	Title of Entry	
1.1	Title of Sponsored Work	Interdisciplinary research to examine the Urban Heat Island intensity in Delhi NCR and its effect on vulnerable communities.
1.2	Name of TERI SAS Department/ Centre (s) involved	DNR
1.3	Туре	Research Project
2.1	Sponsoring Agencies	Housing and Urban Development Corporation Limited, Ministry of Housing and Urban Affairs, Government of India in India.
2.2	Location of work/activity	India
3.1	List of partnering Institutions involved	TERI University
3.2	Lead Partner	
4.1	Begin Date	01/07/2015
4.2	Completed or Ongoing	Completed
4.3	End Date	31/03/2018
5.1	Principal Investigator(s) Internal	Dr Y Nithiyanandam
5.2.	Principal Investigator(s) External	
5.3	Co-Principal Investigator(s) –Internal	Dr Shaleen Singhal
5.4.	Co-Principal Investigator(s)External	
5.3	Associated Researcher(s) internal	NA
6.1	Amount Sanctioned	5,00,000 INR
6.2	Amount received	5,00,000 INR
6.3	In Kind support	Materials, manpower, books, brainstorming events and instruments.
7.1	Description of work and activities	The study aims at adopting a multi-disciplinary approach to examine the intensity of urban heat island in Delhi /NCR and its effect on vulnerable communities. The objectives of this study are: (i) To map urban heat island intensity at higher spatial and temporal resolutions using thermal infrared satellite images and validate through

		 empirical data collection and analysis for the Delhi NCR region. (ii) To evaluate select stressed areas in Delhi NCR identified based on indicators including urban heat island effect and other relevant urban development indicators. (iii) To examine urban heat island influence on urban community particularly
		the vulnerable population of urban poor in select stressed areas in Delhi NCR. (iv) To develop policy recommendations for strengthening community resilience against the UHI impact.
7.2	Project Reach, engagements and beneficiaries, if applicable	Two slum settlements in South Delhi
8.1	List of Publications including dissemination through social media	
8.2	Links to Events page, if any	
9.	Executive Summary and other documents	With rapid urbanisation cities are facing severe heat stress during summer. Urban Heat Island (UHI) is identified as a serious factor causing thermal discomfort to people living in urban areas. Several research works have been carried out across globe to map different dimensions of UHI and its impact on urban microclimate, environment, health, people, energy consumption, etc., Majority of research works are quantitative and limited number of them are qualitative in nature. In the case of India maximum number of works focusses on quantifying UHI intensity using remote sensing techniques (satellite images) and others followed the classical field investigation to quantify UHI by measuring air temperature at the canopy layer level. An amalgamation of satellite and land-based measurements are required to map UHI intensity for detailed studying of its influence, pattern and trend. Secondly, the focus was largely limited to urban build environment and the urban villages / slums were simply neglected in existing literatures. May due to a fact that it has less impervious surfaces and expected to be cooler compared with the adjacent built-up areas. However, the anthropogenic heat released in an adjacent building may likely move toward the slums/ villages and increases the danger of heat stress to that community which are facing challenges due to lack of delivery of basic urban services such as water provision. Delhi NCR would be an ideal place for this study since it has a significant number of urban villages / slums adjacent to the residential and commercial areas which are the large possible sources for anthropogenic emission and experiencing hot summers.

To add value to existing literature on UHI measurement, and to newly contribute on the thermal comfort of urban slums and its relation to UHI are studied in this research. The results are arranged into two parts (part 1 and part 2) to get a holistic view on two different aspects – UHI mapping and thermal comfort, separately. The Part 1: ,Understanding the seasonal pattern of Urban Heat Island and its spatial relationship to surface characteristic in Delhi NCR for the period of twenty-five years (1990-2015) ^c discuss the technical aspects of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		
contribute on the thermal comfort of urban slums and its relation to UHI are studied in this research. The results are arranged into two parts (part 1 and part 2) to get a holistic view on two different aspects – UHI mapping and thermal comfort, separately. The Part 1: ,Understanding the seasonal pattern of Urban Heat Island and its spatial relationship to surface characteristic in Delhi NCR for the period of twenty-five years (1990-2015)' discuss the technical aspects of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		To add value to existing literature on UHI measurement, and to newly
studied in this research. The results are arranged into two parts (part 1 and part 2) to get a holistic view on two different aspects – UHI mapping and thermal comfort, separately. The Part 1: ,Understanding the seasonal pattern of Urban Heat Island and its spatial relationship to surface characteristic in Delhi NCR for the period of twenty-five years (1990-2015)' discuss the technical aspects of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		contribute on the thermal comfort of urban slums and its relation to UHI are
 2) to get a holistic view on two different aspects – UHI mapping and thermal comfort, separately. The Part 1: ,Understanding the seasonal pattern of Urban Heat Island and its spatial relationship to surface characteristic in Delhi NCR for the period of twenty-five years (1990-2015)' discuss the technical aspects of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season. 		studied in this research. The results are arranged into two parts (part 1 and part
comfort, separately. The Part 1: ,Understanding the seasonal pattern of Urban Heat Island and its spatial relationship to surface characteristic in Delhi NCR for the period of twenty-five years (1990-2015)' discuss the technical aspects of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		2) to get a holistic view on two different aspects – UHI mapping and thermal
Heat Island and its spatial relationship to surface characteristic in Delhi NCR for the period of twenty-five years (1990-2015)' discuss the technical aspects of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		comfort, separately. The Part 1: ,Understanding the seasonal pattern of Urban
for the period of twenty-five years (1990-2015)' discuss the technical aspects of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		Heat Island and its spatial relationship to surface characteristic in Delhi NCR
of UHI mapping through remote sensing. It also addresses the temporal change in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		for the period of twenty-five years (1990-2015)' discuss the technical aspects
in UHI intensity in Delhi over a span of twenty-five years. This is taken to understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		of UHI mapping through remote sensing. It also addresses the temporal change
understand the UHI expansion, which is trusted to raise on with rapid land use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities [*] discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		in UHI intensity in Delhi over a span of twenty-five years. This is taken to
use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		understand the UHI expansion, which is trusted to raise on with rapid land
comfort of vulnerable communities' discuss heat stress through a vulnerability assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		use/land cover changes. The Part 2: ,Impact of urban heat islands on thermal
assessment, thermal comfort assessment, multiple scenario assessment and policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		comfort of vulnerable communities' discuss heat stress through a vulnerability
policy study. This component eyes the severity of UHI impact on vulnerable communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		assessment, thermal comfort assessment, multiple scenario assessment and
communities (especially urban slums) and adaptive measures used by them to tackle heat during summer season.		policy study. This component eyes the severity of UHI impact on vulnerable
tackle heat during summer season.		communities (especially urban slums) and adaptive measures used by them to
		tackle heat during summer season.