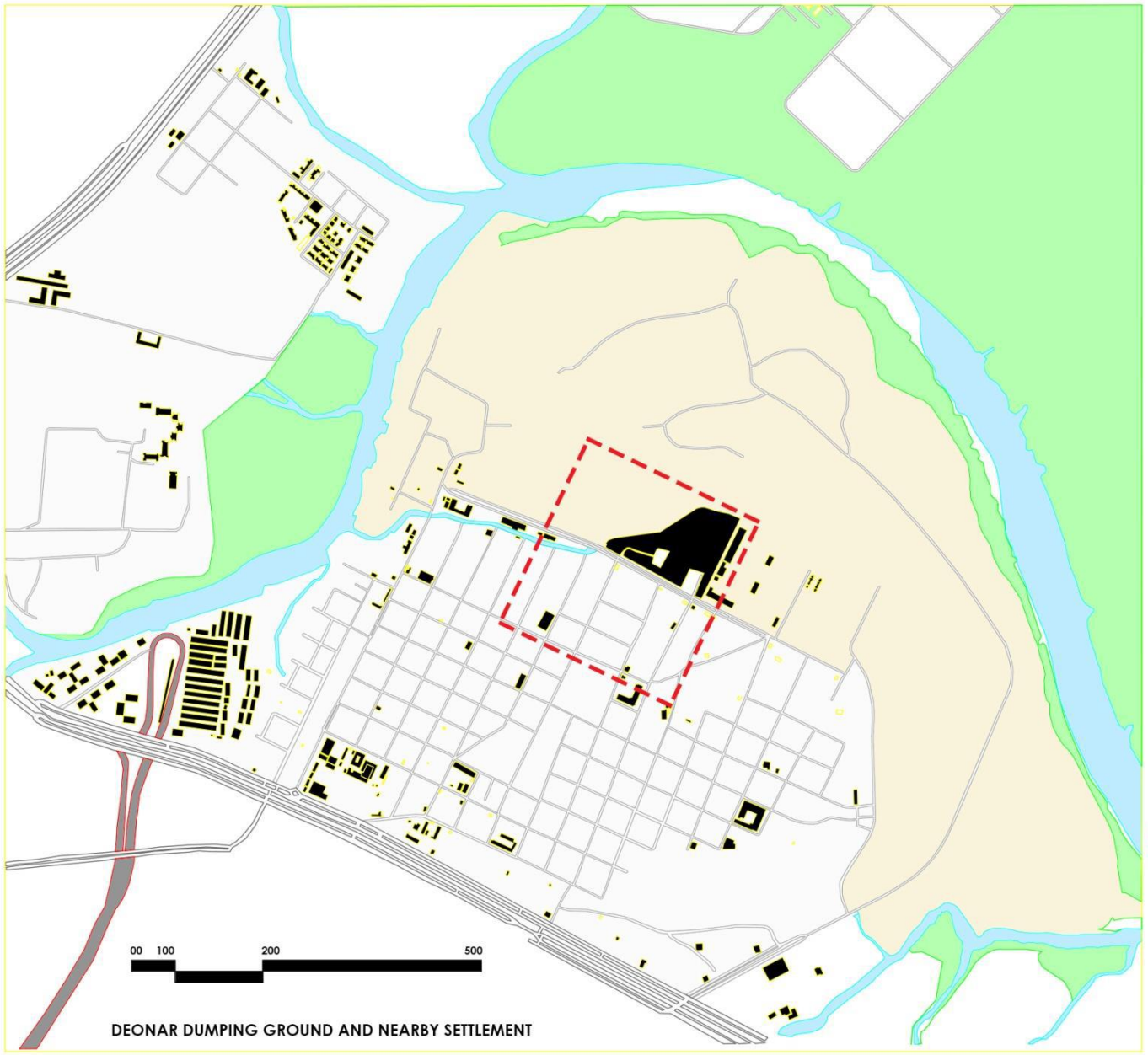
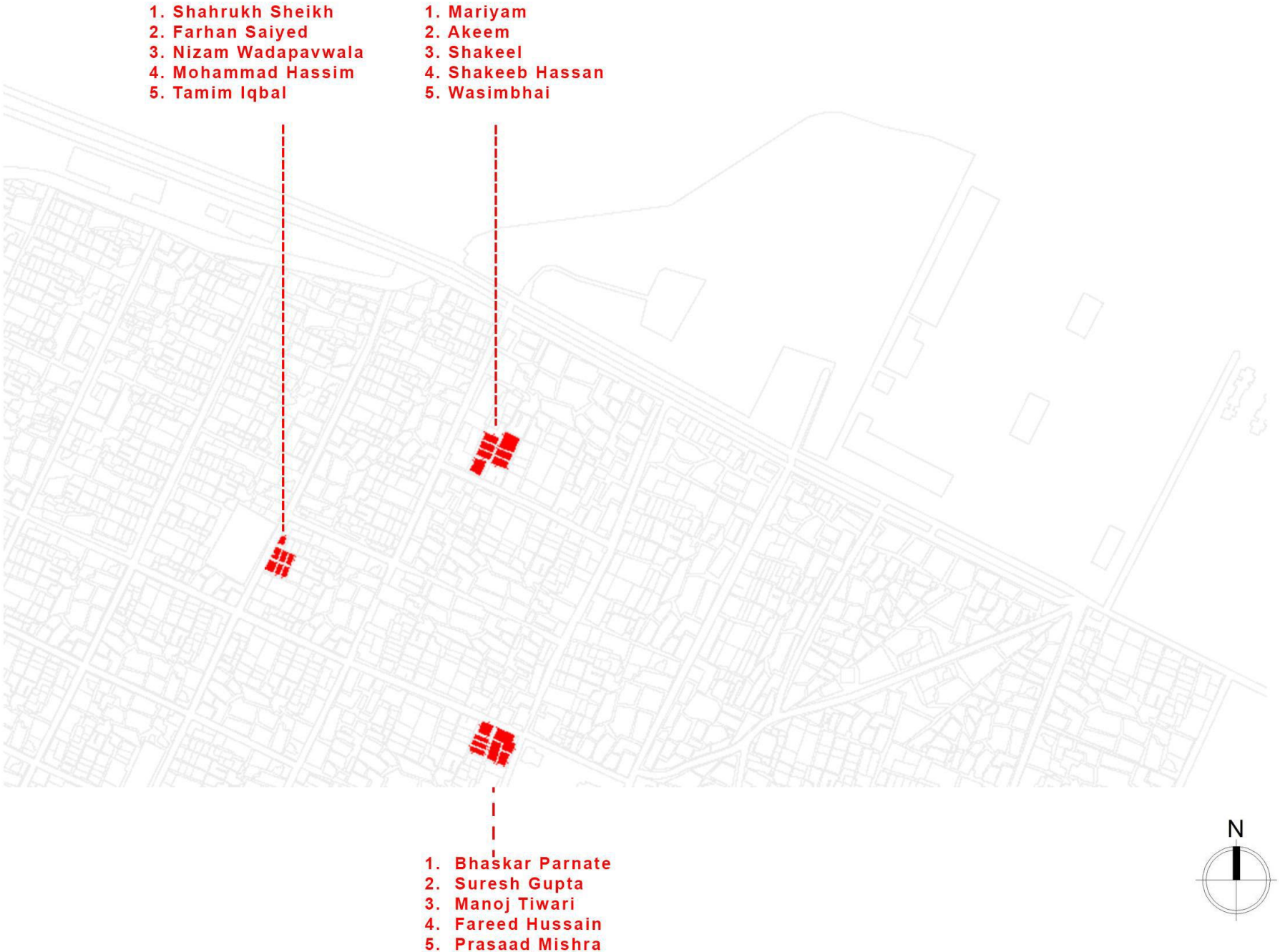
Deonar Dumping Ground: Site Interviewed



Interviewed Residents



Hazardous Zones In the Dumping Ground

Health Hazards: Toxic gases, Water and Sanitation

- **Overcrowding, poor housing, and exposure to multiple types of pollutants**
- **Asthma, wheezing, coughs, and loss of breath, as well as cases of allergic rhinitis and chronic obstructive lung disease in women.**
- The gases—a concoction of **carcinogenic methane, carbon dioxide and hydrogen sulphide and fine particulate matter.**
- **Lack of basic services like clean drinking water and sanitation**
- **Water borne diseases like pneumonia, diarrhoea, malaria, and measles**

Poor Structural Quality of Housing

The choice of materials that is resultant of insecurity arising from the illegal status tends to be:

- Temporary
- Hazardous
- Easily flammable

Easily susceptible to the dangers of **landslides and fires**, their **dense arrangement** also leads to easy **spread of infectious diseases.**

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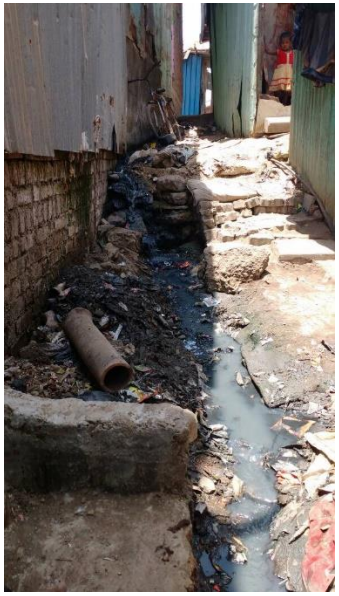
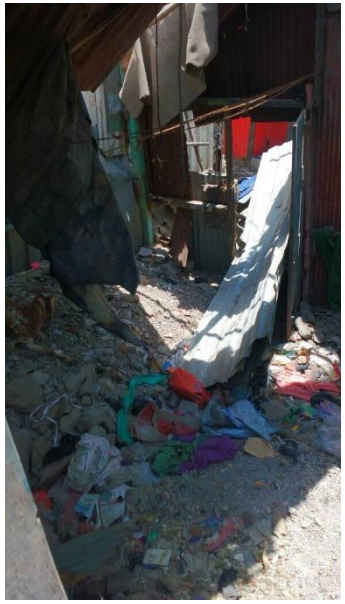
Landfill Fires

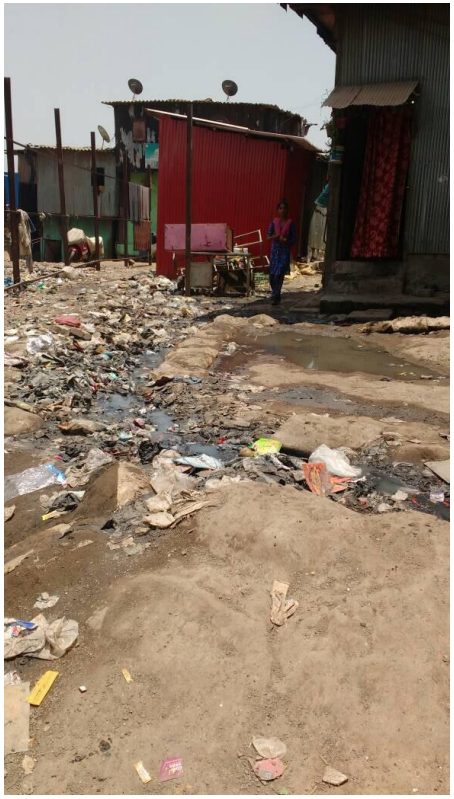
While Mumbaikars have been coughing and complaining about the toxic haze, which has settled over the city since the landfill fire, thousands of rag pickers, who live adjacent to the 20-storey mounds of garbage, have had to battle respiratory ailments, while also fighting off hunger.

With the smoke, doctors said residents are likely to suffer from eye irritation, worsening of bronchial asthma, cough, cold and throat irritation.

THE ENVIRONMENT DEGRADATION AND HEALTH IMPACT ON THE VULNERABLE GROUP: A CASE STUDY OF WOMEN IN THE DEONAR SLUMS



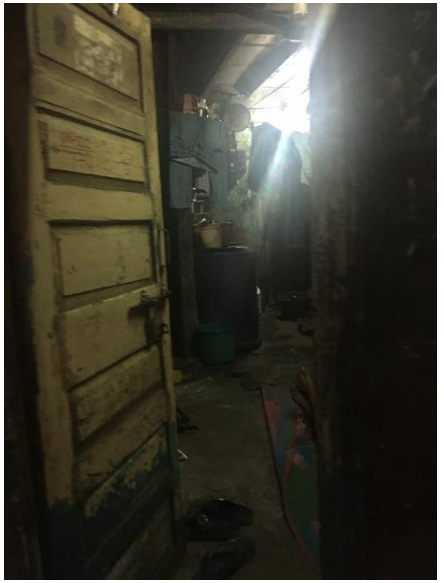








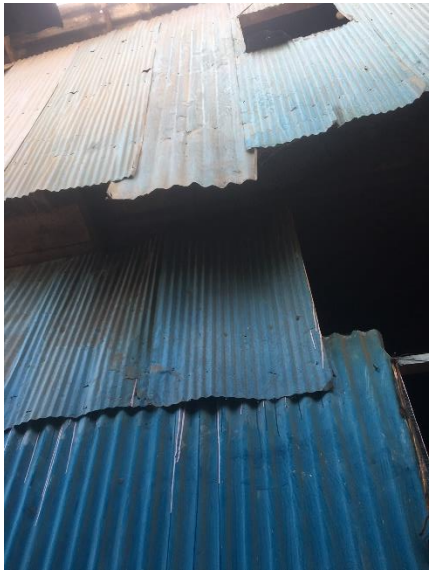






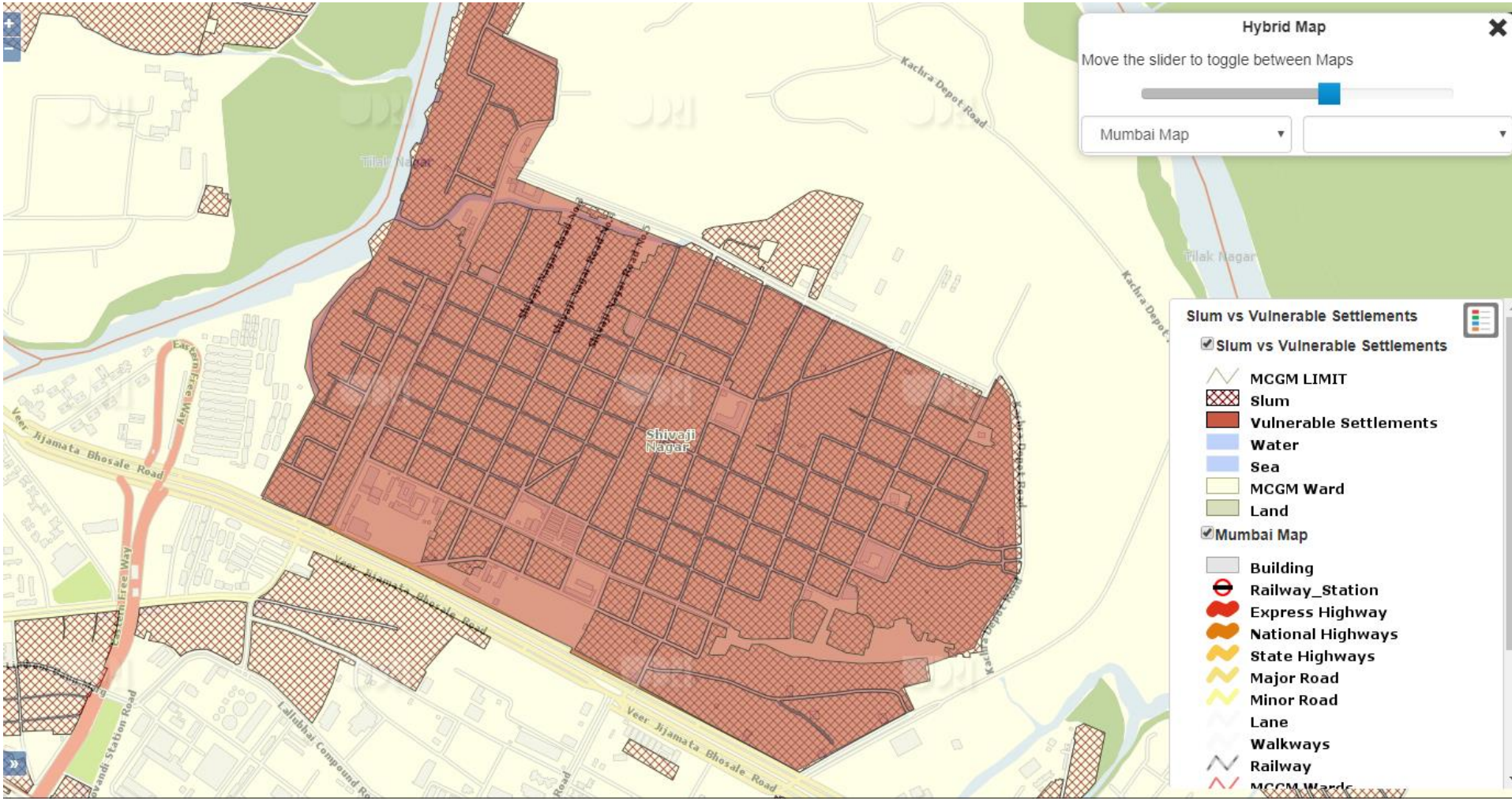




Slum map

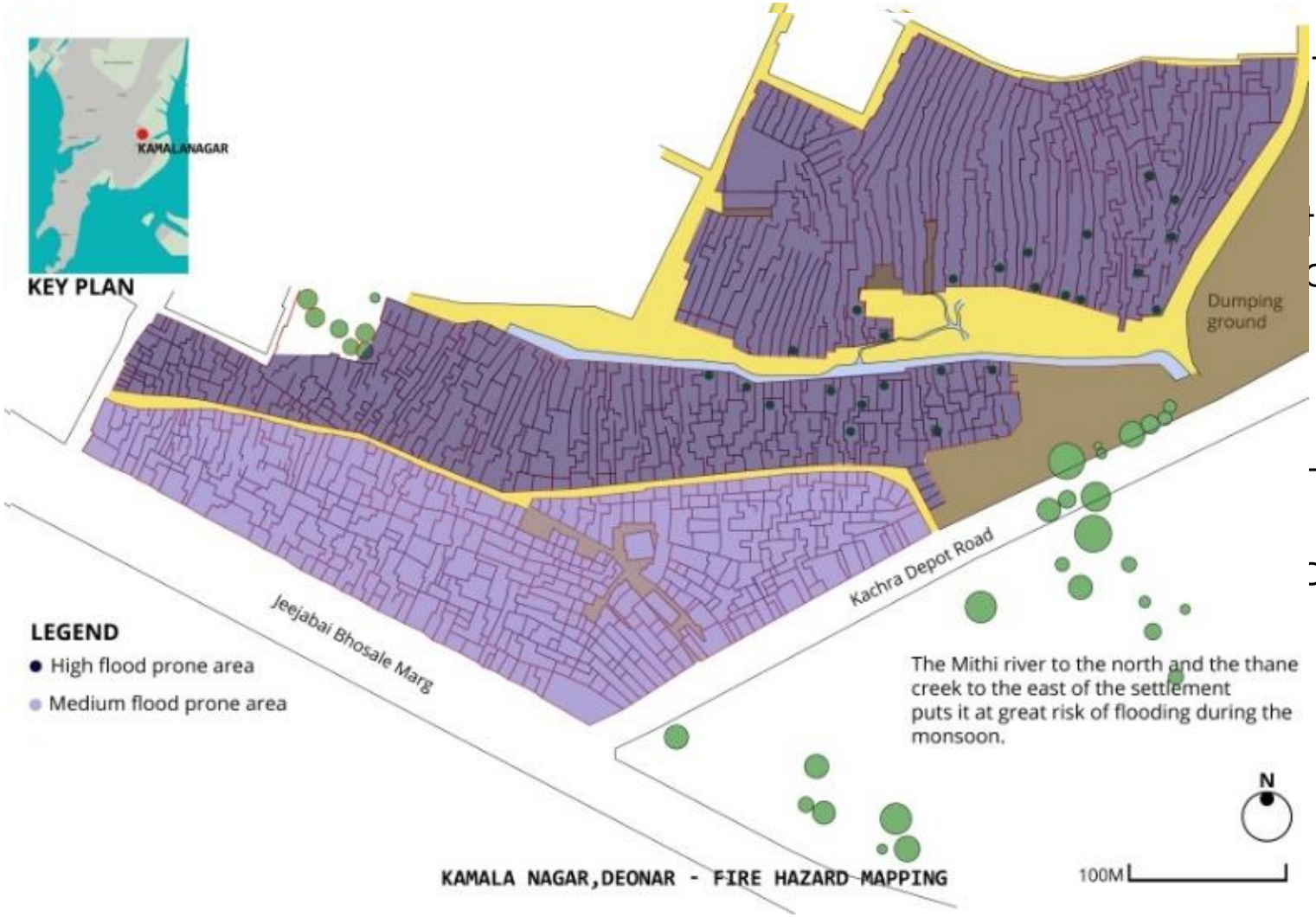

Hybrid Map
Move the slider to toggle between Maps
Mumbai Map
Slums and Transit Camr
Slums and Transit Camps
Slums and Transit Camps
MCGM LIMIT
Railway Station
Railway
Transit Camp
Slum
Water
Sea
MCGM Ward
Land
Mumbai Map
Building
Railway_Station
Express Highway
National Highways
State Highways
Major Road
Minor Road
Lane

Slums VS Vulnerable Settlements



Hazard Mapping

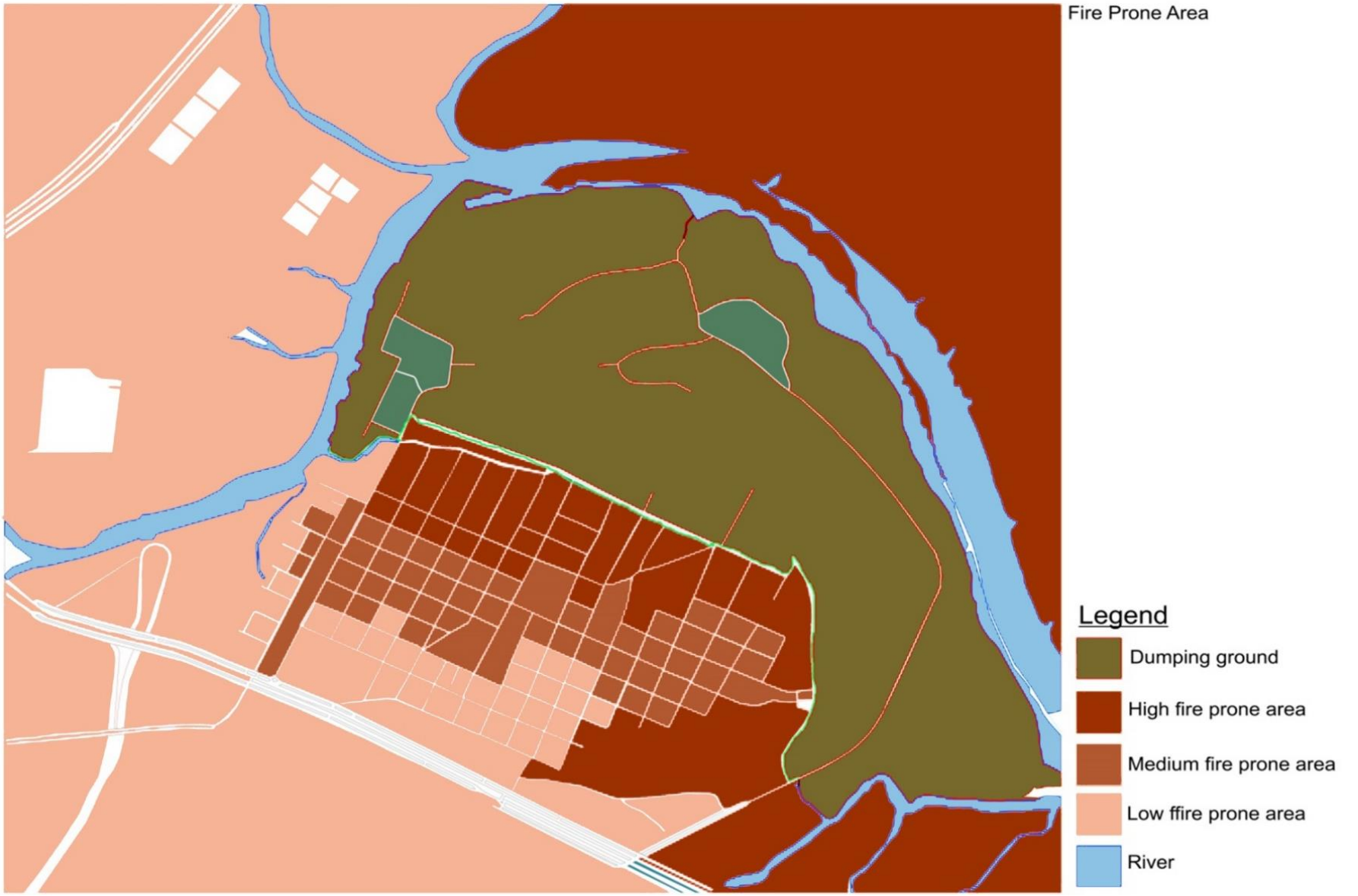
Probabilistic hazard models

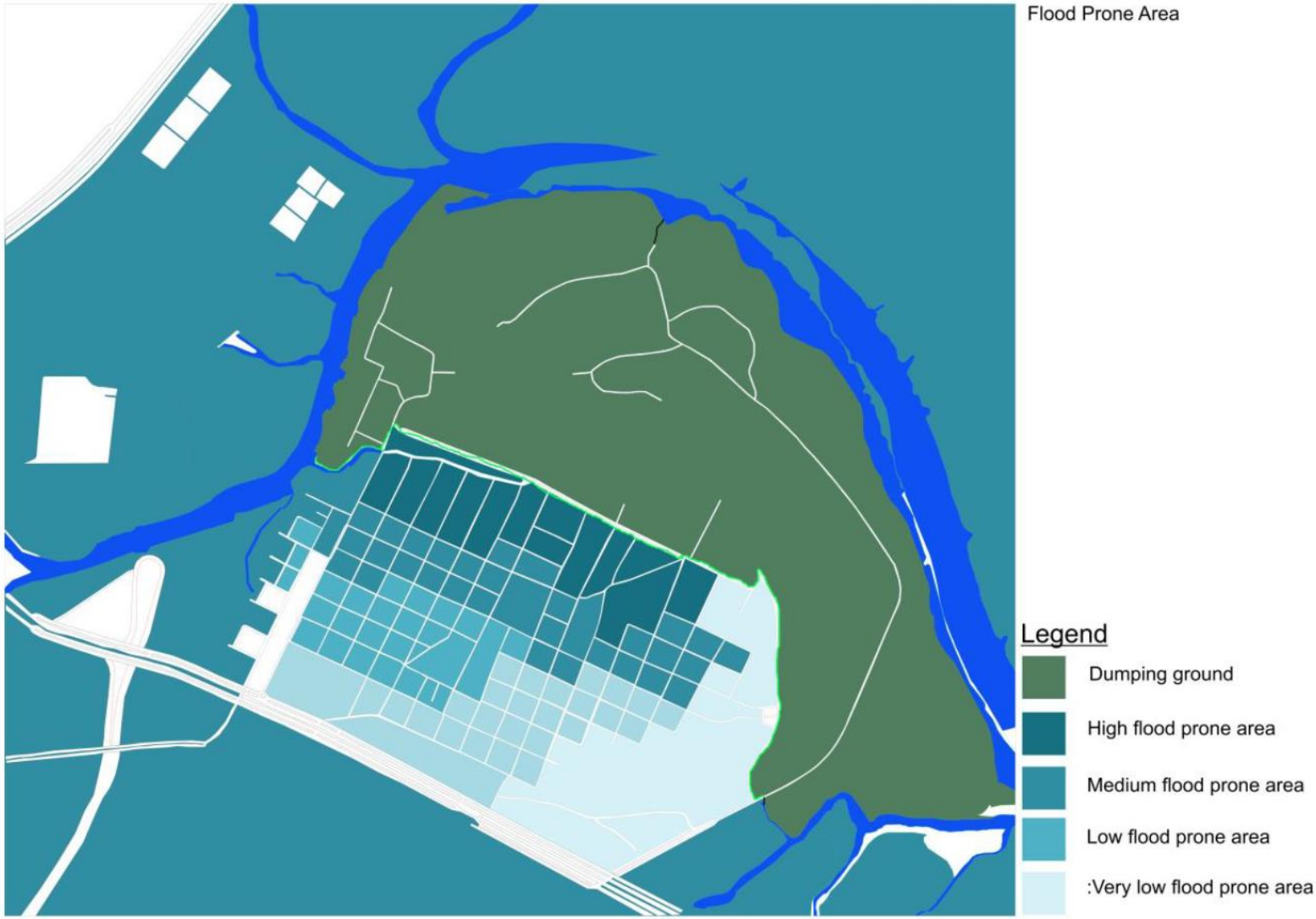


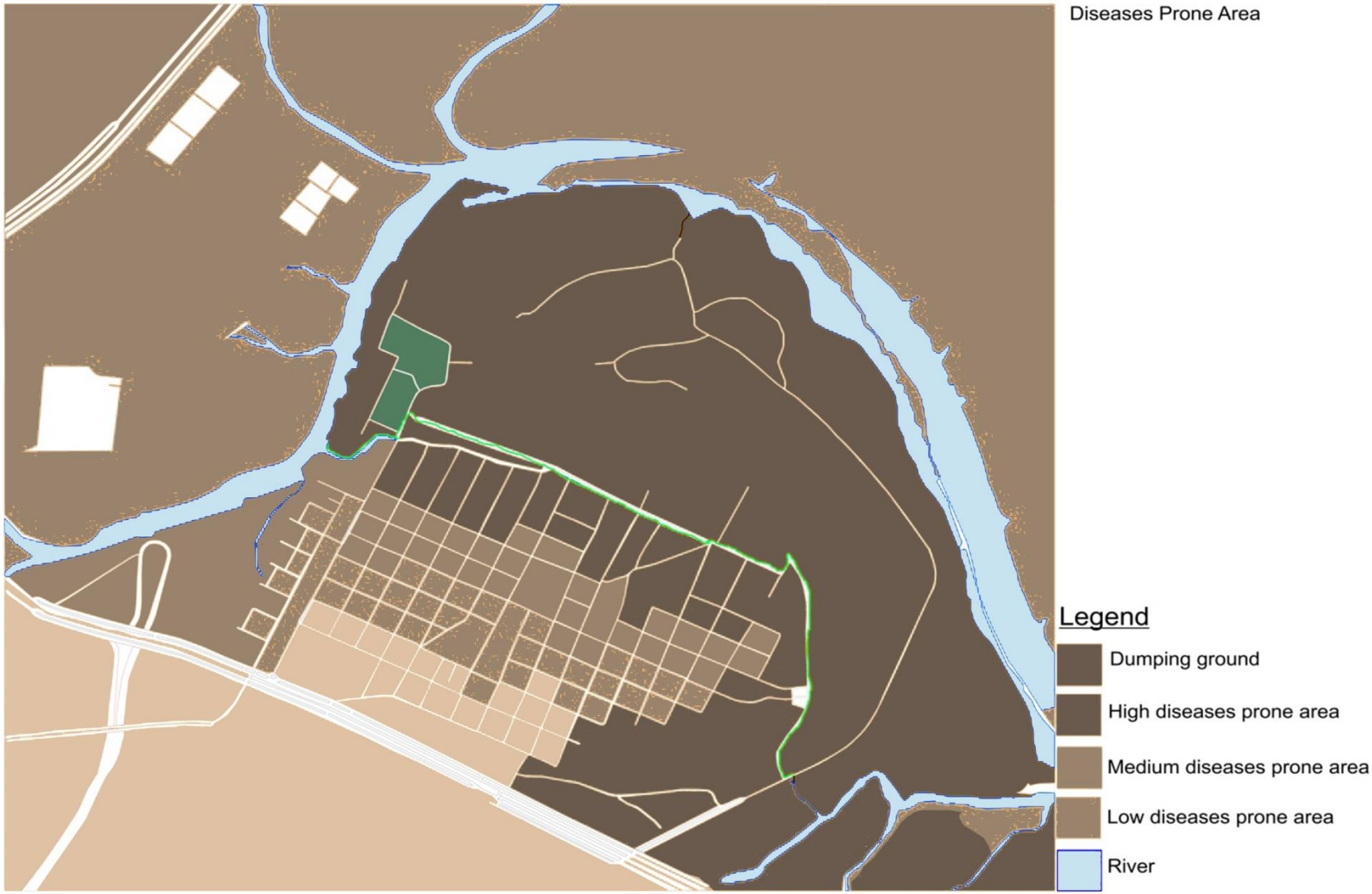
The resolution of hazard analysis will determine the fitness-of-use of the overall risk assessment output.

Hazard mapping is the most common form of identification and is recommended for urban investment projects.

Mapping of Deonar




Flood Prone Area
Legend
Dumping ground
High flood prone area
Medium flood prone area
Low flood prone area
:Very low flood prone area



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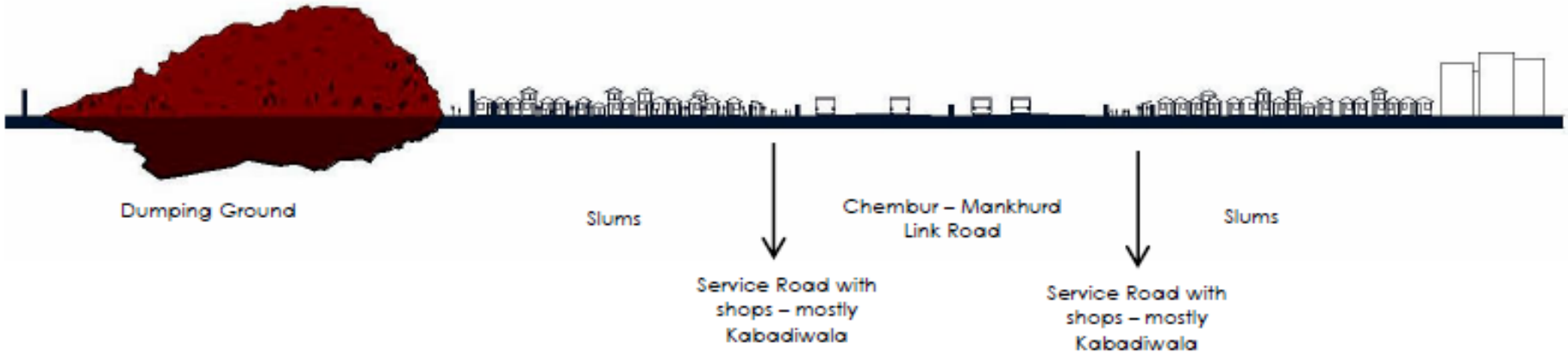
Typical section of the Deonar Dump and neighboring Slums



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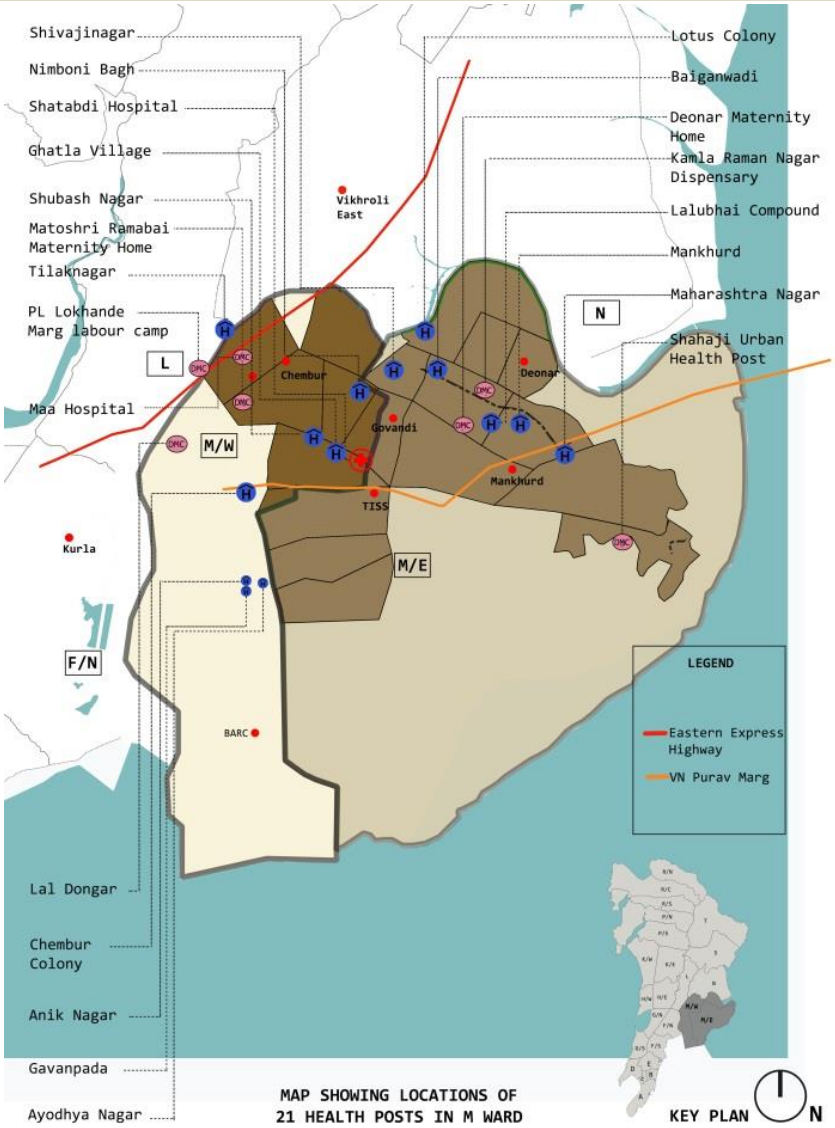
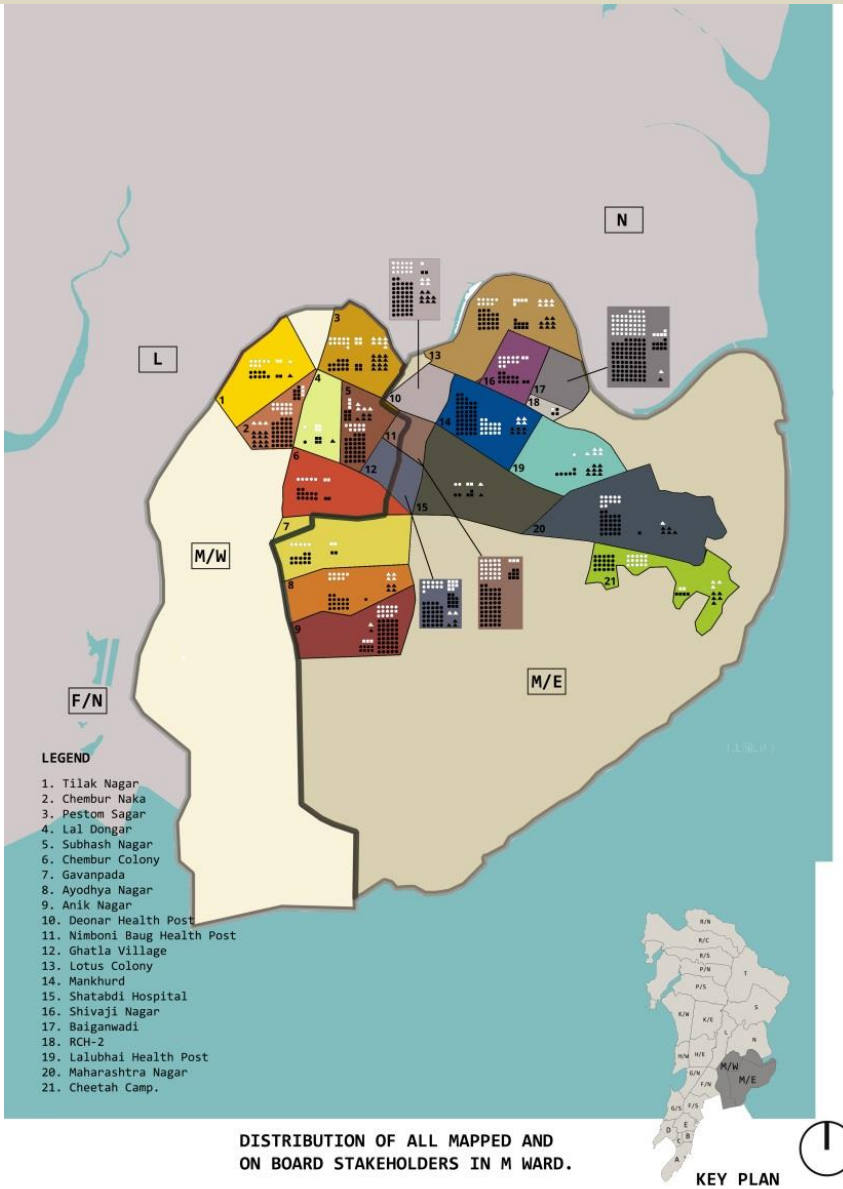


MAP SHOWING LOCATIONS OF 21 HEALTH POSTS IN M WARD



DISTRIBUTION OF ALL MAPPED AND ON BOARD STAKEHOLDERS IN M WARD.

RISK COMPONENT =	HAZARD	VULNERABILITY	RESPONSE PREPAREDNESS	RECOVERY PREPAREDNESS
RQ1: Existing risk reduction/adaptation practices	(Hazard reduction and avoidance) How do people try to reduce hazard exposure, e.g. by taking measures avoiding hazard zones or keeping hazards out of the settlement?	(Vulnerability reduction) How do people try to reduce their place-specific vulnerability to hazards?	How do people respond to hazards, or during normal times try to ensure that they can respond better during the next hazard?	How do people recover after hazards, or during normal times try to ensure that they will recover better after the next hazard?
RQ2: Link between risk reduction/adaptation practices and health				
RQ3: poor health → disaster risk	(How) do health issues in informal settlements contribute to increased HAZARD EXPOSURE	(How) do health issues in informal settlements contribute to increased VULNERABILITY	(How) do health issues in informal settlements contribute to LACK OF RESPONSE PREPAREDNESS	(How) do health issues in informal settlements contribute to LACK OF RECOVERY PREPAREDNESS
RQ4: disaster risk → poor health	How have past hazards/disasters contributed to exacerbating health problems in the settlement?			
RQ5: role of lack of basic services				

Christine Wamsler
Professor at LUCSUS (Lund University Centre for Sustainability Studies)

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Risk Reduction

HAZARD EXPOSURE	VULNERABILTY	DEFICIENCIES IN RESPONSE	DEFICIENCIES IN RECOVERY
Unsafe drinking water	Water-borne disease	Ignoring water quality Unaffordability of clean drinking water	Unaffordability of good treatment
Poor sanitation	Cholera, typhoid, infectious hepatitis and ascariasis.	Absence of investment to build resilience	
Hazardous Location-dumpyard	Respiratory diseases/ Fire	Livelihood demands	

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RISK COMPONENT	HAZARD	VULNERABILITY	RESPONSE PREPAREDNESS	RECOVERY PREPAREDNESS
RQ1: What are the existing risk? And what are the adaptation and reduction methods used?	**Flooding** – During rains mainly and due to drain blockage. **Fire Breakouts** – Due to short circuits and cigarette butts or during cooking on chulhas. **Epidemics** – like diahorrea , and jaundice due to bad water quality and sanitation facilities like lack of toilets. **Local fights** due to druggists.	1. To avoid flooding people lay big stones on paths to demarcate paths even if water fills in order to be able to know the existing holes on paths. 2. Lay plastic sheets on roofs to avoid leakage and water entering from top. 3. Keep big tyres handy in order to float. 4. Cover the alleys between two houses to avoid rain water to come directly on lanes and home. For fire breakouts , small fires are extinguished by soil. Basic health centres for curing diseases in area.	1.Mostly people have the mobile furniture. 2. They keep their valuables and documents on the higher level. 3. In case of emergency they can leave their houses immediately as they do not have any valuables or electric devices. 4. They go to basic government hospitals like Rajawadi hospital in Ghatkopar for their health issues. 5. Basic defence like rods and bamboos are kept handy by women in order to drive away druggists. 6. In case of minor fires drain water and soil is used.	1. Firstly they do not have pukka houses and more to it they do not have any valuables , so resettling at new places is easy. 2. During rains , floods , they have now started having higher plinth homes in order to avoid water entering the houses. 3. They do not have all their money at home , but all of them have bank accounts and so their money is safe during emergencies, hence rehabilitation becomes easy.
RQ2: What is the Link between risk reduction/adaptation practices and health	•During rains they drink boiled water to avoid diseases. •Nowadays even though they defecate in open they cover feaces with soil , thus reducing risk of diseases to some extent.	Vulnerable to many lung and skin diseases due to dumping yard, as a result lifespan is decreasing.	Health centers in the area serve the basic purpose. Things like childbirth are often carried out at home with the help of experienced ladies.	At times , time is wasted while travelling the narrow alleys as no vehicular access is possible. Nothing beyond local health centres help. In case of local fights , people themselves resist without involving police.
RQ3: what are poor health ➔ disaster risk	Disesases of lungs, eyes and skin are mainly associated with area. Also lack of hygiene causes many women problems and infant mortality is on high.	Things like consistent smoke by burning dump and continuous bad stench causes lot of lung diseases. Also at times there are cuts on hands and legs while fetching waste.	Lack of awareness and money leads to no exposure or visit doctors for health check ups.	Due to lack of knowledge ,awareness and bad financial condition , they refer suffering to death or else the whole family income gets disturbed.

RQ4: disaster risk ➔ poor health	•People have started drinking boiled water. •They cover their open feaces with soil , than leaving them open to spread diseases. • Childbirths are carried out with the help of the local doctors. • Children are given vaccinations on time from the time of birth.
RQ5: role of lack of basic services	•Basic services like lack of widened roads , limits the access of emergency vehicles likefire brigades and ambulances in case of emergencies. • No proper water supply in toilets leads to bad sanitation. • No electricity leads to increased eveteasing and encourages druggists and drunkards during the dark. • Locals do not allow police to enter areas as a result , there are increase in crimes. • Lack of health centres and monthly health camps lead to increase in diseases.

MUNICIPAL CORPORATION OF GREATER MUMBAI
PUBLIC HEALTH DEPARTMENT

M East Ward	YEAR	2012	2013	2014	2015	2016
	Births	15278	14676	14675	15208	6828
	Infant Deaths	540	403	499	489	NA*
	IMR	35.34	27.46	34.00	32.15	

Note : * In CRS System Ward wise Infant deaths are not available till today.

s://docs.google.com/spreadsheets/d/1QQOLoxR7PGxMvP3VaXpjnsUr0sC1OYCZcG_IsXgf_8A/htmlview

D	E	F	G	H	I	J	K	L	M
o. of Males	No. of Females	No. of Children	No. of Dependents	No. ofPregnant Women	Occupation of Mother	Occupation of Father	Short term Illnesses	Long Term Illnesses	No. of Deaths
3	3	3	4	0	Stitching	Driver		Difficulty with PMS	1
2	3	3	4	0	Handiwork	-	-	Paralysis	0
3	6	7	8	0	-	Driver		Frequent spasms	0
4	2	4	5	0	-	Assistant in Clinic	Cough and cold, Fever		0
3	2	1	3	0	- (did stitching before)	-	Bone and joint pain		0
3	3	4	5	0	Handiwork (irregular)	Plasterer	Low BP, Loose motion	Delayed Puberty	0
2	4	4	5	0	-	Driver	-	-	0
10	3	4	13	0	-	-	Fever, cough	husband lost legs afte	0
4	4	4	6	0	-	interior work	Fever, cough, vomiting	dengue, malaria, typh	0
2	1	0	2	0	stictching	-	cold	husband in a mental	0
5	2	5	6	0	-	plastering work	-	-	0
2	2	2	3	1	-	locksmith	-	-	0
3	1	2	3	0	stitching	-	-	husband has heart di	0
4	3	4	5	0	-	making envelopes and	-	-	0
3	3	3	4	0	Maid	-	-	-	0
2	5	2	2	0	Stitching	Manual labour	Cough, cold	Child continuosly bre	0
3	4	3	6	0	-	Rickshaw driver	Headache	Typhoid	0
3	1	4	3	0	-	Plumber	Fever	-	1
2	4	4	6	0	Stitching	-	-	Mental illness	0
3	5	5	5	0	-	-	Fever	-	0
3	2	3	5	0	-	Manual labour	-	Partial blindness in th	0

Exposure Analysis

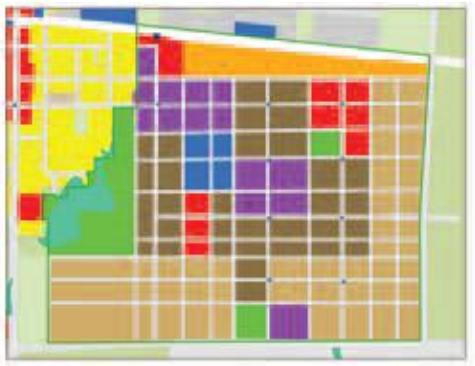
- Exposure analysis is intended to **connect identified hazard**s with the elements at risk, which in urban infrastructure projects generally refer to **human populations and infrastructure**
- **Physical characteristics**
- **Monetary value**
- **Spatial location**
- Understanding the **application for the risk assessment** is important for exposure development.

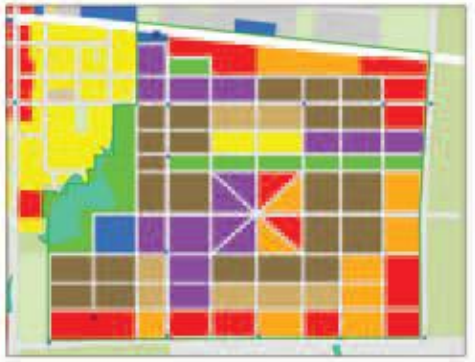
Vulnerability Analysis

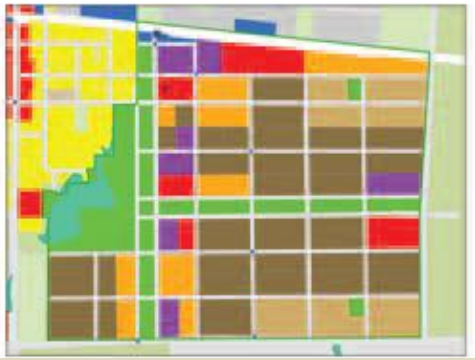
This analysis quantifies the

susceptibility of exposed populations and their

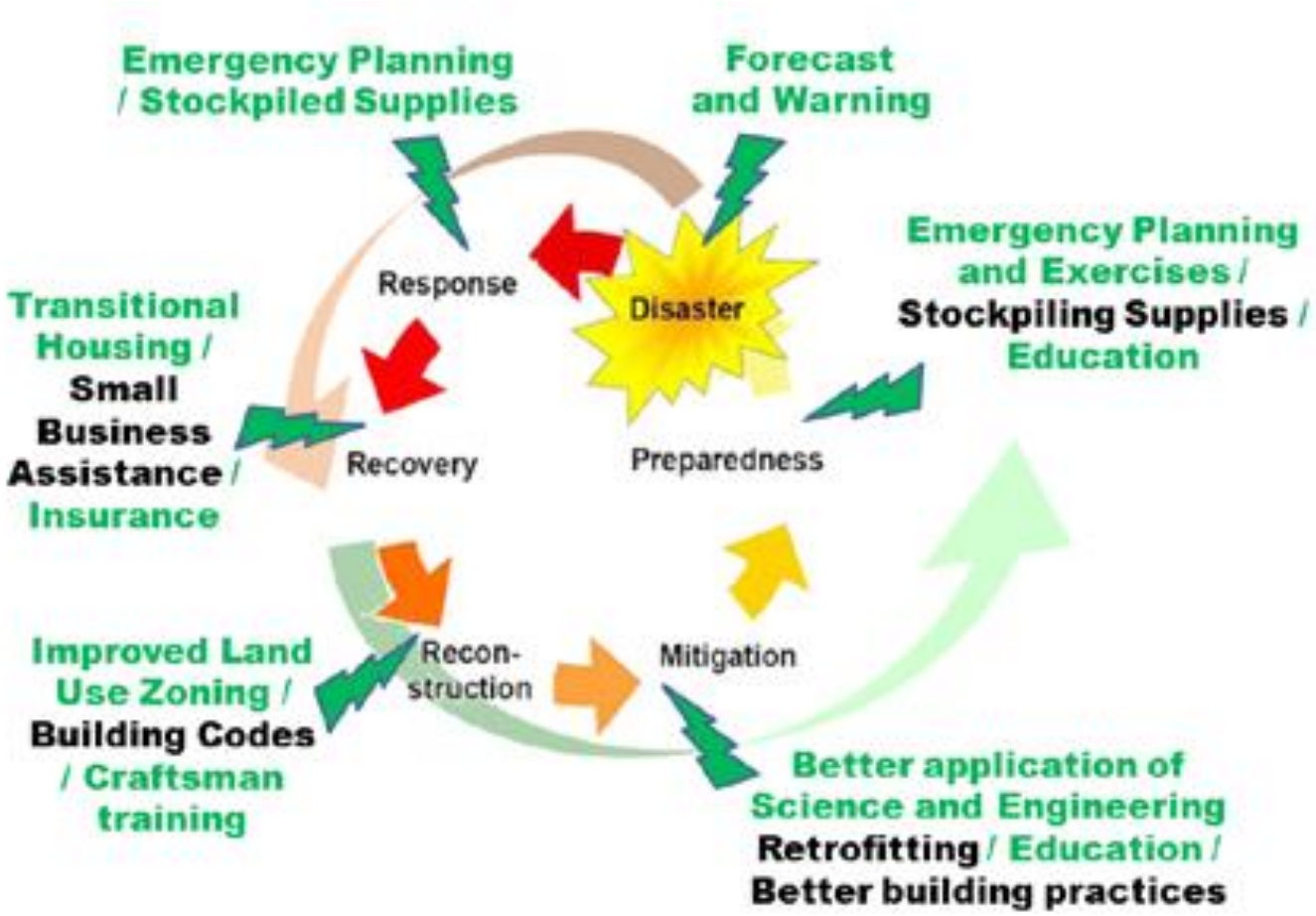
assets to different levels of hazard intensity







Disaster Cycle



ADOPTING GUIDELINES

LUND UNIVERSITY

Managing urban risk: perceptions of housing and planning as a tool for reducing disaster risk

Wamsler, Christine

Published in:
Global Built Environment Review

Published: 2004-01-01

ADOPTING GUIDELINES

LUND UNIVERSITY

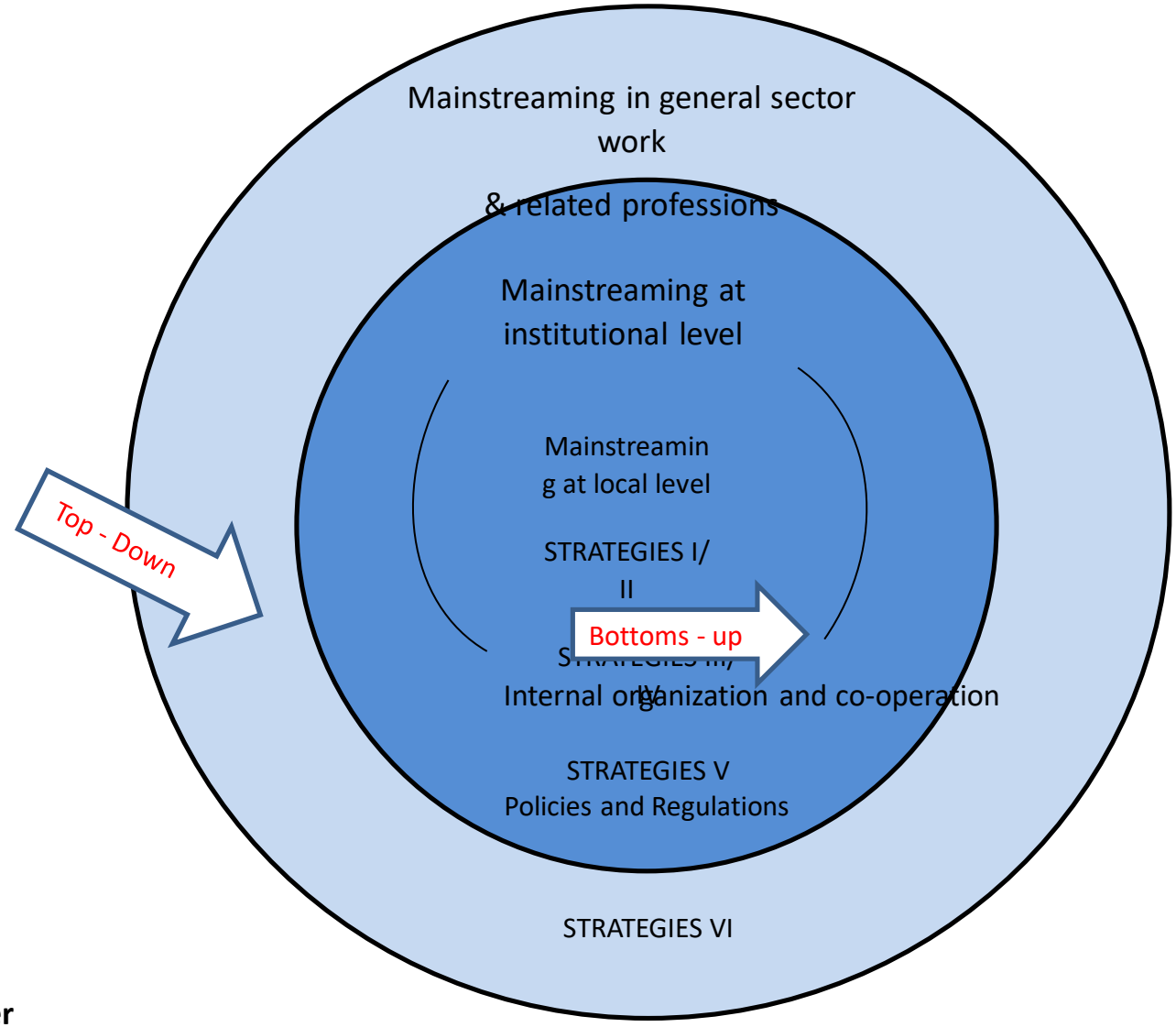
Integrating risk reduction, urban planning and housing: Lessons from El Salvador

Wamsler, Christine

Published in:
Open House International

Published: 2006-01-01

Risk Reduction

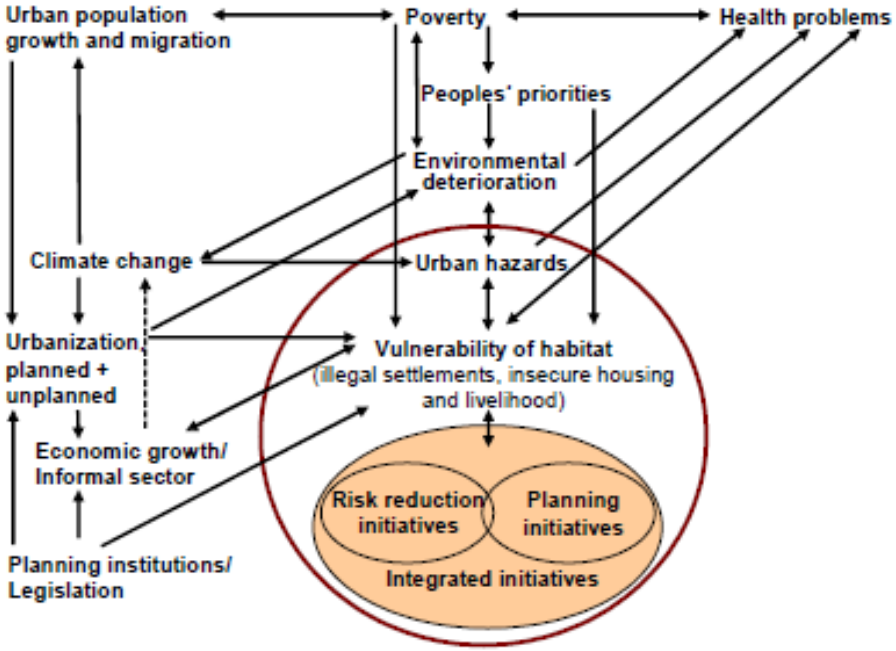


Christine Wamsler
Professor at LUCSUS (Lund University Centre for Sustainability Studies)

Funded by the Erasmus+ Programme of the European Union

INTEGRATED RISK REDUCTION AND PLANNING INITIATIVES

Figure 5: The complex interplay between planning and the occurrence of disasters showing the potential of integrated risk reduction and planning initiatives



Note: The research focus is highlighted.

Building Urban Resilience: Principles, Tools and Practice

THE WORLD BANK

Australian AID

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Methodology

Risk Assessment,
Risk-Based Land Use Planning,
Urban Ecosystem Management, Urban Upgrading,
Community and Stakeholder Participation,
Disaster Management Systems,
Data Gathering, Analysis and Application,
Risk Financing and Transfer Approaches

Building Resilience

Urban Resilience

1. **Building resilient cities in the context of today's urban development** – investing in new infrastructure; altering landscape
2. **Risk, uncertainty and complexity** – Identification of risks – Lack of basic Services
3. **Disaster risk management**- risk reduction – Location from dumpyard
4. **Social resilience** – sense of community; ability of women to adapt; sense of belonging (dwelling is a precious commodity)
5. **Infrastructural resilience** - vulnerability of built structures; health care facilities, the vulnerability of buildings to hazards, critical infrastructure, and the availability of roads/ lanes for evacuations
6. **Land use planning (LAP)** – identifying safer pockets for investment, mainstreaming land use planning in health infrastructure
7. **Urban ecosystems**- regulating slum development in hazard-prone areas, ii) reducing losses by planning evacuation routes, and iii) promoting safe and socio-economically viable low-income neighbourhoods in accordance with a citywide plan.
8. Incorporating resilience into the project cycle.

Risk Assessment

1. Hazard identification i.e. Health, hygiene and fire, flood
2. Exposure analysis – Assets, people within proximity of the hazard that expect to sustain loss or damage during a disaster event eg. Diseases aggravation during rains, floods, fire etc.
3. Vulnerability assessment – susceptibility of exposed population – historical data, human casualty estimates,
4. Risk analysis - This analysis combines hazard, exposure and vulnerability analysis and provides a spatial assessment of risk based on hazards, vulnerable populations and the ability of the community to cope with disasters.

Land Use Planning

Risk-based land use planning identifies the safest areas to prioritize immediate investments in urban development and infrastructure projects.

Historically, urban centers have been located in naturally hazardous zones.

Land use planning efforts have not responded to rapid urban growth and spatial expansion that is exposing more people and economic assets to disaster risks.

Risk-based land use planning can reduce both episodic and everyday risks.

Land development based on notions of safety from episodic risks that are promised by large engineering works can accentuate disaster risks.

The Hyogo Framework for Action (HFA) for disaster resilience emphasizes the incorporation of risk reduction in urban planning.

Risk Based Land-Use Planning

Step 1: Conduct local risk assessment
Step 2: Prepare a risk-based land use plan
Step 3: Analyze cost-benefits of land use implementation tools
Step 4: Find the right mix of regulations and incentives

Risk Based Land-Use Planning

1. The lack of basic services and dump yard are identified as the primary cause of health and fire risks embedded in existing land development practices. Through regulation of land use in hazard-prone areas and building codes, infrastructure upgradation and solid waste management practises the risk can be adapted and mitigated.
2. Choice of building materials and method of construction can be proposed through LAP
3. Reduce losses by facilitating faster response through provision of open spaces and well planned road network for rescue operations.
4. Clean drinking water and sanitation facilities to be proposed in local area planning.
5. Promote controlled urban growth without generating new risks, through rebuilding and upgrading infrastructure using hazard-resistant construction as per plan.

Urban Ecosystem Management

Watershed Management -
Coastal zone management -

Urban landscape design

Green infrastructure – Network of green spaces that provide protection from floods, erosion, etc. Increase in soft-scape for permeability and reduction in run-off.

Environmental buffers – preservation and integration into comprehensive land use plans

Urban Upgrading

Urban upgrading prioritizes infrastructure, housing, livelihoods and social networks for the most vulnerable households living in slum settlements. The majority of slum settlements are located on relatively inexpensive yet hazard-prone sites. Over-crowded living conditions in poorly built structures, lack of basic services and insecure tenure along with socio-spatial exclusion, make the urban poor vulnerable to disaster risks. However, variations in slum conditions create different degrees of risk. Strategic urban upgrading can manage risks by:

i) Identifying, planning and implementing urban investment projects, focusing on upgrading health infrastructure that would include water and sanitation services as well as primary health care centres. Upgradation of the slum dwelling could also be looked at.
ii) regulating slum development in hazard-prone areas through planned resettlement and building codes,
iii) reducing losses by prioritizing critical infrastructure, escape routes and community refuges in slums, and
iv) Promoting safe and socio-economically viable low-income neighbourhoods in accordance with a citywide plan.
v) Integration of Community and Stakeholder Participation

Community and Stakeholder Participation

Community-Driven Approaches to Urban Development and Poverty Reduction

The environment minister stated that India will generate thrice the amount of waste generated right now. It would be 165 million tonnes by 2030 and 450 million tonnes by 2050. Only 22-28% of the waste is collected and treated.

BOGOTA

This recognition is illustrated by the payment system to remunerate waste pickers for their services in the areas of collection, transport and recycling incentives that was launched in March 2013. By October 2014, this system had benefitted system has benefitted 2,300 of the almost 14,000 waste pickers that were identified in the census. However, findings from the surveys and the focus groups show that professional waste pickers continue to perceive the need for ongoing struggle given that most government institutions are biased towards privatization and the use of large private service providers, especially those with political connections.

Legalising rag picking

"In Bogota, Columbia, every rag picker is paid $2 per day by the municipality. In Brazil, they have made sure that only the rag picker can pick the waste (from the source). Why can't India do it?" he asked.

Disaster Management Systems

Mitigation Phase
Preparedness Phase
Disaster Phase
Response Phase
Recovery Phase
Reconstruction Phase

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Data Gathering, Analysis and Application

Data Gathering, Analysis and Application

Box 24 Slum mapping in Pune & Sangli-Miraj-Kupwad, India

Shelter Associates, an NGO, is working with slum communities to use satellite imagery in combination with field surveys to negotiate for slum improvement. VHR images from Google Earth are used to digitize slum boundaries and attach information on households, dwellings and site characteristics from field surveys collected by slum residents. Settlements are mapped by professional agencies using plane table methods showing plot boundaries. Spatial and socio-economic data is entered into a GIS database and accessed by the community to prepare upgrading plans.

In Pune, satellite images were used to provide evidence that individual slums were not growing in size but that in-migration needed to be planned for and prevent formation of new slums. Shelter Associates collaborated with slum residents and compelled the local government to legitimize migrants and initiate city planning to improve slum settlements by widening roads and install flood protection and develop new infrastructure. The Pune slum census covered over 100,000 households on over 200 slum pockets scattered throughout the city. The residents gained skills on data collection, a better understanding of their collective community problem, and their opportunities to negotiate with the local government in the planning process.

In Sangli Miraj Kupwad, slum mapping by the community initiated a comprehensive approach to improve all slum pockets with the local administration and elected members. Many slums have been mapped and their improvement plans have been produced in a cost-effective manner.

For more details, see work of Shelter Associates at www.http://shelter-associates.org/

Source: Sliuzas, Mboup and Sherbinin, 2008b.

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Risk financing AND Transfer Approaches

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Thank you for agreeing to participate in the session on curriculum development for Building Inclusive Urban Communities (Binucom) workshop on the 16th at KRVIA. For this session, we look forward to hearing your views on pedagogy for inclusive housing in architecture, urban design and planning schools. We also look forward to your suggestions on 5 courses developed by KRVIA faculty on informal housing and policy, understanding claims and conflicts, mapping methods, environmental risk and climate adaptation.

We wish to investigate two broad questions in this session: (1) what are the pedagogic challenges in understanding existing practices, processes, and settlements in our cities? (2) How can we transform our current educational frameworks and curricular structures to educate environmental practitioners who can frame, investigate, and intervene in the production of and transformation towards a sustainable and inclusive urban future?