Women's Action towards Climate Resilience for Urban Poor in South Asia: Baseline Report

Baseline Report to the Global Resilience Partnership

By the Mahila Housing SEWA Trust (MHT)

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1.1 Purpose of Programmatic Intervention

Climate Vulnerabilities Facing Women in Informal Settlements: South Asia is highly susceptible to climate-related events: the 2010 heat wave caused 1344 excess deaths in Ahmedabad; the 2014 floods in the region left more than 700 people dead and displaced millions. The region is already water stressed with per capita water availability of less than 2500m^3. These climate vagaries have direct affect human health with increased incidence of water and vector borne diseases and on livelihoods with loss of wages and assets. The dense urban populations in South Asia, are particularly susceptible to these negative climate changes (World Bank 2013), and the most vulnerable would be the estimated 190.7 million people (www.un.org) living in informal settlements (IPCC, 2013).

Those living in informal settlements are already exposed to multiple stress factors: Geographical disadvantages, being located mostly in environmentally vulnerable areas; Infrastructure deprivation i.e. inadequate water supply, poor or non-existent drainage systems, inadequate healthcare, unreliable energy sources, flawed communications methods, unsecure housing; Occupational risks due to informal/outdoor nature of work, making them more vulnerable; Financial susceptibility due to paucity of income resources and limited access to credit/insurance forces them to exhaust limited savings to respond. Caught in this "poverty trap," the poor become poorer due to climate change and can often react only to short-term/immediate concerns instead of making investments that induce longer-term resilience. Social and political marginalization as "informal citizens" results in their exclusion from early warning systems and public infrastructure investments, leaving them to fend for themselves. Climate risks, thus not only contribute to, but also exacerbate existing inequalities, worsening poverty and triggering new vulnerabilities for the poor (World Bank, 2010). High degree of gender discrimination in the region results in women being even more vulnerable as they bear the dual burden of these climate-related events, while having least access to information, resources and assets (UN Women Watch, 2009).

The Project: The *Women's action towards managing health impacts of climate change affecting urban poor in south Asia* Project aims to build the resilience capacity of women from slum communities in seven cities of South Asia, to take the lead in action against four climate risks. These four climate stressors – heat waves, flooding and inundation, water scarcity, and increased incidence of water and vector borne diseases – often impact the poor most but are slower-onset and less apparent than climate disasters and extreme events.

The project aims to create a model wherein women take a lead through collective action and technology incubation, to devise locally relevant pro-poor and gender sensitive climate resilient solutions and promote a culture of sustainable development and resilience among the urban poor in South Asia. Success for this project means a demonstration of how women-led initiatives build the necessary social capital, policy influence, technical expertise, for poor urban communities to respond effectively to climate change, thereby sustaining their health and livelihood options. The project aims to achieve this by significantly changing:

1. The knowledge and behaviour of slum communities, particularly women, to better understand the inherent climate risks so that they plan and make investments with strong consideration for the future, to improve their standards of living and resilience.
2. The sphere of influence of women leaders and slum communities within the city governance systems to enable policies and programs which include the concerns of the poor.

1.2 Design of Programmatic Intervention

The project is intervening in seven cities within three nations. These cities fall into three categories: established cities (which have well-established networks of women leaders in both the informal settlements and citywide, emergent out of MHT's long history of intervention, i.e., Ahmedabad); emergent cities (which are in the process of establishing networks of women leaders at both the informal settlement and city levels, emergent out of MHT's shorter history of working in these cities (i.e., Jaipur, Bhopal and Ranchi); and partnered cities, which contain neither an established network of women leaders nor an existing NGO with experience in creating such networks, where MHT is training local NGOs in the application of its community-based model for capacity-building (i.e., Dhaka (Bangladesh), Katmandu (Nepal) and Bhubaneshwar (India)).

The following programmatic interventions are designed to achieve the changes indicated above:

Creation of Community Action Groups (CAGs): The project is forming 100 CAGs at slum levels by training 1,200 women and youth leaders to act as local community advocates and climate specialists on climate risk, surveillance and vulnerability assessment, collective response action and technical solutions. In the four established and emergent cities, MHT will work with CAGs to form Vikasinis (city-level women led federation of CAGs) which will represent the voice of 125,000 people in their slum communities in discussion with local government and technical groups.

Surveillance and Vulnerability assessment: A household level Community Based Vulnerability Assessment toolkit (CBVAT) calculator is being developed and administered to more than 5,000 families through CAG trainings, workshops and surveys.

Climate Risk Communication and Training to Urban Poor toolkit: Local videos and audio programmes on climate change, incorporating local knowledge, expert guidance and technical scientific knowledge will be disseminated through audio podcast through an Interactive Voice Response (IVR) mobile applications including videos for smart phone users. The IVR based model will have a call-back facility to help communities share their issues and feedback.

Improved investment practices and social capital development: The project will focus on building increased knowledge seeking behaviour of 15,000 women and their families on climate risk and available solutions. It will help to incentivize (financially and non-financially) communities to invest in resilience with support of credit organizations for adoption of gender sensitive resilience technologies.

Pro-poor and Gender sensitive technologies: A compendium of pro-poor, gender sensitive climate resilient solutions, customized and validated by community groups, will be developed and made as a catalogue, with city level recommendation. The catalogue will include: 20 technologies that promote climate resilience (including indigenous technologies), an online database of community developed videos of successful demonstration of technologies, and design and piloting of financial products (savings, credits and insurance) for making technology accessible to poor.

1.3 Theory of Change

The project builds upon the conviction that if the urban poor are provided with the requisite knowledge to undertake vulnerability and risk assessments and are equipped with available resilient-technologies, they will be able to devise and implement locally relevant and pro-poor climate resilient solutions. Moreover, if the poor are empowered to implement their own resilience plans, and the institutional mechanisms representing their voices are in place, they will be able to better influence city planning and governance on pro-poor adaptation and resilience action. Our model focuses on building the capacities of the community themselves to take action and prepare for future climate risks.

Figure 1. Core Model

More specifically, the model of change posits seven key expectations that serve both to shape the intervention and to focus the evaluation. These are as follows:

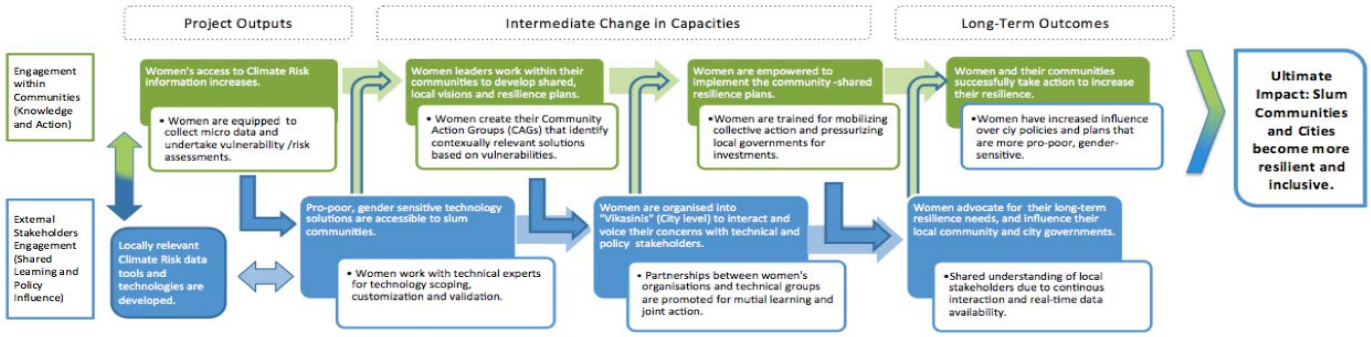


Figure 2. Diagram of Model of Change

1. Resilience in informal settlements requires coordinated action at the slum, community and city level. Therefore, leadership works best when it is developed and interacts at all these levels. This includes development of effective leadership within individual slums (Community Action Groups) and citywide leagues of CAG leaders (Vikasinis), as well as enabling and liaisoning between technical and governmental stakeholders and community leaders. MHT will identify barriers and facilitate knowledge transfer amongst each of these groups.
2. Resilience in informal settlements requires coordinated action amongst many local actors over time. Leadership will not be effective if it is too concentrated amongst a few members of the slum community, or not maintained over time. Therefore each communities' leadership must work within their community with different communication tools to share knowledge and understanding of possible paths to resiliency.

3. Scientific Knowledge sharing to communities requires systematic, repeated and innovative communication tools to enable future-oriented thinking, especially with communities which are used to thinking short-term. Tools for accomplishing this include basic climate change training and advanced training modules for educating community "consultants" who in turn provide advice to other community members.
4. Community-based data collection leads to an increased understanding of the community's vulnerabilities and opportunities for action, thereby leading to more resilient actions and investments. Vulnerability assessment and surveillance, sharing the results with the community and making it available at the city level, provide incentives and a basis for decision making.

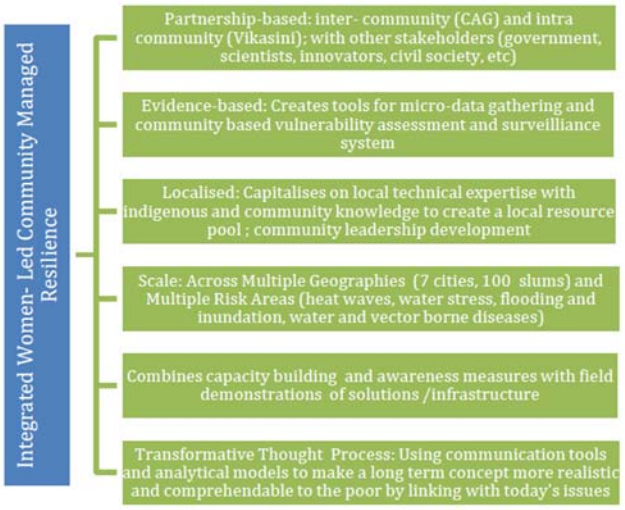


Figure 3. Integrated Women-Led, Community Managed Resilience

5. Technologies to promote resilience fail not only because they are not cost effective but also the supply is not market enabled. Therefore, demonstration projects must be linked to creation of markets for suppliers through partnering with providers and developing private or community investment sources (community level action plans directly taken by the community, government action, or micro-lending supports)
6. Facilitating interactions between communities and technical experts enhances the capacity of both to communicate clearly and develop mutually agreeable solutions to resilience problems. This involves direct contact, identification of legitimate concerns of all partners, outreach to technical experts, and media.
7. Empowering women for advocating in a non-confrontational/collaborative manner increases municipal support to address resilience needs. This involves Local Coordinators helping Vikasini to interact at the city level, strategies to reach out to Municipal Corporations, and strategies for media relations and data sharing.

2 Evaluation Design

2.1 Overall Evaluation Design

The evaluation design of the project looks for impact of the project at three scales: city level, slum level and household level. Before discussing the research methodology used in this baseline assessment and the results of this assessment, we will first clarify the context of our work at these three scales.

2.1.1 City:

The term "City" has been used to connote the total area which is covered as part of the city municipal corporation as well as peri-urban areas which are typically covered under a parastatal body called the (city) urban development authority. For example, Ahmedabad city would include the area covered under Ahmedabad Municipal Corporation (AMC) as well as the periphery areas around AMC which are being developed and managed by Ahmedabad Urban Development Authority (AUDA).

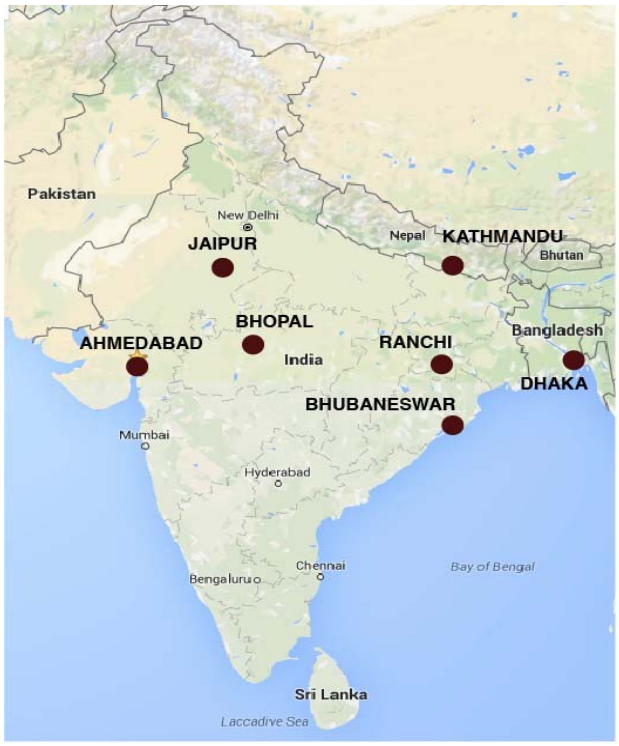


Figure 4. Map of Project Cities

The project is being implemented in seven such cities of South Asia: Ahmedabad, Bhopal, Bhubhaneshwar, Jaipur and Ranchi in India; Dhaka in Bangladesh and Kathmandu in Nepal. Most of these cities are regional (or State) capitals, emerging as strong economic hubs within their respective region, and are therefore subject to high ongoing and future in-migration. A significant percentage of the population of each city resides in slums.

All seven cities are in either the Central India belt or corresponding climatic zones in Bangladesh or Nepal. Only one of the seven cities is prone to climate-related shocks (Bhubhaneshwar is prone to cyclones) but all are extremely vulnerable to ongoing climate related stresses.

While Ahmedabad has been the most progressive in its efforts to promote slum development, the other cities are also striving to improve slum development and enhance quality of life for the urban poor.

MHT involvement in these cities varies considerably. MHT has been active in Ahmedabad over two decades. Ahmedabad therefore has strong community-based institutions supported by well-established MHT operations. MHT also enjoys a strong rapport with the local city government here. Within the context of this project, Ahmedabad is an "Established City" in the sense that the city already has a well-established social capital base for resilience work.

Jaipur, Bhopal and Ranchi are three other cities in India wherein MHT has begun work over the last few years. While some progress has been made, slums in these cities are only beginning to be organized and citywide collaboration amongst the urban poor remains weak. In the context of this project, these cities are "Emergent cities" in the sense that social capital within the cities is emerging from current work. Resilience work will be the nucleus of community organizing in these cities, thereby contributing to and growing from improvements in social capital.

Finally, MHT is not actively working on the ground in Bhubhaneswar, Dhaka and Kathmandu. In these communities, MHT is partnering with local NGOs and CBOs who work on climate change and resiliency issues and wish to adapt MHT's social capital models to local conditions. The project is therefore testing the transferability of the model to local partners in other cities. These cities have been termed as "Partnered cities".

While the overall evaluation looks at all three types of cities, the baseline survey was conducted only in established and emergent cities. Further, since all slums in Jaipur, Bhopal and Ranchi are emergent slums (slums with little prior community organization and MHT activity) while project slums in Ahmedabad are evenly split between established slums (ones with a CBO already organized) and emergent slums (slums where MHT began organizing through the GRP project), the baseline survey is over-weighted to Ahmedabad. This has been done mainly to be able to test the theory of change in the specific context of the project, which is that increased social capital can lead to better resilience action. Thus it was essential that the

evaluation components aimed at understanding individual and slum-level change identify slums possessing different levels of social capital prior to the interventions. Since project interventions in the partnered cities were limited to working with partners and did not involve slum level work, and given the short duration of the project, these cities were not covered in the baseline survey.

2.1.2 Slum:

The term "slum" has multiple definitions in international and national parlance. UN Habitat defines slums as an urban area typically being deprived of one or more shelter-related conditions, including durable housing, sufficient living space, access to safe water and sanitation, and security of tenure. The Census of India defines slums as residential areas unfit for human habitations by reasons of dilapidation, overcrowding, arrangements or design of buildings and streets, or lack of ventilation and light which are detrimental to the safety and health. In India, slums can be notified (governed under the national Slum Act), recognized (acknowledged as slums by state and local officials but not directly governed under the Slum Act), or identified (any area that is neither notified nor recognized but which consists of compact areas of at least 300 population or about 60 to 70 households of poorly built, congested tenements in unhygienic environments, usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities).

Local development plans and policies like the Urban Health Plans go further to define slums as neighbourhoods characterised by lower incomes, lacking quality housing and basic services and unhygienic living conditions. Ahmedabad Health Action Plan's definition of slums includes not only recognized slums, but also chawls, gamtals, newly merged villages, walled city areas, and other neighborhood characterized by lower incomes, lack of quality housing and basic services, and unhygienic living conditions.

In the areas that are considered under GRP project, over 55% of the region's slum households have one or two shelter deprivations, 22.6% suffer from three shelter deprivations, and 16% lack four or more basic shelter needs. This last group, in particular, live in extremely poor conditions. Generally, the lack of sanitation and water in the area are compounded by insufficient living space for families and inadequate, makeshift housing.

MHT works beyond "recognised" slums and includes areas like chawls and low income housing societies. Most of these areas lack access to secure land tenure systems with a constant threat of eviction, although actual eviction is not common. The tenure systems in these areas are also very complicated, ranging from completely illegal residences to incremental tenure security systems (such as properties recognized in municipal property tax systems or with land lease or no-eviction certificates from the government). Most of the residences are poorly constructed and lack basic amenities like water supply and sanitation. Even when available, provision of water and sanitation are often inadequate and of poor quality. For example, even with individual water connections available, a typical household would not receive water supply for more than 2 to 3 hours every day and would typically face significant reductions in water supply during summers. The quality of water available in the areas is also an issue, as most areas either lack sewage systems or have frequent breakage leading to mixing of sewage water with water supply lines. Storm water drainage systems are also often non-existent or clogged (due to lack of solid waste management) leading to water logging in monsoons. Inefficient living spaces (with 5 to 6 people sharing a home) and lack of ventilation due to the high population density in the neighbourhoods are also common phenomena.

The residents are mostly low-income communities working in the informal sector as daily wage labourers, construction workers, iron smiths, tailors, embroiderers, domestic help, bamboo basket makers, necklace

makers, sweepers and rag pickers, vegetable and food vendors, or sellers in clothes markets and home-based workers (papad, agarbatti makers). Some also work in factories, or as auto-drivers, plumbers, masons, electricians, etc. Most of them lack access to secure incomes or to any form of social security.

Typically, a slum in India would constitute a group of people living in unhygienic conditions and constantly struggling and fighting for access to basic services, especially water. (This condition is so common it is reflected in government advertisements for housing schemes). Literacy within these families is low. Households also suffer due to a lack of social capital.

3 Research Methodology, Baseline Assessment

3.1 Intervention Slums

Slums were selected for inclusion in the project based on a dearth of basic amenities within the slums and to provide diversity in the level of pre-existing social capital. This was verified based on a slum profile developed interactively with slum residents, focused on level of individual water supply connections, sanitation, housing pattern and existence of a Community Action Group (CAG). Altogether, 100 slums were identified for intervention, as shown in Table 1 below.

3.2 Stratified Sampling Technique, Slum Selection

The baseline survey was designed to provide baseline statistics from which post-intervention changes could be compared. While baseline conditions are measured at the household level, interventions occur primarily at the slum-level. The household to be interviewed were therefore selected using a stratified random sample method, with slums randomly selected for inclusion, then individual households within each slum randomly sampled from the household living in each slum.

Table 1. Treatment Type and Sample Slums, by City

City	Slum Type	Treatment Slums in Sample			Control Slums in Sample	
		No. of Slums	No. of CAG Households	No. of Non-CAG Households	No. of Slums	No. of Households
Ahmedabad	Established	10	10	15	10	150
	Emergent	10	10	15		
Jaipur	Emergent	5	10	15	5	75
Bhopal	Emergent	5	10	15	5	75
Bhuvaneshwar	Emergent	5	10	15	5	75

For the baseline survey, 20 project intervention (treatment) slums in Ahmedabad and 15 treatment slums in the other 3 cities (5 in each) have been selected. Since Ahmedabad contained both established and emergent slums, the sample in Ahmedabad was further stratified based on the level of social capital in the slums (the existence or not of a Community Action Group (CAG) in the slum prior to the project). Equal number of slums with existing CAGs and ones lacking a CAG were selected. The other three cities only contained emergent slums because MHT has begun working in these cities only recently and no intervention slum contained an existing CAG.

In addition to the treatment slums, 10 slums in Ahmedabad and 15 slums in other cities (5 in each) were selected as control slums for the baseline assessment. These slums were selected based on their similarity to treatment slums. Slums were matched one to one on the basis of proximity, infrastructure status and governance and vulnerability to climate risks. Data used to control slums to treatment slums data was verified through slum profiles developed with the participation of local residents. Sampling of households within each control slums was then randomized, as described below.

3.3 Stratified Sampling Technique, Household Selection

The project does not apply any specific criteria to include or exclude a household other than that a woman must be a member of the household (since the project focuses on women residents). For the baseline survey, selection was made from households that consist of a group of individuals, related by blood or marital relations, living under the same roof and sharing the same kitchen (cooking together) and having at least one female member.

In each of the slums (treatment and control) the number of non-CAG households indicated in Table 1 were selected randomly using one of two techniques. In the treatment slums, a list was first made of all households located within the slum and Research Randomizer was used to select households. In the case of control slums, which lacked a list of residents, geo-spatial coordinates within the boundaries of the slum were randomly generated to select the respondents. A list of 15 households (plus 5 randomly selected alternatives) were surveyed based on their availability and acceptance to participate in the survey during the first home visit. In addition, in all the treatment slums, 10 CAG members were also surveyed. This was mainly based on the data supplied by the MHT program staff. In all households, only adult women respondents were interviewed.

Interviews were conducted in person using a fixed format questionnaire (see Annex 1). Responses were recorded using SocialCops Collect android application.

Overall, this technique resulted in a greater than 99% response rate.

3.4 Research Methodology

In addition to baseline demographic data, the questionnaire included variables used to calculate climate change vulnerability scores. These vulnerability scores are based on risk (potential exposure to climate change hazard) and susceptibility (incapacity to access financial and social capital resources needed to cope with hazards either by preventative investments or coping strategies).

Five risk and two susceptibility scores have been constructed for each of the surveyed households.

The risk scores included:

1. Heat stress
2. Water adequacy/quantity,
3. Water quality,
4. Flooding and
5. Vector-borne disease risks.

The two susceptibility scores included:

1. Financial capital and
2. Social capital.

The risks and susceptibility scores were developed from the baseline household survey data, and standardized to a 0 to 10 scale. Each scale indicates the household's liability to be adversely affected by the climate risk or their precariousness due to socio economic conditions. Scale value of "0" indicates lower risk/susceptibility, a "5" indicates average risk/susceptibility, and "10" indicates higher risk/susceptibility. The level of risk or susceptibility indicated by these scores are relative measures, measured along the lines of typical risks and susceptibilities faced by urban poor in South Asia. Even slum dwellers with "lower" risk or vulnerability remain at significant risk compared to wealthier South Asia residents, and especially compared to most residents of more developed nations located in more temperate climates.

We used these Risks and Susceptibility scores to classify households into low, moderate and severely vulnerable.

3.5 Calculating Risk Stress, Susceptibility, and Vulnerability Scores

Baseline survey questionnaire encompasses 115 questions (see Annex 1). Sixty-one of these were used to calculate the risks and susceptibilities. The remainder were used to document general demographic backgrounds and conditions of interest to the project.

Accessibility, availability and adequacy of different types of resources, facilities and services in slum communities differ from more wealthy urban communities. Thus, the presence or absence of a particular service or facility and its impacts on the household's vulnerability is calculated relative to general slum community conditions. For example, while the possession of a motor scooter is a common attribute of urban middle-income group family, the possession of a motor scooter in a slum community indicates a relatively sound financial state.

Below is a sample of the variables used to calculate risk and susceptibility scales.

Table 2. Examples of Indicators Used to Construct Risk and Susceptibility Scales

Risk					Susceptibility	
Heat stress	Water quantity	Water quality	Flooding	Health	Financial	Social capital
Type of house, Type of Roof	Main source of water	Source of water	Incidences of House and street flooding	Incidence of malaria and dengue	Average family income	Type of family, caste, literacy, education
Type of cooking fuel	Discontinuity in the water supply	Water purification practice	Loss of property due to flooding	Use of window screens or mosquito nets to block mosquitoes	Household assets	CC awareness, feel in change of climatic condition
Number of doors and windows, ventilation	Purchase of water	Water contaminati on due to sewage overflow	Children missed school due to flooding	Domestic water storage container	House ownership	Involvement in CBO, participation in training, benefits from government

These and other relevant variables were compared and discussed by the investigating researchers to determine the degree to which the variable contributes to the relevant risk or susceptibility. The values given to varying conditions within each risk or susceptibility scale were designed to indicate the relative contribution of the variable to the risk or susceptibility, such that higher values indicated more risk or susceptibility. The scores implicitly weighted both the magnitude and the significance of each variable relative to all other variables. The variable scores within each group were summed to produce a total risk or susceptibility scale. The totals were then standardized to 0 to 10 scales based on either setting 10 at a threshold determined to be highest risk or at the highest score found within the sample.

The specific methods of calculating the risk and susceptibility scales is provided in Annex 2. Section 1 of Annex 2 focuses on the general method of calculating the scales, while subsequent sections describe the specific variables and weights used to calculate each of the risk and susceptibility scales.

3.5.1 Risk Scales

Generally, the risk and susceptibility scales were calculated as follows:

Heat stress

Heat stress vulnerability is function of a heat gain and heat retention associated with the structural properties or a household's residence. Heat gain score is the measure of the residence's heat resistance and transmission capacity (R-values and U-values, as determined by http://www.inspectapedia.com/heat/HVAC_Definitions.php#RValue and similar sources) of the building material, including type of house, roofing and walls. Tin roofs without underlayment created the greatest risk. The heat score also included other sources of heat, including the impact of overcrowding (person/room) and type of cooking fuel. Heat retention factor is the measure of capacity of the residence to cool by means of ventilation (number and location of doors and windows) and electric fans. See Annex 2.2 for the full list of variables and calculations.

Water quantity

Variables used to calculate water availability (quantity) include direct indications by the respondent as to water availability, both generally and seasonally, as well as indirect measures indicating the main source of water, presence/absence of a motorized pump, and the type of flush and bathroom facility. For example, households with a municipal water line connection within their house are presumed to receive sufficient water regularly (score of 1, least vulnerable), whereas households who must fetch their water from a neighboring community are more vulnerable (score of 4, more vulnerable). In the same context, households that use motorized pumps to suction water from the supply line are less vulnerable because they are capable of extracting sufficient amounts of water in case of limited supply hours or low water pressure. (Note, the measures of vulnerability are estimated at the individual household level; while use of pumps decreases the household's vulnerability, it increases vulnerability of neighboring residents who lack a pump).

See Annex 2.3 for the full list of variables and calculations.

Water Quality

Water quality is measured based on the respondent's perception and experiences. Variables considered include the respondent's perception of the quality of water available, whether water ever gets contaminated due to mixing with the sewage water, etc. Questions such as these directly reflect the status of water quality.

See Annex 2.4 for the full list of variables and calculations.

Flooding

Flooding risk was calculated primarily based on HHs experience about street and house flooding. It also envisages variables like loss of property or raw material, missed days of work and school for children. Higher score was given for *loss of property or raw material* variable, because this tends to lead to financial crisis as well.

See Annex 2.5 for the full list of variables and calculations.

Vector-borne Diseases

Vector-borne disease risk was calculated based on the family's medical history of malaria and dengue, the use of mosquito nets and screens to block access of mosquitoes, and total number of containers used for storing water for domestic use. Members of HHs who have suffered from both malaria and dengue are more at risk. The use of mosquito nets and/screens to block access of mosquitoes reduce the health risk. Water storage containers provide opportunity for breeding, thereby increasing risk.

See Annex 2.6 for the full list of variables and calculations.

3.5.2 Susceptibility Scales

Susceptibility scales were calculated as follows:

Financial Susceptibility

Financial susceptibility is based on four components: 1. household income, 2. house ownership and tenure status, 3. structural/physical properties of house, and 4. Assets and durable goods owned by the household. Income encompasses household income relative to the poverty line, number of employed household members, and type of occupation. Housing status is measured through tenure (ownership of land, certifications for tenure rights, payment of household tax, etc.) and type of house. Assets and durable goods are measured as the possession or lack thereof of 18 assets. Each of the four components were scaled from 0 to 10, then combined into a single scale with income weighted 40%, house ownership and tenure status 17.5%, structural/physical properties of house 17.5%, and assets and durable goods 25%.

See Annex 2.7 for the full list of variables and calculations.

Social Capital Susceptibility

Social capital susceptibility is measured with three components: 1. General social capital, 2. Climate change awareness social capital and 3. Community governance social capital. General social capital includes variables associated with the household's caste and education, dependency ratio, marital status, residence time in city, etc. Climate change awareness social capital is based on respondent's experience with, understanding of, and perception about climate change. Community governance social capital measures whether the community has a CBO, the respondent's perception of how well it works, participation in the CBO by the respondent, and similar measures. The three components are combined into a single scale of overall social capital susceptibility with equal weightings.

See Annex 2.8 for the full list of variables and calculations.

3.5.3 Vulnerability Assessment

Vulnerability to climate change is seen as the potential for exposure to health-threatening changes (risks) linked to the lack of resources needed to resist these changes (susceptibility). For purposes of analysis, the research team ranked households by their degree of vulnerability: low, moderate and high. Households

were determined to be at moderate or high vulnerability if either their social or financial capital susceptibility is above the group mean AND the household was exposed to above average risks in less than two (low vulnerability), two (moderate vulnerability), or more (high vulnerability) of the five risk categories.

On scales of 0 to 10, we used a cut-off score of 5 for all the climate risk factors, 6 for social capital susceptibility and 7 for financial capital susceptibility. These scores were closest whole numbers to group means for each of these risks and vulnerabilities. Those households which scored higher than these cut-offs were considered to be risk-exposed and socially/financially susceptible.

4 Results of the Baseline Assessment

4.1 Treatment Cities

While the primary level of intervention occurs at the level of slum communities, these communities are significantly affected by the cities within which they are located. As noted above, the history of MHT involvement in these cities also varies. MHT was founded in 1994 and until recently focused most of its work in slums in Ahmedabad. Field offices in Jaipur, Bhopal and Ranchi were established between 2008 and 2013. A brief description of each city and MHT's involvement in slums located therein follows.

4.1.1 Ahmedabad

Ahmedabad, the former capital of Gujarat, serves as the administrative headquarters of the Ahmedabad district and the seat of the Gujarat High Court. With city population of 6.3 million and a regional population of 7.8 million, it is the sixth largest city and seventh largest metropolitan area of India.

Ahmedabad is an important economic and industrial hub in India, with emphasis on cotton production, pharmaceuticals, chemicals, other heavy industry, commerce, communication and construction. The city is also home to a large number of educational and research institutions, particularly in IT, science and technology. In 2010, Forbes magazine rated Ahmedabad as the fastest-growing city in India and listed it as third fastest-growing in the world after the Chinese cities of Chengdu and Chongqing.[i]

Ahmedabad is located in a sandy and dry area of western India, on the Sabarmati River. Until recently, the river frequently dried up in the summer. In addition, expansion of the Rann of Kutch threatened increased desertification around the city. The Sabarmati River Front Project diverted waters from the Narmada River to the Sabarmati, thereby providing increased water supply to the city.

Ahmedabad has a hot, semi-arid climate with three main seasons: summer, monsoon and winter. In summer (March to June), the average maximum temperature is 43 °C (109 °F) and the average minimum is 24 °C (75 °F). In winter (November to February), the average maximum temperature is 30 °C (86 °F) and the average minimum is 13 °C (55 °F). The climate is extremely dry in both of these seasons (with a total average of 27 mm (1.1") falling from October through May). Droughts are not uncommon. The southwest monsoon brings 723 mm (29") between June to September, with infrequently torrential rains causing local flooding.

According to the 2011 city census, the city had a literacy rate of 89.6% (94.0% for men and 84.8% for women), a sex ratio of 898 women per 1000 men, and an official poverty rate of 5.4%. The city is 81.6% Hindu, 13.5% Islam, 3.6% Jain (a small but politically influential group) and 1.3% other. Social tensions amongst castes and religions have led to several bouts of violence, including anti-reservation protests in

1981 and 1985 (with violent clashes between various castes) and the 2002 three-day period of violence between Hindus and Muslims.

As per the Natural Resources Defense Council (NRDC) 2013 report, *Rising Temperatures, Deadly Threat: Recommendations for Slum Communities, in Ahmedabad*, around two million Ahmedabad residents are living in the slum communities where they have greater exposure to extreme heat, susceptible to its negative health effects due to the heat-trapping building materials of the households. The majority of these household roofs have made by tin roofs, asbestos, plastic coverings, PVC tarps, and bricks which increase the indoor temperatures and reduce the ability for residents to cool down. The slums are also lacked stormwater drainage systems and encountering water quality and water logging issues which lead to increase in dengue and other vector-borne disease cases.

Two Ahmedabad Municipal Corporation (AMC) departments are responsible for improving housing facilities to the residents of the city slums: the Housing and Slum Networking Project Department and Safai Kamdar, under different housing schemes of State & Central Government.

MHT began working in Ahmedabad in 1994. The organization joined in slum upgradation under the *Parivartan* or Slum Networking Project (SNP) with the partnership of slum communities, AMC, and other private sector organizations in 1995. From this work, MHT emerged as one of the major NGOs in the city. MHT currently works in more than 140 slums, with programs focused on improving the basic services including water and sanitation facilities, drainage systems and paved roads, affordable housing projects for the poor, and climate resilience.

4.1.2 Jaipur

Jaipur is the capital of Indian State Rajasthan and it is the tenth largest metropolitan city in India. It was planned and founded by Raja Swai Jai Singh II in 1727 as the new capital of Dhoondhar Kingdom. The city is one of the important examples of medieval Indian Town-planning and architecture. The city is located on a semi-arid plain flanked to the north and east by hills of the Aravali range.

The city climate is hot and dry, reaching an average maximum temperature of 40.3 °C is in May. Winters are mild with an average monthly temperature of 7.8 °C in January. Humidity is low around the year with average annual rainfall of 633 mm. The city also is exposed to dust storms and dust-raising winds in the summers.

The Jaipur Municipal Corporation contains 91 municipal wards, each represented by an elected member. Tourism, trade and commerce and local handicraft industries are the key strengths of the city. The city is well known for its traditional gems and jewelry, textile, wooden furniture, leather bags, and other handicrafts.

According to the 2011 census, Jaipur is the tenth most populous city in India with a population of 3.05 million. The population grew rapidly over the last few decades due to the in-migration of people from rural areas as well as from other parts of the state and country. From 2001–2011, JMC grew by 31.06%, which is above the national decadal growth rate (DGR) of the urban population. The city had an overall literacy rate of 84.34 % (90.61% males and 77.41% females). The sex ratio was 898 females per 1,000 males. The child sex ratio stood at 854, Hindus comprise 77.9% of the city's population, followed by Muslims (18.6%), Jains (2.4%) and others (1.0%).

The city has been selected for smart city mission by the Ministry of Urban Development, Government of India in 2016 to improve the quality of life of the residents and to improve the efficiency of services.

Meeting the ever-increasing housing demand is the major challenge to the city administration. In the absence of affordable housing, continued migration into the city has resulted in rapid slum formation. Approximately 22.4% of the total population of Jaipur lives in over 235 slum areas. The slums are largely concentrated along the foothills. The majority of women in the slums work as tailors and embroidery workers, mat-makers, factory workers, domestic workers or daily laborers. Men work as drivers, day laborers, stone cutters, vegetable vendors, jewelleryy makers, factory workers, and shopkeepers.

The slums lack basic services. According to India's 2011Census, 56.13% of Jaipur's slums are lacking drinking water access and 19.0% lack access to sanitation facilities. Most of these slum areas are in low-lying areas which making them vulnerable to natural calamities such as flooding and inundation. Mahila Housing Trust (MHT) is working with the Jaipur municipal corporation to improve the household level services of sewage and water connections toilets, paved roads and to building climate resilience in these communities.

4.1.3 Bhopal

Bhopal, the capital of Madhya Pradesh, is governed by the Bhopal Municipal Corporation. The city is located 744 km south of New Delhi and 779 km northwest of Mumbai on hilly terrain within the Malwa Plateau.

Bhopal has a humid subtropical climate, with mild, dry winters, a hot summer and a humid monsoon season. Summers start in late March and end in mid-June with average temperatures around 30 °C and with peaks in May, when the highs regularly exceed 40 °C (104 °F). Total annual rainfall is about 1146 mm.

As per the Census of India 2011, the population of the city is 1,798,218 of which a sex ratio is 921 women per 1000 males. The literacy rate (for population aged above7 years) was 85.24%, with male and female literacy respectively at 89.2% and 80.1. Hinduism (69.20%) and Islam (26.28%) are the two most common religions. In 2011, 242,103 residents were from scheduled castes and 46,076 from scheduled tribes.

Industries in the old city are involved in the manufacturing of electrical goods, medicinals, cotton, chemicals, jewellery, cotton and flour milling, cloth weaving and painting, and also making matches, sealing wax, and sporting equipment. Retail businesses include the making and selling of traditional handicrafts. It is also home to several national level research and higher education institutions.

The city has 380 slums with the total population of 936,066 persons. A large number of slums in the city are located on or close to *nallah* or riverbanks. Slums near to the industrial areas have densities as high as 150 to 200 persons per hectare, while slums on the periphery of the city are less dense.

The majority of slum residents work in the informal sector as daily wage construction industry workers. Further, men have involved in fishing, maintenance and repairing. On the other hand, some women are involved in embroidery and stitching. The slums lack basic services such as water connections, sanitation, drainage facilities and garbage disposal systems. In 2011, MHT first collaborated with the Corporation under the Integrated Low-Cost Sanitation Project to enable construction of individual toilet. Currenly, MHT works in more than 24 slums, forming Community-based organizations (CBO) while advocating for access to improved basic services.

4.1.4 Ranchi

Ranchi is the capital of Jharkhand and is located in the southern part of the Chota Nagpur plateau in the State of Jharkhand, India. The city contains 173 km^2 and is organized into 55 wards.

The city has a subtropical climate characterized by hot summers from March to May and well-distributed rainfall during the southwest monsoon from June to October. Winter is marked by dry and cold weather

during the months of November to February. The average annual temperature varies between 18 °C to 29°C., with temperature going as high as 44° C.

According to the 2011 Indian Census, Ranchi has a population of 1,073,440, 52% of whom are male, making it the third largest city in Jharkhand after Jamshedpur and Dhanbad. The city witnessed a sudden surge in population after the declaration of the new state of Jharkhand in 2000. High in-migration is a result of rising employment opportunities and the opening of numerous regional and state level offices, banks, and FMCG companies. According to the 2010 *ASSOCHAM* study, Ranchi was one of the highest employment generating Tier-III cities in India with a share of 16.8%.

As per the Census of India 2011, the average literacy rate of the city is 87.37 percent of which male and female literacy was 91.67 and 82.72 percent respectively. A majority of residents (64.31%) practice Hinduism, 16.42% Islam, 8.52% Christian, with the remainder split amongst other religions. In 2011, the scheduled caste population of the city was 50,452 and Scheduled tribe as 217,024.

Population Foundation of India's 2013 report *Water, Sanitation and Hygiene in poor settlements of Ranchi – A mapping of facilities, access, use and perceptions* stated that 3.6 lakh of the city population resides in 215 slums located around the city. The expansion of the city boundaries and inclusion of the periphery tribal villages into the municipal corporation areas are the primary causes for the rapid growth of the slum population. Increased density within these villages and a lack of basic services characterized these areas. The residents of the slums are very poor, engaged in rickshaw pulling, construction laborers, and other temporary employment on a daily wage basis for their livelihood.

The slums are lacking in basic infrastructure including water and sanitation facilities. The majority of slum residents depend on groundwater extracted from tube wells and dug wells. A very small percentage of slums depend exclusively on piped water supply. Sewerage and drainage systems in slums are usually not connected to any centralized sewerage network. Due to the lack of sanitation facilities like shared or individual toilets, residents rely on open defecation.

MHT started working in the city in 2011, focusing on water supply connections in slums. In addition, MHT is promoting roof rainwater harvesting, augmenting wells and recharge pits to increase the ground water. Further, MHT is working with the Ranchi municipal corporation for the better implementation of government projects such as Swachh Bharat (Toilet construction and behavioral change), and Rajiv Awas Yojana (RAY) which foresees a "Slum Free India" with inclusive and equitable cities in which every citizen has access to basic civic infrastructure and social amenities and decent shelter. MHT runs the "Karmika School of Construction Workers" in the city to upgrade skills, certify and place women workers in construction jobs.

4.2 Socio-Demographic Characteristics of Sampled Population, by City

The survey was administered to the female head of sampled households. As indicated in Table 3 below, 60% of the respondents were between 30 to 50 years of age; 94.5% were married. The caste composition (20% Scheduled castes and 16% Scheduled tribes) was higher than census estimates for urban India. About half of the women could read and write. Seventy percent of the households reported monthly incomes between Rs. 5,000 to 20,000 and 35% of them possessed below-poverty-line (BPL) cards which indicates that they were poor and eligible for state subsidies. Possession of BPL cards was disproportionately higher in Bhopal. Less than 10% of the women possessed a smart phone and another 40% possessed ordinary mobile phones. Nearly 90% of the households reported that they owned their homes but only half of them held proper legal titles to them; 30% were illegal. A quarter of the women reported that they participate in meetings of their

local community-based organization. Most of the women who participated were active CAG members associated with MHT-initiated community action groups.

Table 3. Socio-economic characteristics of samples households by city

City (# of Respondents)		Ahmedabad (642)	Jaipur (199)	Bhopal (200)	Ranchi (200)	Total (1241)
Age of the respondents	Up to 20	3.9%	2.5%	1.5%	3.0%	3.1%
	21-30	13.4%	27.6%	30.5%	31.0%	21.3%
	31-40	34.7%	36.2%	39.5%	42.5%	37.0%
	41-50	25.7%	23.1%	22.0%	19.5%	23.7%
	51 & above	22.3%	10.6%	6.5%	4.0%	14.9%
Marital Status	Married	94.1%	96.0%	97.0%	92.5%	94.6%
	Unmarried	5.3%	4.0%	2.0%	7.0%	4.8%
	Seperated	.3%	0.0%	0.0%	.5%	.2%
	Divorced	.3%	0.0%	1.0%	0.0%	.3%
Caste composition[1]	General	15.7%	25.1%	24.5%	10.0%	17.7%
	Other backward castes	55.1%	47.2%	44.0%	14.0%	45.4%
	Scheduled castes	20.4%	20.1%	26.0%	16.5%	20.6%
	Scheduled tribes	8.7%	7.5%	5.5%	59.5%	16.2%
Literacy	Can read and write	45.5%	48.7%	49.5%	57.5%	48.6%
	Can read	4.0%	.5%	1.5%	.5%	2.5%
	Can sign	5.1%	30.2%	37.0%	19.0%	16.5%
	Can't read and write	45.3%	20.6%	12.0%	23.0%	32.4%
Average monthly family income	Below 5000	4.4%	18.6%	22.0%	25.0%	12.8%
	Bet 5000 to 10000	28.5%	55.3%	58.5%	35.0%	38.7%
	Bet 10000 to 20000	47.4%	16.1%	17.0%	14.0%	32.1%
	Above 20000	19.8%	10.1%	2.5%	26.0%	16.4%
BPL card[2]	Yes	32.1%	11.6%	75.5%	30.0%	35.5%
Aadhar card[3]	Yes	88.0%	96.5%	98.0%	94.5%	92.0%
Type of phone with respondent	No phone	58.6%	28.1%	56.0%	45.0%	51.1%
	Ordinary	32.7%	59.8%	35.5%	49.5%	40.2%
	Smart	8.7%	12.1%	8.5%	5.5%	8.7%
Ownership of house	Own house	91.9%	86.5%	79.9%	85.0%	88.0%
	Rented or Family home	4.2%	2.2%	2.9%	2.2%	11.4%
Ownership of land	Legal	49.2%	62.8%	56.0%	51.5%	52.9%
	Partially legal	26.5%	10.1%	12.5%	0.5%	17.4%
	Illegal	24.3%	27.6%	31.0%	48.0%	29.3%
Participate in CBO meetings	Yes	26.2%	15.6%	21.0%	40.0%	25.9%

[1] The Scheduled Castes (SCs) and Scheduled Tribes (STs) are officially designated groups of historically disadvantaged people in India. The terms are recognized in the Indian Constitution and, according to the 2011 census, comprise 16.6% and 8.6% of India's population. The Constitution lays down general principles of positive discrimination for SCs and STs. Other Backward

Castes are also recognized by the constitution, are less socially disadvantaged (than SCs and STs) and compose the largest bulk of the Indian population.

[2] A BPL card is issued to households below the poverty line, an economic threshold set by the government of India, based on a survey which scores household assets to indicate households targeted for social welfare programs.

[3] An Aadhar card is issued to every Indian resident and carries a unique identification number. Demographic and biometric information is recorded in a central repository during the enrolment process. The Aadhar card is used to transfer benefits directly to beneficiaries' bank accounts.

4.3 Socio-Demographic Characteristics of Sampled Population, by Membership in CAG

Three-fourths of respondents were more than 30 years of age. However, more than 10% of Ahmedabad's CAG respondents were very young and unmarried; this reflected MHT's new efforts to include adolescent women in its interventions. In Ahmedabad, a larger proportion of CAG households were from General caste category and in the other three cities, from Scheduled caste category. Around 60% of CAG respondents were literate (could read and write) compared to 30-40% of non-CAG respondents. More than 60% of households in Ahmedabad had monthly incomes more than Rs. 10,000, and in the other three cities, a similar proportion had incomes less than Rs. 10,000. Only 16% of emergent CAG households in Ahmedabad had BPL (below-poverty-line) cards, while more than 50% of established CAG households in Ahmedabad and emergent CAG households in other cities had these cards. These characteristics may indicate a tendency for poorer literate women to engage with community-based organizational efforts. More than 90% of households possessed Aadhar cards. Except for the control households in Ahmedabad where nearly 80% households did not possess any phone, 50% of households from other groups did not possessing any phone, 40% possessed ordinary phones and 10% smart phones. More than 95% of respondents in established slums owned their homes. In other slums, 80% typically owned their home. However, only 50% of households reported that they had legal ownership of the land on which their home was constructed. The differential between ownership of home and ownership of land on which the home was constructed was between 30-50% in the established slum communities of Ahmedabad. Among emergent slum communities in Ahmedabad, 75% CAG households reported that their homes were built on illegal land.

Table 4. Socio-economic characteristics of samples households by type of slum community

		Ahmedabad (642)					Jaipur, Bhopal & Ranchi (599)			
		Established (244)		Emergent (248)			Emergent (374)			
		CAG (94)	Non-CAG (150)	CAG (98)	Non-CAG (150)	Controls (150)	CAG (149)	Non-CAG (225)	Controls (225)	Total (1241)
Age of the respondent	Up to 20	12.8%	0.0%	11.8%	2.0%	1.3%	5.4%	1.8%	0.9%	3.2%
	21-30	10.6%	16.0%	13.2%	14.7%	11.3%	32.2%	32.4%	25.3%	21.5%
	31-40	26.6%	32.7%	32.4%	38.7%	39.3%	38.9%	40.4%	38.7%	37.1%
	41-50	31.9%	28.0%	16.2%	30.0%	16.0%	18.8%	20.9%	24.0%	23.2%
	51 & above	18.1%	23.3%	26.5%	14.7%	32.0%	4.7%	4.4%	11.1%	15.0%
Marital Status	Married	85.1%	99.3%	86.7%	99.3%	94.0%	87.2%	98.2%	97.3%	94.6%
	Unmarried	14.9%	0.7%	10.2%	0.0%	6.0%	10.7%	1.8%	2.7%	4.8%
	Separated	0.0%	0.0%	1.0%	0.7%	0.0%	0.7%	0.0%	0.0%	0.2%
	Divorced	0.0%	0.0%	2.0%	0.0%	0.0%	1.3%	0.0%	0.0%	.3%
	General	35.1%	4.0%	43.9%	5.3%	6.0%	19.5%	11.6%	28.4%	17.6%

Caste composition	OBC	42.6%	62.0%	43.9%	65.3%	54.7%	32.2%	38.7%	33.3%	45.6%
	Sch castes	14.9%	22.0%	8.2%	22.0%	28.7%	28.9%	19.1%	17.3%	20.6%
	Sch tribes	7.4%	12.0%	4.1%	7.3%	10.7%	19.5%	30.7%	20.9%	16.2%
Literacy	Can read and write	57.4%	32.0%	66.3%	37.3%	46.0%	59.7%	45.8%	52.9%	48.6%
	Can read	2.1%	6.0%	5.1%	4.7%	2.0%	0.7%	0.9%	0.9%	2.5%
	Can sign	16.0%	4.7%	4.1%	4.7%	0.0%	25.5%	37.8%	21.8%	16.5%
	Can't read and write	24.5%	57.3%	24.5%	53.3%	52.0%	14.1%	15.6%	24.4%	32.4%
Average monthly family income	Below 5000	7.4%	3.3%	10.2%	1.3%	2.7%	16.1%	23.1%	24.4%	12.8%
	Bet 5000 to 10000	37.2%	25.3%	37.8%	15.3%	33.3%	55.7%	57.8%	37.3%	38.7%
	Bet 10000 to 20000	38.3%	47.3%	34.7%	62.0%	46.7%	15.4%	18.2%	13.3%	32.1%
	Above 20000	17.0%	24.0%	17.3%	21.3%	17.3%	12.8%	0.9%	24.9%	16.4%
BPL card	Yes	58.5%	40.7%	16.3%	26.0%	23.3%	48.3%	37.3%	34.7%	35.5%
Aadhar card	Yes	96.8%	80.0%	98.0%	84.0%	88.0%	97.3%	96.9%	95.1%	92.0%
Type of phone (respondent)	No phone	38.3%	61.3%	53.1%	52.0%	78.7%	36.9%	34.2%	56.0%	51.1%
	Ordinary	53.2%	32.0%	35.7%	42.7%	8.7%	53.7%	56.0%	36.9%	40.2%
	Smart	8.5%	6.7%	11.2%	5.3%	12.7%	9.4%	9.8%	7.1%	8.7%
Ownership of House	Own house	95.7%	96.0%	79.6%	95.3%	90.0%	88.6%	83.1%	81.3%	88.0%
	Rent/Family home	4.3%	4.0%	20.4%	4.7%	10.0%	11.4%	16.9%	18.7%	12.0%
Ownership of land	Legal	38.3%	67.3%	18.4%	42.0%	65.3%	63.8%	51.6%	57.3%	52.9%
	Partially legal	22.3%	21.3%	7.1%	48.7%	24.7%	6.0%	9.8%	6.7%	17.4%
	Illegal	39.4%	11.3%	74.5%	9.3%	10.0%	30.2%	38.7%	36.0%	29.7%
Participate in CBO meetings		84.0%	11.3%	54.1%	12.7%	0.0%	62.4%	26.7%	0.0%	25.9%

4.4 Climate Risk Characteristics of Sampled Population

Heat Stress

While Ahmedabad and Jaipur residents generally built more protective roofs (65% and 83% respectively of households had reinforced cement concrete (RCC) or stone roofs), these cities also had higher heat stress climates, with higher temperature and humidity than Ranchi and Bhopal. Correspondingly, while the climatic conditions in Ranch and Bhopal are somewhat more manageable, the housing conditions are significantly worse. Ranchi residences typically use asbestos roofs, while Bhopal residences typically have tin roofs (the least effective for protecting against heat stress).

Table 5. Characteristics of sampled households with respect to climate risks by cities

City (# of Respondents)		Ahmedabad (642)	Jaipur (199)	Bhopal (200)	Ranchi (200)	Total (1241)
Factors influencing climate stressors		%	%	%	%	%
Factors influencing heat stress/exposure						
Type of roof	RCC Cement or Stone (best)	65.7	83.4	24.5	9.5	52.9
	Thatched/ Tiles	9.8	0.0	2.5	25.5	9.6
	Tin/Asbestos/Plastic (worst)	24.3	16.5	73.0	65.0	37.5
Place of cooking	Inside the house	97.8	87.4	93.0	97.0	95.2
	Outside the house	2.2	12.5	7.0	3.0	4.7
Total equivalent windows (1 door = 2 windows) opening to open space	No windows	25.9	26.6	2.5	42.0	24.8
	1 window	2.0	0.5	0.0	0.0	1.1
	2 or more	72.1	72.9	97.5	58.0	74.1
Access to LPG		66.4	73.4	63.0	29.0	60.9
Electric fan present		84.7	78.9	79.5	45.0	37.0

Water Quality and Quantity

More than 70% of households in Ahmedabad received municipal water supply (primarily from treated surface water), with toilets and bathrooms in over 90% of dwellings. Possibly, as a result of these high numbers of in-house facilities, a high percentage of respondents (over 40%) were aware of sewage overflows within their communities.

Respondents in the other three cities were significantly more dependent on in-slum water supplies, particularly from groundwater. Over 55% of households in Jaipur depended on community supply (community residents pooled finances to set up a water supply system from a bore well), while a similar percentage in Ranchi depended on a hand pump or a well. Bhopal used a wide array of water sources, but like Jaipur and Ranchi, little of it is treated. Nearly 70% of households from across all cities reported good quality water. This was mostly due to dependence on ground water.

Three-quarters of the households had toilets within their homes except in Ranchi where 40% of them practiced open-air defecation. Sixty percent of toilets in Ahmedabad were connected to a sewer system and in other cities were connected to a septic tank. Bathing facilities were in temporary and shared bathrooms for more than half the households in Ranchi and quarter of the households in Jaipur.

Table 6. Characteristics of sampled households with respect to climate risks by cities

City (# of Respondents)		Ahmedabad (642)	Jaipur (199)	Bhopal (200)	Ranchi (200)	Total (1241)
Factors influencing climate stressors		%	%	%	%	%
Factors influencing water quality and quantity						
Main Source of Water	Municipal water supply	72.4	34.7	37.0	12.0	50.9
	Stand post/Hand pump	12.5	7.5	39.0	59.50	23.5
	Community supply	11.1	56.8	24.0	27.0	23.0
	From neighbors	4.0	1.00	0.0	1.5	2.5
Type of toilet facility	Toilet in dwelling	93.0	82.4	87.0	50.5	83.5
	Community toilet	4.5	14.1	7.5	8.5	7.2
	Practicing ODF	2.5	3.5	5.5	41.0	9.3
Type of bathing facility	Bathroom in dwelling	96.0	77.4	92.0	33.0	82.9
	Shared/ temporary bathrooms	4.0	22.6	8.0	67.0	17.1
Purification of drinking water	Don't do anything	79.9	34.2	86.0	40.5	67.2
	Straining with cloth	14.5	46.2	8.0	15.5	18.7
	Other methods	5.5	19.6	6.0	44.0	14.1
Receiving good quality water		70.7	63.3	69.0	81.0	70.9
Sewage overflowed in the last year		41.6	34.7	10.0	1.5	28.9

Flooding and Vector-Based Disease

Flooding is of particular concern in Jaipur and Bhopal, where 44% and 50% of residents reported street flooding and 11% and 27% reported property loss due to flooding. The impact of localized flooding in Ahmedabad and Ranchi were considerably less.

Malaria is a significant problem in India, with WHO-UNICEF reporting India is third among 15 countries having the highest cases of malaria and deaths due to the disease.[ii] At present, official figures for malaria in India indicate 0.7–1.6 million confirmed cases annually (.05% - .12% of the population). The biggest burden of malaria in India is borne by the most backward, poor and remote parts of the country, with >90-95% cases reported from rural areas and <5-10% from urban areas, but both Ahmedabad and Ranchi are in areas considered to be more susceptible to urban malaria due to construction, industrial, agricultural, and mining activities within the region.[iii] Additionally, Dengue transmission is now strongly established in urban India.

It is within this context that 15% of Ahmedabad and 9% of Ranchi respondents report malaria within their household. Ahmedabad and Ranchi residents also are more proactive in preventing this disease.

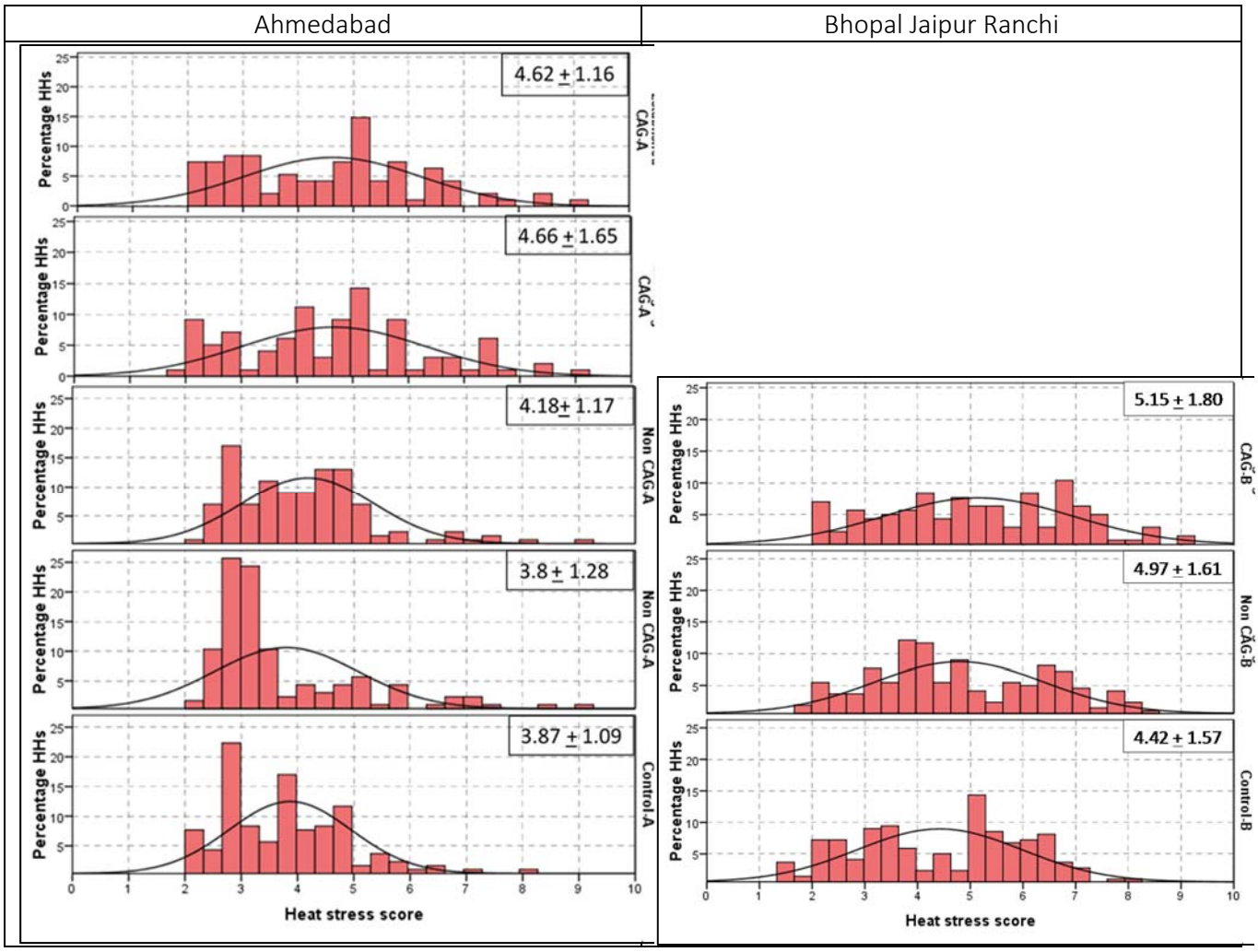
Table 7. Characteristics of sampled households with respect to climate risks by cities

City (# of Respondents)	Ahmedabad (642)	Jaipur (199)	Bhopal (200)	Ranchi (200)	Total (1241)
Factors influencing climate stressors	%	%	%	%	%
Factors influencing flooding					
House gets flooded in monsoons	7.9	31.7	34.5	18.5	17.7
Flooding of streets	12.9	44.5	50.3	28.5	26.5
Loss of work in last one year	5.3	40.2	8.0	6.5	11.5
Missed school in last one year	1.9	1.0	12.6	0.0	3.1
Loss of property or raw material	1.4	10.6	26.5	0.0	6.7
Factors influencing vector-borne disease					
Malaria and Dengue both	0.3	0.0	2.0	0.0	0.5
Only Malaria	14.6	3.0	4.5	9.0	10.2
Only Dengue	1.4	0.5	4.5	0.0	1.5
Mosquito screens on windows	46.3	28.5	20.6	30.0	36.7
Mosquito nets while sleeping	3.7	6.5	5.0	85.0	17.5
>=5 water storage containers	22.1	50.0	4.0	4.0	20.8

4.5 Susceptibilities and Risks

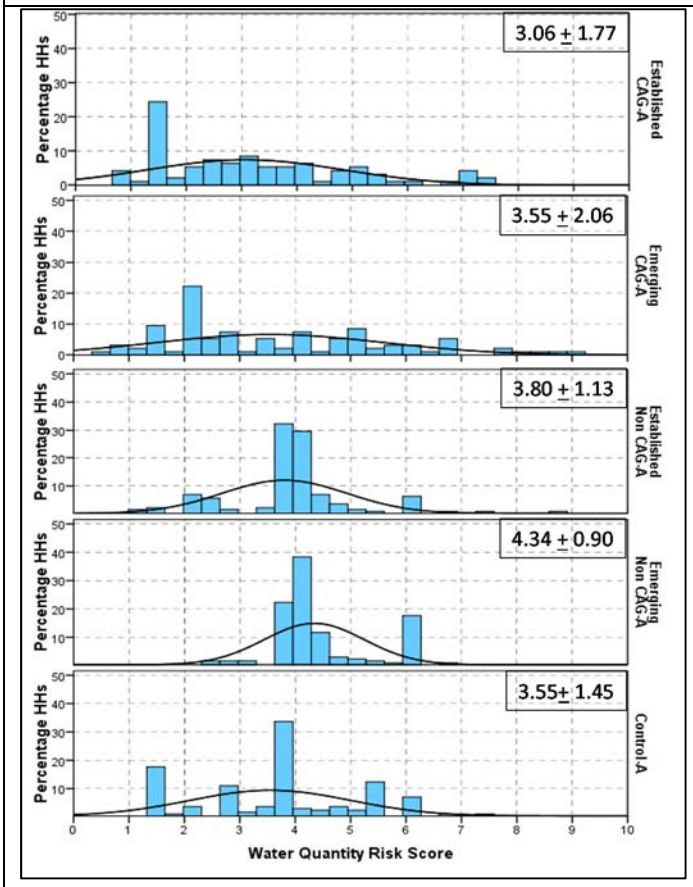
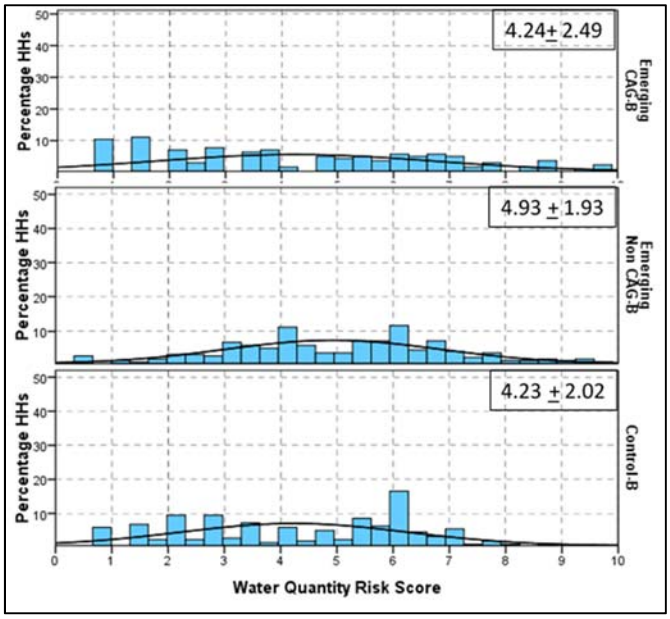
4.5.1 Heat Stress Risk

The mean heat stress risk scores were lower in Ahmedabad (4.0) than in the other cities (5.2). It was lower by nearly a point among controls than CAG households in Ahmedabad.



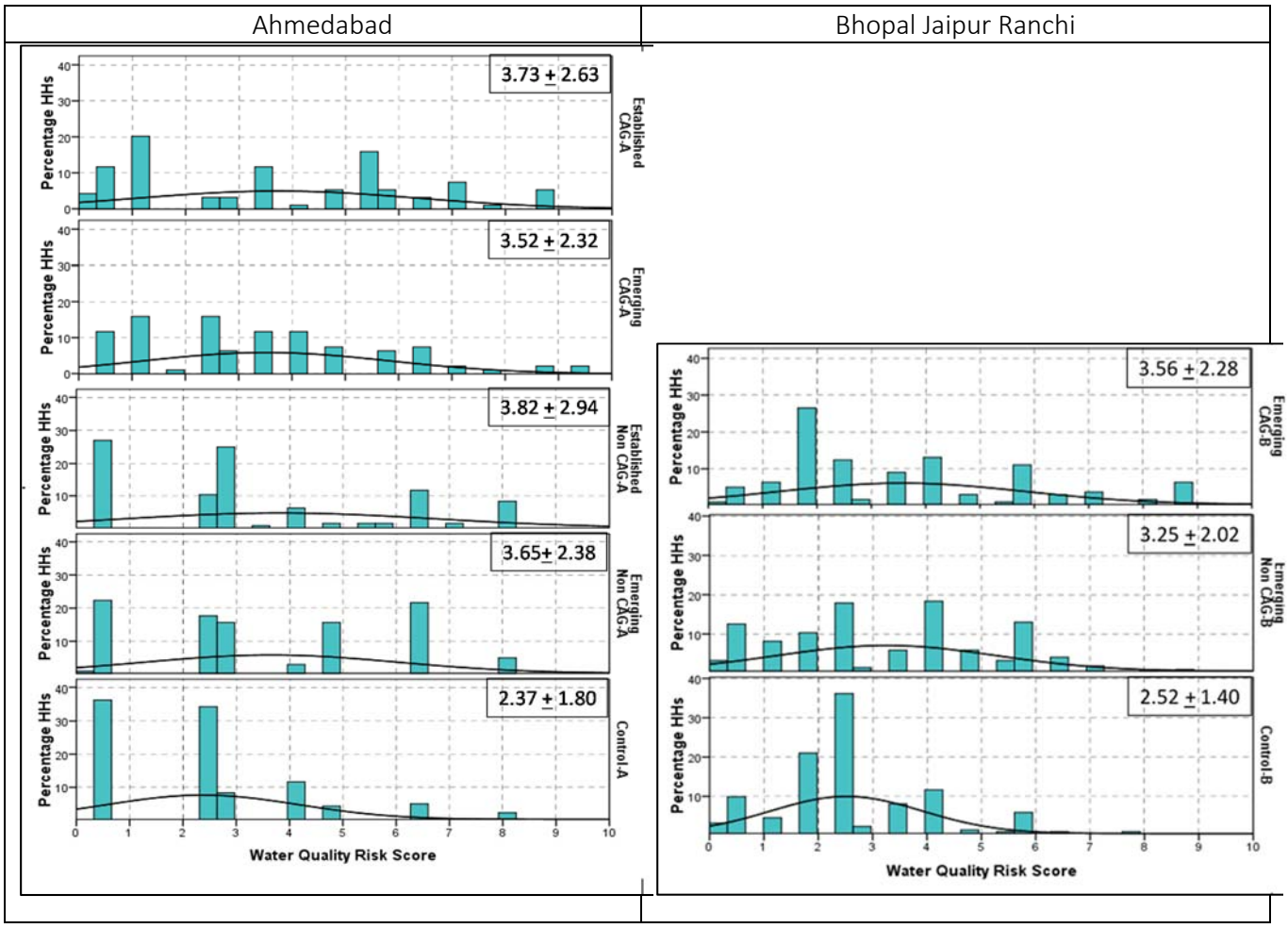
4.5.2 Water Quantity Risk

The risk score for water quantity in all groups in Ahmedabad averaged around 3.6, implying mostly adequate quantity of water. The water quantity risk score was slightly lower among CAG households (3.06) and its variation was also less. In the other three cities, the average water quantity risk score averaged slightly higher at 4.5. Here too, CAG households appeared to be slightly less at risk than non-CAG by half a point.

Ahmedabad	Bhopal Jaipur Ranchi
	

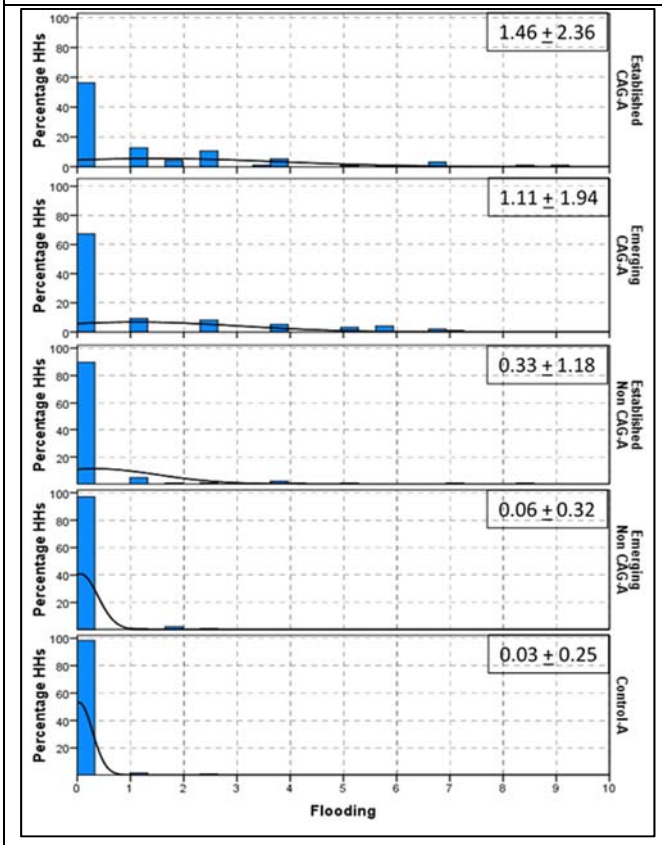
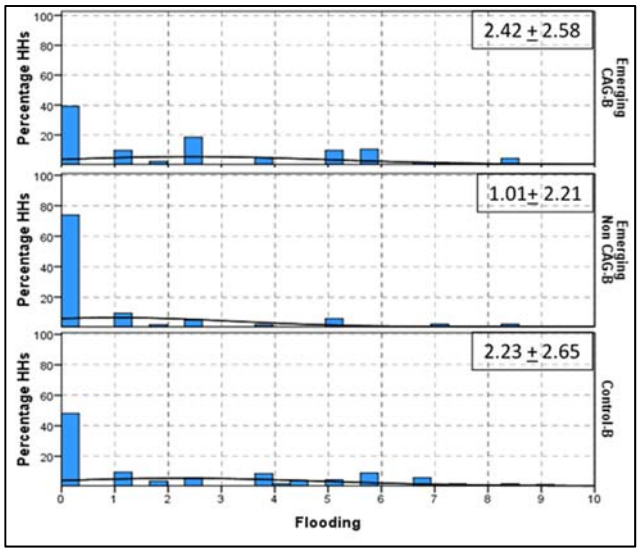
4.5.3 Water Quality Risk

Water quality risk in Ahmedabad was distinctly higher by one point in all the intervention communities (3.6), than the Control communities (2.4). In the other three cities too, intervention communities had a higher risk at 3.4, compared to Control communities at 2.5.



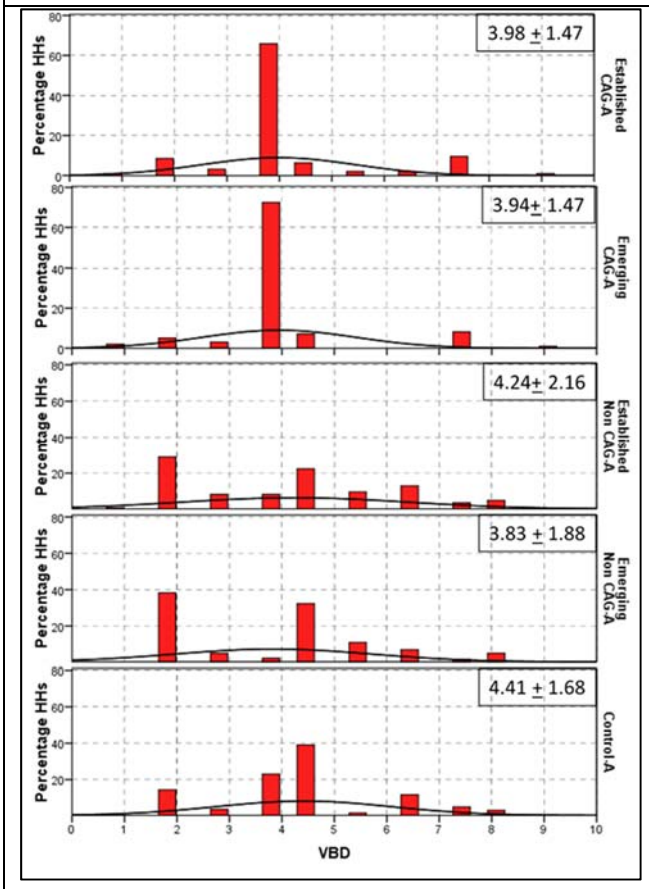
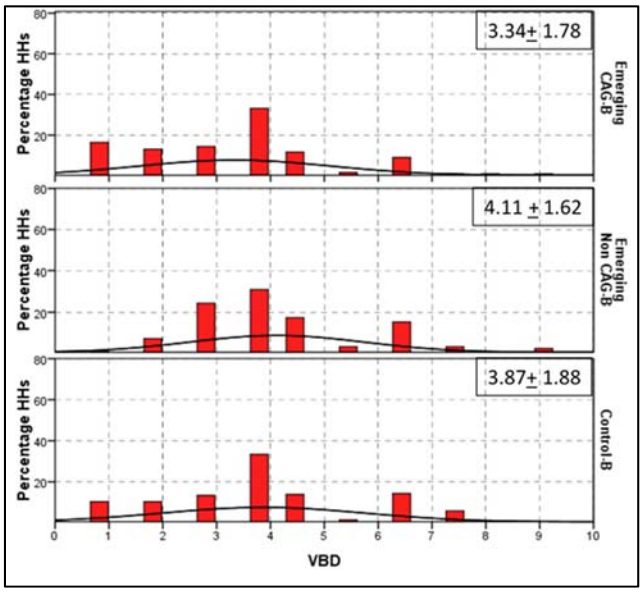
4.5.4 Flooding Risk

Flooding risk was much lower in Ahmedabad than the other cities. In Ahmedabad as well as the other cities, the CAG households were more at risk than the non-CAG households.

Ahmedabad	Bhopal Jaipur Ranchi
	

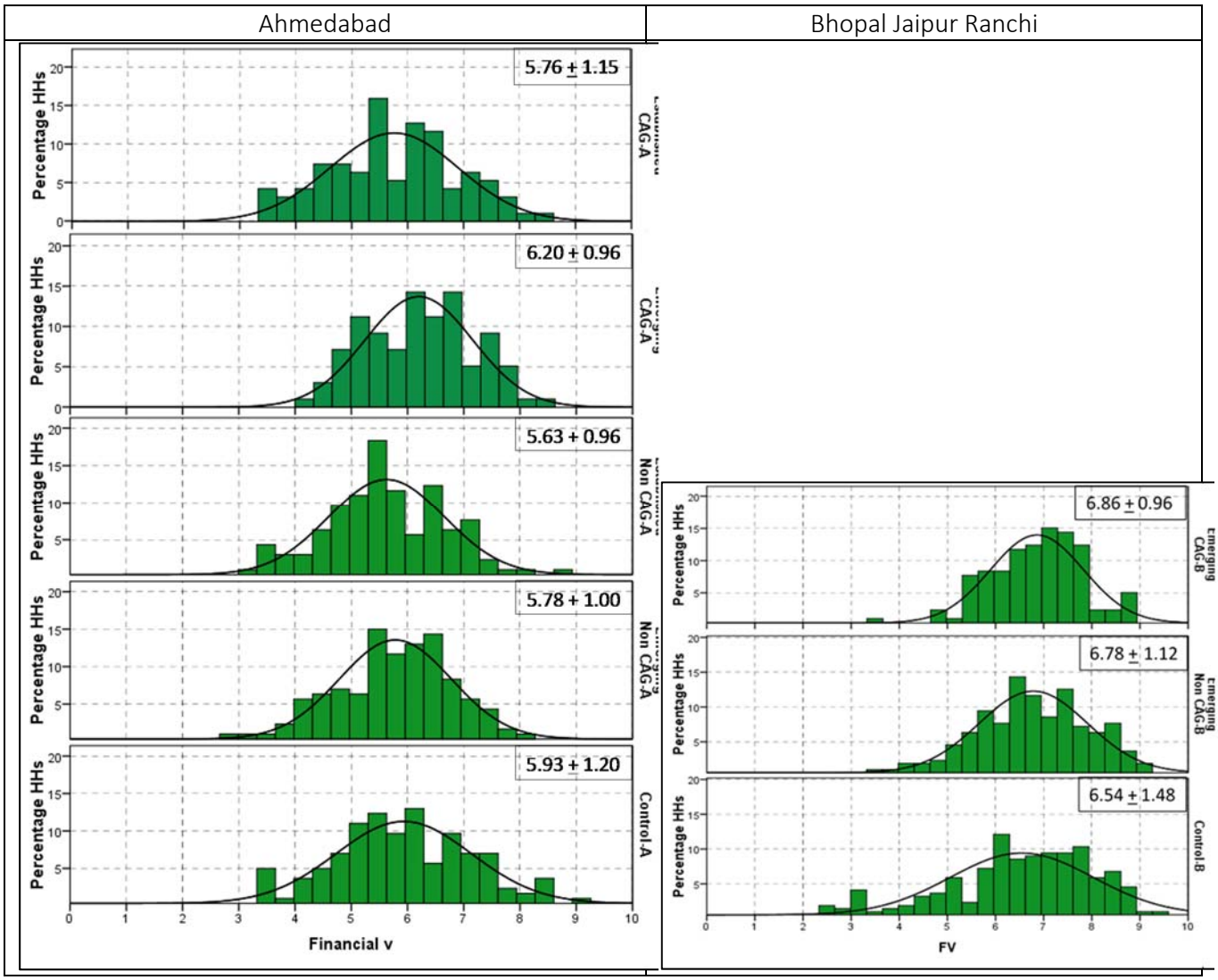
4.5.5 Vector Borne Diseases Risk

Vector borne diseases averaged around 3.8 in all cities.

Ahmedabad	Bhopal Jaipur Ranchi
	

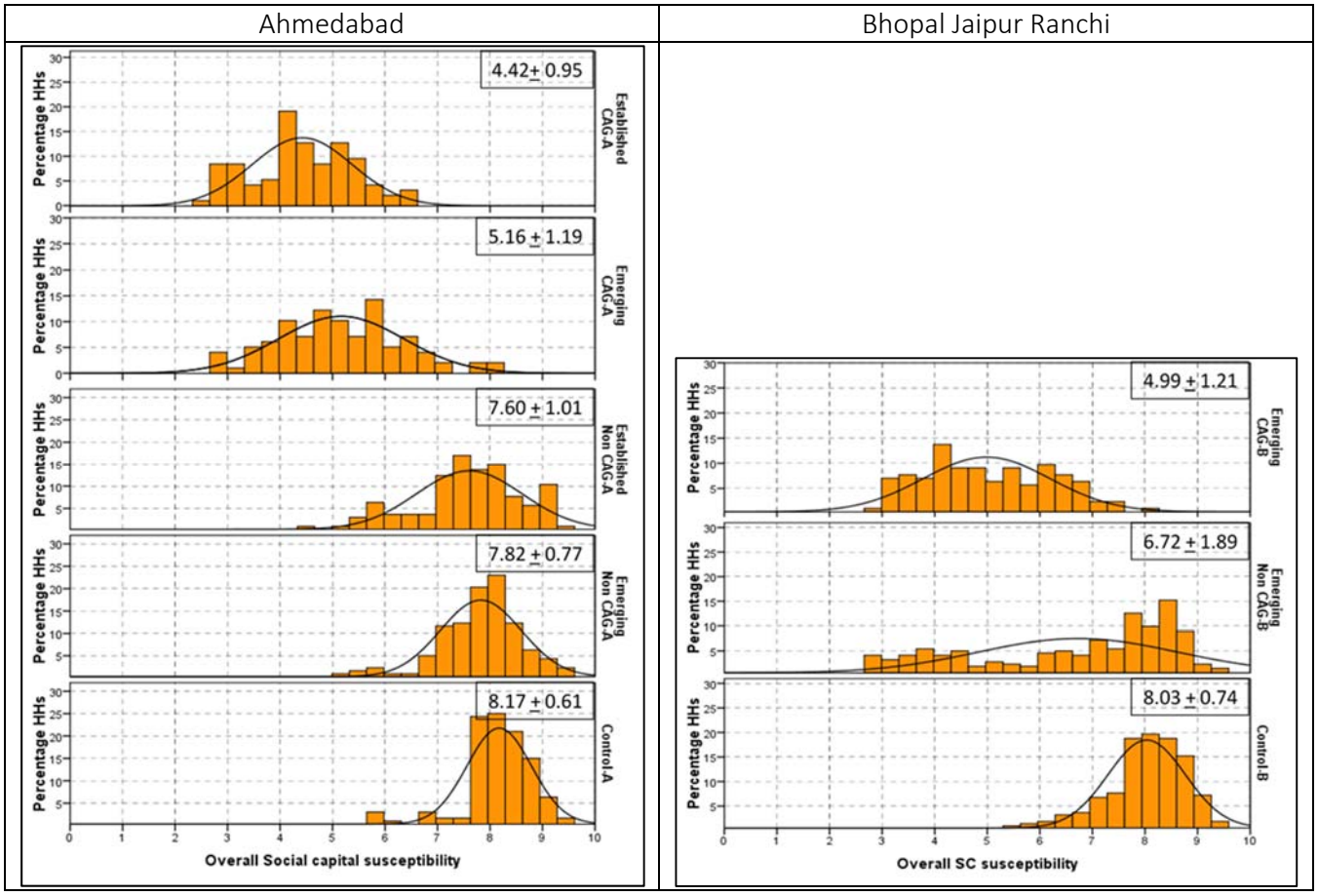
4.5.6 Financial Capital Susceptibility

The overall financial susceptibility of Ahmedabad households, at 5.75, was one point less than that of the other cities. Financial susceptibility of all the households in the other cities averaged at 6.75. There was not much difference in scores between intervention and control groups.



4.5.7 Social Capital Susceptibility

Social capital susceptibility averaged at around 7 in Ahmedabad and the other cities, with CAG members being the least susceptible and the Controls being the most susceptible. This differential was in large part due to CAG's higher scores for (i) their ability to collectivize and approach the local government for improving their housing and daily living conditions, and (ii) CAG members being aware of climate change and its risks, both these capitals being higher in CAGs as a result of the trainings they had attended.



We found that the CAG households had higher exposure to risks of heat stress, poor water quality and flooding. They also scored higher on financial vulnerability than the non-CAG and Control households. It is possible that these women are most affected and a therefore motivated to become active members of the CAG, leading to their lower social capital susceptibility scores.

5 Conclusions: Identifying and Understanding the Most Vulnerable

5.1 Vulnerability Classifications

To better understand the implications of these findings, we examined our data more deeply by classifying households into low, moderate and high vulnerability groups. For this, we used a cut-off score of 5 for all the climate risk factors, 6 for social capital susceptibility and 7 for financial capital susceptibility, all on scales of 0 to 10. These scores were closest whole numbers to group means for each of these risks and vulnerabilities. Those households that scored higher than these cut-offs were considered to be risk-exposed and socially/financially susceptible.

Ninety-four percent of our sample (1181 households) was susceptible in terms of financial or social capital or both, and was also exposed to one or more climate risks of heat stress, water scarcity, poor water quality, flooding and vector-borne diseases. (See Table 8). We therefore set a higher threshold to be considered moderately and highly vulnerable. Those households which were socially and/or financially susceptible and were exposed to (i) no or one risk, (ii) two risks or (iii) three and more climate risks were classified as low, moderate and highly vulnerable households.

Based on these thresholds, 33% of households are least vulnerable, 36% of the households (455) were moderately vulnerable and 30% (375) were highly vulnerable.

Table 8. Conversion of socio-economic susceptibilities and climate risk exposures to vulnerabilities

	Exposure to climate risks						
Susceptibility	**No risk**	**One risk**	**Two risks**	**Three risks**	**Four risks**	**Five risks**	**Total**
No susceptibility	60	73	42	16	6	0	197
Financial or Social susceptibility	196	217	138	41	14	4	610
Financial and Social susceptibility	82	196	110	39	7	0	434
Total	338	486	290	96	27	4	1241
Least vulnerable 411 households (33.12%)							
Moderately vulnerable 455 households (36.66%)							
Highly vulnerable 375 households (30.22%)							

5.2 Who Are the Most Vulnerable?

As shown in Table 8, households were least vulnerable in Ahmedabad and most in Bhopal. A slightly higher proportion of CAG households were highly vulnerable, compared to non-CAG residents of intervention slums and controls.

As expected, lower incomes were associated with higher levels of vulnerability. While scheduled castes were more highly vulnerable as expected, the most vulnerable population did not belong to any protected caste, indicating that for urban poor, caste reservations may to some extent help protect castes. Forty percent of Muslim households in the sample were highly vulnerable. While vulnerability decreased with increases in education, nearly 30% of women with higher secondary and 15% of women with graduate level education were in highly vulnerable households. Vulnerability was not clearly correlated to years of residency in the

city. The most highly vulnerable were households that had been living in the cities more than 15 years (33% highly vulnerable). Surprisingly, greater tenure rights are associated with higher vulnerability. This finding will require further analysis. Finally, average family size did not vary much across vulnerability categories. Households with a larger ratio of girls to boys (.96 vs. .75) tended to be more vulnerable.

Table 9. Characteristics of vulnerable households

		Total households	Least Vulnerable (411 hhs)	Moderately Vulnerable (455 hhs)	Highly Vulnerable (375 hhs)
City	Ahmedabad	642	45.2%	35.8%	19.0%
	Bhopal	200	13.5%	31.5%	55.0%
	Jaipur	199	21.6%	39.7%	38.7%
	Ranchi	200	25.5%	41.5%	33.0%
CAG/ Non-CAG	CAG	341	36.7%	30.2%	33.1%
	Non-CAG	525	33.3%	37.0%	29.7%
	Control	375	29.6%	42.1%	28.3%
Average family income, in Rs	Above 20,000	204	46.6%	38.7%	14.7%
	Between 10,000 to 20,000	398	42.7%	34.2%	23.1%
	Between 5000 to 10,000	480	25.6%	39.4%	35.0%
	Below 5000	159	14.5%	32.1%	53.5%
Caste	General	218	28.4%	35.8%	35.8%
	Other backward class	562	34.7%	37.7%	27.6%
	Scheduled castes	256	32.0%	32.8%	35.2%
	Scheduled tribes	201	35.3%	38.8%	25.9%
	Other	4	25.0%	75.0%	0.0%
Religion	Hindu	801	37.5%	35.8%	26.7%
	Muslim	315	24.1%	35.9%	40.0%
	Christian	14	28.6%	42.9%	28.6%
	Other	110	27.3%	44.5%	28.2%
Education	Post-Graduate/ Graduate/Diploma	55	52.7%	32.7%	14.5%
	Higher Secondary (11th-12th Std.)	66	43.9%	28.8%	27.3%
	Secondary (6th-10th Std.)	297	33.3%	39.4%	27.3%
	Primary (up to 5th class)	267	33.7%	40.1%	26.2%
	Didn't go school	555	29.5%	35.0%	35.5%
Period of residence in city	More than 15 years	926	32.5%	34.3%	33.2%
	11-15 years	149	37.6%	43.6%	18.8%
	7-10 years	94	39.4%	36.2%	24.5%
	4-6 years	44	18.2%	54.5%	27.3%
	0-3 years	28	32.1%	50.0%	17.9%
Owner-ship of land	Legal	656	32.5	38.1	52.9
	Partially legal	216	41.2	30.6	17.4
	Illegal	369	29.5	37.7	29.7
Family size			5.39 $\pm$ 2.87	5.50 $\pm$ 2.50	5.74 $\pm$ 2.81
Women-to-men gender ratio of population below 18 years of age			0.75	0.73	0.96

1 Annex 1. Questionnaire

a) Background Information

S No	Question	Response
1.1	Name of Investigator	
1.2	Ward Name	
1.3	Slum Name	
1.4	House No	
1.5	GPS Coordinates	
1.6	Name of woman	
1.7	Mobile number	

b) Demographic Information

S No	Question	Response
2	Age (In Actual years) :	
3	Marital status	□ 1.Married □ 2.Unmarried □ 3.Seperated □ 4.Divorced
4	Husband's name:	
5	Family size (Total no. of members)	
6	Type of family	□ 1.Joint □ 2.Nuclear □ 3.Extended
7	Number of usual residents in your household (write separately for male and female)	

Category	Male	Female
Adult (Above 18)		
Adolescent (11-18)		
Child (5- 11)		
Child (below 5)		
Total		

8	Religion	□ 1.Hindu □ 2.Muslim □ 3.Christian □4.Jain
9	Community	□ 1.Scheduled tribes □ 2.Scheduled castes □3.Other backward class □ 4.General □ 5. Other
10	Literacy	□ 1.Can sign alone □ 2.Can read □ 3.Can read and write

11	Education	□ 1. Did not go school □2. Primary (up to 5th class or below) □ 3.Secondary (up to high school) □ 4.ITI/Diploma □ 5. Higher secondary (up to 12th class) □6.Graduate/Post Graduate (Bachelor's degree and above) □ 7. Other (Specify)
12	Do you have a phone? If yes, of what type	□ 1. Ordinary □ 2. Smart phone □ 3. No Phone
13	Does anyone else in your family have a phone?	□ 1. Ordinary □ 2. Smart phone □ 3. No Phone
14	How long have you been residing here	In the city_____ In this locality_____
15	Does your household have a below Poverty Line (BPL) card?	□1.Yes □2. No □3.Not aware
16	Do you have an Aadhar card?	□1.Yes □2. No □3.Not aware

c) Economic Profile

S No	Question	Response
17	What is the number of earning members in the family	Full Time:____ Part Time: _____
18	What are yours and other household members' means of livelihood? (Tick as many as applicable)	

Sl No	Occupation	Yours	Other Household Members
1)	Domestic Work		
2)	Construction Work (2.1 Labour/2.2 Mason)		
3)	Stitching / Tailoring		
4)	Vending (4.1 Vegetable/4.2 Fish/4.3 Fruits)		
5)	Embroidery		
6)	Office help		
7)	Drivers (LMV/HMV)		
8)	School/Hospital support staff		
9)	Government Job		
10)	Govt Informal Work (ANW, Mid-Day Meal, etc)		

		11)	Service Delivery (11.1 Plumbing/11.2 Electrician/11.3 Carpenter/Parlor/other)		
		12)	Shop (12.1 Grocery/ 12.2 Stationery/12.3 Hardware/12.4 Other Consumables)		
		13)	Brick Kiln worker		
		14)	*Papad* Making		
		15)	*Hadiya* (country liquor) making		
		16)	Agriculture Labour		
		17)	Bamboo-worker		
		18)	Not working		
		19)	Others (specify)		
19	In the last year, what has been your average family income per month		□1.Below 5000 □2. Between 5000 to 10000 □3.Between 10000 to 20000 □4. Above 20000		
20	Does your household have any of the following (tick as many as applicable)				

Household item	Tick as many as applicable
1. Mattress	
2. Pressure cooker	
3. Chair	
4. Cot/bed	
5. Table	
6. Electric fan	
7. Radio/transistor	
8. B & W television	
9. Colour television	
10. Sewing machine	
12. Any other telephone	
13. Computer	
14. Refrigerator	
15. Watch/clock	
16. Bicycle	
17. Motorcycle/scooter	
18. Animal-drawn cart	
19. Car	
20. Water pump	
21. CFL	
22. Solar Lighting	
23. Roof ventilation	
24. LPG GAS connection	
25.Other	

d) Water

<table>
<tr><th>S No</th><th>Question</th><th>Response</th></tr>
<tr><td>21</td><td colspan="2">Please tell us your source(s) of Water for drinking and domestic use purpose (tick as many as applicable).
<table>
<tr><th>Water source</th><th>Drinking Water</th><th>Domestic Water</th></tr>
<tr><td>1. Municipal Supply with Individual Tap into Dwelling (GI)</td><td></td><td></td></tr>
<tr><td>2. Municipal Supply with Individual Tap into Dwelling (PVC)</td><td></td><td></td></tr>
<tr><td>3. Community Water supply system</td><td></td><td></td></tr>
<tr><td>4. Dug well</td><td></td><td></td></tr>
<tr><td>5. Tube well/Borewell</td><td></td><td></td></tr>
<tr><td>6. Hand pump</td><td></td><td></td></tr>
<tr><td>7. Public Tap/Stand Post</td><td></td><td></td></tr>
<tr><td>8. Tanker</td><td></td><td></td></tr>
<tr><td>9. Lake/River</td><td></td><td></td></tr>
<tr><td>10. Rain Water</td><td></td><td></td></tr>
<tr><td>11. Others (specify)</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>22</td><td>Which is your main source of water? (Tick the appropriate)</td><td>□1. Municipal Supply with Individual Tap into Dwelling (GI)
□2.Municipal Supply with Individual Tap into Dwelling (PVC)
□3.Community Water supply system
□4.Dug well
□5. Tube well/Bore well
□6.Hand pump
□7.Public Tap/Stand Post
□8.Tanker
□9.Lake/River
□10.Rain Water
□11.Others (specify)</td></tr>
<tr><td>23</td><td colspan="2">Within your house, which of the following do you have to store water? How much do you store therein on a daily basis (as many as applicable):
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Water storage property</th><th rowspan="2">Availability</th><th colspan="2">Purpose</th></tr>
<tr><th>Storage capacity/Quantity for Drinking</th><th>Storage capacity/Quantity for Domestic Use</th></tr>
<tr><td>1.</td><td>Cement Tank (liters)</td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Synthetic tank (liters)</td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td>Storage containers (plastic drums) (nos)</td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td>Plastic cans (nos)</td><td></td><td></td><td></td></tr>
<tr><td>5.</td><td>Buckets (nos)</td><td></td><td></td><td></td></tr>
</table></td></tr>
</table>

	6.	Pots (nos)			
	7.	Utensils (nos)			
	8.	Other			

24	Do you use a pump to get water from the municipal/community water supply system?	□1.Yes □2. No
25	Who fetches the water in your family?	□1. Adult female □2. Adult male □3. Girl Child □4. Boy Child
26	How much time does the person spend on each round trip?	
27	Was there any discontinuity in the availability of water for more than 2 days in last one month?	□1.Yes □2. No
27.1	If Yes, Number of times?	
28	Is the quantity of water available in summer adequate?	□1.Yes □2. No
29	Do you have enough water in summer for bathing	□1.Yes □2. No
30	Was there any discontinuity in the availability of water for more than 2 days in last summer (2015)?	□1.Yes □2. No
31	What happens in a water supply breakdown?(Describe)	
32	Do you ever have to purchase water? If yes, when	□1.Daily for drinking □2. Daily for drinking and domestic □3.In summers for drinking □4. In summers for drinking and domestic use □5.Only sometimes during breakdowns □6. Never
33.1	If you have purchased water, then Specify the amount you spent per month	
34	Is the quality of water available good?	□1.Yes □2. No
35	Is your water ever contaminated due to mixing with sewage water?	□1.Yes □2. No □3. Only during monsoons □4. Don't know

Time	General/Regular Scenario	During Supply Break down
1. Less than 10 minutes		
2. 10 to 20 minutes		
3. 20 to 30 minutes		
4. More than 30 minutes		
5. Available Within premises		
6. Available Within 5 meters radius		

36	Have you ever had the water tested?	□1.Yes □2. No
37	Do you practice any water purification practices for drinking water?	□1.Water Purifier □2. Purification drops □3. Alum □4. Boiling everyday □5.Boiling when dirty □6.Straining with cloth □7. Don't do anything
38	Have you ever lost work due to water stress	□1.Yes □2. No
38.1	If yes, how many days in last four months:	Hours per day_____ Number of days_____
39	Have your children lost school days due to water stress	□1.Yes □2. No
39.1	If yes, how many days in last four months:_____	

e) Housing/Habitat

S No	Question	Response
40	Do you own the house you are living in?	□1.Yes □2. No
41	If no, is this a	□1. Joint family home □ 2. Rented House □ 3. Living in relative/friends house without paying □ 4. Other (Specify)_____
42	If yes (own the house), do you know the status of the land ownership	□ 1. Own land with clear titles □ 2. Own land but no titles □ 3. *Khatyani* □ 4. *Gair Majura* Land □ 5. Government Land □ 6. Private Land □ 7. Unauthorised occupation □ 8. Other (Specify)_____
	If you have the legal titles, in whose name is the house:	□ 1. Own □ 2. Parent □ 3. Spouse □ 4. In-laws □ 5. Don't Know
43	Do you Pay Holding Tax/ Chapparbandi/ Municipal Property Tax for your house	□ 1. Yes □ 2. No
44	Type of House (confirm record by observation):	□ 1. Kutchcha

		□ 2. Pucca □ 3.Semi-Pucca
45	Type of Roof	□ 1.Thatched □ 2.Asbestos □ 3.Tin Roof □ 4.Plastic roof □ 5.Any Other (Specify)_____
46	Material of Floor	□ 1.Cement □ 2.Soil/Mud □ 3.Marble □ 4.Broken tiles □5.Tiles □6. Other (Specify)_____
47	Number of Rooms	□ 1. One Room only (no kitchen) □ 2. One Room with Kitchen □ 3. Two Rooms only (no kitchen) □ 4. Two Rooms with Kitchen □ 5. More than two Rooms with kitchen □ 6. Other (Specify)_____
48	Source of natural light	□ 1. No source □ 2. Window □ 3. Door □4.Roof Ventilator □ 5. Other (Specify)_____
49	Do you have any screens to block access of mosquitos	□1.Yes □2. No
50	Do you use mosquito nets while sleeping	□1.Yes □2. No
51	Source of ventilation (state the number available; 0 is none)	
52	Windows/doors allow for cross ventilation	□1.Yes □2. No
53	Roof ventilation	□1.Yes □2. No

Source of ventilation	Number
Doors opening on open space	
Doors Opening on closed space (Next house is very closer to the door)	
Windows open to closed space	
Windows opening on open space	

f) Sanitation

S No	Question	Response
54	Does any member of your family practice open defecation	□ 1. Elderly parents □ 2. All Children □ 3. Children below 5 years □ 4. Everyone □ 5. Other (Specify)_____ □6. Nobody

55	What kind of toilet facility do members of your household use?	□ 1. Own toilet within dwelling □ 2. Own toilet near dwelling □ 3. Shared toilet (with extended family) □4. Shared toilet (with neighbours) □ 5. Open space/field □ 6. Community toilet □ 7. Others
56	What kind of flush/ toilet facility do members of your household use?	□ 1. Flush □ 2. pour-flush
57	If you have a toilet, what it is connected to? **[explain by showing pictures]**	□ 1. not connected to anything □ 2. Ventilated improved pit latrine □ 3. Pit latrine with slab □ 4. Pit latrine without slab/ open pit □ 5. Dual pit latrine □ 6. Bio-toilet □ 7. Piped sewer system □ 8. Septic tank □ 9. Open Drain □ 10. Open Pit □ 11. Open Field □12.other(Specify)_____
57.1	If pit latrine or septic tank, how far is this from the water source you or your neighbours use	□ 1 More than 30 meters (60 kadam) □ 2. Between 15 to 30 meters □ 3. Less than 15 meters (30 kadam)
58	Has sewage system ever overflowed in the past year?	□ 1. Yes □ 2. No
59	Does your water ever get contaminated due to mixing with sewage water?	□1.Yes □2. No □3. Don't know
59.1	If yes, Tell us the frequency of mixing of sewage water with drinking water:	□ Always □ Sometimes
60	If water contaminated due to sewage water in your area, then tell us when it is being high	□ Only during monsoons □ Only during Summer □ No specific season
61	What type of bathing facility do you use (tick multiple if applicable)	

Bathing facility	Availability
Proper bathroom within dwelling	
Temporary bathroom created within dwelling	
Shared bathroom (with extended family)	
Shared bathroom (with neighbours)	
Community bathroom	
Open ghat	
Others(specify)_	

g) Energy

S No	Question	Response
62	Electricity Connection	□ 1. Legal (metered)

		□ 2. Illegal □ 3. No electricity
63	What type of fuel is used in your house for cooking? (Tick as many as possible)	

Fuel	Tick as many as possible
1. Electricity	
2. LPG/natural gas	
3. Bio gas	
4. Kerosene	
5. Coal/lignite	
6. Charcoal	
7. Wood	
8. Straw/shrubs/grass	
9. Agricultural crop waste	
10. Dung cakes	
11. Forest waste/forest wood	
13.Others (specify)_____	

64	Where do you cook generally:	□ 1.Inside your house □2.Outside(Courtyard/ Veranda) □3.Outside (Street) □4.Multiple depending on season

h) Flooding

S No	Question	Response
65	Does your house get flooded in monsoons	□1.Yes □2. No
65.1	If yes, after how many hours of rainfall does the flooding happen:	□ 1. Less than one □ 2. One to Two □ 3. Three to Five □ 4. More than one-day □ 5. Can't Say
65.2	If yes, how many days in last one year?	
65.3	If Yes, Have you taken any actions to prevent flooding? If so, what?	
66	Has the street in front of your home ever been flooded	□1.Yes □2. No
66.1	If yes, how many days in last one year	
66.2	If yes , Within how many hours of rainfall does your street get flooded	□ 1. Less than one □ 2. One to Two □ 3. Three to Five □ 4. More than one-day □ 5. Can't Say
67	Due to flooding have you faced problems in preparing food for your family	□1.Yes □2. No
68	Have you ever lost work due to flooding	□1.Yes □2. No
68.1	If yes, how many days in last one year?	Number of days:_____

69	Has your child every missed school in the last year due to the flooding	□1.Yes □2. No
69.1	If yes, how many days in last one year	Number of days:_____
70	Have you ever lost property or raw material due to flooding	□1.Yes □2. No
70.1	If yes, Tell us the value of lost property or raw material due to flooding:_____	

i) Health

S No	Question	Response
71	Do you have children below 5 years of age	□1.Yes □2. No
71.1	If Yes, Have they had diarrhoea in the last six months	□1.Yes □2. No
71.2	If, Yes Number of episodes :_____	
71.3	Have they had Jaundice in the last year	□1.Yes □2. No
72	Has your child every missed school in the last year due to the heat waves	□1.Yes □2. No
72.1	If yes, how many days in last one year :_____	
73	Did any family members fall sick by being affected by any of the following diseases (If the respondent don't know the exact term, the enumerator can facilitate by listing two or three symptoms of the disease)	

	1.Yes/ 2.No/ 3.Not aware	If Yes, No. of family members affected	No. of Days of Illness	No. of work or school days lost
Heat-related				
Typhoid				
Malaria				
Diarrhea				
Dengue				
Jaundice				
Filariasis				

j) Investments in-house and Infrastructure

S No	Question	Response
74	Have you made any investments/changes in improving your house/ household infrastructure in the a)last one year: b)last 3 years:	 □1.Yes, □2. No □1.Yes, □2. No
74.1	If YES, What led you to make this investment/change:_____	
75	What were the improvements?	

Improvement	Tick as many as possible

	1. Mod Roof	
	2. Air Lite	
	3. Greening Roofing	
	4. More windows for ventilation	
	5. Change in design of home	
	6. Mosquito Screening	
	7. Using Mosquito nets	
	8. Regular cleaning of water storage tank	
	9. Water purification system	
	10. Toilet construction	
	11. Rain water harvesting	
	12. Improved water supply system	
	13. Connection to municipal tap	
	14. Solar Lighting	
	15. Solar Coolers	
	16. Roof Repair	
	17. Raising Plint level	
	18. Mosaic Roofing	
	19. Planting trees	
	20. Planting mosquito repellant shrubs	
	21. Other (Specify)_____	
	22. Parapet wall in front of house to prevent water from entering in	

75.1	How did you learn about the value of these improvements	
75.2	If you have invested to improve your house, How much money you have spent from your family	
76	Have you taken any loan to improve your house, if so tell us the amount	: _____ □2. No Loan obtained

76.1 If loan has obtained , please give the following details (Write only the codes)

Sr.no	Amount loan obtained Rs	Purpose of borrowing 1.Toilet 2. Bathroom 3. Water facility 4.Roof Repair 5. Kitchen 6. Wall Plaster 7. Flooring 8. Additional Room 9. Additional Floor 10. Other	Source of loan 1.Money lender 2. Friends 3.Relative 4.Neighbors 5. Self-help group 6. MFI 7. MHT 8.Bank 9.Other
1			
2			

77	Are you planning on future investments	□1.Yes □2. No

77.1	If yes, Why are you planning to invest	

k) Awareness about climate change

S No	Question	Response
78	Over the last ten years, have any of the following changes occurred? a. **Temperature rise** During summer During winter b. **Change in the rainfall patterns** c. Duration of winter season	 : □1.Yes □2. No □3.Not aware : □1.Yes □2. No □3.Not aware : □1.Yes □2. No □3.Not aware : □1.Yes □2. No □3.Not aware
78.1	If you say "YES" for one or more of the above, what do you think are the causes of the change?	□1. Not aware □2. Act of God □3.Other (please specify)
79	Do you know anything about climate change	□1.Yes □2. No
79.1	If, YES where you have heard/learned that _____	
79.2	If ,YES How have these changes affected you or your family:_____	
79.3	Is there anything you can do, either personally or as a group, to improve your situation?	

l) Community governance

S No	Question	Response
80	Does your community have any community-based organization (CBO/CAG)?	□1.Yes □2. No
80.1	If, yes does the CBO/CAG work well to help the community?:	□1.Very good □2.Good □3.Moderately good □4. Poor □3.Very poor
80.2	Are you involved with the CBO/CAG	□1.Yes □2. No □3.Not aware
80.3	If yes, what type of CBO	□1.MHT/SEWA promoted CBO □2.Self-help Group/Mahila Mandal/ Committee □3.Pani Samiti □4.Religious Samiti □5.Elders Group □6.Other (specify)_____
80.4	If involved with MHT, has she got any training in the following (Tick as many as applicable)	□1. CBO/CAG Training □2. Construction/Govt Services related □3. Climate Change related □4. Has participated but can't remember content □5. Others (Specify)_____

		□6. Not participated in any training □7. Don't know
81	Do you participate in CBO (MHT) meetings	□1.Yes □2.No
82	Do you receive any benefits by becoming a CBO member/MHT programme? If yes, what	□1.Increase in social standing □2. Ability to visit local government office □3. Increase in access to information □4. Ability to speak to councillor □5. Better, access to services at home □6. Other_____ (Specify) □7. No benefit
83	Has your household ever been a beneficiary of any of the government development schemes(Toilet construction, Connection to municipal tap)	□1.Yes □2. No □3.Not aware

2 Annex 2. Calculations for Risk and Susceptibility Scales

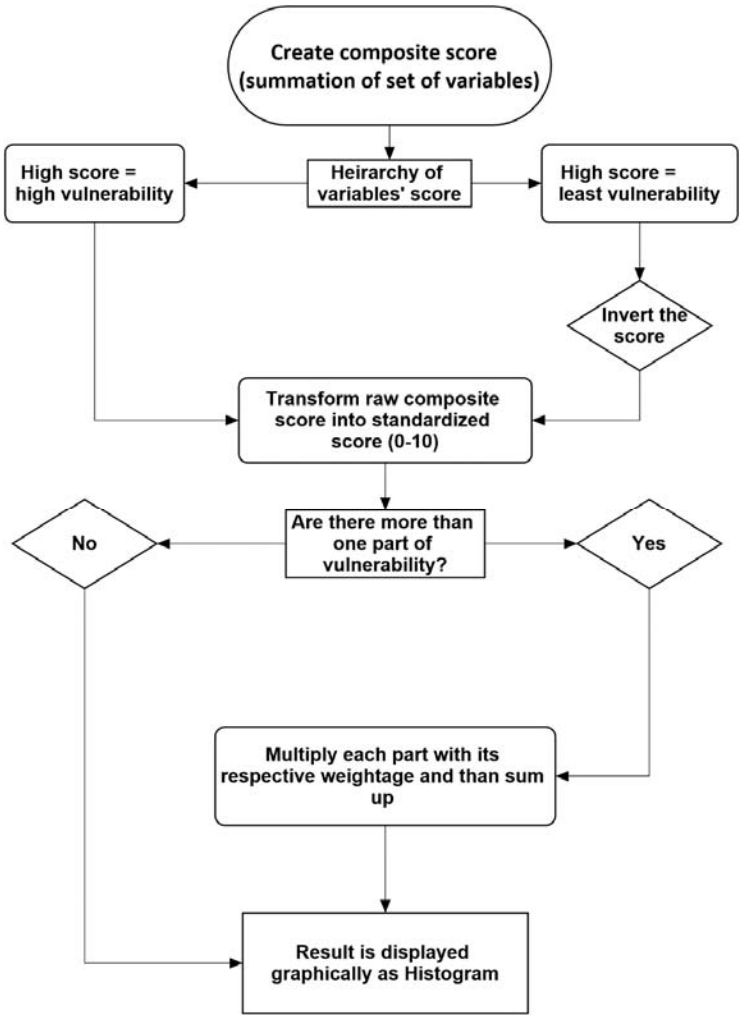
The baseline assessment provides data as to the existing demographics and conditions found in the slum communities wherein the project is being implemented. In addition, the data collected through the initial surveys serves as input into the calculation of five risk scales and two measures of susceptibility. As noted in the body of the report, the risk scores included: 1. Heat stress 2. Water adequacy/quantity, 3. Water quality, 4. Flooding and 5. Vector-borne disease risks. The two susceptibility scores included: 1. Financial capital and 2. Social capital.

The risks and susceptibility scores were developed from the baseline household survey data, and standardized to a 0 to 10 scale. The following sections explain the method employed, the variables used, and the weighting applied to construct each scale.

We begin by explaining the overall approach to constructing the scales.

2.1 Overall Method for Calculating the Risk and Susceptibility Scales

The flow chart below describes the stepwise approach for calcuating the Risks and Susceptibility scores.



There are total of 5 risks and 2 susceptibilities. All risks and susceptibilities can be calculated using the flow chart below except the Heat stress. Method for calculating heat stress is described seperately in section 2.2. More detail on the variables and weightings for each of the other scales are described in the subsequent sections.

- Identify variables to be included in the scale. All variables are derived from the baseline questionnaire.
- Convert nominal and ordinal variables into interval measures by assessing the impact of each variable on the characteristic under review. For example, tin, asbestos, and concrete roofs are assigned heat gain values based on their respective R-values (resistance to heat transfer per inch, times the typical thickness of said roofs), while household incomes are converted to scales based on the ratio of income to the corresponding poverty line associated with the household's size). Set the intervals such that all variable used to construct a specific scale are compatible. For example, relative to roofs, walls are assigned a lower heat gain value for a given R-value because summer heat gain on vertical surfaces (walls) is less than that of horizontal surfaces (roofs).
- Create a composite score for each household by summing up the values of the associated variables
    - Composite score = $variable_1$ + $variable_2$ + ……. + $variable_n$
- For all composite variables, an increasing value, once standardized, should indicate an increasing level of vulnerability. When composite variables increase as risk or susceptibility decrease (e.g., an increasing number of durable assets, a higher degree of home tenure, or a higher level of awareness of climate change), the values are inverted (such that an increasing value indicates a decreasing number of durable assets, a lower degree of home tenure, or a lower level of awareness of climate change). To calculate the inverted composite score:
    - Inverted composite $score_x$ = abs(Composite $score_x$ – (Composite $score_{max}$ + Composite $score_{min}$))
- Transform these raw scores into standardized 0 to 10 scales
    - Standardized score = Composite score / (maximum composite score/10)
- If the scale consists of more than one subscale, combine the scales through weighted averaging. In this study, social capital susceptibility and financial susceptibility have 3 and 4 segnents respectively. For social capital susceptibility, each of its component is weighted equally (33.33%). For financial susceptibility, income, structural properties, house ownership and assets were weighted 40 %, 17.5 %, 17.5 % and 25 % respectively.

2.2 Heat Stress Variables and Calculations

Heat stress scale consists of a heat gain score and a heat retention factor. The heat gain score is based on R values. R values measure thermal performance (the insulation and heat transfer capacity of material). The heat retention factor is the capacity of a structure to dissipate heat. This is calculated in terms of the ventilation of the home (total number of equivalent windows that open onto either open or closed outdoor spaces, with or without a fan to increase circulation). Finally, the climate of the city is incorporated into the heat stress measure to allow for inter-city comparisons.

The calculations are as follows:

- Heat gain score = Roof + HouseType + PersonsPerRoom + CookingFuel…

- Heat retention factor = NumberOfEquivalentWindows x OpeningsToOpenOutdoors x ElectricFanAssist
- Heat stress composites score = Heat gain score x Heat retention factor
- Finally, the heat stress composite score is multiplied by city multiplier, which is city specific heat index value, based on June's high temperature and humidity, averaged over the past 20 years. For Ahmedabad, Jaipur, Bhopal and Ranchi, city multiplier/heat index is 1.17, 1.06, 0.99 and 0.93 respectively. The heat stress scale = Heat stress composite score x city
- The final step is to generate 0-10 unit standardized score. Heat stress standardized score = Heat stress composite city multiplier score / (max. heat stress composite city multiplier score/10).

2.2.1 Heat gain score

Q. No.	Question	Response	Score
50	Type of roof	Any Other (Specify)	0
		Thatched (300 mm)	1
		Mod roof	2
		T girdle roof	2
		RCC Cement Roof	4
		Thatched (100 mm)	4
		Tile roof	5
		Stone roof	5
		Asbestos	6
		Plastic roof	8
		Tin Roof	10
6 & 52	No of individual per room (Family size/number of rooms)	0-3	0
		3-5	1
		5-7	2
		Above 7	3
49	Type of House (confirm record by observation)	Pucca	2
		Semi-pucaa	3
		Kuchcha	5
70	Cooking fuel	Efficient fuel	2
		Both efficient & Inefficient fuel	3
		No fuel = Both fuel	3
		Inefficient fuel	4

2.2.2 Heat retention factor

Q. 56: Cross ventilation & Q. 57: Windows opening on open/close space	Q. 27	
	without fan	With fan (Without fan*0.9)
Three or less windows opening on closed space without ventilation	1	0.9

Four or more windows opening on closed space without ventilation	0.9	0.81
Three or less windows opening on open space with ventilation	0.7	0.63
Four or more windows opening on open space with ventilation	0.6	0.54

2.3 Water Quantity Variables and Calculations

The water quantity risk scale is based on availability of water related facilities and experience about the water deficiency. It is a non-inverted score. The water quantity vulnerability includes variables/questions given in table 2.3.1.

The calculations are as follows:

- *Composite score:*
  - Water quantity composite score = Main source of water + Use of motorized pump + overall water adequacy in summer + Water adequacy for bathing + Discontinuity in water supply for more than two days (June 2016) + Purchase of water + loss of word due to water inadequacy + No. of days of lost work + Type of flush + Type of bathing facility
- *Standardized score/Scale (0-10 unit)*
  - Water quantity standardized score = Water quantity composite score / (max. water quantity composite score/10).

2.3.1 Water quantity

Q. No.	Question	Responses	Score
23	Main source of water	Water supply within dwelling	1
		Tube well/Bore well	3
		Community Water supply system	3
		From neighbours	4
25	Do you use a pump to get water from the municipal/ community water supply system?	Yes	0
		No	1
30	Is the quantity of water available in summer adequate?	Yes	0
		No	4
31	Do you have enough water in summer for bathing?	Yes	0
		No	4
32	Was there any discontinuity in the availability of water for more than 2 days in last month? June 2016	Yes	3
		No	0
34	Do you ever have to purchase the water? If yes, when	Daily for drinking and domestic	4
		Daily for drinking	3
		In summers for drinking and domestic use	3

		In summers for drinking	2
		Only sometimes during breakdowns	1
40	Have you ever lost work due to water stress:	Yes	4
		No	0
41	If Yes, how many days in last four months: Number of Days	0	0
		2 or less	2
		3 or more	4
61	What kind of flush/ toilet facility do members of your household use?	Flush	0
		Pour-flush	2
		pit latrine	3
		No flush	4
68	What type of bathing facility do you use?	Proper bathroom within house	0
		Shared bathroom	1
		Temp. bathroom within house	2
		Open ghat / No bathroom/Other	4

2.4 Water Quality Variables and Calculations

Water quality scale was constructed using variables related to the water purifying techniques and experience of bad water quality and consequences. The water quality risk is non-inverted scale. The variables/questions considered are given in table 2.4.1.

- *Composite score*
  - Water quality composite score = Main source of water with purifcation practice + observed quality of water + Water contamination due to mixing with sewage + Overflow of sewage system
- *Standardized score/Scale (0-10 unit)*
  - Water quality standardized score = Water quality composite score / (max. Water quality composite score/10).

2.4.1 Water quality

Q. No.	Question	Response	Score
23 & 39	Water purifier	Any source of water	0
	Don't do anything	MWS	1
	Some purification except purifier	MWS	2
	Some purification except purifier	Other than MWS	3
	Don't do anything	Other than MWS	4
36	Is the quality of water available good?	Yes	0
		No	3
37	Does your water ever get contaminated due to mixing with sewage water?	Yes	6
		Only during monsoons	3
		Don't Know	0

		No	0
64	Has sewage system ever overflowed in the last year? 2015	Yes	4
		No	0

2.5 Flooding and Stormwater Variables and Calculations

The flooding risk was calculated based in HHs experience regarding house and/or street flooding and loss of property. The flooding risk is non-inverted scale. The variables/questions list is given in table 2.5.1.

- *Composite score*
  - Flooding composite score = House and/or street flooding + Lost work due to flooding + Chldren missed school days + Loss of property or raw material
- *Standardized score/Scale (0-10 unit)*
  - Flooding standardized score = Flooding composite score / (max. Flooding composite score/10).

2.5.1 Flooding

Q. No.	Question	Response	Score
72-76	None	Yes	0
	Only street flooding	Yes	3
	Only house flooding	Yes	4
	Both	Yes	6
80	Have you ever lost work due to flooding?	No	0
		Yes	6
82	Has your child every missed school in the last year due to the flooding	No	0
		Yes	4
84	Have you ever lost property or raw material due to flooding	No	0
		Yes	8

2.6 Vector-based Disease Variables and Calculations

The VBD scale construction is based on the medical history and use of disease prevention technologies and practices. The VBD risk is non-inverted scale. The variables/questions considered are described in table 2.6.1.

- *Composite score*
  - VBD composite score = Medical history (malari and/dengue suffering) + Use of mosquito nets + Use of mosquito screen (window screen) + No. of domestic water storage container
- *Standardized score/Scale (0-10 unit)*
  - VBD standardized score = VBD composite score / (max. VBD composite score/10)

2.6.1 Vector based disease

Q. No.	Question	Response	Score

92	Have any of your family member affected by Malaria and/or dengue in last six months?	Malaria and Dengue	6
		Only malaria	4
		Only dengue	4
		None	0
55	Do you use mosquito nets while sleeping?	Yes	1
		No	2
54	Do you have any screens to block access of mosquitoes?	Yes	0
		No	2
24	Total no. of Storage container and plastic cans used to store domestic water	2 or less	0
		3 or 4	1
		5 and more	3

2.7 Financial Susceptibility Variables and Calculations

The financial susceptibility as described in section 3.5.2, has four components. Namely, 1. Assets, 2. Structural properties 3. House ownership and 4. Household income. Out of these four components, Assets, Structural properties and House ownership are the inverted scales, and HHs income is non-inverted scale. List of variables/question used for constructing each of these scale are given in table 2.7.1 – 2.7.4.

Overall financial susceptibility is combined weighted scale of these 4 scales. The method for calculation is as follows.

- *Composite score:*
  - Asset composite score = Mattress + Pressure cooker + Cot/bed + Table + Wall clock + Electric fan + Black & white TV + Sewing machine + Bicycle + Animal cart + Radio/transistor + Color TV + Other telephone + Refrigerator + Motorcycle + Computer + Car
  - Structural properties composite score = Type of house + Number of rooms + Main source of water + Type of sanitation facility + Tyoe of flush + Electricity connection + Type of fuel
  - House ownership composite score = Type of house ownership + Household tax
  - Income composite score = Equivalent total earning members + Type of occupation + Income with respect to poverty level
- *Inversion of 3 composite score:* Assets, Structural properties and House ownership
  - Inverted asset composite score = Composite score – (max. asset composite score + min. asset composite score)
  - Inverted structural properties composite score = structural properties composite score – (max. structural properties composite score + min. structural properties composite score)
  - Inverted House ownership composite score = House ownership composite score – (max. House ownership composite score + min. House ownership composite score)
- *Standardized score/Scale (0-10 unit)* : The formula remains same for inverted and non-inverted composite scores
  - Standardized score = Inverted OR Non-inverted composite score / (max. inverted OR non-inverted composite score/10)

- *Overall financial susceptibility standardized score* = (Assets standardized score* x 25/100**) + (Structural properties standardized score* x 17.5/100**) + (House ownership standardized score* x 17.5/100**) + (Income standardized score x 40/100**)
  *= inverted standardized scores
  ** = weightage of the components

2.7.1 Assets

Q. 21		
Asset No.	Asset – Durable goods	Score
1	Mattress	1
2	Pressure Cooker	1
3	Cot/Bed	1
4	Table	1
5	Wall clock	1
6	Electric Fan	2
7	B&W Television	2
8	Sewing machine	2
9	Bicycle	2
10	Animal cart	2
11	Radio/Transistor	3
12	Telephone other	3
13	Color TV	4
14	Water pump	4
15	Refrigerator	5
16	Motorcycle	5
17	Computer	6
18	Car	8

2.7.2 Structural properties

Q. No.	Question	Responses	Scores
49	Type of House	Kutchcha	0
		Semi-Pucca	3
		Pucca	6
52	Number of Rooms	One Room only (no kitchen)	1
		One Room with Kitchen	3
		Two Rooms only (no kitchen)	3
		Two Rooms with Kitchen	6
		More than two Rooms without kitchen	6
		More than two Rooms with kitchen	8

23	Main source of water	From neighbors	1
		Other	1
		Community Water supply system	2
		Tube well/Bore well	3
		Water supply within dwelling	4
60	Type of sanitation facility	Practicing ODF	0
		Pit latrine	1
		Community toilet	2
		Own toilet near dwelling	3
		Own toilet within dwelling	4
61	What kind of flush/ toilet facility does members of your household use?	No flush	1
		pit latrine	2
		Pour-flush	3
		Flush	4
69	Electricity Connection/ Source of light	No electricity	0
		Illegal	2
		Legal (metered)	4
70	Type of fuel	Inefficient	1
		Efficient (with kerosene)	3
		Both	3
		No response (Both fuel)	3

2.7.3 House ownership

Q. 46	Q. 48	
Ownership of Immovable Property	Don't pay tax	Pay tax (+2)
No titles with home on Government Land	0	2
Don't Own the house	0	2
Unauthorised occupation	1	3
Own but don't know ownership	1	3
Power of Attorney	2	4
Other (Specify)	2	4
Bhoodan	2	4
No Titles with home on Private Land	3	5
Gair Majura Land	3	5
License / Lease	4	6
Patta	7	9
Own land with clear titles	8	10
Own land but no titles	8	10
Khatyani	8	10
Clear Home Titles	8	10

2.7.4 Income

Q. No.	Question	Response	Scores
18	Equivalnet Total earning members (Full time earners + 0.3*Part time earners)	More than 2	0
		2	2
		1	3
19	Type of occupation (Respondent and family)	Stable + Stable	0
		Stable + Less stable	1
		Stable + Opportunistic	1
		Stable + NA	2
		Less stable + Less stable	3
		Less stable + Opportunistic	5
		Less stable + NA	7
		Opportunistic + opportunistic	7
		Opportunistic + NA	8
		No response	8
6 & 20	Poverty level (100 % B = poverty line income)	B >= 151	1
		101<B<150	3
		50<B<100	6
		B<50	9

2.8 Social Capital Variables and Calculations

There are three separate components of social capital, 1. General social capital, 2. CC awareness and 3. Community governance. The first segments describes general conditions eg. Education, literacy, marital status, community/caste type etc (table ___2.8.1). The second segment describes awareness related to climate change eg. Experience of changed weather conditions, cause of climate change etc (table 2.8.2) and third component is about respondent's pro-active measures and involvement in developmental activities (2.8.3). CC awareness and Community governance are inverted scales and General SC is non-inverted scale.

Overall social capital scale is calculated giving the equal (33.33 %) weightage to all three segments.

- *Composite score:*
  - General SC composite score = Marital status + Type of family + Type of community + Literacy + Education + Dependency ratio + Type of phone (family and/or respondent) + Residence time in the city + Aadhar and/or BPL card + Computer + Electricity connection
  - CC awareness SC composite score = Purpose of investment in last 3 years + Feel changes in climate/seasons + Cause of climate change + Where have you learned about CC
  - Community governance composite score = CBO in community + Helpfulness of CBO + Involvement in CBO and/or participation in meetings + Participation in training + No. of benefits of being CBO member/MHT programme
- *Invertion of composite score:* Climate change awareness composite score and Community governance composite score
  - Inverted CC awareness score = CC awareness composite score – (max. CC awareness composite score + min. CC awareness composite score)
  - Inverted community governance composite score = community governance composite score – (max. community governance composite score + min. community governance composite score)
- *Standardized score/Scale (0-10 unit)* : The formula remains same for inverted and non-inverted composite scores
  - Standardized score = Inverted OR Non-inverted composite score / (max. inverted OR non-inverted composite score/10)
- *Overall social capital susceptibility standardized score*: Sum of weighted standardized scores of General social capital, CC awareness and Community governance
  Overall social capital susceptibility standardized score = (General social capital x 33.33/100**) + (CC awareness* x 33.33/100**) + (Community governance* x 33.33/100**)
  *= inverted standardized scores
  ** = weightage of the components

General social capital

Q. No.	Question	Response	Score
4	Marital status	Married/ Unmarried	0
		Separated/divorced	2
7	Type of family	Joint	1
		Extended	2
		Nuclear	3
10	Type of community	General	0
		Other backward class	2
		Other	2
		Scheduled tribes	3
		Scheduled castes	4
11	Literacy	Can read and write	1
		Can read	2
		Can sign alone	3
		Can't read and write	4
12	Education	Post-Graduate/Graduate/Diploma	0
		Higher Secondary (11th-12th Std.)	0
		Secondary (6th-10th Std.)	1
		Primary (upto 5th class)	2
		Other	3
		Didn't go school	3
6 & 18	Dependency ratio (FT earning members/Total family members)	Above 0.70	1
		0.51-0.70	2
		0.21-0.50	3
		0-0.20	4
13 & 14	Type of phone family and respondent (F = Family; R = Respondent)	F = Smart; R = Smart	0
		F = Smart; R = Ordinary	1
		F = Ordinary; R = Smart	1
		F = Ordinary; R = Ordinary	2
		F = Smart; R = no phone	3
		F = Ordinary; R = no phone	3
		F = no phone; R = Ordinary	3
		F = no phone; R = Smart	3
		F= no phone; R = no phone	4
15	How long have you been residing in the city (Years)	More than 15 years	0
		11-15 years	1
		7-10 years	2
		4-6 years	3

		0-3 years	4
16 & 17	Aadhar card & BPL card	Have both Aadhar and BPL card	0
		Have only Aadhar card	1
		Have only BPL card	1
		Don't have either	3
21	Computer	Yes	0
		No	3
69	Electricity connection	Legal	0
		Ilegal/No connection	4

2.8.1 Climate change awareness

Q. No.	Question	Response	Score
93 & 94	Investment in last 3 years	No Investment	0
		Yes for reasons like family expansion, son's marriage, etc / Other reason	2
		Yes for improved living conditions like access to water and sanitation	4
		Yes for improved CC resilience like heat stress	6
102	Do you feel any change in Rise in temperature (summer, winter) , Rainfall (pattern, duration)	Feel no changes	0
		Feel only one change	1
		Feel at least 2 changes	2
		Feel at least 3 changes	3
		Feel all four change	4
103	Cause of Climate change	Act of God	0
		Not aware/No response	2
		CC, Urbanization, pollution	4
104 & 105	From where have you learned about climate change	No response/haven't heard	0
		MHT	3
		Self-learned(news, observation, school,study, perception)	4

2.8.2 Community governance

Q. No.	Question	Response	Score
108	Does your community have CBO? (those who have CBO have responded to Q. 109)	No CBO (108)	0
		Not aware of CBO	0
109	Does your community have CBO? If yes, How helpful is it	CBO is there but ranks very poor in helpfulness	3
		CBO is there but ranks poor in helpfulness	4
		CBO is there and ranks moderately good in helpfulness	4

		CBO is there and ranks good in helpfulness	5
		CBO is there and ranks very good in helpfulness	6
110 & 113	Involvement in CBO and Participation in Meetings	No involvement at all	0
		Involvement in only CBO	3
		Involvement in only Meeting	3
		Involvement in CBO and Meeting	5
112	Training (CC, Construction, CBO/CAG)	Who haven't participated or don't know	0
		Who underwent training but don't remember	3
		Who underwent training and remember	6
114	Do you receive any benefits by becoming a CBO member/MHT programme?	Benefits_none	0
		Benefits_only_1	1
		Benefits_2	2
		Benefits_3	3
		Benefits_5	4
		Benefits_4	4
		Benefits_6_SC	4

Endnotes

[i] *"Cheers Ahmedabad! City is racing ahead". DNA India. Archived from the original on 18 October 2010. Retrieved 23 July 2017.*

[ii] WHO-UNICEF (2015). *Achieving the malaria Millennium Development Goals Target*.

[iii] *Malaria in India*, http://www.malariasite.com/malaria-india/, retrieved on 7/26/2017.