

“Building climate change and disaster resilience for urban children”

A Snapshot of key findings of GEAG-UNICEF's Interventions in four cities: Bhopal, Patna, Udaipur and Visakhapatnam

Cities, Children and Urban Climate Change Resilience

“Rapidly transforming cities are the centres of urbanisation, providing enormous opportunities for achieving the 2030 Agenda for Sustainable Development. Building child friendly resilient cities can reduce the exposure of urban populations, especially children to multiple shocks and stresses including demographic shifts, economic uncertainties, socio-cultural changes, environmental risks and most importantly the impacts of changing global climate. A resilient city is able to adapt to these changes, can accommodate unexpected events and shocks and continue to function effectively.”

Today most of the Indian cities are grappling with challenges of resource scarcity, ageing or inadequate infrastructure, limited institutional capacities, constrained municipal finances, large scale in-migration & growing population and inadequacy in provisioning of urban basic services. These problems of development deficit are further aggravated by additional stress of climate change impacts on critical urban basic services, urban ecosystems which consequently affects the livelihoods and well-being of urban population.

Children, especially the younger ones are highly vulnerable to these rapid transformations occurring in the urbanizing world amidst increasing impacts of climate change. The types of

climate risks confronting children are diverse, ranging from direct physical impacts, such as cyclones, storm surges and extreme temperatures, to impacts on their education, psychological stress and nutritional challenges. Higher temperatures are linked to increased rates of malnutrition, cholera, diarrhoeal disease and vector-borne diseases like dengue and malaria. The urban poor children are “**most at-risk**” children, including those living in low income settlements, slums, streets, those who are orphans or have physical disability and those are working. They are frequently exposed to physical hazards, such as polluted water; open sewer systems; inadequate public transport; lack of local safe play areas or cultural facilities; toxic local environments; and overcrowding.

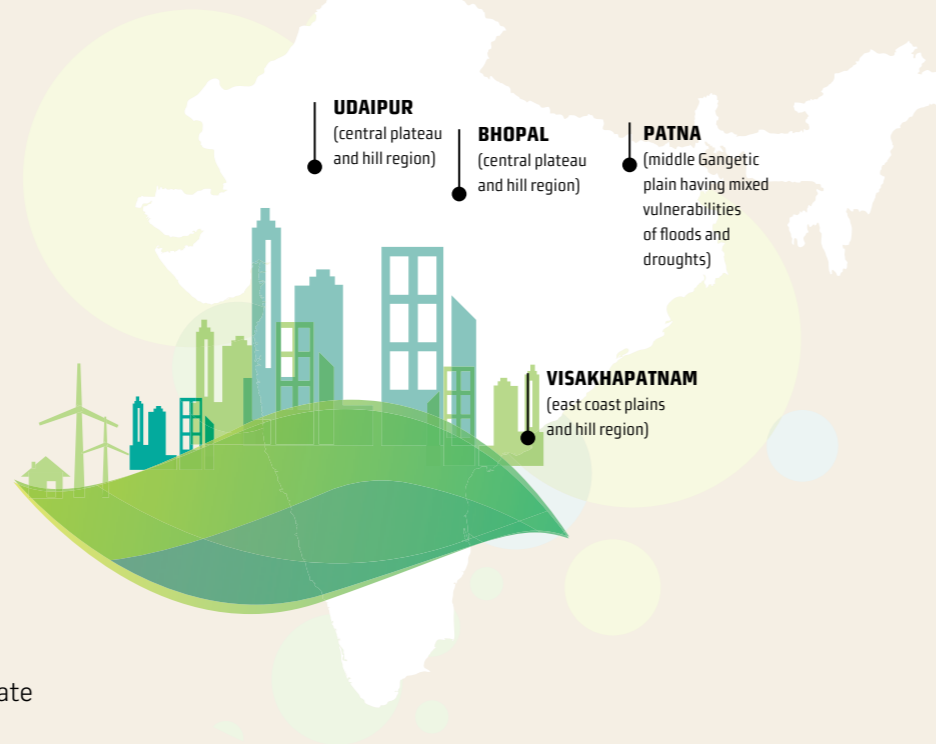


Urban resilience is the capacity of cities to function, so that the people living and working in cities—particularly the poor and vulnerable including women and children—survive and thrive no matter what stresses or shocks they encounter. Building **Urban Climate Change Resilience** (UCCR) entails climate change adaptation, mitigation actions, and disaster risk reduction while recognizing the complexity of rapidly growing urban areas and the uncertainty associated with climate change. Cities are considered as dynamic systems capable of evolving and adapting to survive and even thrive in the face of volatile shocks or stresses. UCCR puts greater emphasis to address the differential impacts of climate change on marginalized populations (poor men, women and children and cultural minorities etc.) who often lack secure access to critical urban systems, or depend on systems that are fragile and particularly susceptible to failure when exposed to climate related stress and shocks.

The disproportionate affects of climate change and disasters on children are not well-studied and understood in the urban space. There specific vulnerabilities and individual needs are largely neglected in the urban development plans, governance systems and municipal budgets. It is high time to understand and address their vulnerabilities and recognise children and youth as critical agents of change for a safer and sustainable world by enhancing their adaptive capacities. To cater to this problem, **Gorakhpur Environmental Action Group (GEAG)** with the support of **UNICEF**, New Delhi undertook an initiative to build resilience options and facilitate good urban governance mechanisms to address the climate change and disaster risk vulnerabilities of urban deprived children and marginalised populations in four cities representing different agro-climatic zones: **Bhopal, Patna, Udaipur and Visakhapatnam**.

Children-focused city resilience action strategies have been developed for two cities (Patna and Udaipur) in close collaboration with the city governments. The project also worked in partnership with the School of Planning and Architecture (SPA), New Delhi, India to integrate the agenda of UCCR and child-friendly cities in their Post Graduate Studio Programme, which they undertake in various cities. Towards the end, GEAG will organize a National Workshop on urban climate change and governance with focus on children. The workshop will discuss the key vulnerabilities of urban poor children in the context of climate change, the resilience actions evolved under this programme and the governance mechanisms as emerged from the studies, to disseminate and advocate for a need to integrate climate and children's concerns in development programmes.

Intervention Areas



Child Centred Urban Resilience Framework- Understanding vulnerabilities and developing resilience options

The Child-Centered Urban Resilience Framework, adapted from the internationally acclaimed Climate Resilience Framework developed by ISET International, is an integrated approach for understanding vulnerabilities of urban poor children, one on part, due to climate change impacts around their five key development parameters – Health, Education, Child Protection, Nutrition and Water, Sanitation and Hygiene (WASH). The causes of vulnerabilities across these five development parameters are inter-linked and inter-dependent on each other.

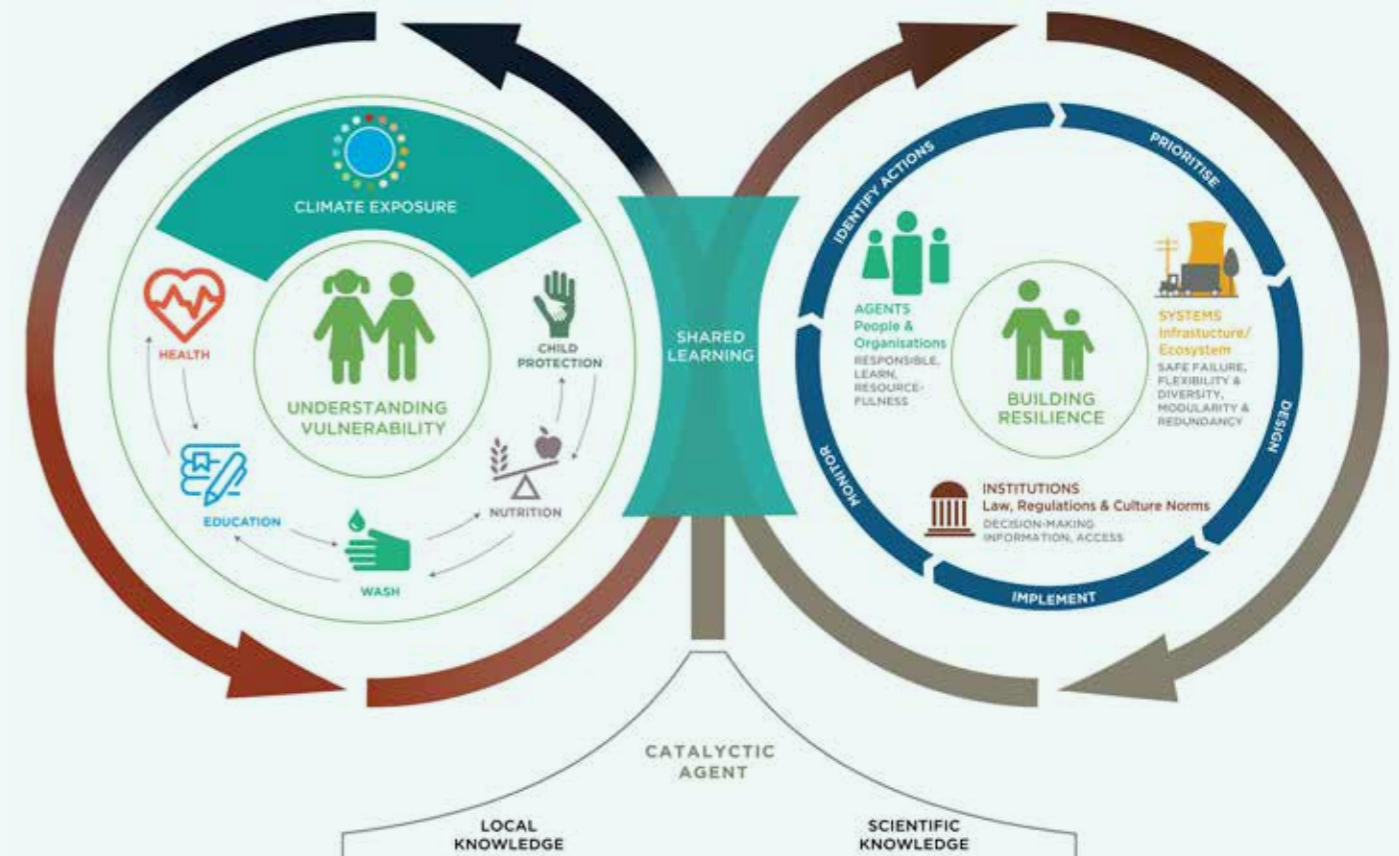
The framework defines resilience as high where system characteristics (diversification, flexibility, redundancy, modularity, and safe failure), agent capacities (ability to visualize, act, organize and reorganize, and learn), and enabling institutions combine in ways that enable all groups to access systems and ensure that those systems continue to function as climate conditions evolve. The framework entails building resilient characteristics at three levels:

- **Systems:** Identify the fragile urban systems (infrastructure, ecosystems, water and food supply, energy, transport, shelter, and communications) and strengthen their characteristics which can

contribute to build urban climate change resilience for children.

- **Agents:** Building the capacities of social agents (individuals, households, and private and public sector organization) to anticipate and develop adaptive responses, as well as access and maintain supportive urban systems.
- **Institutions:** Addressing the institutional factors (laws, policies, social and cultural rules or conventions that structure human behaviour and exchanges in social and economic interactions, including rights and entitlements, decision-making processes and access to information and knowledge) that limit effective responses to system fragility or undermine the ability of agents to take action.

It further guides that for resilience planning, it is important to *identify actions* across key thematic sectors, *prioritize actions*, *design* resilience options/solutions, *implement* them and *monitor* them around a set of key indicators. The framework incorporates the concept of shared learning as part of an iterative process in which analysis feeds into planning, planning into actions, action into learning, learning into further cycles of analysis, and so on.



Climate Scan of Cities

Knowledge of past, present and future climate trends and projections helps to determine how to address the projected changes and reduce the risks posed to effective functioning of city's systems, environment, lifestyle, economy and overall well-being of people. Regional Climate Modelling projections for cities were done using the A1B scenario conducted for near-term of 2021-2050. The following table gives a brief overview of the exercise:

Observed Climate	Annual Climate Change Trend	Future Climate Change Projections
BHOPAL		
<ul style="list-style-type: none"> - Humid subtropical climate, with mild, dry winters, hot summer and a humid monsoon season. - Summers starts in late March and go on till mid-June. - In summer average maximum temperature however soars as high as 36.8 °C. - Winter season average minimum temperature is 10.5 °C. - Annual mean rainfall is of 1027 mm. 	<ul style="list-style-type: none"> - Annual mean minimum temperature shows significant rising trend of 0.025 °C per year during last 36 years. - Temperature data analysis for period from 1981-2016 shows overall increasing trend for annual mean maximum temperature by 0.02 °C (per year). - Data for period 2001-2016 however show decreasing trend of rainfall during rainy seasons, particularly in month of July. Over all, significant decline of 2.5 mm per day rain is reported during rainy season. 	<ul style="list-style-type: none"> - Annual maximum temperature is projected to increase by 1.9 °C by 2050. - Annual minimum temperature is projected to increase by 2.4 °C by 2050. - Hot days and warm night might increase. - Mean annual rainfall likely to increase by 10-14 %. - Mean monsoon rainfall likely to increase by 125-130 mm by 2050. - Extreme rainfall events might increase by 10-20% by 2050.
PATNA		
<ul style="list-style-type: none"> - Humid subtropical climate with four main seasons Winter, Summer, Monsoon, Post-monsoon. - Extreme hot summer from late March to early June. - The monsoon season from mid-June to late September accounts for more than 80 % of its annual rainfall. - Chilly winter nights and foggy / sunny days from November to February. - Annual mean maximum temperature is 31.30 °C. - Annual mean minimum temperature is 19.80 °C. 	<ul style="list-style-type: none"> - The rainfall amount is decreasing at the rate of 3 mm over the last 30 years (1985-2015). - Annual mean minimum temperature has significantly increased in last 37 years i.e. .0210 C/year. - The highest increase in mean minimum temperature in winter and post monsoon season i.e. .022 °C /year during 1980-2016. - Significant change in monsoon and summer mean minimum temperature over the city i.e.012°C /year and .010°C /year respectively. 	<ul style="list-style-type: none"> - Annual maximum temperature is projected to increase by 1.82 °C by 2050. - Annual minimum temperature is projected to increase by 1.95 °C by 2050. - Hot days and warm night might increase. - Mean annual rainfall is projected to increase by about 8-12 % - Mean monsoon rainfall will increase by 70- 90 mm by 2050. - Extreme rainfall events might increase by 10-25% by 2050.
UDAIPUR		
<ul style="list-style-type: none"> - Tropical climate with three main seasons: summer, monsoon and winter. - Summer season (March to June) temperature ranges from 23°C to 46°C. - Heat waves prevail when day time summer temperature rise to 4 – 6 °C above normal. - Winter season minimum temperature remains around 5–10 °C. - Annual mean rainfall is 654.7 mm with 31 per cent coefficient of variation. 	<ul style="list-style-type: none"> - Significant increasing trend were found in the mean annual maximum temperature over Udaipur 0.60 °C during last century. - The maximum increase in annual mean maximum temperature was observed after 1960. - Annual mean minimum temperature has significantly increased in last century over the Udaipur i.e. .07°C/decade. - Spatially coherent decreasing trend in annual rainfall are found over the Udaipur (11.5 mm/decade) during 1901-2016. 	<ul style="list-style-type: none"> - Annual maximum temperature projected to increase by 1.75-1.85 °C by 2050. - Annual minimum temperature projected to increase by 2.1 to 2.2°C by 2050. - Hot days and warm night might increase. - The probability of occurring of mild to severe drought is high. - Mean annual rainfall likely to increase by 6 to 10 per cent by 2050. - Mean monsoon rainfall Increases by 40-60 mm by 2050. - Extreme rainfall is expected to increase in frequency and intensity. 2050 projections show an increase of 20 mm for maximum 1-day rainfall and 30 mm for maximum 5-day rainfall.

Observed Climate

Annual Climate Change Trend

Future Climate Change Projections

VISAKHAPATNAM

- Tropical climate with three main seasons: summer, monsoon and winter.
- Summer season (March to June) temperature ranges from 23 °C to 32°C.
- Heat waves prevail when day time summer temperature rise to 6 – 8 °C above normal.
- Winter season minimum temperature remains around 16-26 °C.
- Annual mean rainfall is 1118.8 mm

- Significant increasing trend were found in the mean annual maximum temperature over Vizag 1°C during last century.
- The maximum increase in annual mean maximum temperature was observed after 1980.
- Annual mean minimum temperature has significantly increased in last century over Vizag i.e. .09°C/decade

- Annual maximum temperature is projected to increase by 1.75-2.15°C by 2050.
- Annual minimum temperature is projected to increase by 1.6 to 2.0°C by 2050.
- Hot days and warm night might increase.
- The probability of occurrence of mild to severe cyclones is high.
- Mean annual rainfall is likely to increase by 10 to 12 % by 2050.
- Mean monsoon rainfall is likely to increase by 13-22 % by 2050.
- Extreme rainfall is expected to increase in frequency and intensity. 2050 projections show an increase of 70 mm for maximum 1-day rainfall and 90 mm for maximum 5-day rainfall.

Child Centred Climate Change Vulnerability Assessment: Key Findings



The impacts of climate change on children differ from one agro-climatic zone to another and also the impacts are different for children belonging to different socio-economic classes and age-groups. In order to understand the different vulnerabilities among urban poor children in the context of climate change, a series of steps were undertaken:

- Literature review and collection of secondary data and information linking urbanization, climate change, urban poverty and the status of urban poor children in project cities.
- Participatory stakeholder workshops involving Urban Local Bodies, Para-statal, State Governments, National Government, CSOs, Communities, Children and Academicians etc. to map children's vulnerabilities and propose resilience strategy that address the current and future risks of the city. This exercise contributed to the development of Vulnerability Risk Frame of the cities and identification of resilience options.
- Shared Learning Dialogues (SLDs) and Focussed Group Discussions (FGDs) with communities to source information on their key vulnerabilities and identifying resilience options. SLDs and key informant interviews were also conducted with officials of government departments.

The entire exercise looked at five main domains of children's development which guide the overall growth and development in children. These domains are – Health; Education; Water, Sanitation and Hygiene (WASH), Nutrition and Child Protection. These domains are the primary lenses through which vulnerabilities of urban poor children were assessed using the Child Centred Urban Resilience Framework.



Health	Education	WASH		Nutrition	Child Safety and Protection
UDAIPUR (CENTRAL PLATEAU AND HILL REGION)					
<p>Degrading Urban Ecosystem The surrounding hills, its dense vegetation located in peri-urban areas of Udaipur city are continuously being degraded affecting the urban ecosystem and micro-climate of the city. The direct impacts of increasing daytime summer temperature on children living and working on streets are observed as thermal stresses, such as heat exhaustion, heat cramps, dehydration and sunburns etc.</p> <p>Temperature Fluctuations and Air Pollution Increasing temperature coupled with air pollution due to increased traffic, large-scale cutting of trees, deforestation along hill slopes, and burning of wood and charcoal in low income areas in the urban fringes of the city is leading to asthma, allergy and skin diseases among children.</p>	<p>Floods and Water-logging Recurrent floods and water-logging during the last one decade coupled with inadequate school infrastructure of government schools has affected the access and quality of education among poor children.</p> <p>Heat Waves and Cold Waves They affect the school going children the most by causing thermal stresses during summer afternoons and Pneumonia in winter season.</p>	<p>Lake Deterioration and Water-borne diseases Deterioration of natural rivers and lake based ecosystem by human (pollution, overexploitation) and climate change induced (less rainfall, high evapo-transpiration) factors have degraded the drinking water quality and increased the incidences of water-borne diseases like typhoid, paratyphoid, amoebic dysentery, colitis, diarrhoea and viral hepatitis.</p> <p>Open Defecation A large number of slum dwellers of the city i.e. 1702 households perform open defecation in surrounding vacant and agricultural lands which is a major cause of diarrhoea among children. Children weakened by frequent diarrhoea episodes are more vulnerable to malnutrition, stunting, and opportunistic infections such as pneumonia.</p>		<p>Diminishing food security and malnutrition Primary production is being affected by scanty and irregular rainfall conditions and higher evapo-transpiration rates from surface water bodies leading to diminishing water availability and depleting soil quality. This is leading to diminishing food security and malnutrition among urban poor children.</p> <p>During floods and water logging, most of the slum dwellers are unable to take proper diets having fats, minerals, salt and micro-nutrients eventually leading to in protein energy malnutrition, mental retardation due to lack of iodine intake, birth defects due to malnourished mothers and repeated infections due to unhygienic food leading to diarrhoea, T.B. and many other gastrointestinal diseases.</p>	<p>Child Labour The children of poor families especially the cultivators and agricultural labourers whose livelihoods are affected by low productivity or crop failure due to climate change are encouraged to work in small hotels, restaurants, as petty vendors and as domestic help to support their family.</p> <p>Physical Safety In summers, high temperature and lack of resources in slums, congested settlements and fringe areas of the city having migrant populations, forces the children to sleep on roadside at night where the physical safety and protection of their children is always at stake.</p> <p>Child Trafficking Children are forced to work in torturous environments in factories and the BT Cotton fields in Gujarat.</p>
PATNA (MIDDLE GANGETIC PLAIN HAVING MIXED VULNERABILITIES OF FLOODS AND DROUGHTS)					
<p>Natural Vulnerability -The city is highly prone to floods owing to its vicinity to rivers, low slope gradient, high groundwater table, saucer-shaped terrain and infrastructure based on such natural conditions. Unhygienic conditions get developed during and after floods causing rapid increases in infectious diseases like Malaria, Dengue and Chikungunya.</p> <p>Temperature Variation -The mean minimum temperature in winter and post monsoon season has increased. This is creating conducive environment for breeding of mosquitoes giving rise to vector-borne diseases among children.</p> <p>Irrigation with sewerage water -Lack of irrigation infrastructure in peri-urban areas leads to usage of sewerage water for irrigation which is the entry point of pathogens in our food cycle, especially affecting children as they have underdeveloped immune system.</p>	<p>Heat Stress -The number of days above 40°C in the city is increasing which is influencing child health and causing heat stroke in school going and working children in the open.</p> <p>Inadequate School Infrastructure -The schools situated in low lying areas are highly prone to inundation during floods and water logging affecting access to education.</p> <p>-Inadequate school infrastructure in terms of drinking water facilities, toilets, and safe play areas further aggravates the climate change impacts leading to diseases among children affecting school attendance.</p>	<p>Floods and water borne diseases -Acute Flooding, water-logging in the city causes contamination of drinking water resources causing high incidences of diarrhoea and hepatitis among children.</p> <p>Inadequate Water and Sanitation Infrastructure -Inadequate water treatment facilities, open sewerage drains, solid waste dumping and lack of awareness and civic sense about good hygiene practices among economically weaker groups further increases the exposure to water and vector borne diseases.</p> <p>-Higher water temperature and changes in extremes, including floods and droughts will further affect the water quality in city, exacerbating water pollution and many forms of diseases.</p>		<p>Diminishing food production in peri-urban areas -The absolute rainfall amount is decreasing while frequency of light rainfall (less than 7.5 mm) in increasing which is impacting food production in the peri urban areas.</p> <p>Lost livelihoods and improper diet -Floods and water logging affects the livelihoods of daily wage labourers and street vendors and leads to family starvation.</p> <p>-Due to unhygienic conditions in slums and low income settlements which further get worse after disasters like floods, the absorption of nutrients from the food eaten by the children is not complete, due to which the problems of malnutrition is more in children in such areas.</p>	<p>Lost Childhood -Rainfall variability and floods have affected the livelihoods of farming families, forcing their children to earn at a very early age with loss of their childhood.</p> <p>Lack of identity -Climate refugees from surrounding areas are getting settled down in slums where there is a lack of basic services and local safe play areas for children.</p> <p>Drug Abuse - A large number of children are drug addicted using solvent-based glues (Dendrite) and Correcting fluids (Erasex). Older children are addicted to Cannabis and Alcohol. Poverty, stress among children, lack of education and facilities, early jobs and easy availability of drugs are the main reasons for substance abuse.</p>
BHOPAL (CENTRAL PLATEAU AND HILL REGION)					
<p>Degradation of lake ecosystem Encroachments on hills and degradation of lake ecosystem in the city have disturbed the natural micro-climate modification process and have lead to higher daytime summer temperature. This is leading to increased heat stress and burden of diseases like dengue and malaria which proliferate faster in warmer temperatures.</p> <p>Diminishing drinking water quality Water borne diseases like typhoid, cholera, jaundice, diarrhoea are on rise among children due to degrading drinking water quality.</p>	<p>Poor condition of school infrastructure Inadequate maintenance of school infrastructure leads to seepage of rainwater from school buildings.</p> <p>Water Fetching Changing rainfall patterns have lead to drinking water scarcity. Mostly small children are involved in fetching water causing absenteeism in schools.</p>	<p>Droughts Droughts and water scarcity in the region has caused a major deficit of potable water. The available water from lakes is of high TDS/iron and nitrates causing water borne diseases.</p> <p>Insufficient sanitation infrastructure Insufficient infrastructure of water supply, open drainage, lack of sewerage treatment facilities, storm water management and solid waste disposal creates unhygienic conditions during and after disasters leading to water-borne and food-borne diseases: diarrhoea, malaria, dengue, cholera etc.</p>		<p>Diminishing primary productivity Decreasing productivity from surrounding peri-urban agricultural lands due to decreasing water availability is threatening the food security of marginalised populations in the fringe areas.</p> <p>Behavioural Issues Unhygienic food intake habits especially among the children of migrants and children living near lakes, nala - canals and near railway station is leading to infectious diseases and several nutritional deficiencies.</p>	<p>Child labour and Trafficking Children in slum pockets, at tourist places, beggar children and children in Bhopal Gas Tragedy area are highly vulnerable to child labour and trafficking due to loss of family livelihoods and disruption of family relations.</p> <p>Child Marriage Early marriage of children especially among migrant population is observed due to lack of education and awareness among parents about child safety issues.</p>

Health	Education	WASH	Nutrition	Child Safety and Protection
VISAKHAPATNAM (EAST COAST PLAINS AND HILL REGION)				
<p>High vulnerability to Hydro-met disasters The affect of Hydro-meteorological disasters like cyclones, storm surges, flash floods due to torrential rains are increasing in an arithmetic progression with severe fluctuations in occurrence round the year having serious implications for health in terms of burden of diseases.</p> <p>Malaria incidences are on rise while considering the data for the last 5 years. Mostly cases reported in the northern part of the city. Increasing humidity after post monsoon season is causing high incidence of malaria and dengue.</p>	<p>Absenteeism due to burden of diseases Heavy rains during September to November causes water logging conditions which disrupts the access to schools. Children fall prey to vector and water borne diseases.</p> <p>There is a lack of adequate and safe infrastructure in municipal corporation schools including playgrounds and open spaces.</p>	<p>Inadequate storm water drainage Water logging in selected pockets due to inadequate storm water drain and choking of existing drains causes water borne diseases like typhoid and diarrhoea.</p> <p>Saline water intrusion Saline water intrusion due to sea level rise may lead to increased cases of hypertension and strokes, adversely affecting pregnant women.</p> <p>Open Defecation Around 50% of the households in slum areas, traditional fishermen villages and peri-urban agricultural villages do not have toilets. They largely depend upon pay-to-use community toilets. Children, specifically the younger ones do not use these community toilets and defecate in open near the sea and open drains.</p>	<p>Diminishing livelihood security Reduced fish catch due to ocean salinity, storms and cyclones is affecting the livelihood and food habits of poor fishermen communities.</p> <p>Changes in seasonality (monsoonal variations-failure of on-set of monsoon/delayed or early onset of monsoonal rain) lead to erratic wet and dry climate cycles (heat waves and coastal flooding) affecting agriculture production in peri-urban areas and impacting the livelihoods by affecting incomes and food security of city on the whole.</p>	<p>Traditional Livelihoods Due to family traditions, poverty and open access to marine resources, the children of fishermen families get involved in the fishing at a very early age where there physical safety is always at stake.</p> <p>As a coping strategy to increasing cost of food, lost livelihoods due to climate change, children are removed from schools and are compelled to work as labourers in high risk jobs at harbour, factories and port area.</p>

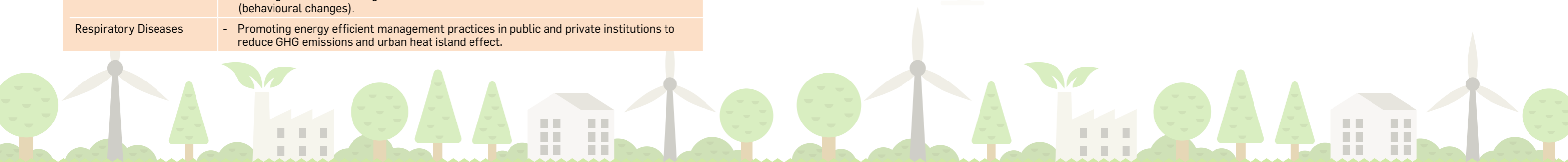
Strategic Directions to Build Child Friendly Resilient Cities

The required resilience actions at three levels: Systems, Agents and Institutions using child centred urban resilience framework were identified to build child friendly resilient cities through participatory stakeholder workshops, SLDs and FGDs. It involved of all levels of government, all sections of society, especially children so that they can prepare for and adapt to the increasing impacts of climate change and disasters.



Major Climate Change Induced Issues	Key Actions (Systems, Agents, Institutions)
HEALTH	
Thermal Stresses	<ul style="list-style-type: none"> - Restoration and development of natural water bodies, parks and open spaces with community participation - Conservation of peri-urban agriculture by incentivisation (payment for ecosystem services). - Providing heat resilient and low cost housing for low income groups. City specific Guidelines for new housing construction can be developed. - Creating awareness among children about heat stresses and changes in the school timings.
Water Borne Diseases	<ul style="list-style-type: none"> - Promote access to new improved sources of drinking water that are resilient to climate change impacts. - Mandating rainwater harvesting at premises. - Quality monitoring of water at source and destination (Setting up of high quality lab equipped with modern testing instruments, trained personnel, and financial allocation for conducting sample surveys for water quality testing in a professional manner).
Vector Borne Diseases	<ul style="list-style-type: none"> - Scientific Management of Municipal Solid Waste- Implementation of MSW Rules 2016. - Development of integrated underground sewerage network with continuous monitoring and evaluation for leakages and functioning. - Creating awareness among children and communities on water and vector borne diseases (behavioural changes).
Respiratory Diseases	<ul style="list-style-type: none"> - Promoting energy efficient management practices in public and private institutions to reduce GHG emissions and urban heat island effect.

Major Climate Change Induced Issues	Key Actions (Systems, Agents, Institutions)
EDUCATION	
Absenteeism due to burden of diseases during and after disasters	<ul style="list-style-type: none"> - Near real time diseases surveillance system to monitor and reduce incidences of water and vector borne disease outbreaks - Promoting good Sanitation and Hygiene practices among children through their course curriculum. - Regular fogging during monsoon season. - Resilient school building. For example Cool roof technology for resilience against heat strokes. - Need assessment of human resources in hospitals and adequate deployment.
Absenteeism due to involvement of children as labourers to support lost livelihoods of families	<ul style="list-style-type: none"> - Creating additional employment opportunities and ensuring basic support systems to urban informal sectors with social security amenities like insurance for life, health, assets, pension and micro-credit. - Strict enforcement of labour laws.
Damage to school infrastructure in Extreme weather events	<ul style="list-style-type: none"> - Retrofitting the existing school infrastructure with climate and disaster resilient measures. - Changes in the Building regulations on including flood resistant/enabling design strategies - Preparing and implementing School Safety Plans.



Major Climate Change Induced Issues

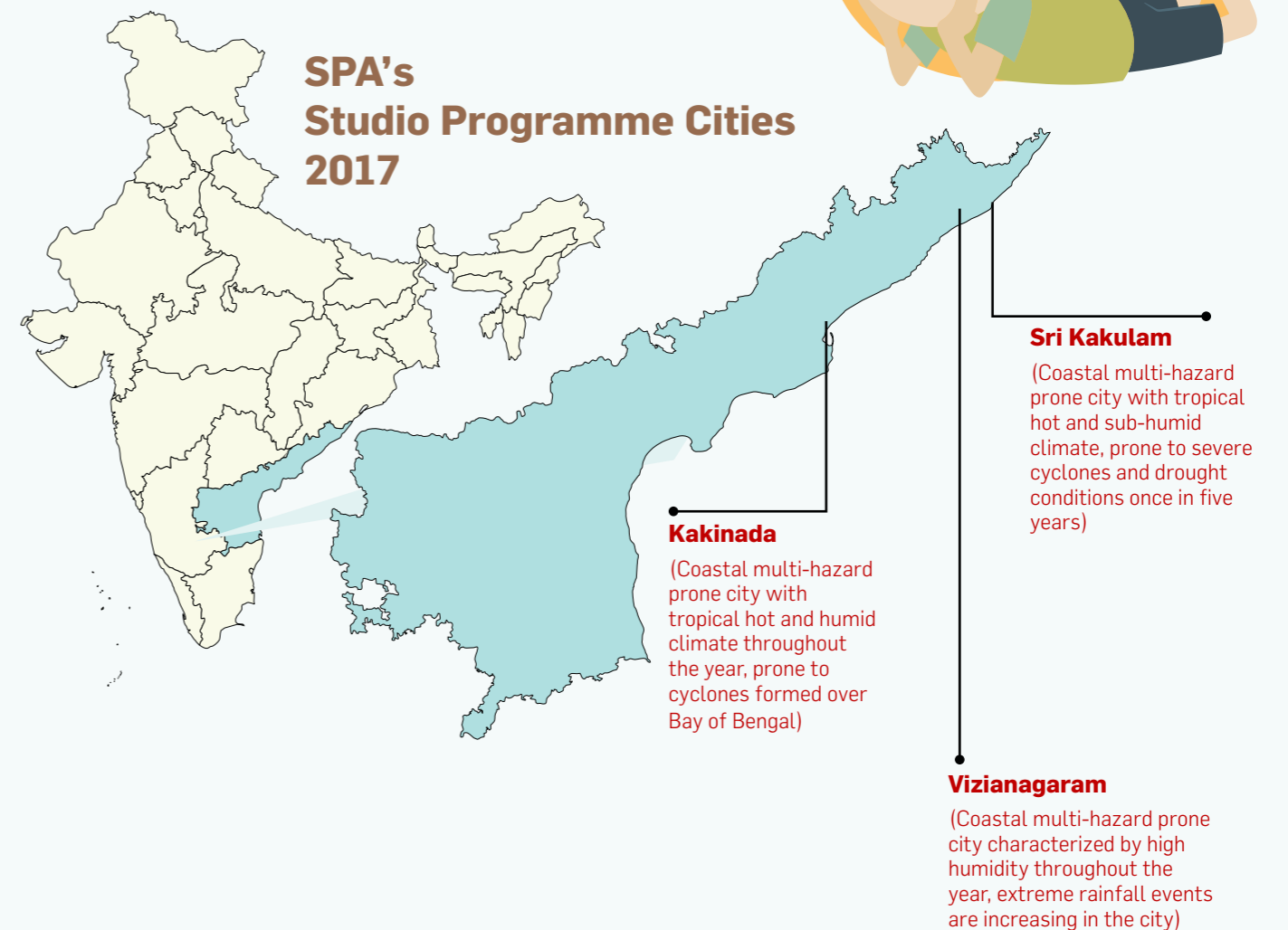
Key Actions (Systems, Agents, Institutions)

WASH	
Scarcity of potable drinking water	<ul style="list-style-type: none"> - Decentralised zone based water supply systems with quality treatment facilities. - Rainwater Harvesting - Maintenance of peri-urban agriculture, open green spaces and wetlands for ground water recharge.
Diminishing quality of available surface and Ground water resources	<ul style="list-style-type: none"> - Development of new de-centralised water treatment plants. - Consideration of land suitability and demarcated green areas/ water bodies while land use allocation to promote natural water recharges mechanisms.
Saline water intrusion due to sea level rise	<ul style="list-style-type: none"> - The over-extraction of water for agriculture and manufacturing, which causes the water table to decline, should be avoided by strict enforcement of rules and regulations. - Promoting river bed filtration.
Damage to water supply, treatment, storage and distribution infrastructure	<ul style="list-style-type: none"> - Preparing guidelines for resilient infrastructure design at household, institutions and community level. - Proper maintenance of existing infrastructure against leakages and damage should be done.
Damage to sanitation infrastructure	<ul style="list-style-type: none"> - The household coverage of toilets should reach 100%. - Construction of new resilient community toilets with gender segregation, provision of toilets to lower income households preceded by awareness drives.
NUTRITION	
Decreasing yield and quality of primary production	<ul style="list-style-type: none"> - Increasing incentives for farmers to ensure a basic support system. - Strict enforcements of laws to stop encroachments on agricultural lands and water bodies. - Maintenance of irrigation infrastructure to avoid usage of sewerage water.
Diminishing food security and malnutrition	<ul style="list-style-type: none"> - Creating additional employment opportunities for urban informal sectors. - Awareness among parents and children on balanced diet, intake of seasonal and local food etc.
Unhygienic environment and food intake habits	<ul style="list-style-type: none"> - Distribution of food packets to inaccessible settlements during floods and water logging. - Awareness about food borne diseases among children and parents. - Awareness about open defecation and its consequences leading to malnutrition, diarrhoea and other gastro-intestinal diseases.
CHILD PROTECTION	
Children in low income settlements at a high risk (Heat stress, floods, no safe play areas, violence, abduction, drug abuse)	<ul style="list-style-type: none"> - Safeguarding the poor children with improved access to health centres at their locality. - Creation of local safe play areas - Strict enforcement of laws for child protection against violence and drug abuse. - Making children aware of safety measures from floods, water logging, heat and cold waves.
Climate change induced migration (lack of identity, Separation from family, psychosocial impacts)	<ul style="list-style-type: none"> - Creating special identity proofs for migrant population so that they can get the benefits of education, ration and other basic services. - Special shelter houses for migrant populations - Counselling of children to reduce mental stress and sense of separation from families.
Child Labour	<ul style="list-style-type: none"> - Strict enforcement of labour laws. - Awareness among children and parents.
Child Trafficking	<ul style="list-style-type: none"> - Strict enforcement of child protection laws. - Awareness among children and parents about their rights, entitlements and child abuse.

Mainstreaming Resilient Development Planning in School of Planning and Architecture's Course Curriculum

The journey to a safer and sustainable world begins with planning and building resilient cities through a climate, gender and more specifically through a child friendly lens which will ultimately reduce the social and environmental effects of urban growth. In India, there is a dearth of both understanding and capacities on mechanisms of integrated urban planning considering development, climate change and disaster management. There is a huge planning gap in the current urban development planning regime where the needs and participation of children as stakeholders in the city planning process are ignored. Urban planners can support a forward looking approach, influence the long-term decisions across systems and can act as visionaries for climate & disaster resilient and child friendly cities. To facilitate this forward looking urban planning approach, GEAG in collaboration with School of Planning and Architecture (SPA), New Delhi undertook an intervention to integrate the agenda of urban climate change resilience and child-friendly cities in their post-graduate Studio Programme, which they undertake in various cities.

The Studio Programme emphasizes on training students with skills for analyzing physical, social, cultural, economic and ecological dimensions of urban settlements, comprehending their problems, preparing strategies to address the issues and emerging challenges in a planned manner and working out implementation mechanisms. This year the programme was conducted in three Andhra Pradesh Cities:



This year the Studio Assignment was to develop an Outline Development Plan (a Master Plan) for the cities. During Studio Programme in three cities capacity building of post graduate students was done to take cognizance of climate change and child friendly aspects in urban planning process. They were given an orientation about the child centred urban resilience framework, climate change impacts on the cities with the help of climate change scenarios. Expert lectures were held to sensitize the students on direct and indirect impacts of changing climate on children and marginalised populations. To evolve resilience planning options in studio cities, the students were given assignments/group activities where they came up innovative ideas on climate and disaster resilient child friendly urban development planning options.

The Way Forward

Resilience is a characteristic of systems, agents, and institutions that are alive and evolve dynamically over time. The innovative ideas on child-friendly and resilient city planning evolved in a short-term through this intervention will be crucial for addressing climate vulnerabilities of urban poor communities like children and women.

Planning for child-friendly climate resilient development also demands ability to respond to uncertainty and complex situations. Planners are therefore, required to deal with a range of challenging problems, like climate change and climate-induced disasters. Experiences also suggest that the practice of incremental planning will be insufficient and that transformations via developing deliberate adaptive pathways will be necessary which will require planners to develop their capacity for adaptive learning. As planners have to deal with an array of challenges at any given time, the emergence of a new challenge, such as climate change adaptation, on the planning agenda and the adaptive learning that planners are required to undertake to build their capacity to respond, is not a new phenomenon for the planning community. It is critical that urban planners have a sound understanding of the importance of the environmental components of sustainable development and the ability to negotiate this within the context of other competing interests.



Climate Change and Disaster Resilience for Urban Children:

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