
Scoping Study for Policy Initiatives to minimize Urban Heat Island Effect for Low Carbon Urban Growth

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&**

Ashok B. Lall Architects

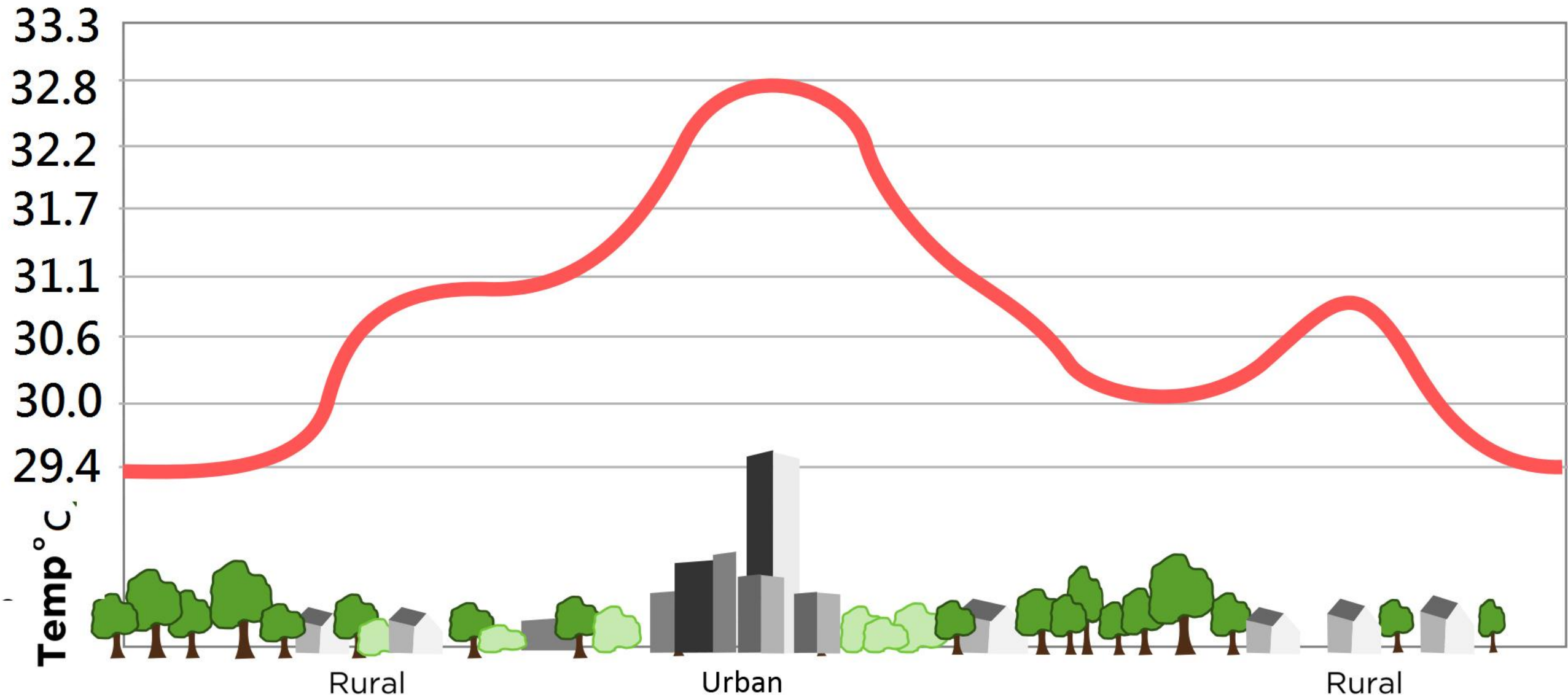
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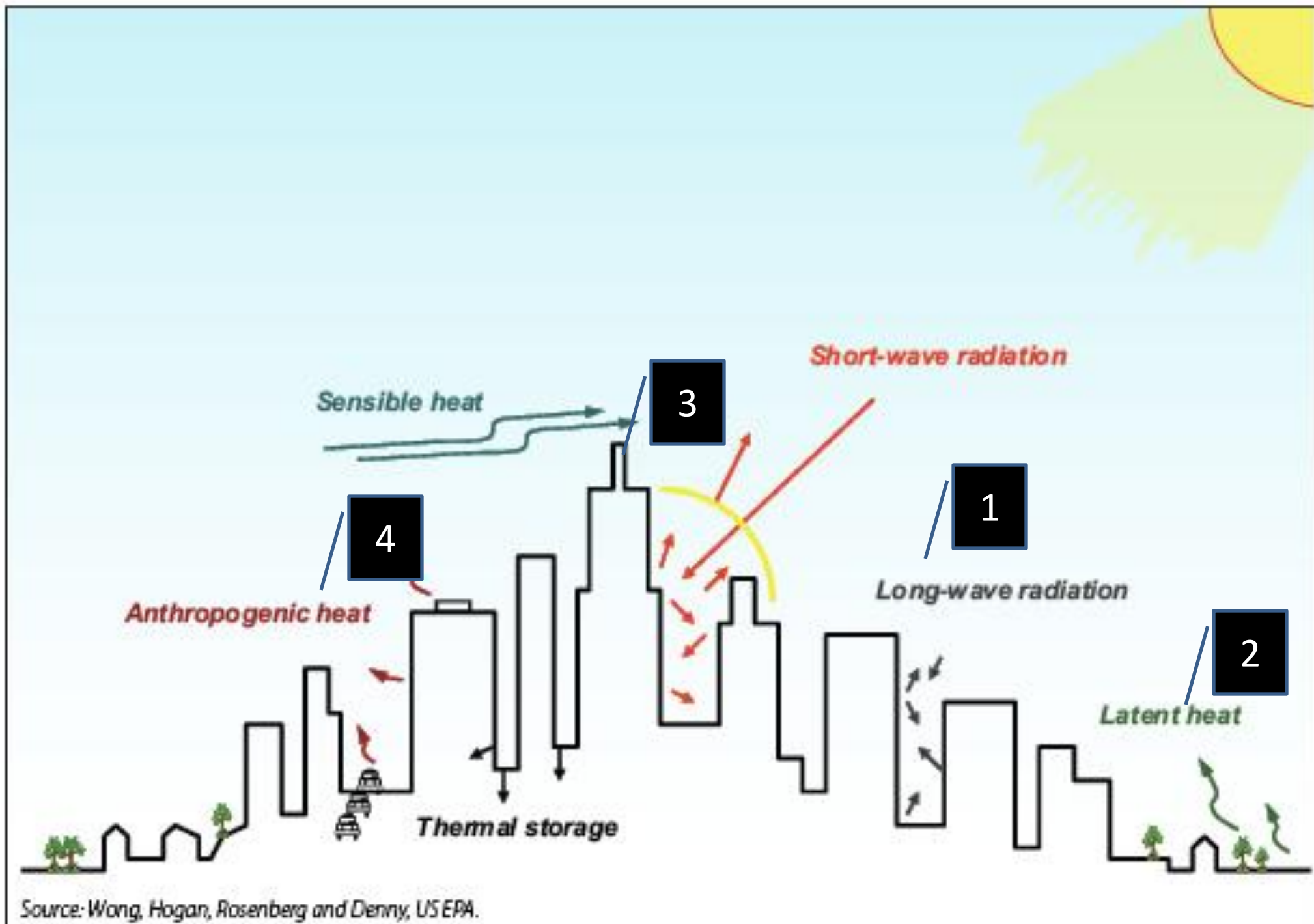


URBAN HEAT ISLAND

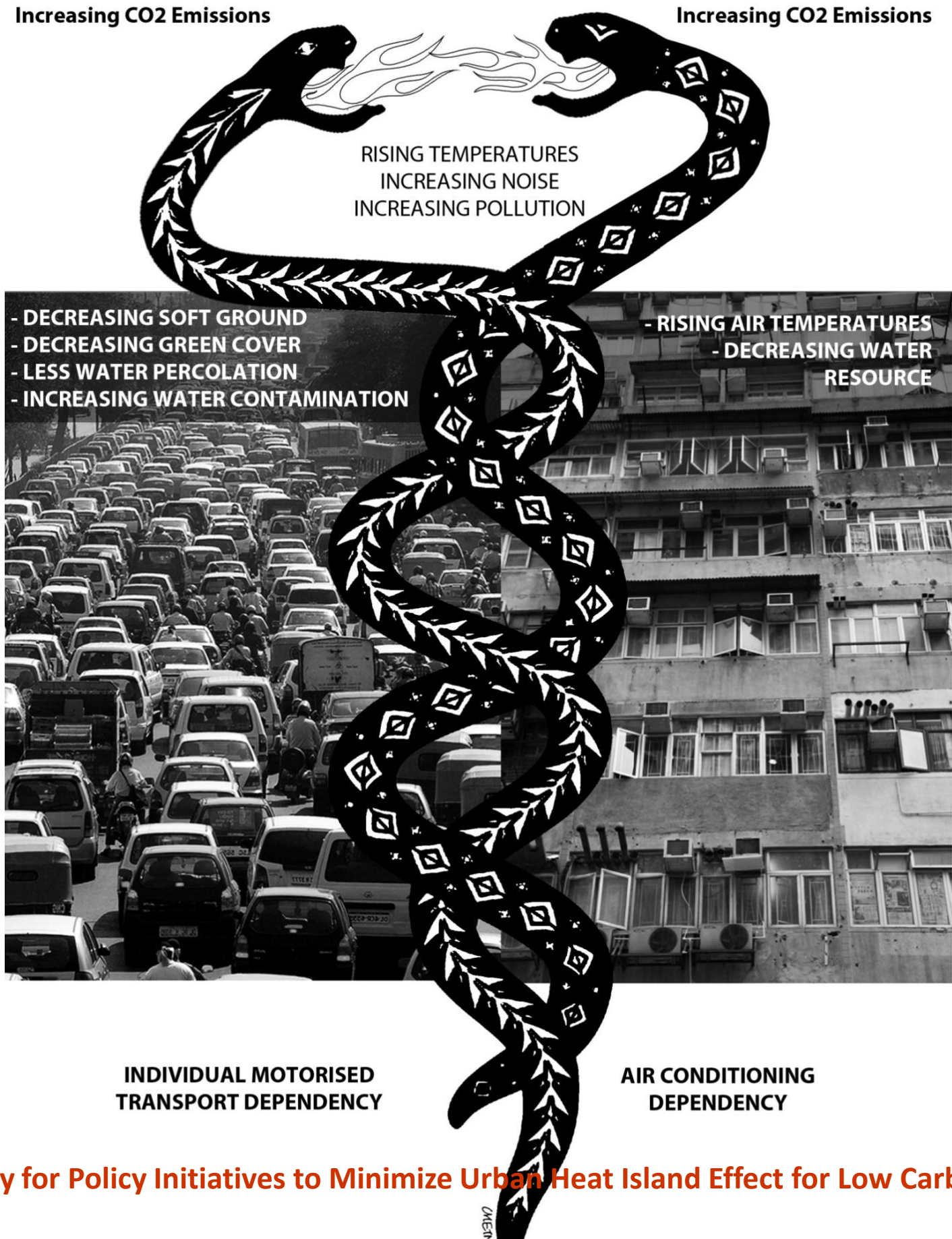
“Heat island” is an area specific phenomenon where the temperature of one area is higher than that of the surrounding areas.

Source: USEPA



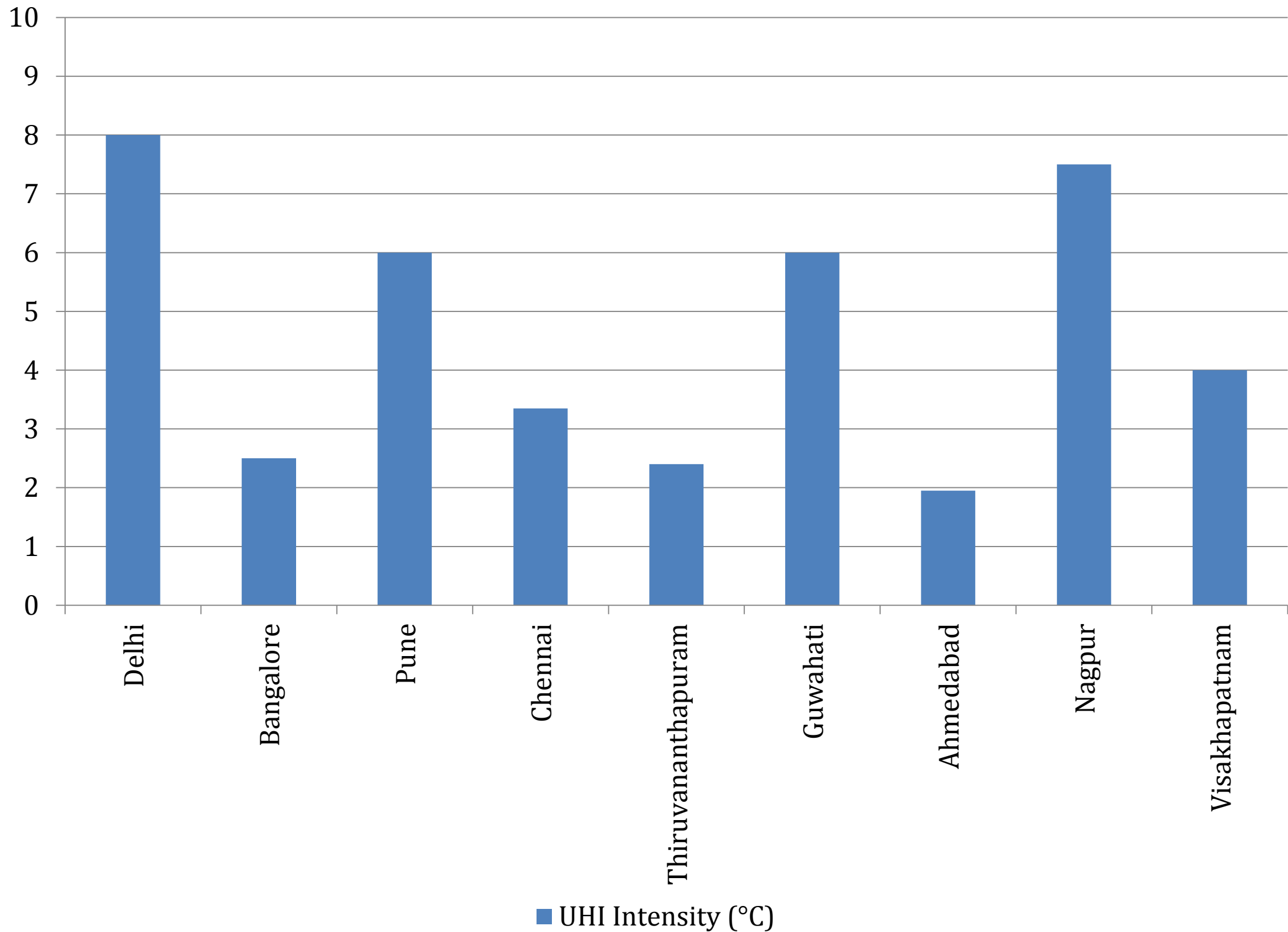


Viscous cycle affecting health & economics

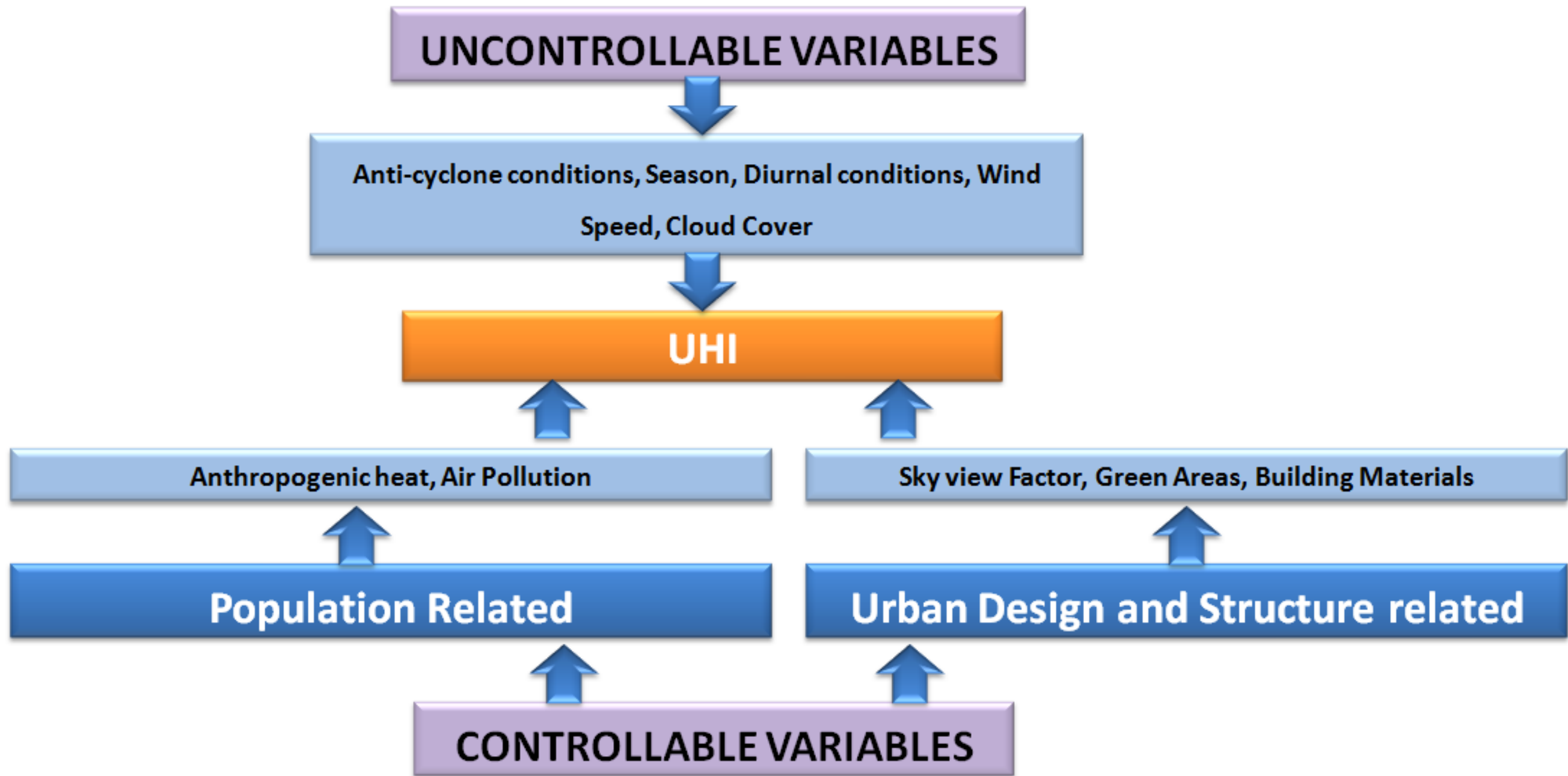


Source: ABL

Status of Research - India

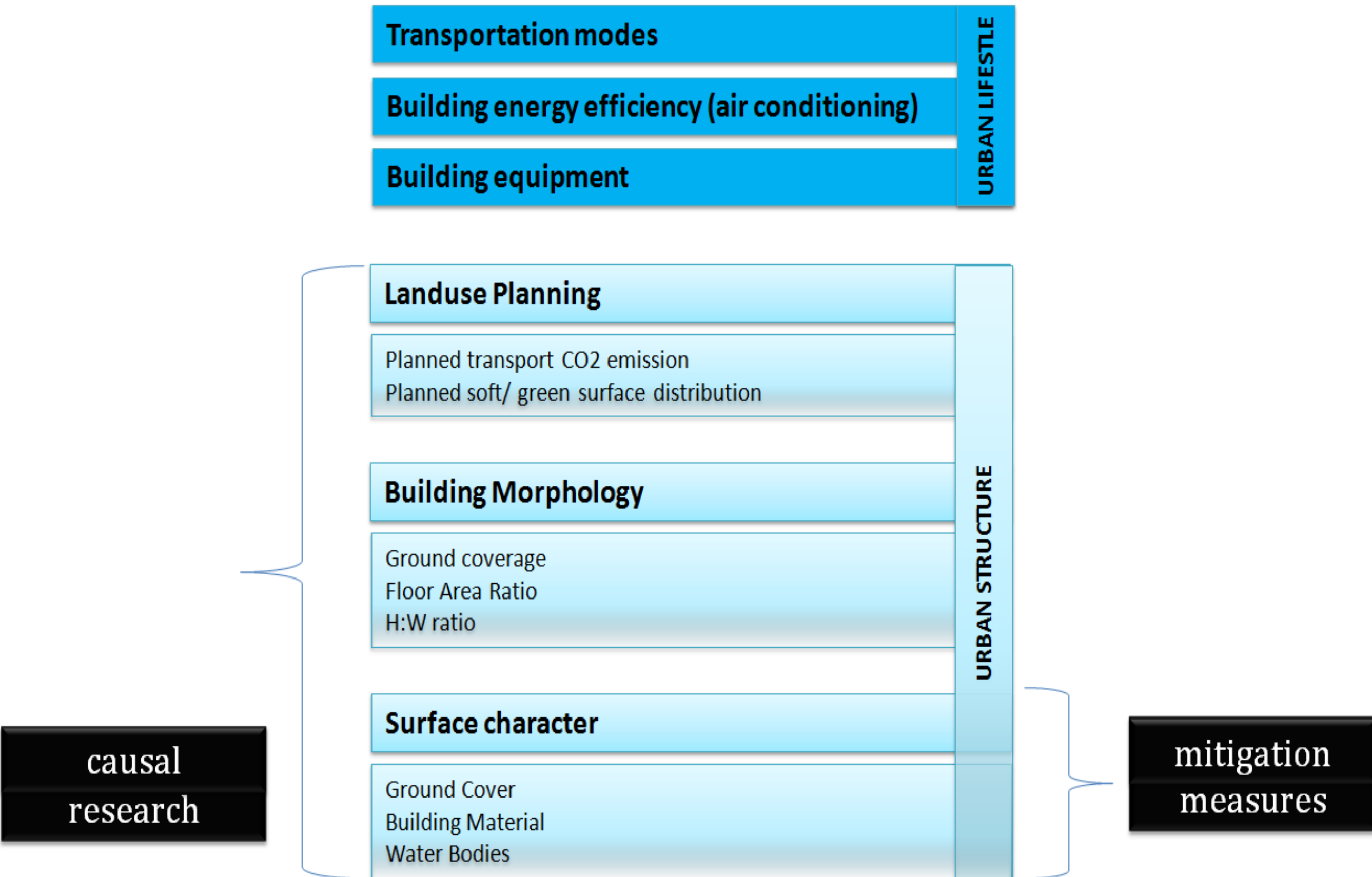


CAUSAL FACTORS

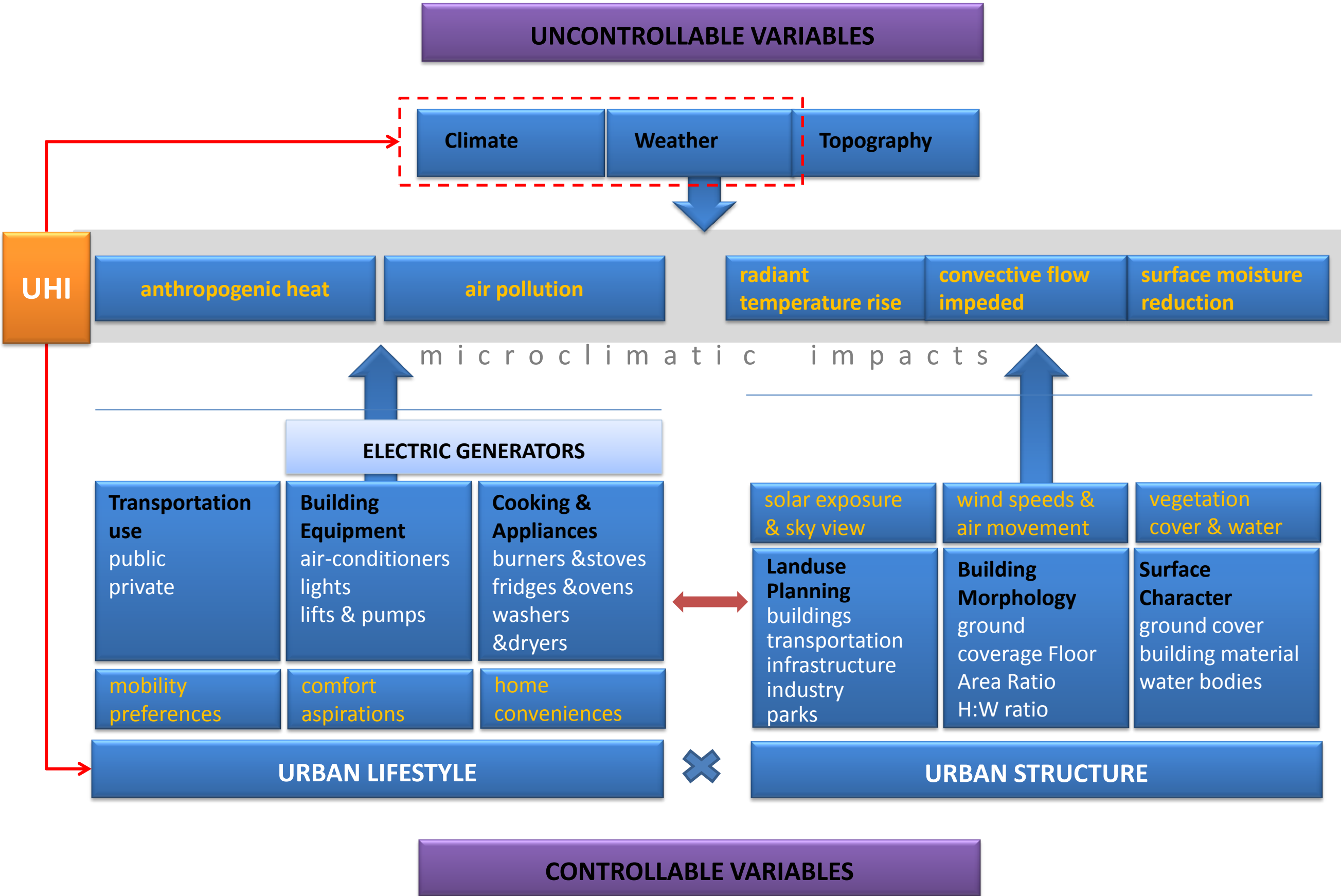


Source: (Memon, Leung, & LIU, 2007)

Summary of Research Findings



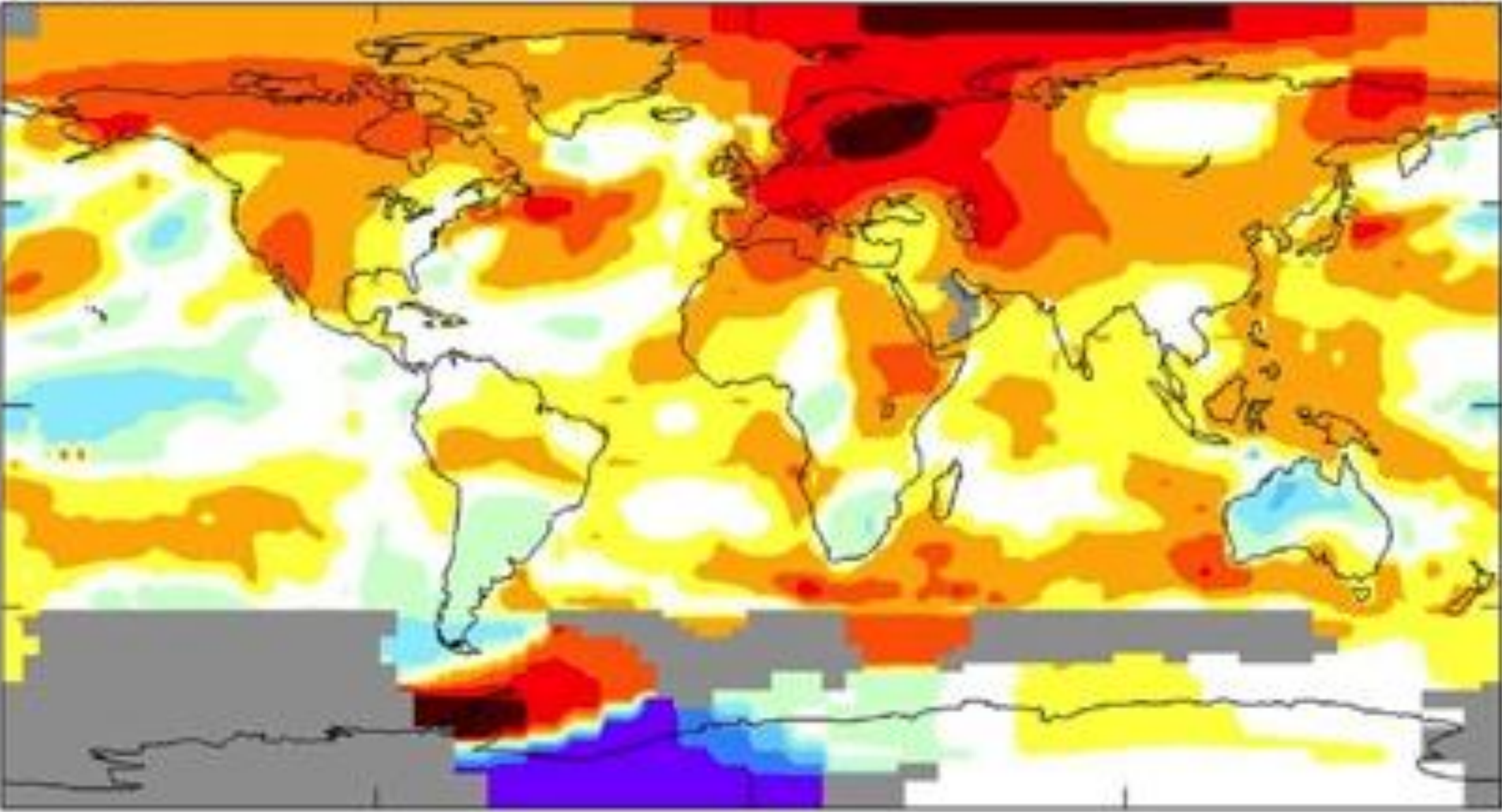
DESCRIPTIVE FRAMEWORK



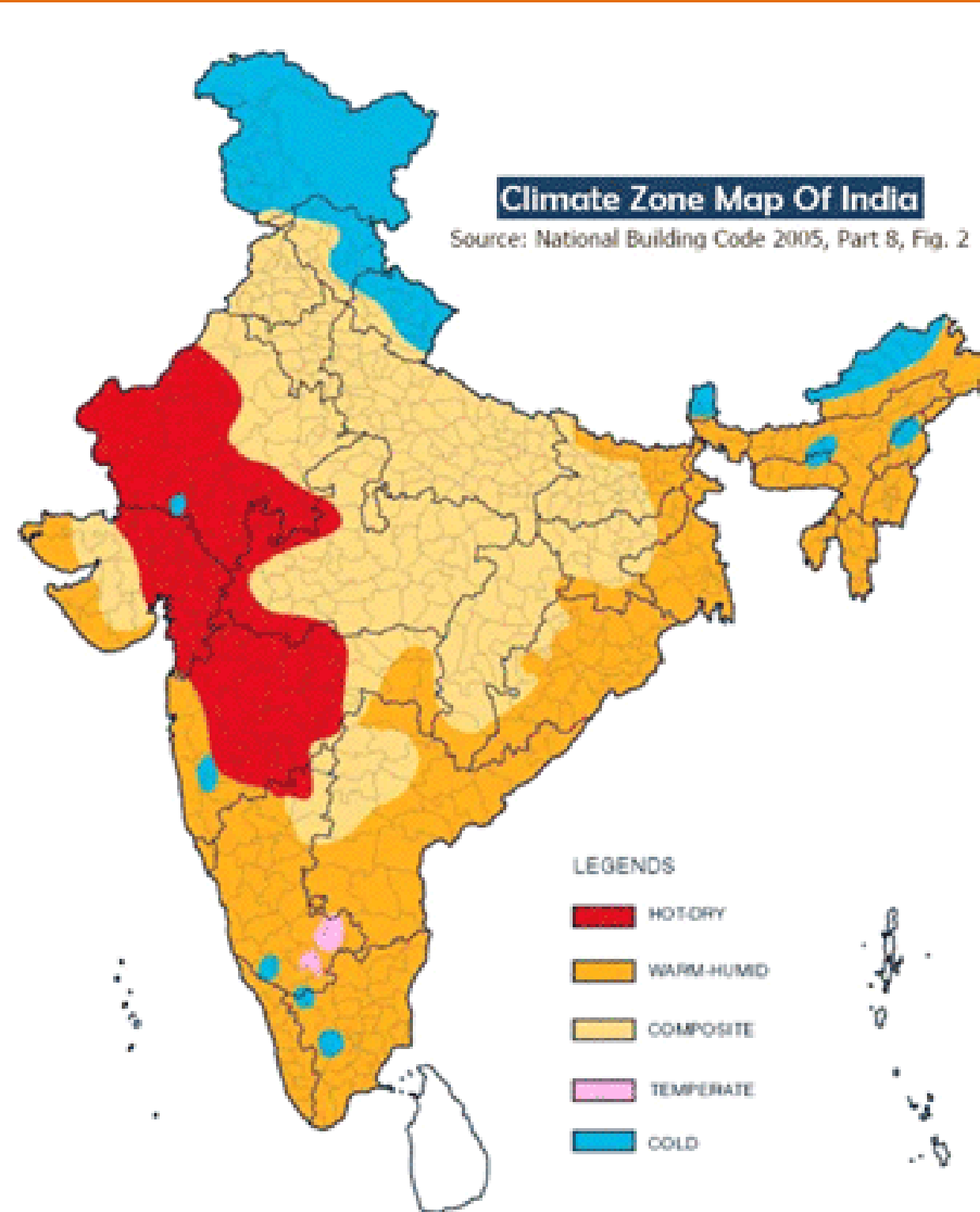
Surface Temperature Anomaly (°C)

(a) 2000

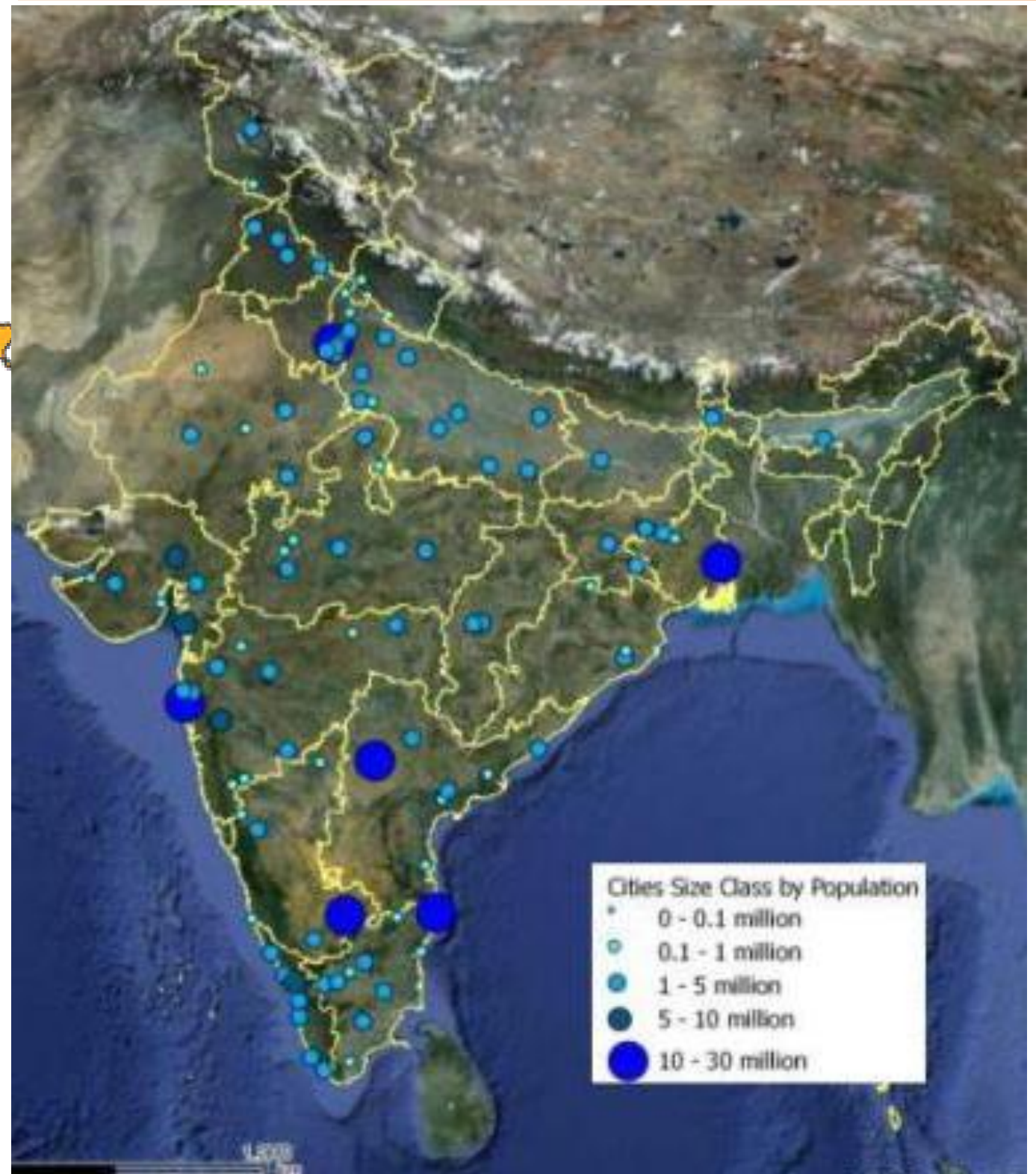
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Climate Zones of India compared with projected urban growth for 2031



(source ECBC, 2007)



(source: IIHS)

Policy instruments for possible UHI Interventions : INDIA

Climate Change

Global warming

GOI initiatives

National Action Plan on Climate Change

National Solar Mission

National Mission for Enhanced Energy Efficiency

National Mission on Sustainable Habitat

National Water Mission

National Mission for Sustaining the Himalayan Ecosystem

National Mission for a "Green India"

National Mission for Sustainable Agriculture:

National Mission on Strategic Knowledge for Climate Change

Planning Commission Low Carbon Strategies for Inclusive Growth

Power Sector

Transport Sector

Industry

Buildings

Forestry

Urban Heat Island

Local warming

Transportation use

Building equipment

Cooking & Appliances

Urban Lifestyle

Landuse Planning

Buildings & Industries
Transport & other infrastuture
Green cover distributuion

Building Morphology

Ground coverage
Floor Area Ratio
H:W ratio

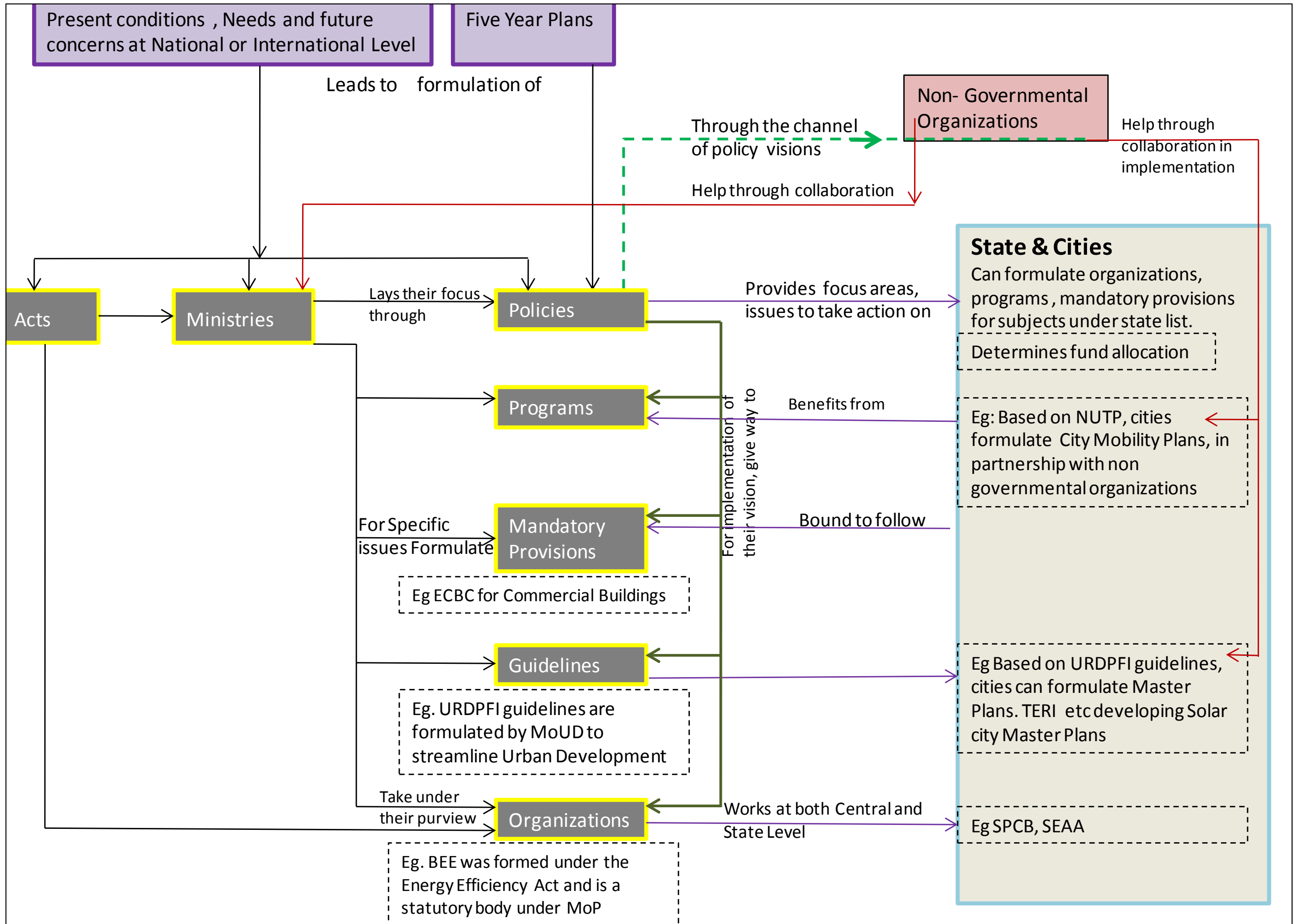
inadequately addressed

Urban Structure

Surface character

Ground Cover
Building Material
Water Bodies

Governmental and Non-Governmental organisational structure Legislative Framework



Overview of Indian Policy Instruments w.r.t UHI

Direct mention/ addressal

UHI indirectly Implied

Urban Heat Island						
Policy Instruments	Acknowledgement of UHI effect	Identification of Causal Factors				Implementation Suggestions
		Suggested Mitigation Measures				
		Land-use Planning	Building Morphology	Surface Characteristics	Urban Lifestyle	
MoEF						
National Environmental Policy	Focus: Prevention of Env degradation					Setting up env. standards, Action plans, Env Clearance
National Mission on Green India	Mission is in the context of Climate Change					
		increasing green cover		increasing green cover		
National Conservation Strategy & Policy Statement on Environment & Development	Stresses integration of env. safeguards in development policies					Pollution abatement through setting up standards and monitoring
Environment Clearance (EC/EIA)	acknowledged as a contributor of air pollution Temperature rise		Built up density	Surface material properties	Mentions: We are moving towards Energy intensive lifestyle.	
		Increase green areas, decentralization of urban center.	Design Methodologies	increasing vegetative & tree cover, pervious & reflective surfaces.		

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MoUD						
National Mission on Sustainable Habitat	UHI effect adds on and intensifies climate change . UHI→Increased demand for cooling & air-conditioning equipment →generating heat & adding to rising temperatures & GHGs	Loss of vegetative cover			Condemns lifestyle tends of increasing AC use	Formulation of – National Urban Policy, Sustainable habitat standards, policies in support of energy efficiency
		Good urban Planning	adopting appropriate urban design measures	increasing green cover, using cool roofs	Public transport	
National Urban Transport Policy						
		integrated land-use transport planning			promoting use of non motorized transport	
Urban and Regional Development Plan Formulation and Implementation	the basic form of our urban centres					
		Open spaces	Green ,Compact, Smart cities. planning as per solar & wind orientation	Green roof, open spaces, pervious ground cover.		
JNNURM						
Model Building Bye Law						Municipalities can engage public or private organization for research.

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MNRE-						
National Solar Mission						Solar -Master Plan
MoP-						
National Mission for Enhanced Energy Efficiency						
					Energy efficient appliances	
Bureau of Energy Efficiency			Energy efficient buildings		Energy efficient appliances	Manual on cool roof
Energy Conservation Building Code (ECBC)	Urban Area warmer than surrounding,. Leads to increased use of AC's and refrigeration in hotter cities.	Modification of land surface by Urban Development			Waste heat generated by energy usage	
			Energy efficient buildings	Cool Roofs		

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Local Govt						
DDA- UTTIPEC						
Street Design Guidelines 'for equitable distribution of road space'	Recognizes UHI effect as an environmental impact causing climatic discomfort.					
				High Albedo Material, trees, reflective paving		
Surat and Indore Municipalities (Supported by TARU)	Recognizes the difference in air temperatures of dense urban areas with rural areas					
			Passive Ventilation Techniques	Cool Roof		
Non Govt						

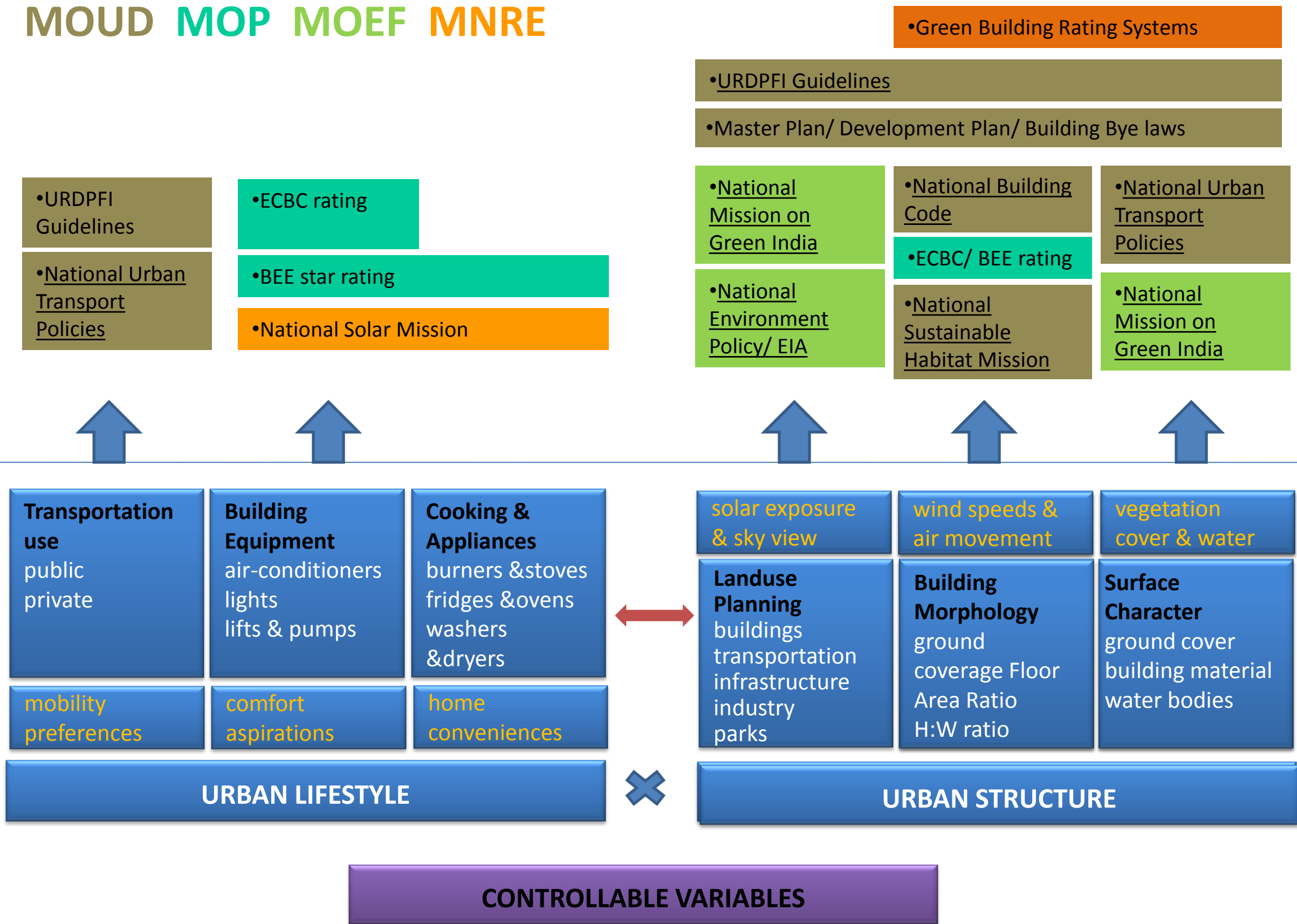
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Rating Systems						
ICBC (LEED) Rating						
				min 50% roof area & non roof area under shade/ vegetation & or high reflective material		
GRIHA	Urban Heat Island Effect (UHIE) refers to a phenomenon common to dense urban clusters . This phenomenon is extremely pronounced in metropolitan cities .		Dense urban clusters restrict the flow of wind	Hard paved surfaces		
		site planning of large developments must be to reduce the overall heat build-up	Medium or low-rise buildings with wide spacing	Criteria 5 – Reduction of UHI by reducing paved areas, increasing green cover, application of high SRI material, green roof		

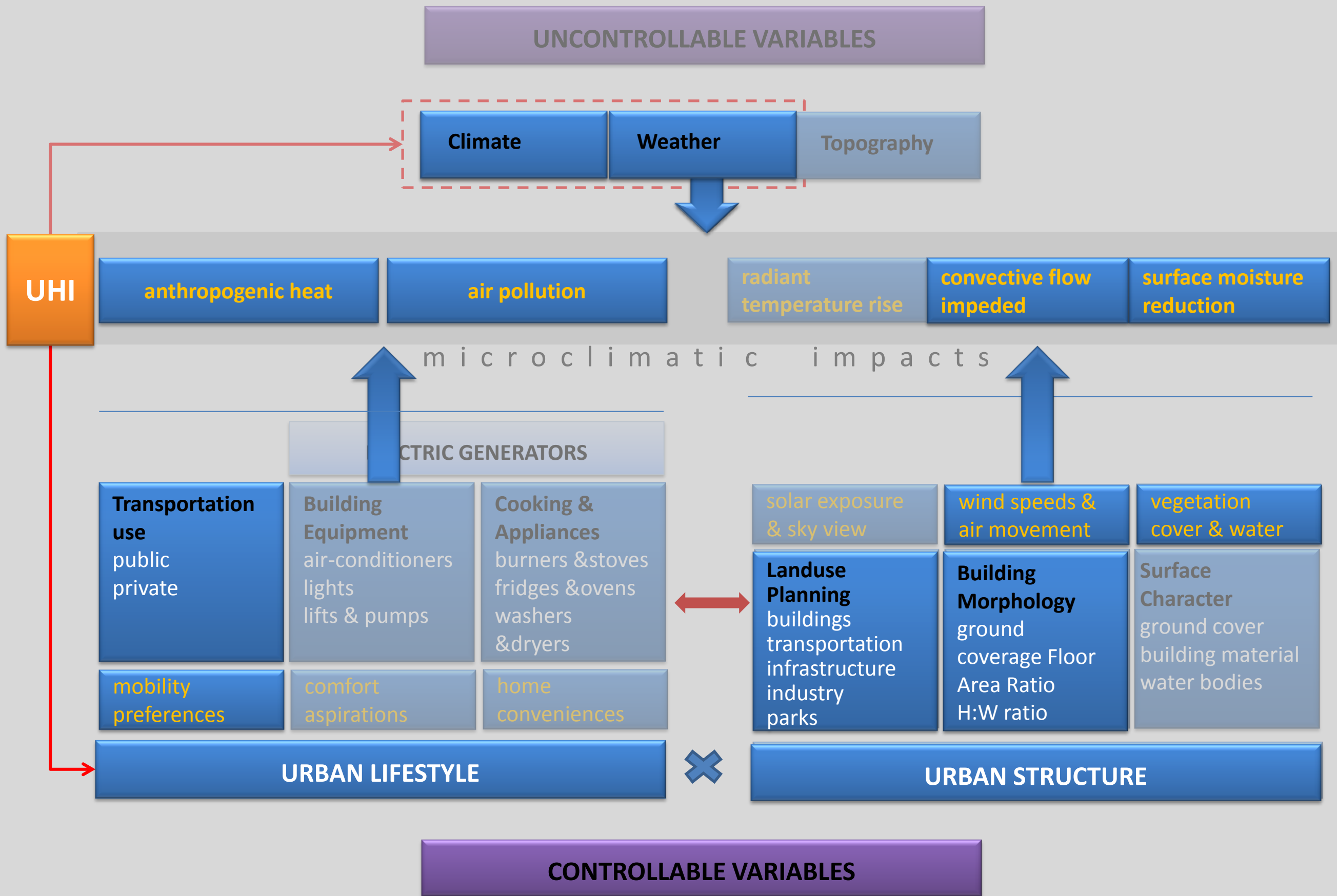
Rating systems although have given UHI due recognition, the points for ratings given are evaluated on basis of surface characteristics majorly.

Linking Descriptive model to policy instruments for possible UHI Interventions

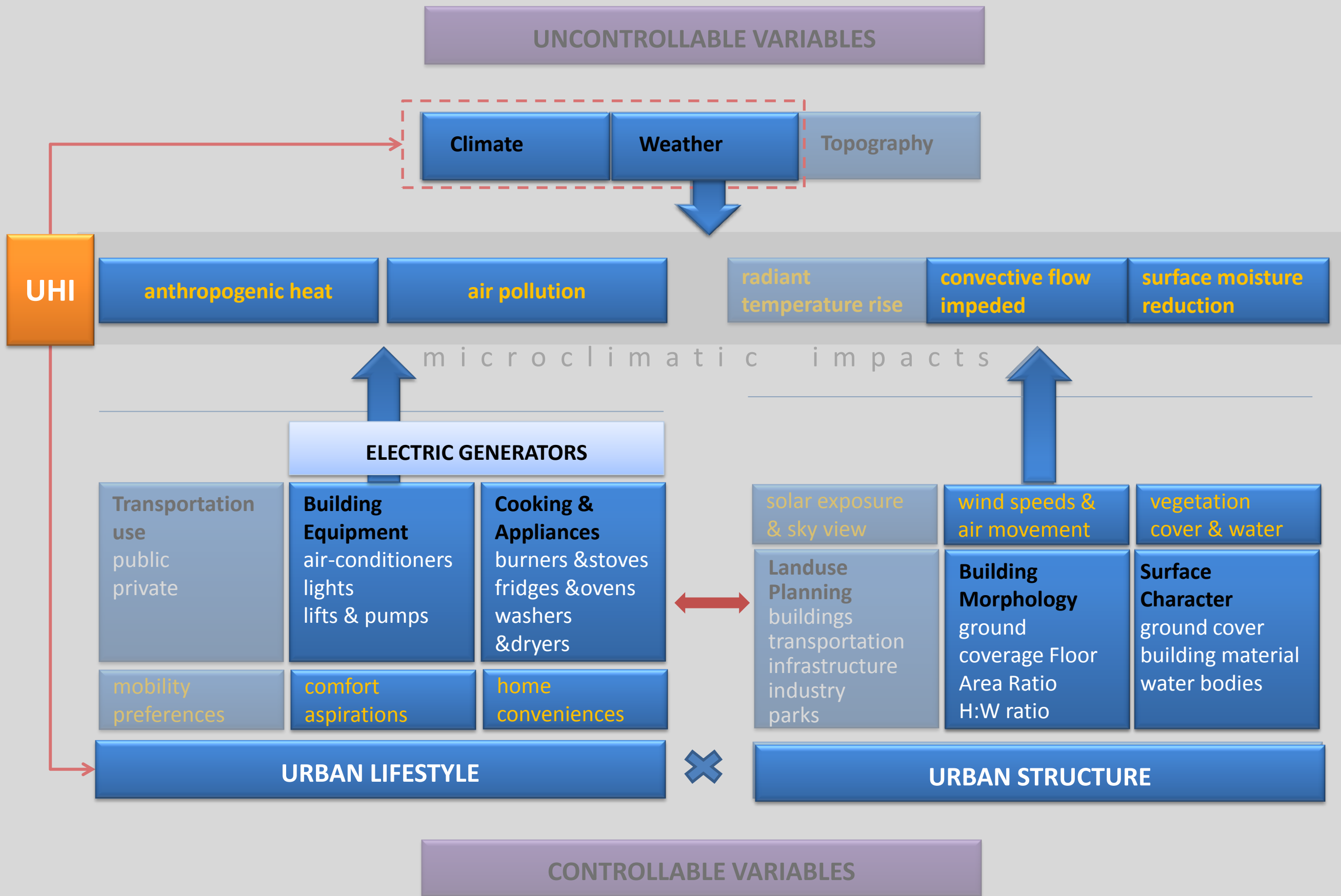
MOUD MOP MOEF MNRE



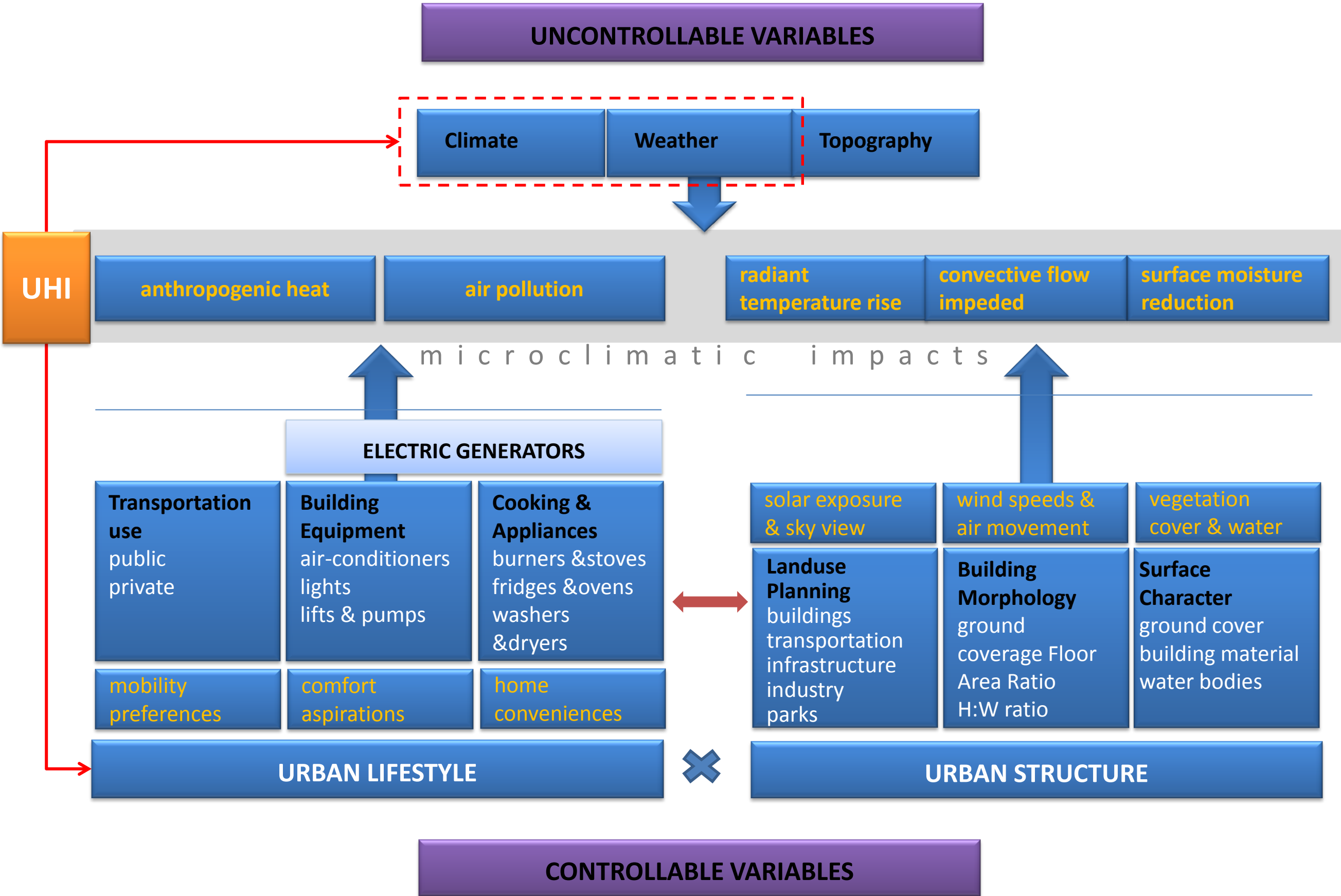
transportation impacts



air-conditioning impacts



DESCRIPTIVE FRAMEWORK



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- CBDs may have stricter codes for energy conservation than low rise/low density areas
 - Allow greater densities where the weather is favourable
 - Allow greater densities at public transportation nodes
 - Have a mixed use development for higher density model with day use commercial at the lower levels and night use residential at the higher

RESEARCH

- Empirical research to prepare a comprehensive and comparable database on UHI intensity in Indian cities in various climatic contexts
- Research to assess the extent of the impact of UHI on the environment, energy use, economics, and health in the Indian context
- Simulation research to help disaggregate the relative impact of various causal factors on UHI individually and in combination with other parameters, with the help of numerical models
- Estimation of the feasibilities and impact of various mitigating strategies in the local contexts of the country

POLICY

- Comprehensive incorporation of UHI strategies developmental instruments
- Attempts to synergize the take of various ministries on the UHI issue.