

**Characterizing urban ecosystems in the capital cities of the Western
Himalaya**

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CERTIFICATE

This is to certify that the research work embodied in this thesis entitled '**Characterizing urban ecosystems in the capital cities of the Western Himalaya**' is submitted to Jawaharlal Nehru University for the award of the degree of **Doctor of Philosophy**. The work is original and has not been submitted in part or in full for any other degree or diploma to any other university/institution.

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LIST OF ABBREVIATIONS

AI	Aggregation index
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
ANN	Artificial Neural Network
AR5	Fifth Assessment Report
AREA_MN	Mean Patch Size
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AWMPFD	Area-Weighted Mean Patch Fractal Dimension
BC ₁	Band Combination 1
BC ₂	Band Combination 2
BOA	Bottom of Atmosphere
CA	Cellular automata
C-alpha	Cronbach's Alpha
CAS	Complex Adaptive Systems
CL _{RE}	Red edge chlorophyll index
CONTIG	Contiguity Index
DAY-NULM	<i>Deendayal Antyodaya Yojana</i> -National Urban Livelihoods Mission
DEM	Digital Elevation Model
DMPS	Defence Meteorological Satellite Program
ED	Edge Density
EECONET	European Ecological Network
ENN_MN	Mean Euclidean nearest-neighbour distance
ESA	European Space Agency
EVD	Eigenvalue Decomposition
FLAASH	Fast Line-of-sight Atmospheric Analysis of Hypercubes
FRAC_AM	Area-Weighted Mean Patch Fractal Dimension
GDP	Gross Domestic Product
GHSL	Global Human Settlement Layer
GI	Green Infrastructure
GIS	Geographical Information System
GlobeLand30	Global Land Cover product
HIGS	Hazard-Infrastructure-Governance-Socio-economic characterises
IPCC	International Panel on Climate Change
IRS	Indian Remote Sensing satellites
ISRO	Indian Space Research Organization
IVI	Inherent Vulnerability Index
LISS	Linear Imaging Self Scanning Sensor
LM	Landscape Metrics
LPI	Largest Patch Index
LSI	Landscape Shape Index
LST	Land Surface Temperature
LULC	Land Use Land Cover

MC	Markov Chain
MC	Municipal Corporation
MESH	Effective Mesh Size
MEVI	Modified Enhanced Vegetation Index
MLC	Maximum Likelihood Classifier
MODIS	Moderate Resolution Imaging Spectroradiometer
MSI	Multispectral Instrument
MSPA	Morphological Spatial Pattern Analysis
MSRRE	Modified Red Edge Simple Ratio
NASA	National Aeronautics and Space Administration
NDRE	Normalized Difference Red Edge
NDVI	Normalized Difference Vegetation Index
NP	Number of patches
NUPF	National Urban Policy Framework
NUSP	National Urban Sanitation Policy
OLI	Operational Land Imager
PC	Principal Components
PCA	Principle Component Analysis
PD	Patch Density
PMA Y	<i>Pradhan Mantri Awas Yojana</i>
PPS	Proportional to Size
RE	Red-edge
RESAVI	Red-edge Soil Adjusted Vegetation Index
SEZs	Special Economic Zones
SVD	Single Value Decomposition
SVM	Support Vector Machine
TAR	Third Assessment Report
TM	Thematic Mapper
TOA	Top of Atmosphere
UA	Urban Agglomeration
UGI	Urban Green Infrastructure
UGIQ	Urban Green Infrastructure Quality
UHI	Urban Heat Island
ULBs	Urban Local Bodies
USGS	United States Geological Survey
VHR	Very High Resolution



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The complete thesis can be obtained from Prof P K Joshi (pkjoshi27@hotmail.com or pkjoshi@mail.jnu.ac.in).