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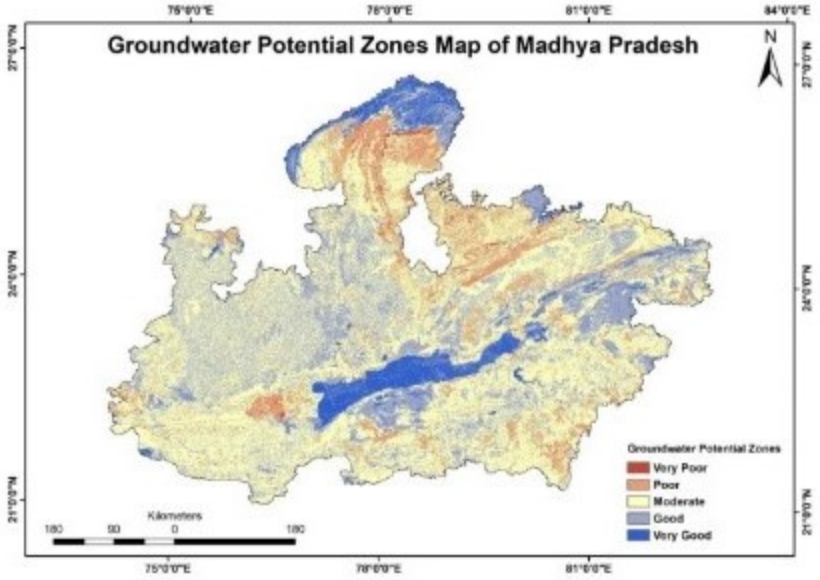
Atlas of Groundwater Potential Zoning for Madhya Pradesh



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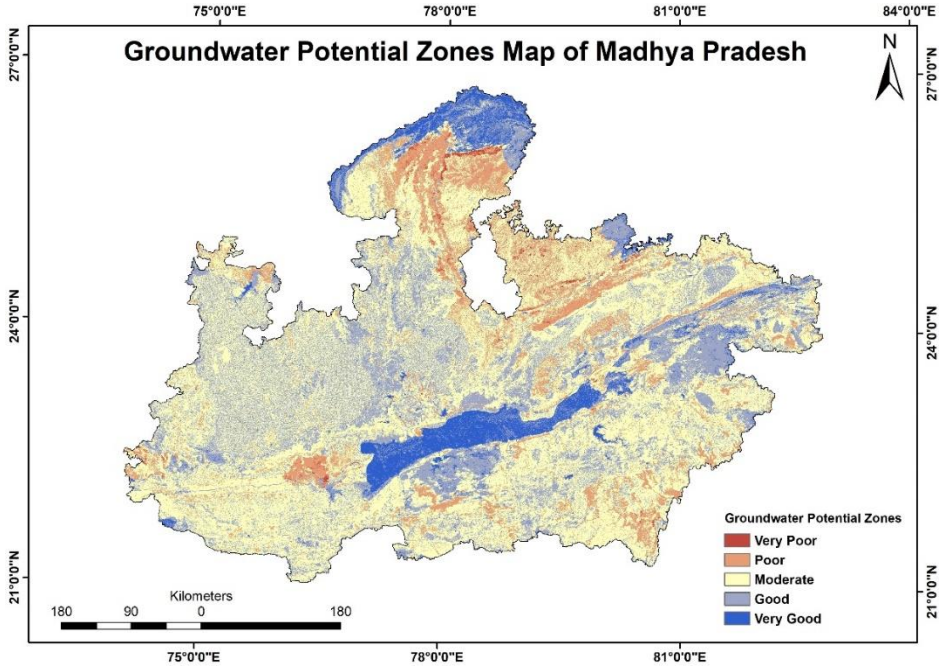

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PREFACE

Readily available information supports decision making. The deep information like spatial groundwater availability is a special case of technical advancement which the Jabalpur center of AICRP on Irrigation Management in particular and Department of Soil and Water Engineering in general, have achieved. I am glad to know that the digital maps of prepared Atlas is of fine resolution of 10 m making it more useful.

I congratulate all the scientists and workers involved in this task and bringing out district wise unique Atlas of Groundwater Potential Zones of Madhya Pradesh.

(P.K. Mishra)
Vice- Chancellor

JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA, JABALPUR

Prologue

Water is a vital resource that sustains all forms of life and drives economic development. In Madhya Pradesh, groundwater is crucial for agriculture, industry, and daily living. The sustainable management of groundwater is essential for ensuring long-term water security and fostering balanced regional development.

The "Atlas of Groundwater Potential Zoning for Madhya Pradesh" is a pivotal tool for sustainable groundwater management, offering detailed insights into groundwater availability, quality, and recharge potential across the state. This atlas is created through the collaboration of experts under AICRP on Irrigation Water Management and National Agricultural Higher Education Project and employing advanced techniques like remote sensing and GIS mapping. This comprehensive atlas provides an in-depth analysis of the groundwater potential across the diverse landscapes of the state, integrating scientific research, technological advancements, and field data. It provides a clear framework for informed decision-making, highlighting areas of high, moderate, and low groundwater potential. It is designed to serve as an invaluable resource for policymakers, planners, researchers, and stakeholders who are committed to the sustainable development of groundwater resources.

As we face the growing challenges of climate change and increasing water demand, the "Atlas of Groundwater Potential Zoning for Madhya Pradesh" stands as a beacon of informed action. It invites all stakeholders to partake in the stewardship of this precious resource, fostering a future where water is available for all, today and for generations to come.

We extend our deepest gratitude to all the contributors, whose dedication and expertise have made this atlas a reality. It is our hope that this atlas will not only guide effective groundwater management in Madhya Pradesh but also inspire similar efforts across the country and beyond.

(G. K. Koutu)
Director Research Services

AII INDIA COORDINATED PROJECT ON IRRIGATION WATER MANGEMENT

JNKVV, JABALPUR

PREMBLE

Lot of work has been done on addressing declining water table. Very first step to do this is finding out present status and potential of groundwater spatially. The maps of this Atlas are prepared for districts of Madhya Pradesh making it more handy for planners, scientific community and students.

The Groundwater potential zone map is an output obtained after integration of different relevant thematic layers developed on GIS environment using ArcGIS 10.8. Huge data and lot of time was involved in preparing each and every such layers. Different government agencies and their official portals provided basic data. The product is validated with 75 to 85 percent accuracy and it is advised to keep it in mind while using these maps.

Authors and contributors are thankful to Indian Council of Agricultural Research for providing guidance, encouragement and funds. Authors are indebted to Dr. P.K. Mishra, Honourable Vice Chancellors for providing opportunity, all necessary facilities and blessings during the work. The guidance provided by Dr. A.K. Sarangi, Director, IIWM and constant encouragement by Dr S.K. Mohanty, Principal Scientist, Project Coordinating unit, Bhubneshwar makes this task possible. Thanks are due for Dr. G.K. Koutu, Director Research Services, Dr A.K. Shrivastava, Dean Faculty of Agricultural Engineering and Head of Soil and Water Engineering Department.

Deepak Patle
M.K. Awasthi
Saurabh Nema
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Content

Introduction

Water is essential for life, which is becoming scarce due to a growing population, cities, and industries. Farmers are also demanding more water to grow crops. The state relies heavily on groundwater for both drinking and agriculture. This groundwater gets refilled every year, mostly from rain, but this replenishment is not the same everywhere or every year. To use this water sustainably, we need to know accurately that how much groundwater is available in the areas where the water level goes up and down seasonally.

Madhya Pradesh has diverse hydrogeological characteristics resulting into varied water potential at different places. More than 80% of the total land area of the state is covered by variety of hard rocks varying in geological structures, geomorphological set up and hydro meteorological conditions. More than 90% of the rural and 50% of Urban population is dependent on ground water sources in the state. Ground water is being the major source of irrigation. There are reports about declining ground water levels throughout the state. Ground water has also proved to be an important resource to meet the rapidly expanding demand of drinking water. This needs study of location specific groundwater potential in the state.

Groundwater potential zoning studies are crucial to identify suitable areas for groundwater development and management. The Groundwater Potential Zones (GPZs) maps are prepared for all districts of the state through weighted sum or weighted overlay model in GIS environment after integrating all the thematic layers viz. geology, geomorphology, lineament density, land use/land cover, soil texture, slope, drainage density and rainfall). The GPZs map can help communities, governments, and farmers locate the best areas for drilling wells, ensuring they tap into this vital resource without depleting it.

Methodology for thematic mapping and creation of database

The study involves data collection from different agencies and various government departments. Numerous toposheets (scale of 1:50,000) were collected from SOI Nakshe portal, Survey of India for preparation of study area location map. Geology (1:50,000) and Geomorphology (1:250,000) map were obtained from Bhukosh portal, Geological Survey of India. Lineament map was extracted from Bhuvan geo-portal of ISRO on a scale of 1:50,000. Satellite images of SENTINEL-2B were downloaded from Earth Explorer portal for the preparation of LULC map. Soil data was collected from the NBSS&LUP Centre, Nagpur to prepare a soil texture map of the river basin of Madhya Pradesh. Average monsoon rainfall data for the year 2020 were collected from India Meteorological Department (IMD), Pune. Digital Elevation Model (DEM) of Shuttle Radar Topography Mission (SRTM) (30 m spatial resolution) was downloaded from USGS Earth Explorer. SRTM DEM was used to prepare a basin map of all the major river basin in ArcGIS 10.8. Permanent Observation Wells (POWs) data of different river basins were obtained from State Water Data Center, Bhopal, and Ground Water Department, Lucknow. Also, collected the well yield data from the Bhujal-Bhuvan portal for validation of Groundwater Potential Zones.

Thematic layers such as geology, geomorphology, lineament density, land use/ land cover, soil texture, rainfall, slope, and drainage density were used, to delineate groundwater

potential zones maps. Geology map was rectified by the using the Arc GIS 10.8 software. A similar process was carried out to prepare geomorphology. Lineament map of the study area was prepared through digitization of various lineaments from WMS service of Bhuvan with the help of QGIS 16 software. Then lineament density map was prepared using a line density tool in the Arc environment. An unsupervised classification method was used to classify the land use/ land cover map in the ERDAS IMAGINE 2020 software using Sentinel-2B data. The soil map sheets were georeferenced and digitized then merge all sheets using Arc GIS 10.8. To prepare the rainfall map, average monsoon rainfall gridded data (0.25 degree x 0.25 degree) for the year 2020 were used. A spatial map on average monsoon rainfall was prepared using the inverse distance weightage (IDW) technique in the Arc GIS environment. SRTM DEM was processed in Arc GIS environment under the spatial analyst tool to prepare a slope map. The same data was used to prepare a drainage density map using line density tool in ArcGIS environment.

Groundwater Potential Zoning

After the preparation of thematic maps, the next task was to choose appropriate multi criterion decision making approaches (MCDMA). For this, Ranks and Weightages were assigned for the different thematic layers and their sub classes. Analytical Hierarchical Process (AHP), was used as a MCDMA to develop the Groundwater potential zones map and classified as five different potential zones namely very good, good, moderate, poor, and very poor in the ArcGIS environment. In the validation, Agreement Scheme approach was used for cross validation between GPZ classes and well yield ranges were done. The overall accuracy of groundwater potential zones of all the river basin was found 70% to 80% which denotes good accuracy. Groundwater potential zones of all twelve river basins of the state, developed by the Jabalpur center before were mosaicked through the ArcGIS 10.8 software and developed the whole MP GPZs map. To obtain the district wise groundwater potential zones, all the 52-district shapefiles were downloaded from Online Maps portal of Survey of India. The whole GPZs map of Madhya Pradesh was clipped by different district shapefiles. Then, the district wise groundwater potential zones maps are obtained.

District Wise Groundwater Potential Zones

The district wise summaries of the groundwater potential zones are given below:

Agar Malwa

A total geographical area of the Agar Malwa district is 2785 sq. km. Agar Malwa district is underlain by mainly Basaltic lava flows of Deccan trap. The map shows that the majority of the district has moderate groundwater potential (70.53%). There are also areas with good (25.67%) and very good (0.57%) groundwater potential. However, there are also areas with poor (3.22%) groundwater potential. The poor zones are located in the central to southern part of the district, whereas the good zones located in northern to western part of the district.

Alirajpur

Alirajpur district is underlain by Archaean Granite-gneisses, phyllite Basaltic lava flows of Deccan trap and Bagh Bed. Out of 3318 sq. km. of geographical area, Moderate zones dominate the central and southeastern parts of the district, encompasing over half of the total area (56.47%). Very poor zones constitute a small portion of the land (1.57%) in the eastern and western extremes of the district. Poor zones cover a larger area (24.27%) after the moderate zone and are spread throughout the district, except for the central and southeastern parts. Good zones represent a smaller area (16.48%) and are concentrated in the southwestern part of the district. Very good zones constitute a minor area (1.21%) in the southeastern corner of the district.

Anuppur

Anuppur district is underlain by Archaean Granite-gneisses, Gondwanas sandstone-clays, Lametas and Deccan trap basalts. Out of 3724 sq. km. geographical area, the Moderate zones dominate the central and northern eastern parts of the district, encompassing over half of the total area (62.87%). The poor zones cover a small area (11.99%) in the northwestern parts of the district. Good zones represent a significant area (24.31%) and are concentrated in the southern and eastern parts of the district. Very good zones constitute a minor area (0.82%) in the southeastern corner of the district.

Ashoknagar

A total geographical area of the Ashoknagar district is 4647 sq. km. Ashoknagar district is underlain by Deccan trap basalts, Vindhyan sandstone and Archaean granite-gneisses. Areas with very poor groundwater potential are located in the northeastern corner of the district and comprise a negligible portion (0.91%) of the total land area. Poor groundwater potential zones are scattered around the district, except for the central and southern parts. They encompass a larger area, constituting 13.50% of the total land area. Moderate groundwater potential zones dominate the central part of the district and cover a significant portion (55.15%) of the total land area. Good groundwater potential zones are concentrated in the southern part of the district and represent a substantial area (29.33%) of the total land area. Very good groundwater potential zones are found in a small area (0.96%) in the southeastern corner of the district.

Balaghat

Balaghat district is underlain by Archaean Granite, gneisses and phyllites. Out of 9229 sq. km. of geographical area, Moderate groundwater potential zones dominate the central and southeastern parts of the district, encompassing the majority of the land area (66.00%). Areas with very poor groundwater potential are negligible, constituting only 0.68% of the total land area and scattered in small patches throughout the district. Poor groundwater potential zones cover a larger area, comprising 25.01% of the total land area. They are spread throughout the district, except in the central and southeastern parts. Good groundwater potential zones represent a smaller area (8.04%) and are concentrated in the southern and eastern parts of the district. Very good groundwater potential zones constitute a minor area (0.28%) and are found in isolated patches in the southern and southeastern parts of the district.

Barwani

Barwani district is underlain by, Basaltic lava flows of Deccan trap. Out of 5422 sq. km. of geographical area, Moderate groundwater potential zones dominate the central part of the district, encompassing the majority of the land area (71.17%). Good groundwater potential zones represent a significant area (16.93%) and are concentrated in the southern part of the district. Very good groundwater potential zones constitute a minor area (2.67%) and are found in isolated patches in the southernmost part of the district. Poor groundwater potential zones cover a small area, comprising 9.22% of the total land area. They are spread throughout the district, except in the southern parts.

Betul

Betul district is underlain by Archaeans Granite-gneisses, Gondwanas sandstone-clays, Lametas and Deccan trap basalts. A total geographical area of the Betul district is 10043 sq. km. Out of which, areas with very poor groundwater potential are negligible, constituting only 0.01% of the total land area, and located in a small patch in the northwestern corner of the district. Poor groundwater potential zones cover a small area, comprising 12.85% of the total land area. They are spread throughout the district, except in the southern and southeastern parts. Moderate groundwater potential zones dominate the central part of the district, encompassing the majority of the land area (58.78%). Good groundwater potential zones represent a significant area (27.22%) and are concentrated in the southern and southeastern parts of the district. Very good groundwater potential zones constitute a minor area (1.13%) and are found in isolated patches in the southernmost part of the district.

Bhind

Bhind district is characterized by alluvial formation, Vindhyan Formation, and Gwalior Series. A total geographical area of the Bhind district is 4459 sq. km. Areas with very poor groundwater potential are negligible, constituting only 0.17% of the total land area, and are located in a small patch along the eastern border of the district. Poor groundwater potential zones cover a small area, comprising 0.05% of the total land area, and are also located in a small patch along the eastern border of the district. Moderate groundwater potential zones encompass a minor area (2.05%) in the northern parts of the district. Good groundwater potential zones represent a significant area (49.27%) and are concentrated in the central and southern parts of the district. Very good groundwater potential zones constitute the majority of the land area (48.46%) and are found throughout the western and northeastern parts of the district.

Bhopal

Bhopal district is underlain by Deccan trap basalts and Vindhyan sandstone. A total geographical area of the Bhopal district is 2772 sq. km. Out of which, areas with very good groundwater potential constitute a minor area (2.19%) and are found in isolated patches in the northern most part of the district. Good groundwater potential zones represent a significant area (57.47%) and are concentrated in the central and southern parts of the district. Moderate groundwater potential zones encompass a moderate area (37.85%) in the northern and eastern parts of the district. Poor groundwater potential zones cover a small area (2.49%) and are scattered in small patches throughout the district.

Burhanpur

Burhanpur district is underlain by, Basaltic lava flows of Deccan trap and Tapi alluvium. Out of 3233 sq. km. of geographical area, Poor groundwater potential zones cover a small area, comprising 2.08% of the total land area, and are located in the northern parts of the district bordering the Tapti River. Moderate groundwater potential zones encompass the majority of the land area (72.56%) and are spread throughout the central and southern parts of the district. Good groundwater potential zones represent a significant area (24.80%) and are concentrated along the Tapti River in the southern part of the district. Very good groundwater potential zones constitute a minor area (0.56%) and are found in a small patch along the Tapti River in the southernmost part of the district.

Chhatarpur

A total geographical area of the Chhatarpur district is 8687 sq. km. About 65% of the district is occupied by Bundelkhand granite in northern & north central part. Moderate groundwater potential zones dominate the central part of the district, encompassing over half of the total area (52.03%). Areas with very poor groundwater potential constitute a negligible portion (2.11%) of the total land area and are located in the northern parts of the district bordering the Ken River. Poor groundwater potential zones cover a larger area (29.90%) and are spread throughout the district, except in the southern parts. Good groundwater potential zones represent a significant area (14.17%) and are concentrated in the southern most part of the district. Very good groundwater potential zones constitute a minor area (1.79%) and are found in isolated patches in the southern part of the district with a thin soil cover.

Chhindwara

Chhindwara district is underlain by Deccan trap basalts, Archaean granite-gneisses and Gondwanas sandstone-clays. Out of the 11815 sq. km. of the geographical area, areas with very poor groundwater potential constitute a negligible portion (0.17%) of the total land area and are located in the northern most part of the district. Poor groundwater potential zones cover a small area, comprising 8.34% of the total land area, and are scattered throughout the district except in the southern parts. Moderate groundwater potential zones dominate the central part of the district, encompassing over half of the total area (63.22%). Good groundwater potential zones represent a significant area (26.89%) and are concentrated in the southern part of the district. Very good groundwater potential zones constitute a minor area (1.39%) and are found in a small patch in the southernmost part of the district.

Damoh

Damoh district is underlain mainly by Vindhyan Shale, Limestone and Sandstone. Out of 7306 sq. km., areas with very poor groundwater potential constitute a very small portion (0.21%) of the total land area and are located in the southeastern parts of the district. Poor groundwater potential zones cover a larger area (21.20%) and are spread throughout the district, except in the southwestern parts. Moderate groundwater potential zones dominate the central part of the district, encompassing over half of the total area (54.18%). Good groundwater potential zones represent a significant area (22.89%) and are concentrated in the southwestern part of the

district. Very good groundwater potential zones constitute a minor area (1.53%) and are found in isolated patches in the western and southwestern parts of the district.

Datia

Datia district is characterized by alluvial formation, Bundelkhand Granite gneiss, and Gwalior Series. Out of 2691 sq. km. of geographical area, very poor zones covers 1.86% of the district, poor zones found with major portion which is about 57.67% of the district, moderate zones represents the significant area 29.97% of the district, and good zones represents the 8.44% of the district. The map also shows that very good zones make up 2.05% of the district. The Northern eastern portion of the district is represents the Good to Very good zones of groundwater potential. The poor zones spreaded from the northern part to western part of the district. Major area with moderate zone is located in central and southern part of the district.

Dewas

Dewas district is underlain by Deccan trap basalts, Archaeans granite-gneisses and Vindhyan sandstone. A total geographical area of the Dewas district is 7021 sq. km. Very poor zones are found (0.9%) in small patches spread across the district. Poor zones with 17.20% are concentrated in the western and southern parts of the district. Moderate zones are the most widespread, covering (59.08%) a large central region and extending towards the east and northeast. Good zones are found in a larger patch in the northeast and smaller patches scattered across the central and western parts of the district. Very good zones are concentrated in a small area in the northeast.

Dhar

Dhar district is underlain by mainly Basaltic lava flows of Deccan trap. Out of 8153 sq. km. of the geographical area, very poor groundwater potential covers 0.03% of the district, while areas with poor groundwater potential falls with 5.55%. Areas with moderate groundwater potential cover the largest portion of the district, at 63.14%. Areas with good groundwater potential zones is about 30.10% of the district, and areas with very good groundwater potential found 1.18%. Groundwater potential zones in the western half of the district, with very poor and poor zones clustered in the northwest. Moderate zones span across the center and south. Good zones are scattered throughout the eastern half, with a concentration in the southeast. Very good zones are concentrated in the far northeast corner of the district.

Dindori

Dindori district is underlain by Deccan trap basalts. A total geographical area of the Dindori district is 5725 sq. km. The majority of the district (71.52%) falls under the moderate zone, indicating a neither good nor poor potential for groundwater. An area of 15.38% of the district has good groundwater potential, while only 0.33% has very good groundwater potential. The remaining 12.77% of the district has poor groundwater potential. Very poor and poor groundwater potential zones are concentrated in the southern and eastern parts of the district. Conversely, areas with good and very good groundwater potential are located in the western and northern parts of the district.

Guna

Guna district is underlain by Deccan trap basalts, Vindhyan sandstone and laterites. Out of 6390 sq. km. of the geographical area, majority of the district (54.13%) falls under the moderate groundwater potential zone. An area of 41.23% of the district has good groundwater potential, while only 0.86% has very good groundwater potential. The remaining 3.78% of the district has poor groundwater potential. Very poor and poor groundwater potential zones are scattered throughout the district. Areas with good groundwater potential are located in the western and northeastern parts of the district, while areas with very good groundwater potential are concentrated in the northeast.

Gwalior

Gwalior district is characterized by Gwalior Series, Bundelkhand granite gneiss, Vindhyan sandstone and alluvial formations. A total geographical area of the Guna district is 4564 sq. km. The very poor zones are scattered around the district, with a concentration in the central-east which is 7.73%. A majority of the are found with 47.30% which is covering nearly half of the district. It stretches across the centre and flanks the eastern and western borders. The Moderate zone found about 25.49% which are located in the north, south, and southwest. Good groundwater potential zones are located in the pockets in the west-central and northeast which is 10.46%. Very good groundwater potential zones are concentrated in the northwest and a small pocket in the southeast found with 9.02%

Harda

Harda district is characterized by alluvial formations and Deccan trap basaltic lava flow. Out of 6704 sq. km. of the geographical area, very poor groundwater potential zones (0.32%) are concentrated in the southernmost tip of the district. Poor groundwater potential zones are scattered throughout the district, with a slight concentration in the central and southern parts (3.68%). A major portion of 47.37% of the district (nearly half) falls under the moderate zone, indicating a neither good nor poor potential for groundwater. Good groundwater potential zones are located in the western and northern parts of the district which is about 21.37%. Very good groundwater potential zones are concentrated with 27.25% in the northwest and a central band stretching north to south.

Hoshangabad (Narmadapuram)

Hoshangabad district is characterized by alluvial formations, Gondwana, Archaean and Deccan trap basaltic lava flow. Out of 6704 sq. km. of geographical area, the majority of the district, about 54.22%, falls under the very good groundwater potential zone. This is followed by good (34.03%) and moderate (12.38%) zones. Areas with poor (0.38%) groundwater potential zones are scarce. The very good groundwater potential zones are concentrated in the central and northern parts of the district. The southern part of the district appears to have more areas classified as moderate, good, and poor groundwater potential zones. The district is horizontally divided into two part where upper part showing very good to good groundwater potential and the lower part depicts the moderate to good groundwater potential.

Indore

Indore district is underlain by mainly Basaltic lava flows of Deccan trap. The total geographical area of the Indore district is 3898 sq. km. Most of the district (69.28%) is classified as moderate groundwater potential. A significant portion of the district (26.89%) is classified as good groundwater potential. Smaller areas are classified as poor (3.40%), and very good (0.42%) groundwater potential zones. Moderate zone is dominant over the district followed by the good groundwater potential zones. Southern portion of the district depicts the poor to moderate groundwater potential zones.

Jabalpur

Jabalpur district is characterized by Alluvium, Archaean granite, Basaltic lava flows of Deccan trap Bijawar and Vindhyan sandstone. The total geographical area of the Jabalpur district is 5221 sq. km. The majority of the district (40.73%) is classified as moderate groundwater potential. A significant portion of the district (27.20%) is classified as very good groundwater potential. Smaller areas are classified as very poor (0.91%), poor (7.66%), and good (23.50%). Major portion of the area spread with moderate groundwater potential across the district. The western part of the district located with the very good groundwater potential. Northern part of the district is shown poor to very poor groundwater potential.

Jhabua

Jhabua district is underlain by Archaeans granite-gneisses, phyllite and Basaltic lava flows of Deccan trap. The total geographical area of the Jhabua district is 3460 sq. km. The majority of the district (67.14%) is classified as moderate groundwater potential. A significant portion of the district (24.54%) is classified as good groundwater. Smaller areas are classified as poor (7.72%), and very good (0.60%) groundwater potential zones. The good groundwater potential zones located in the northwestern to southwestern part of the district. However, rest of the portion located with the poor to moderate groundwater potential zones.

Katni

Katni district is characterized by Vindhyan sandstone, Bijawar Alluvium and Basaltic lava flows of Deccan trap. The total geographical area of the Katni district is 4894 sq. km. Most of the district (41.26%) is classified as moderate groundwater potential. A significant portion of the district (40.78%) is classified as good groundwater potential. Smaller areas are classified as very poor (0.18%), poor (10.50%), and very good (7.28%). Northeastern portion of the district represents the good groundwater potential while central region depicts the poor to moderate groundwater potential areas. North and south part of the district shows the very good groundwater potential zones.

Khandwa

Khandwa district is underlain by mainly Basaltic lava flows of Deccan trap. The total geographical area of the Khandwa district is 7524 sq. km. The majority of the district (67.82%) is classified as moderate groundwater potential. A significant portion of the district (19.98%) is classified as good groundwater potential. Smaller areas are classified as very poor (1.07%), poor (10.07%), and very good (1.06%). The northern part of the district is located with the poor to very poor groundwater potential zones. The moderate groundwater potential zones spread

over the district. Very good and good zones are located in the northeastern portion of the district.

Khargone

Khargone district is underlain by mainly Basaltic lava flows of Deccan trap. The total geographical area of the Khargone district is 8030 sq. km. The majority of the district has moderate groundwater potential (78.19%). Poor groundwater potential zones are found in the western and eastern parts of the district (9.57%). Very poor groundwater potential zones are found in the southeastern part of the district (0.17%). Good groundwater potential zones are found in the northern and central parts of the district (11.86%). Very good groundwater potential zones are found in scattered areas throughout the district (0.22%). The moderate groundwater potential located in entire the district except the northeastern part.

Mandla

Mandla district is characterized by Basaltic lava flows of Deccan trap. The total geographical area of the Mandla district is 7544 sq. km. The map indicates that the groundwater potential zones range from very poor (0.00%) to very good (1.59%). The majority of the district has moderate groundwater potential (67.46%). Poor groundwater potential zones are found in the western and eastern parts of the district (11.40%). Very poor groundwater potential zones are found in a small area in the northeast (0.00%). Good groundwater potential zones are found in scattered areas throughout the district (19.55%). Very good groundwater potential zones are found in a small area in the southwest (1.59%).

Mandsaur

Mandsaur district is underlain by mainly Basaltic lava flows of Deccan trap. The total geographical area of the Mandsaur district is 5535 sq. km. The map indicates that the groundwater potential zones range from very poor (0.11%) to very good (1.14%). Most of the district has moderate groundwater potential (62.36%). Good groundwater potential zones are found in the northern and central parts of the district (30.83%). Very poor and poor groundwater potential zones are found in scattered areas throughout the district (together, they make up 5.66% of the area). The northern portion of the district is located the poor and very poor groundwater potential area.

Morena

Morena district is characterized by alluvial formation, Vindhyan Formation and Gwalior Series. The total geographical area of the Morena district is 4989 sq. km. The map indicates that the groundwater potential zones range from very poor (1.42%) to very good (44.25%). Nearly half of the district has very good groundwater potential (44.25%). Areas with good groundwater potential make up a significant portion of the district (29.20%). Moderate groundwater potential zones are found in scattered areas (9.19%). Poor groundwater potential zones are found in the western and eastern parts of the district (15.94%). Very poor groundwater potential zones are found in a small area in the west (1.42%).

Narsinghpur

Narsinghpur district is underlain by Alluvium, Gondwana sandstone, Bijawar and Basaltic lava flows of Deccan trap. The total geographical area of the Narsinghpur district is 5133 sq. km. The majority of the district has very good groundwater potential (42.08%) located in central and western part. Moderate groundwater potential zones are found in scattered areas throughout the district (28.67%). Good groundwater potential zones are found in the northern part of the district (22.76%). Poor groundwater potential zones are found in scattered areas (6.48%). Very poor groundwater potential zones are found in a small area in the southwest (0.01%).

Neemuch

Neemuch district is underlain by mainly Basaltic lava flows of Deccan trap. The total geographical area of the Neemuch district is 4200 sq. km. The majority of the district has moderate groundwater potential (62.31%). Good groundwater potential zones are found in scattered areas throughout the district (22.86%). Very good groundwater potential zones are found in a small area in the northwest (1.95%). Poor groundwater potential zones are found in scattered areas throughout the district (12.50%). Very poor groundwater potential zones are found in a small area in the southeast (0.38%).

Niwari

Niwari district is occupied by Bundelkhand granite with a thin soil cover. The total geographical area of the Niwari district is 1170 sq. km. The majority of the district has moderate groundwater potential (63.46%) located entire portion with scattered patches. Poor groundwater potential zones are found in the western and eastern parts of the district (31.28%). Very poor groundwater potential zones are found in the southeastern part of the district (3.79%). Good groundwater potential zones are found in scattered areas throughout the district (1.46%).

Panna

Panna district is characterized by Vindhyan Shale, Limestone and Sandstone and Alluvium. The total geographical area of the Panna district is 7135 sq. km. The majority of the district has moderate groundwater potential (55.58%). Poor groundwater potential zones are found in scattered areas throughout the district (26.09%). Very poor groundwater potential zones are found in the southeastern part of the district (1.11%). Good groundwater potential zones are found in scattered areas throughout the district (15.18%). Very good groundwater potential zones are found in a small area in the northwest (2.04%).

Raisen

Raisen district is underlain by Basaltic lava flows of Deccan trap, Vindhyan Sandstone and Alluvium. The total geographical area of the Raisen district is 8467 sq. km. The major portion of the district has moderate groundwater potential (46.00%). Good groundwater potential zones are found in the northern and central parts of the district (32.89%). Very good groundwater potential zones are found in scattered areas throughout the district (13.77%). Poor groundwater potential zones are found in scattered areas throughout the district (7.27%). Very poor groundwater potential zones are found in a small area in the southeastern part of the district (0.06%).

Rajgarh

Rajgarh district is characterized by mainly Basaltic lava flows of Deccan trap. Out of 6155 sq. km. of the geographical area, the majority of the district has moderate groundwater potential (55.29%). Good groundwater potential zones are found in the northern and central parts of the district (41.82%). Very good groundwater potential zones are found in scattered areas throughout the district (0.65%). Poor groundwater potential zones are found in scattered areas throughout the district (2.24%). Very poor groundwater potential zones are found in a negligible area.

Ratlam

Ratlam district is underlain by Basaltic lava flows of Deccan trap. The total geographical area of the Ratlam district is 4861 sq. km. Most of the district has moderate groundwater potential (70.16%). Areas with poor groundwater potential are found in scattered areas throughout the district (3.67%). Good groundwater potential zones are found in the northern and central parts of the district (25.74%). Very good groundwater potential zones are found in scattered areas throughout the district (0.43%).

Rewa

Rewa district is characterized by Vindhyan Shale, Limestone and Sandstone and Alluvium. The total geographical area of the Rewa district is 6314 sq. km. The majority of the district has moderate groundwater potential (63.72%). Areas with poor groundwater potential are found in scattered areas throughout the district (12.20%). Very poor groundwater potential zones are found in a small area in the southeastern part of the district (0.08%). Good groundwater potential zones are found in the northern and central parts of the district (23.72%). Very good groundwater potential zones are found in scattered areas throughout the district (0.28%).

Sagar

Sagar district is underlain by Basaltic lava flows of Deccan trap Vindhyan Sandstone and Alluvium. The total geographical area of the Sagar district is 10252 sq. km. The majority of the district has moderate groundwater potential (57.55%). Areas with good groundwater potential are found in scattered areas throughout the district (24.25%). Poor groundwater potential zones are found in scattered areas throughout the district (17.43%). Very poor groundwater potential zones are found in a small area in the southeastern part of the district (0.35%).

Satna

Satna district is characterized by Vindhyan Shale, Limestone and Sandstone and Alluvium. The total geographical area of the Satna district is 7502 sq. km. The majority of the district (59.73%) falls under the moderate groundwater potential zone. This means that a little less than half of the district has moderately high groundwater availability. A significant portion of the district, (25.61%) falls under the good groundwater potential zone. There are also smaller areas with very good (2.60%) and poor (11.95%) groundwater potential. Only a very small area (0.11%) has very poor groundwater potential. Only the northern portion of the district depicts the very good potential.

Sehore

Sehore district is underlain by Basaltic lava flows of Deccan trap, Vindhyan Sandstone and Alluvium. The total geographical area of the Sehore district is 6578 sq. km. The majority of the district (40.96%) falls under the moderate groundwater potential zone in the central and northern part. This means that a little less than half of the district has moderately high groundwater availability. There is a significant portion of the district with good groundwater potential (43.03%). There are also smaller areas with very good (13.00%) and poor (3.01%) groundwater potential. Very good groundwater potential area located in the southern part of the district.

Seoni

Seoni district is characterized by Deccan trap basalts and Archaeans granite-gneisses. The total geographical area of the Seoni district is 6578 sq. km. The majority of the district (61.91%) falls under the moderate groundwater potential zone. This means that a little more than half of the district has moderately high groundwater availability. A significant portion of the district, (27.73%) falls under the good groundwater potential zone. There are also smaller areas with very good (1.44%) and poor (8.91%) groundwater potential. Only a very small area (0.02%) has very poor groundwater potential. The good zone is located in the scattered form over the district.

Shahdol

Shahdol district is underlain by Archaeans granite-gneisses, Gondwanas sandstone-clays, Lametas and Deccan trap basalts. The total geographical area of the Shahdol district is 5841 sq. km. The majority of the district (50.63%) falls under the good groundwater potential zone. This means that slightly more than half of the district has good groundwater availability. A significant portion of the district (39.74%) falls under the moderate groundwater potential zone. There are also smaller areas with very good (3.80%) and poor (5.83%) groundwater potential. The good and very good zone is located very prominently in the central region of the district. The poor zone located in the southern part of the district.

Shajapur

Shajapur district is characterized by mainly Basaltic lava flows of Deccan trap. The total geographical area of the Shajapur district is 3411 sq. km. The majority of the district (64.84%) falls under the poor groundwater potential zone. This means that a very large portion of the district has low groundwater availability. A significant portion of the district (33.93%) falls under the moderate groundwater potential zone. There are also very small areas with good (0.35%) and very poor (0.88%) groundwater potential. Entire district falling under the poor to moderate groundwater potential zones except the eastern part.

Sheopur

Sheopur district is underlain by Vindhyan Sandstone and Alluvium. The total geographical area of the Sheopur district is 6606 sq. km. The majority of the district (51.13%) falls under the moderate groundwater potential zone. A significant portion of the district (19.78%) falls under the good groundwater potential zone. There are also smaller areas with very good (9.02%) and poor (19.51%) groundwater potential. Only a very small area (0.56%) has very poor groundwater potential. The good and very good groundwater potential zones located in the

northern to western areas of the district. Poor zone located in the northeastern part whereas moderate zone is located in central zone of the district.

Shivpuri

Shivpuri district is characterized by Bundelkhand Granite, Basaltic lava flows of Deccan trap Vindhyan Sandstone and Alluvium. The total geographical area of the Shivpuri district is 10278 sq. km. The majority of the district (60.89%) falls under the moderate groundwater potential zone. A significant portion of the district (31.26%) falls under the poor groundwater potential zone. There are also smaller areas with good (6.34%) and very poor (1.44%) groundwater potential. There is a very small area (0.06%) classified as very good groundwater potential. Entire district falling under the moderate to poor groundwater potential zones except the southern part.

Sidhi

Sidhi district is underlain by Vindhyan limestone sandstone, Archaean granite Gondwana sandstone and Alluvium. The total geographical area of the Sidhi district is 4854 sq. km. The majority of the district (45.26%) falls under the good groundwater potential zone. A significant portion of the district (36.38%) falls under the moderate groundwater potential zone. There are also smaller areas with very good (8.21%) and poor (10.12%) groundwater potential. Only a very small area (0.02%) has very poor groundwater potential. Northern and southern part of the district located in the good to very good groundwater potential zones.

Singrauli

Singrauli district is characterized by Archaean granite and Gondwana sandstone. The total geographical area of the Singrauli district is 5672 sq. km. Very good zones have the highest groundwater potential, and they cover 2.79% of the district. Good: These zones also have high groundwater potential, and they cover 32.60% of the district. Moderate cover 52.28% of the district. Poor zones have a low groundwater potential, and they cover 12.32% of the district. The areas with the very good and good groundwater potential are concentrated in the western and central parts of the district. The areas with poor and very poor groundwater potential are located in the eastern and northeastern parts of the district.

Tikamgarh

Tikamgarh district is occupied by Bundelkhand granite with a thin soil cover. The total geographical area of the Tikamgarh district is 3878 sq. km. Overall, the groundwater potential in Tikamgarh District appears to be dominated by moderate zones (57.52%). A significant portion of the district also has poor groundwater potential (36.97%). There are small areas with very poor (4.42%) and good (1.09%) groundwater potential. Good zones represent a small region in the western central part of the district. Very poor zones occupy the northernmost and southernmost tips of the district.

Ujjain

Ujjain district is underlain by mainly Basaltic lava flows of Deccan trap. The total geographical area of the Ujjain district is 6130 sq. km. Areas with. Poor groundwater potential zones (0.94%) are occupying small pockets throughout the district. Moderate groundwater potential zones

(78.33%) are covering a large central and western swathe of the district. Good groundwater potential zones (20.43%) are spread throughout the eastern and southern parts of the district. Very good groundwater potential zones (0.30%) are representing a small region in the southeastern corner of the district.

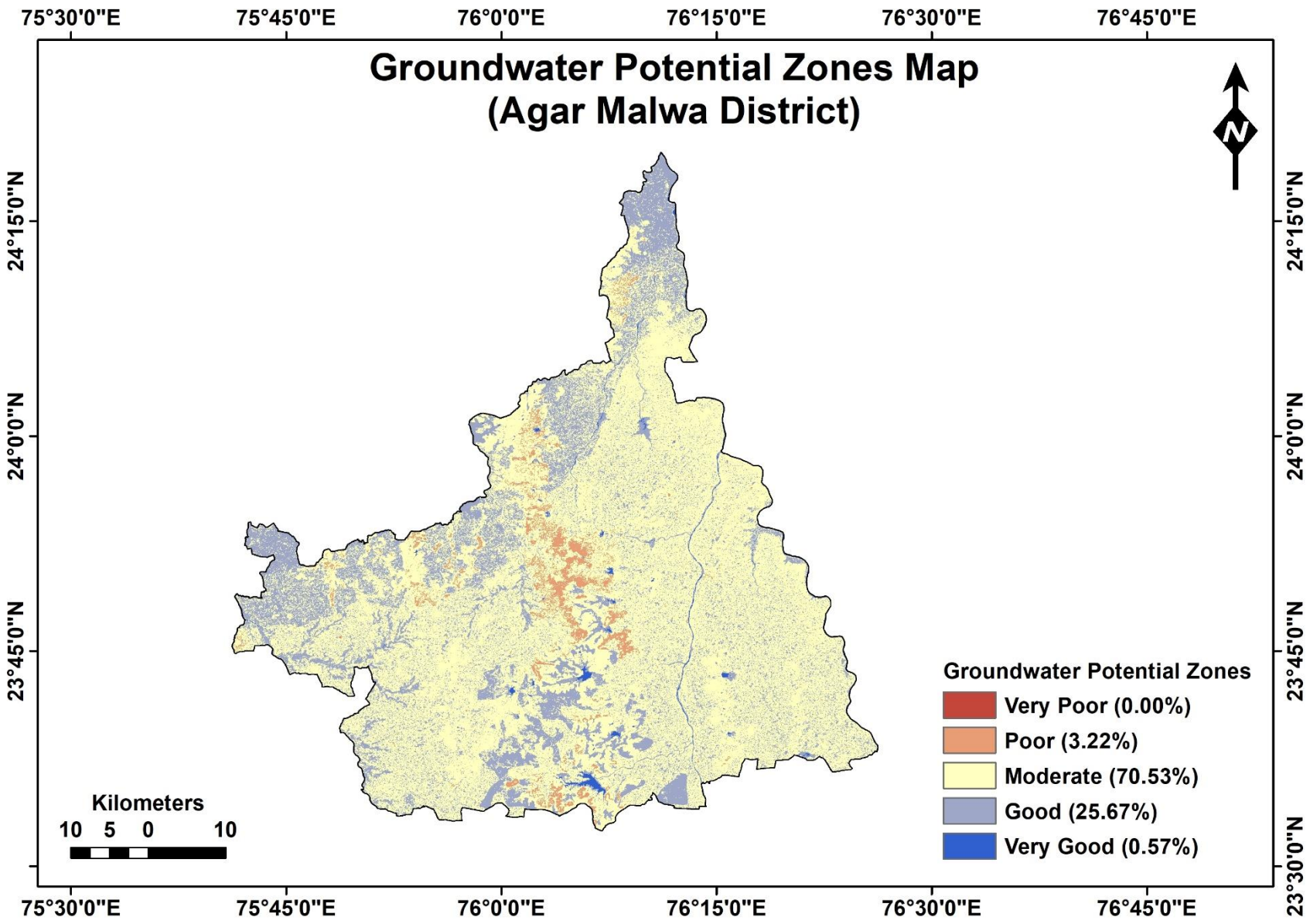
Umaria

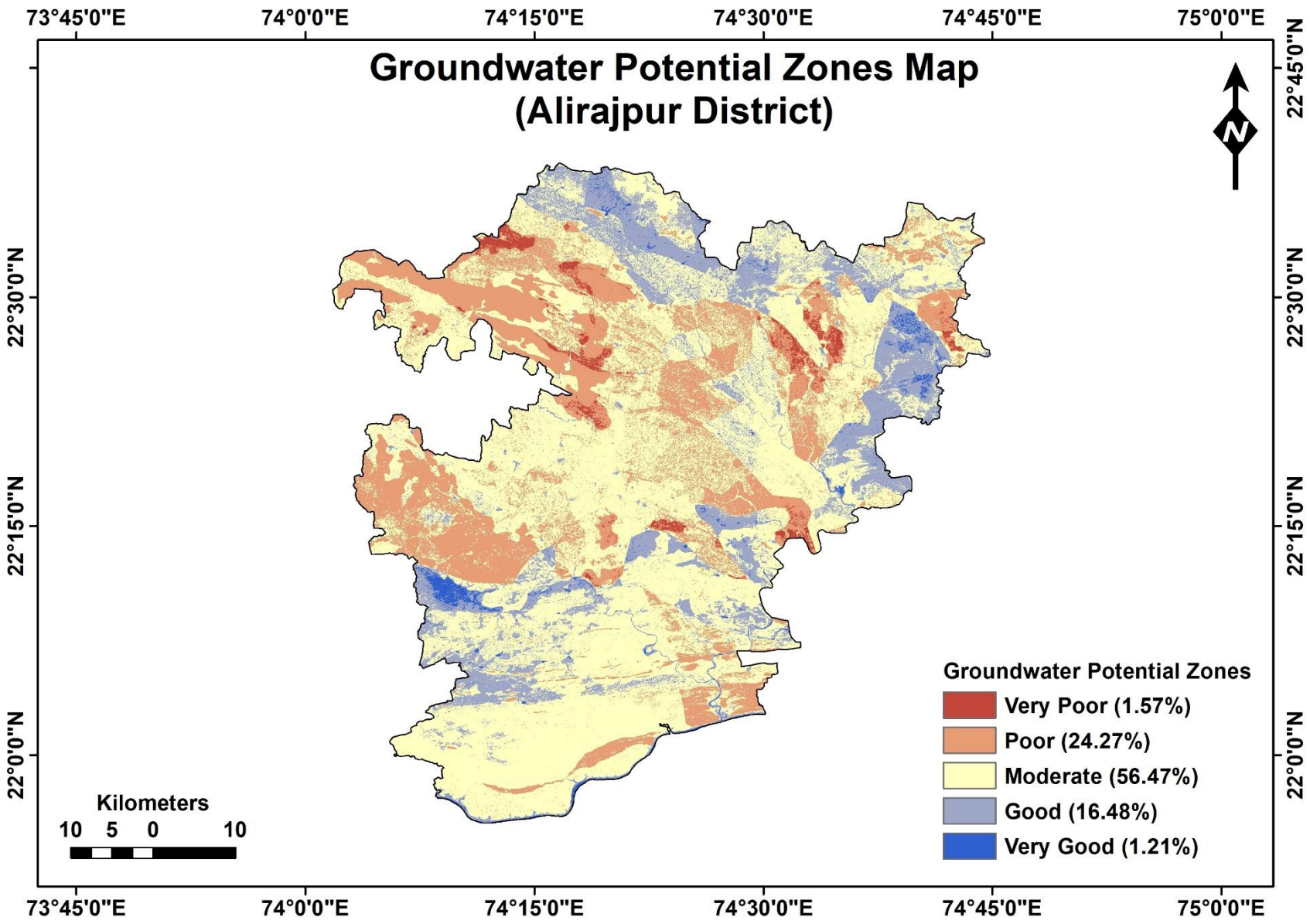
Umaria district is underlain by Gondwana sandstone, Archaeans granite-gneisses, clays, Lametas and Deccan trap basalts. The total geographical area of the Umaria district is 4539 sq. km. The groundwater potential in Umaria District appears to be good, with nearly half of the district (45.71%) falling under this classification. There is also a significant portion of the district with moderate groundwater potential (44.10%). Smaller areas have very poor (0.23%), poor (7.82%) and very good (2.14%) groundwater potential. The very good groundwater potential zones representing in the central portion and a small region southeastern corner of the district.

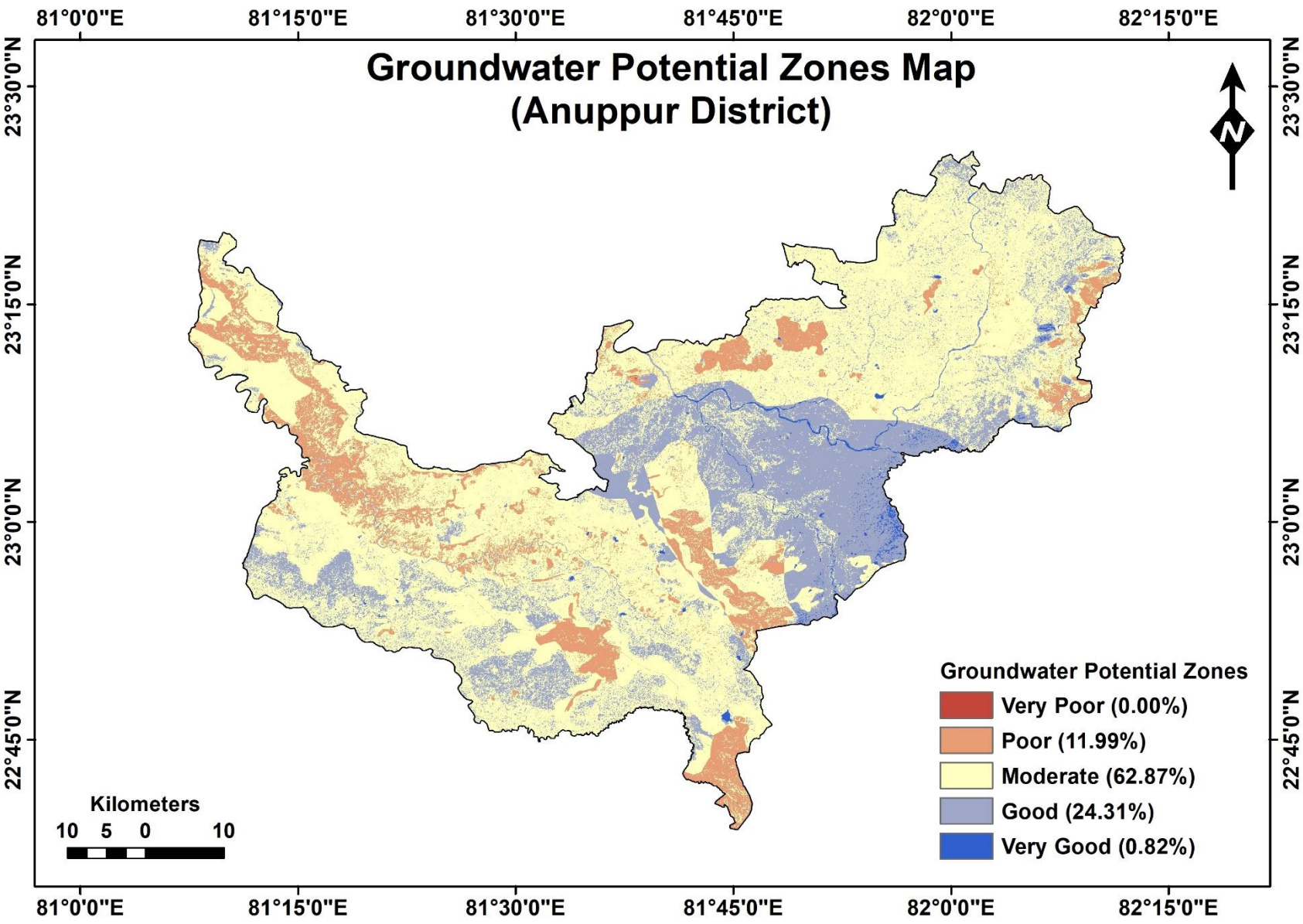
Vidisha

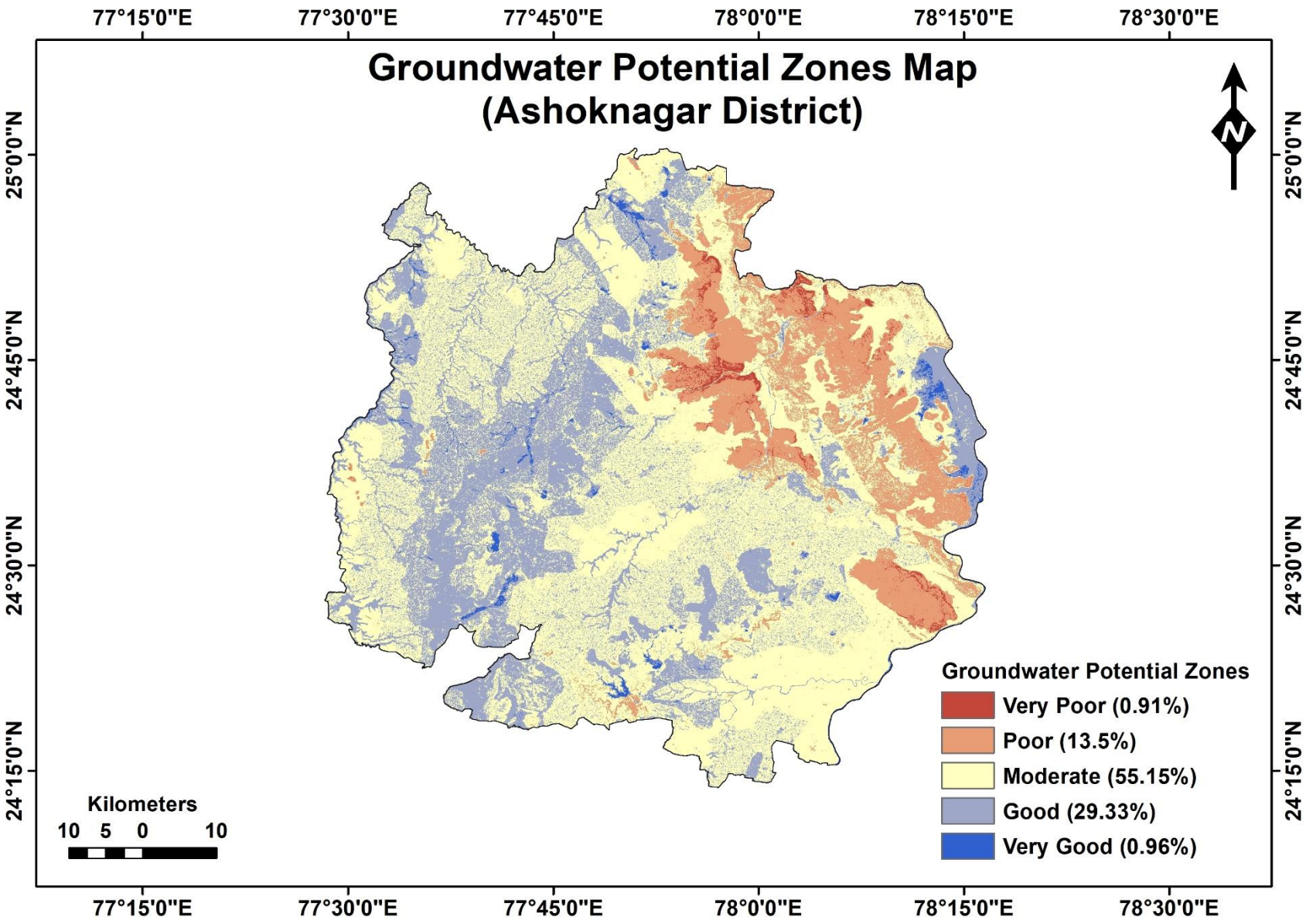
Vidisha district is underlain by Basaltic lava flows of Deccan trap and Vindhyan Sandstone. The total geographical area of the Vidisha district is 7371 sq. km. Areas with very poor groundwater potential (0.02%) are occupy a small region in the westernmost part of the district. Poor groundwater potential zones (3.12%) are scattered throughout the district. Moderate groundwater potential zones (47.82%) are covering a central swathe of the district. Good groundwater potential zones (48.26%) encompass a large portion of the eastern and southern parts of the district. Very good groundwater potential zones (0.78% of the total area) represent a small region in the southeastern corner of the district.

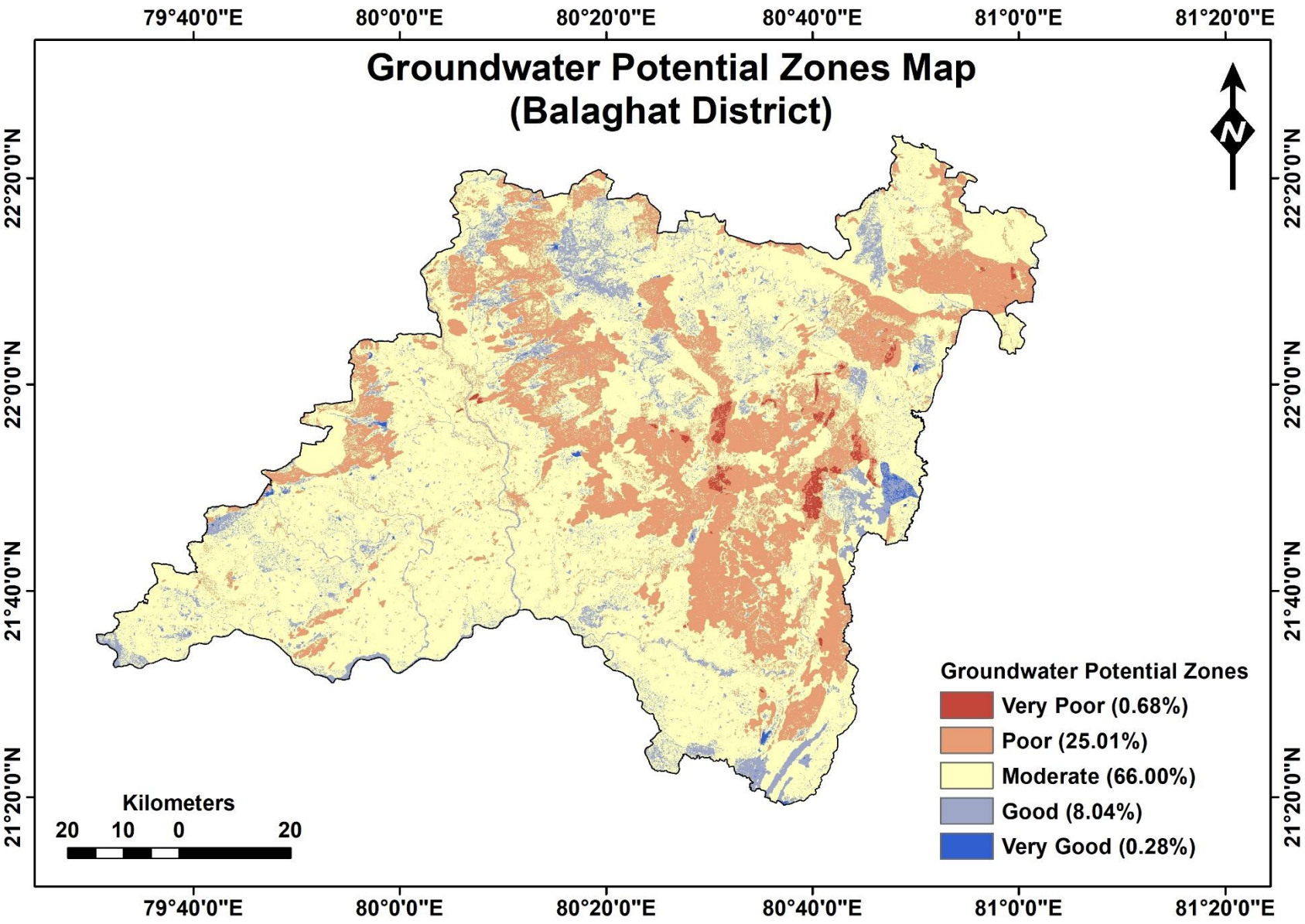
Atlas
of
Groundwater Potential Zoning for Madhya Pradesh

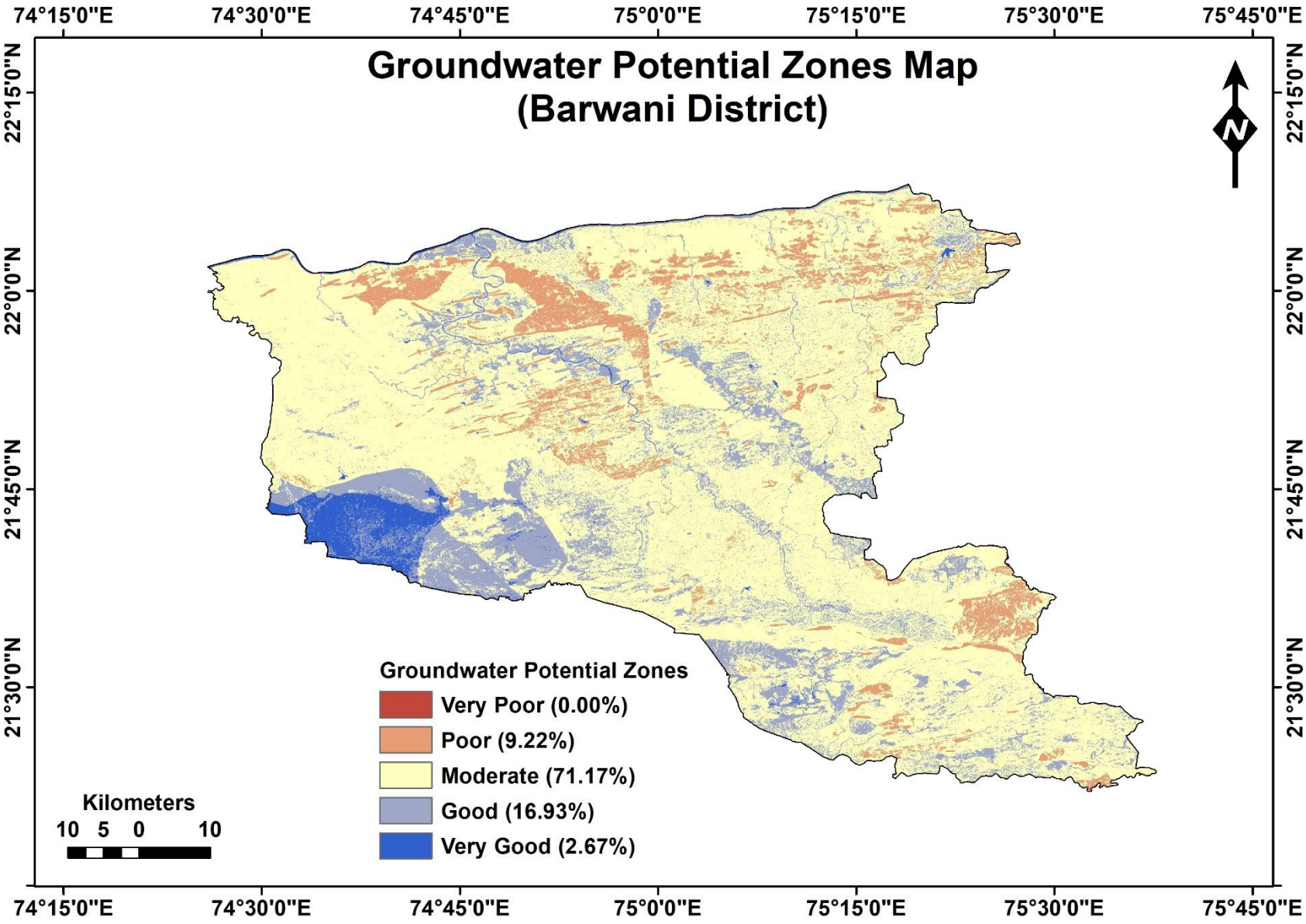

Groundwater Potential Zones Map
(Agar Malwa District)
N
75°30'0"E
75°45'0"E
76°0'0"E
76°15'0"E
76°30'0"E
76°45'0"E
24°15'0"N
24°0'0"N
23°45'0"N
23°30'0"N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (3.22%)
Moderate (70.53%)
Good (25.67%)
Very Good (0.57%)
Kilometers
10 5 0 10

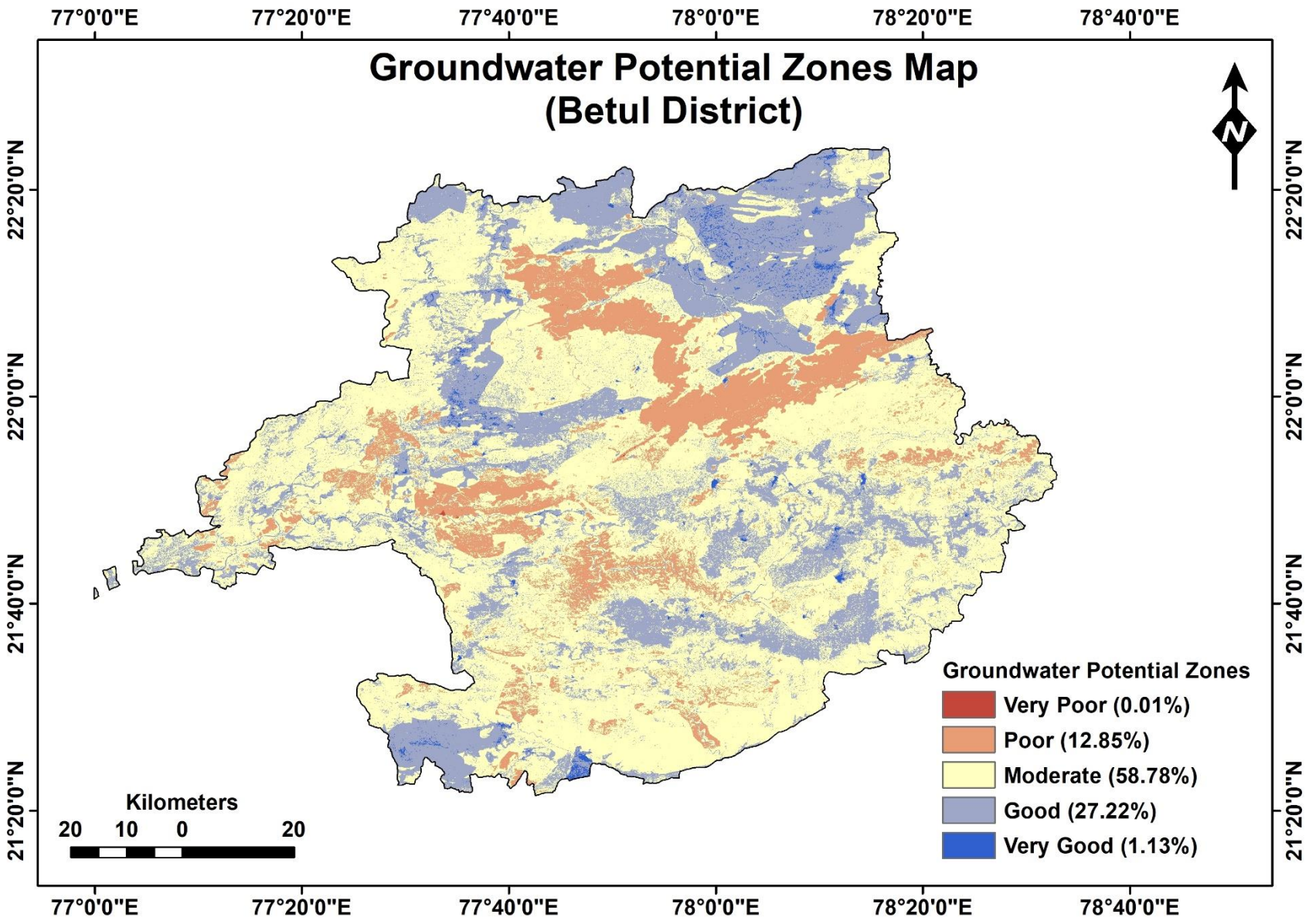

Groundwater Potential Zones Map
(Alirajpur District)
73°45'0"E
74°0'0"E
74°15'0"E
74°30'0"E
74°45'0"E
75°0'0"E
22°45'0"N
22°30'0"N
22°15'0"N
22°0'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (1.57%)
Poor (24.27%)
Moderate (56.47%)
Good (16.48%)
Very Good (1.21%)

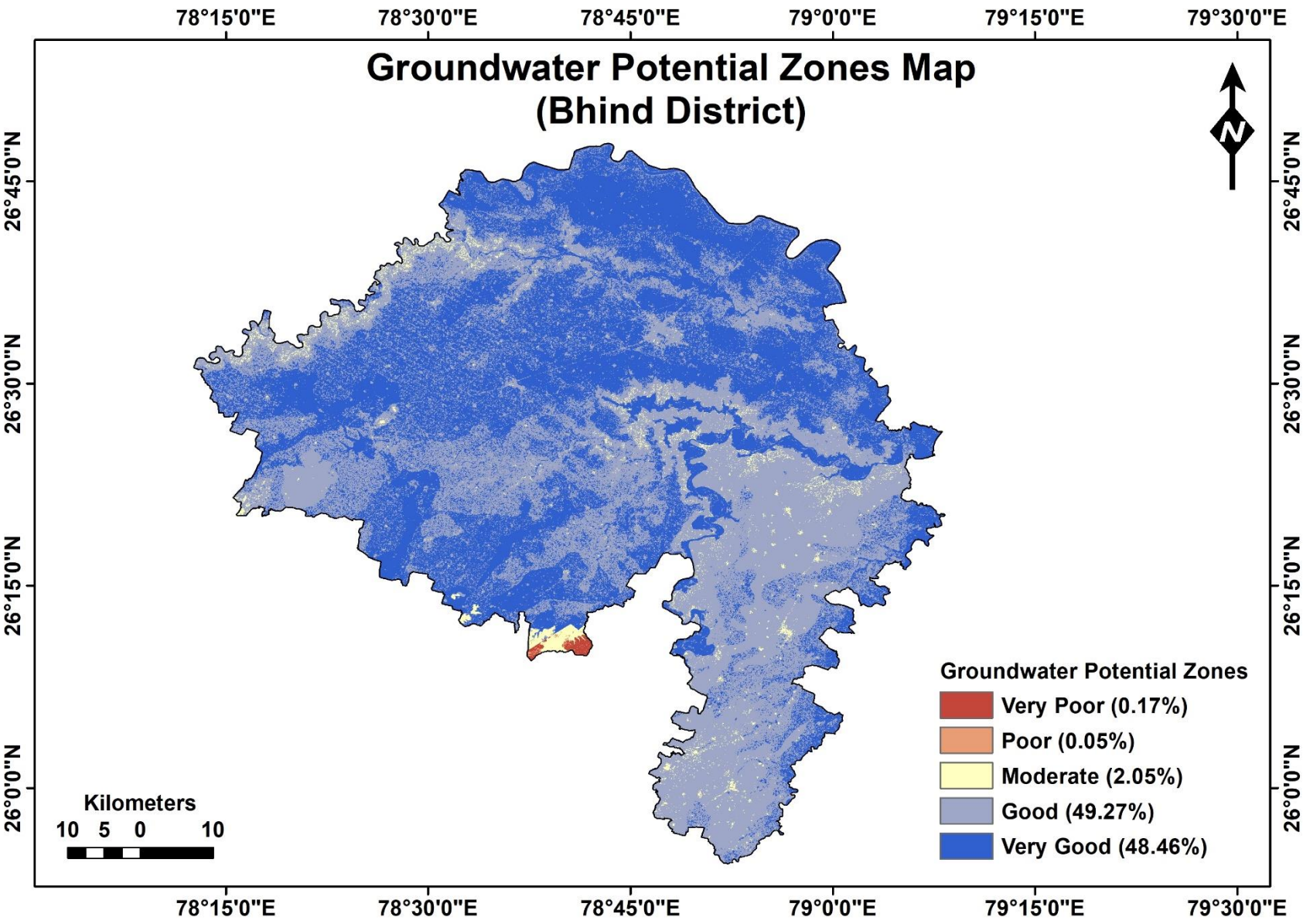

Groundwater Potential Zones Map
(Anuppur District)
81°0'0"E
81°15'0"E
81°30'0"E
81°45'0"E
82°0'0"E
82°15'0"E
23°30'0"N
23°15'0"N
23°0'0"N
22°45'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (11.99%)
Moderate (62.87%)
Good (24.31%)
Very Good (0.82%)
Kilometers
10 5 0 10

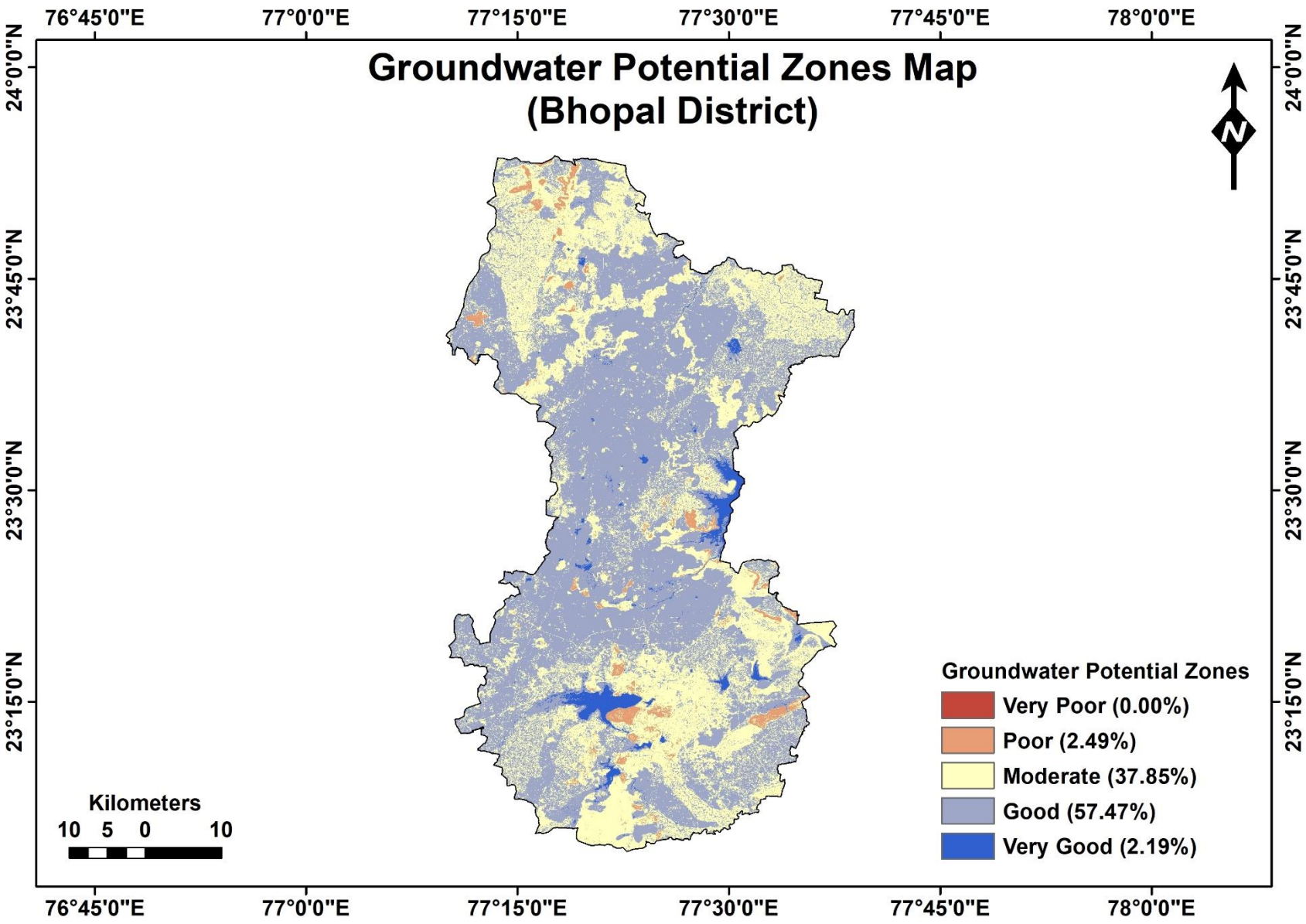

Groundwater Potential Zones Map
(Ashoknagar District)
77°15'0"E
77°30'0"E
77°45'0"E
78°0'0"E
78°15'0"E
78°30'0"E
25°0'0"N
24°45'0"N
24°30'0"N
24°15'0"N
N
Groundwater Potential Zones
Very Poor (0.91%)
Poor (13.5%)
Moderate (55.15%)
Good (29.33%)
Very Good (0.96%)
Kilometers
10 5 0 10

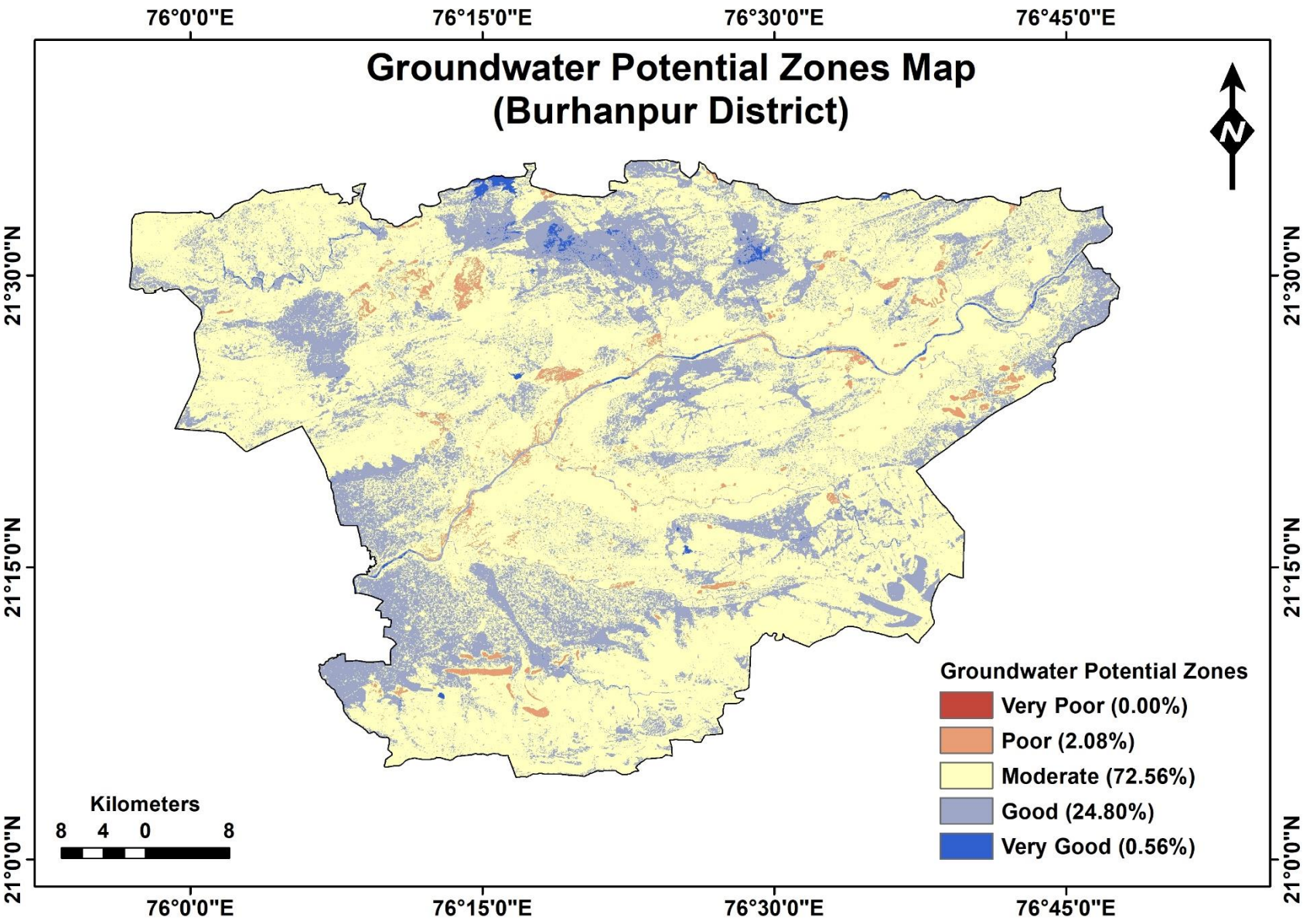

Groundwater Potential Zones Map
(Balaghat District)
79°40'0"E
80°0'0"E
80°20'0"E
80°40'0"E
81°0'0"E
81°20'0"E
22°20'0"N
22°0'0"N
21°40'0"N
21°20'0"N
N
Groundwater Potential Zones
Very Poor (0.68%)
Poor (25.01%)
Moderate (66.00%)
Good (8.04%)
Very Good (0.28%)
Kilometers
20 10 0 20

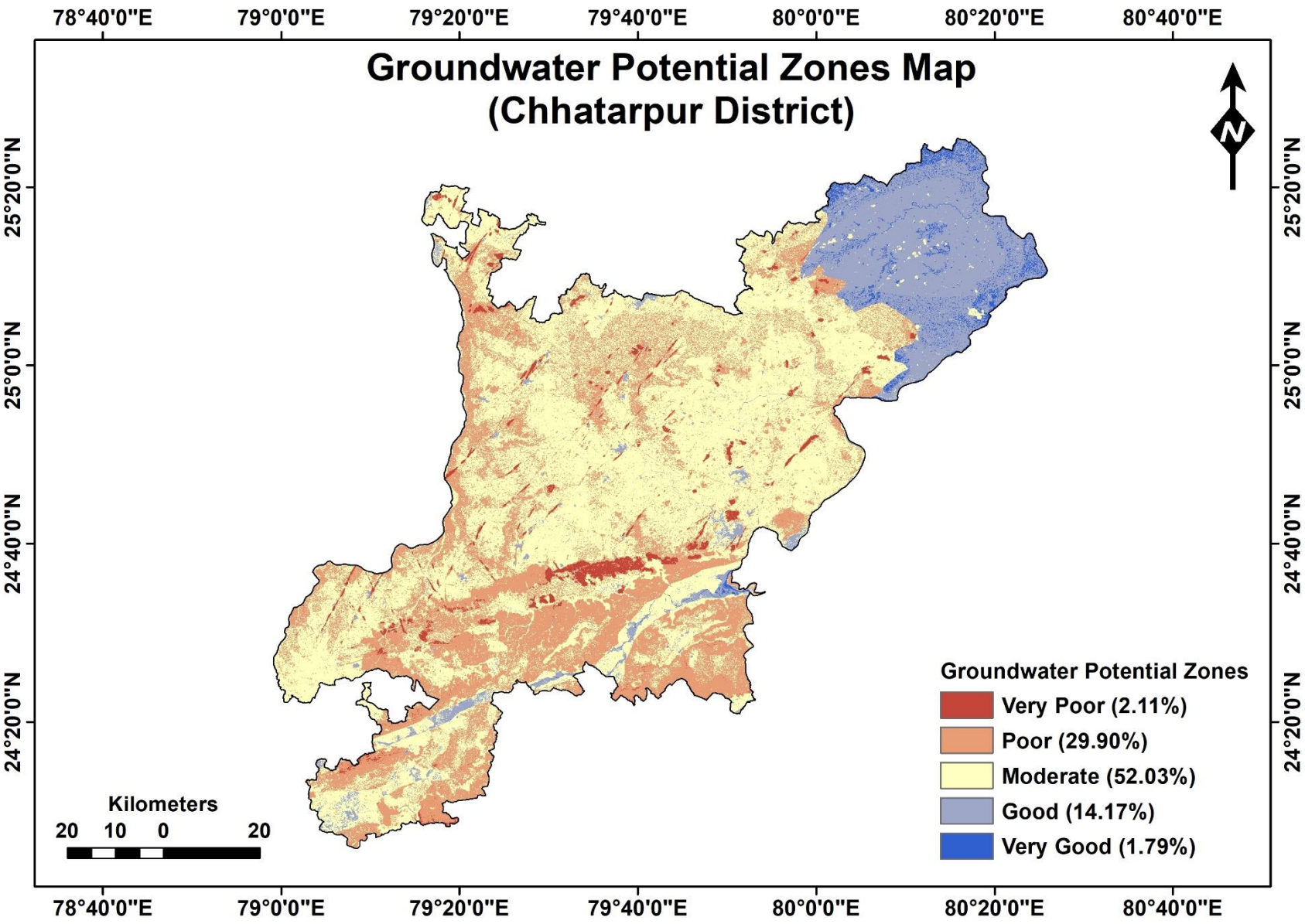

Groundwater Potential Zones Map
(Barwani District)
74°15'0"E
74°30'0"E
74°45'0"E
75°0'0"E
75°15'0"E
75°30'0"E
75°45'0"E
22°15'0"N
22°0'0"N
21°45'0"N
21°30'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (9.22%)
Moderate (71.17%)
Good (16.93%)
Very Good (2.67%)
Kilometers
10 5 0 10

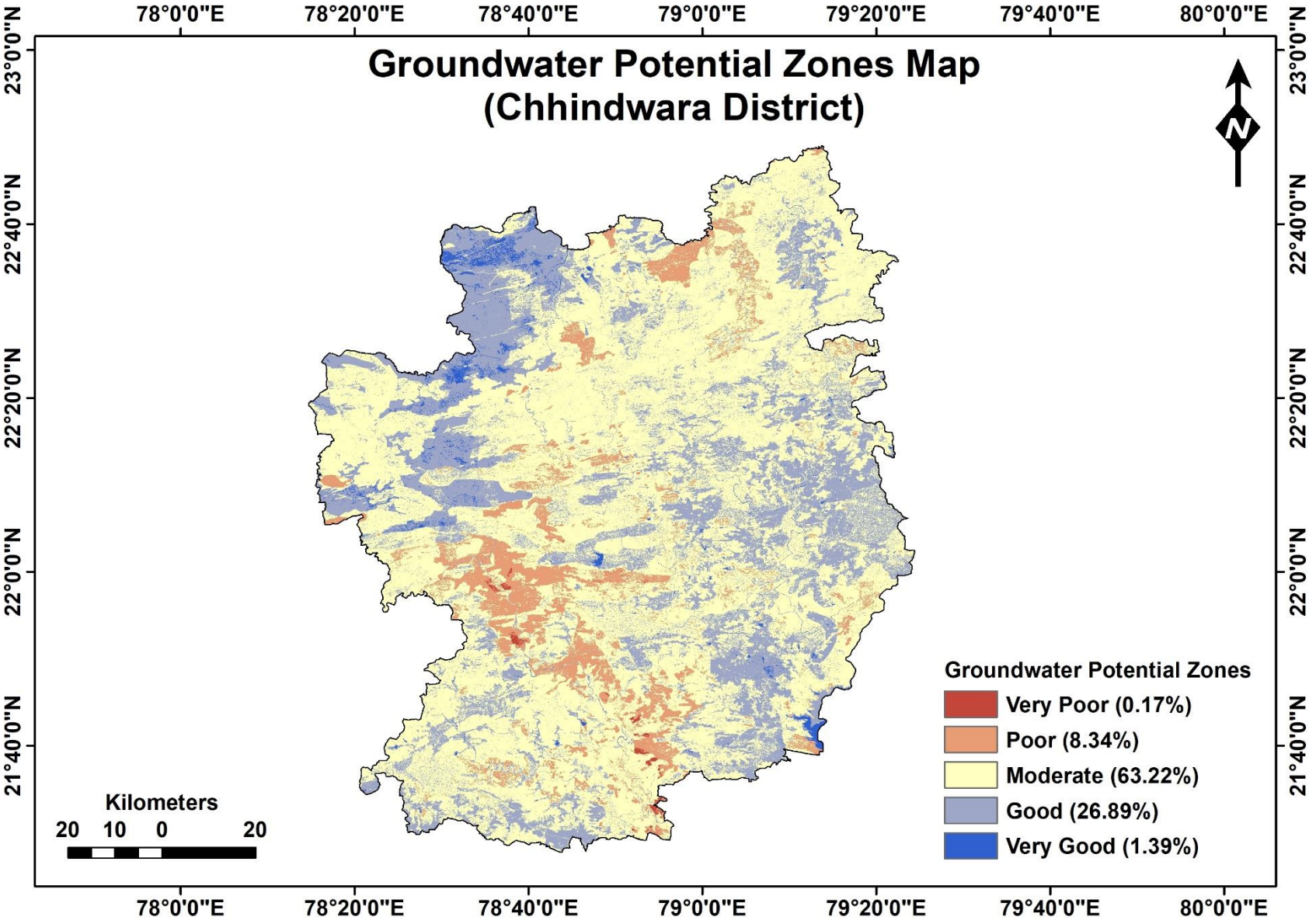

Groundwater Potential Zones Map
(Betul District)
77°0'0"E
77°20'0"E
77°40'0"E
78°0'0"E
78°20'0"E
78°40'0"E
22°20'0"N
22°0'0"N
21°40'0"N
21°20'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.01%)
Poor (12.85%)
Moderate (58.78%)
Good (27.22%)
Very Good (1.13%)

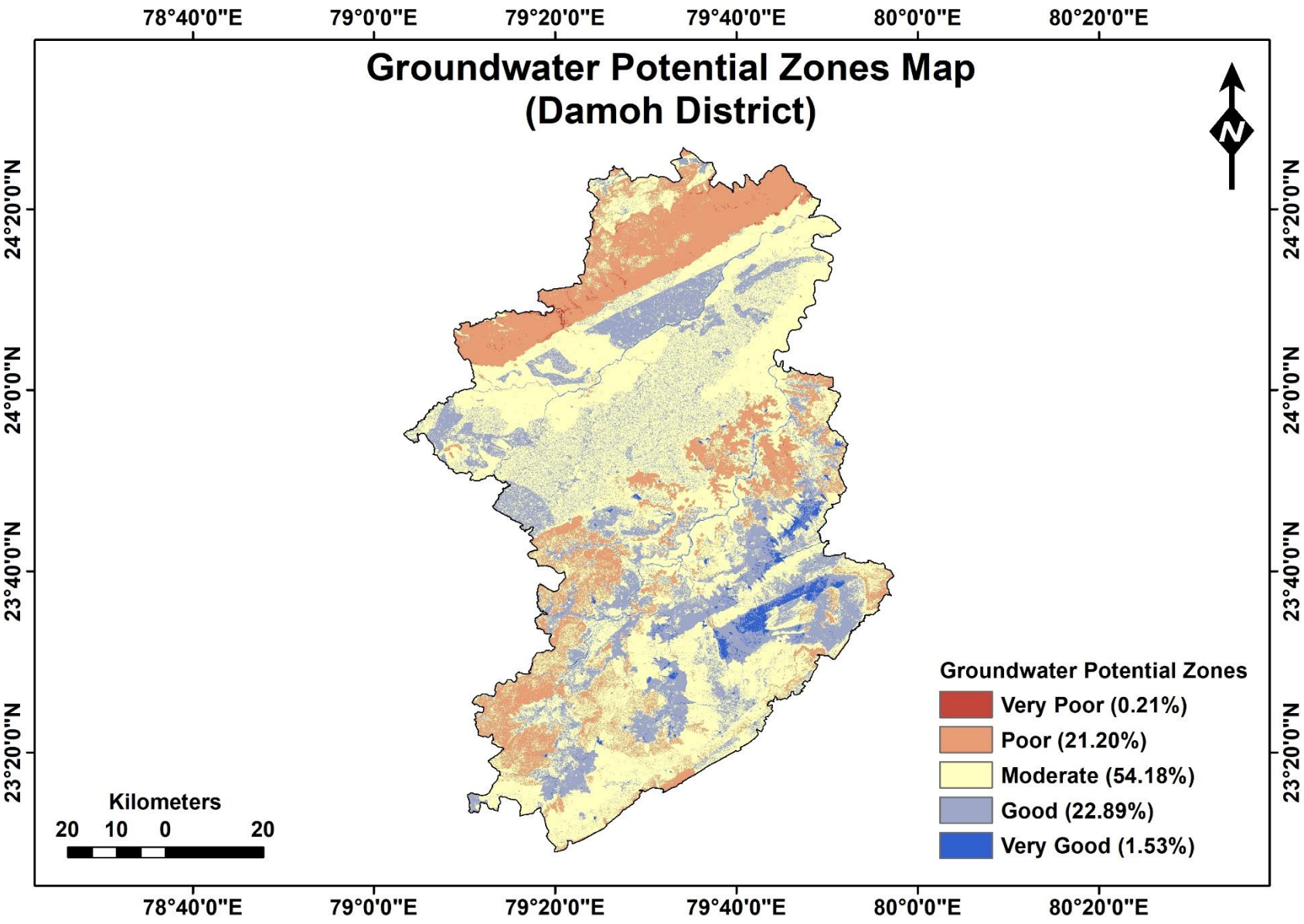

Groundwater Potential Zones Map
(Bhind District)
78°15'0"E
78°30'0"E
78°45'0"E
79°0'0"E
79°15'0"E
79°30'0"E
26°45'0"N
26°30'0"N
26°15'0"N
26°0'0"N
N
Groundwater Potential Zones
Very Poor (0.17%)
Poor (0.05%)
Moderate (2.05%)
Good (49.27%)
Very Good (48.46%)
Kilometers
10 5 0 10

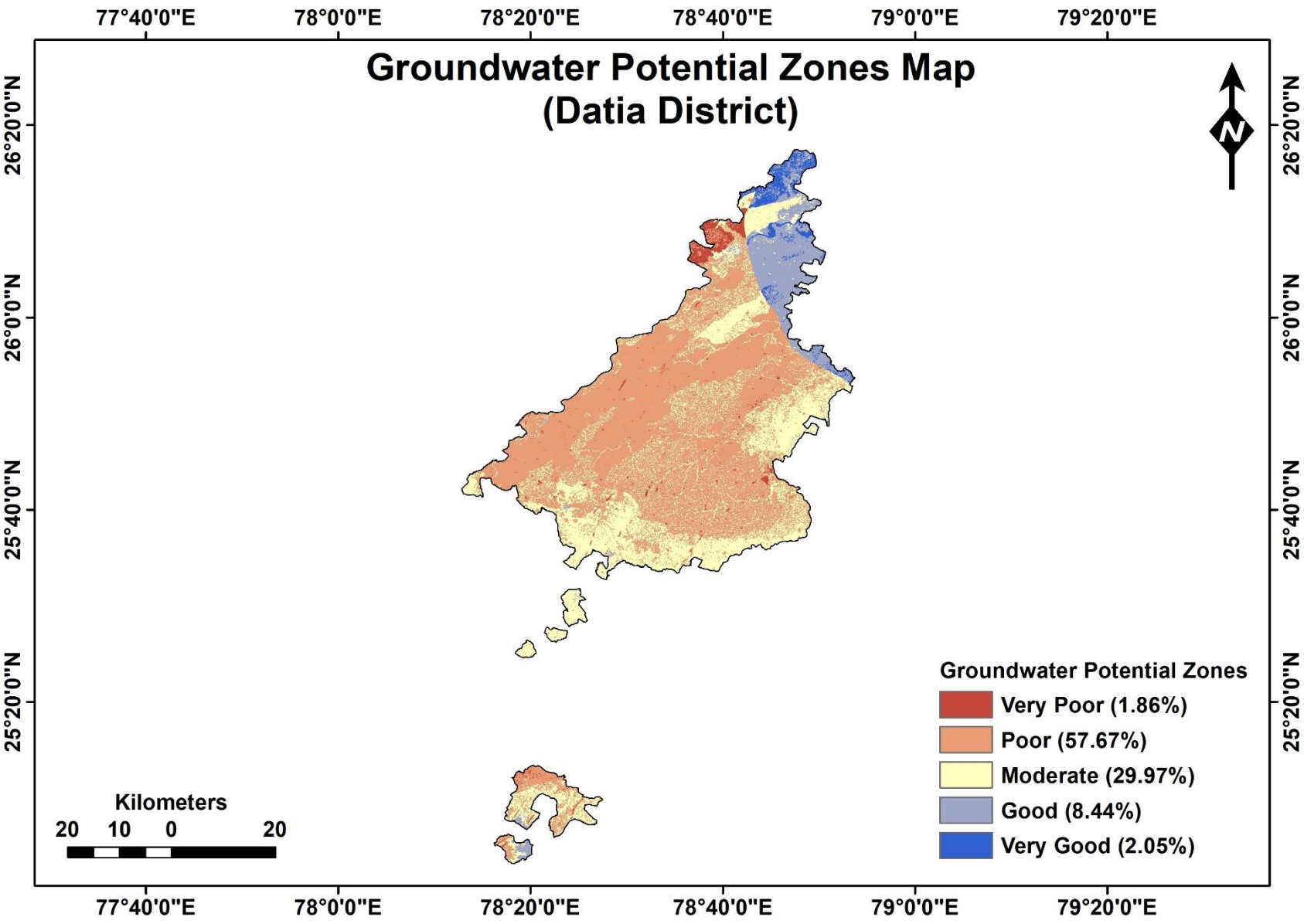

Groundwater Potential Zones Map
(Bhopal District)
76°45'0"E
77°0'0"E
77°15'0"E
77°30'0"E
77°45'0"E
78°0'0"E
24°0'0"N
23°45'0"N
23°30'0"N
23°15'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.00%)
Poor (2.49%)
Moderate (37.85%)
Good (57.47%)
Very Good (2.19%)

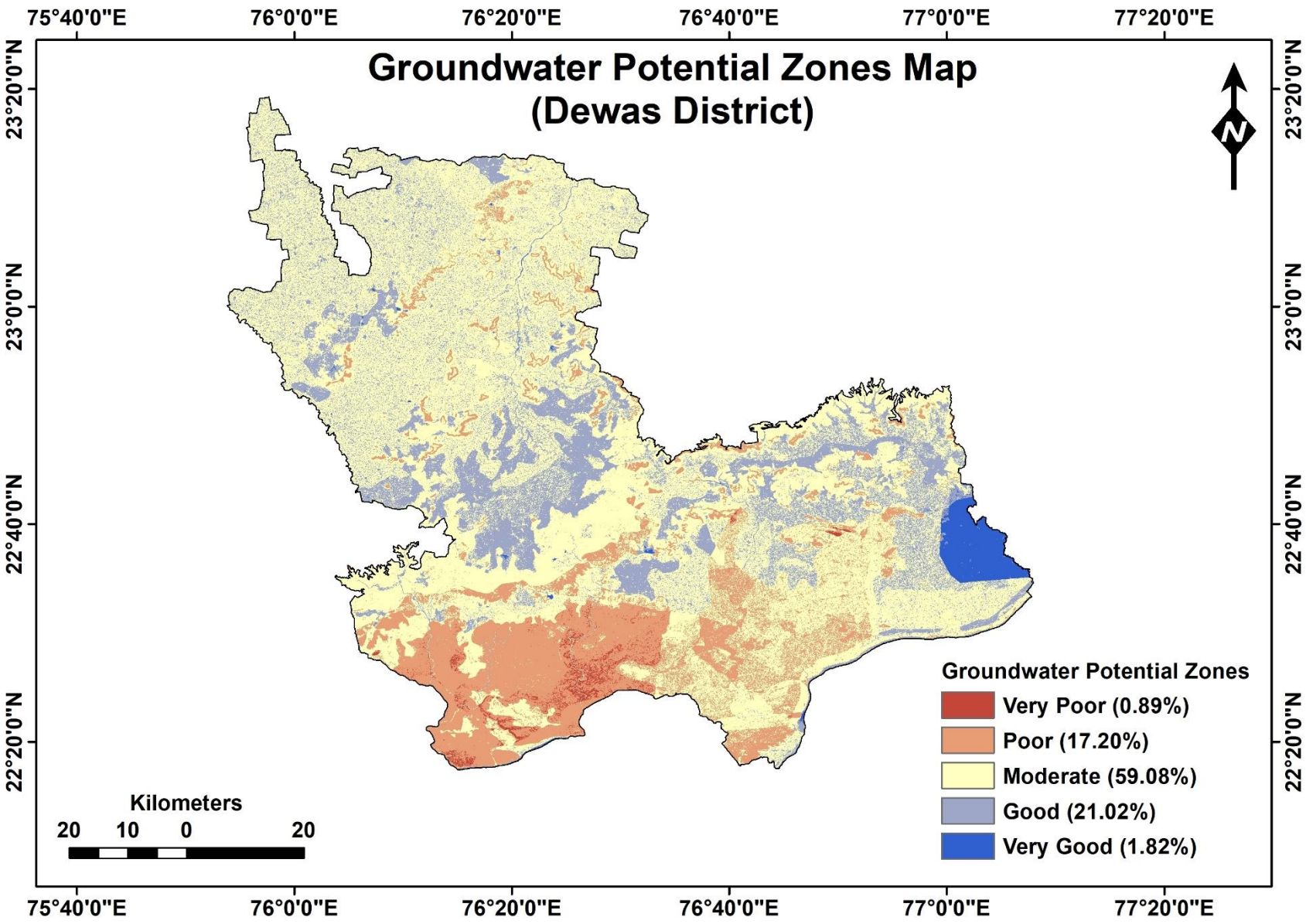

Groundwater Potential Zones Map
(Burhanpur District)
76°0'0"E
76°15'0"E
76°30'0"E
76°45'0"E
21°30'0"N
21°15'0"N
21°0'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (2.08%)
Moderate (72.56%)
Good (24.80%)
Very Good (0.56%)
Kilometers
8 4 0 8

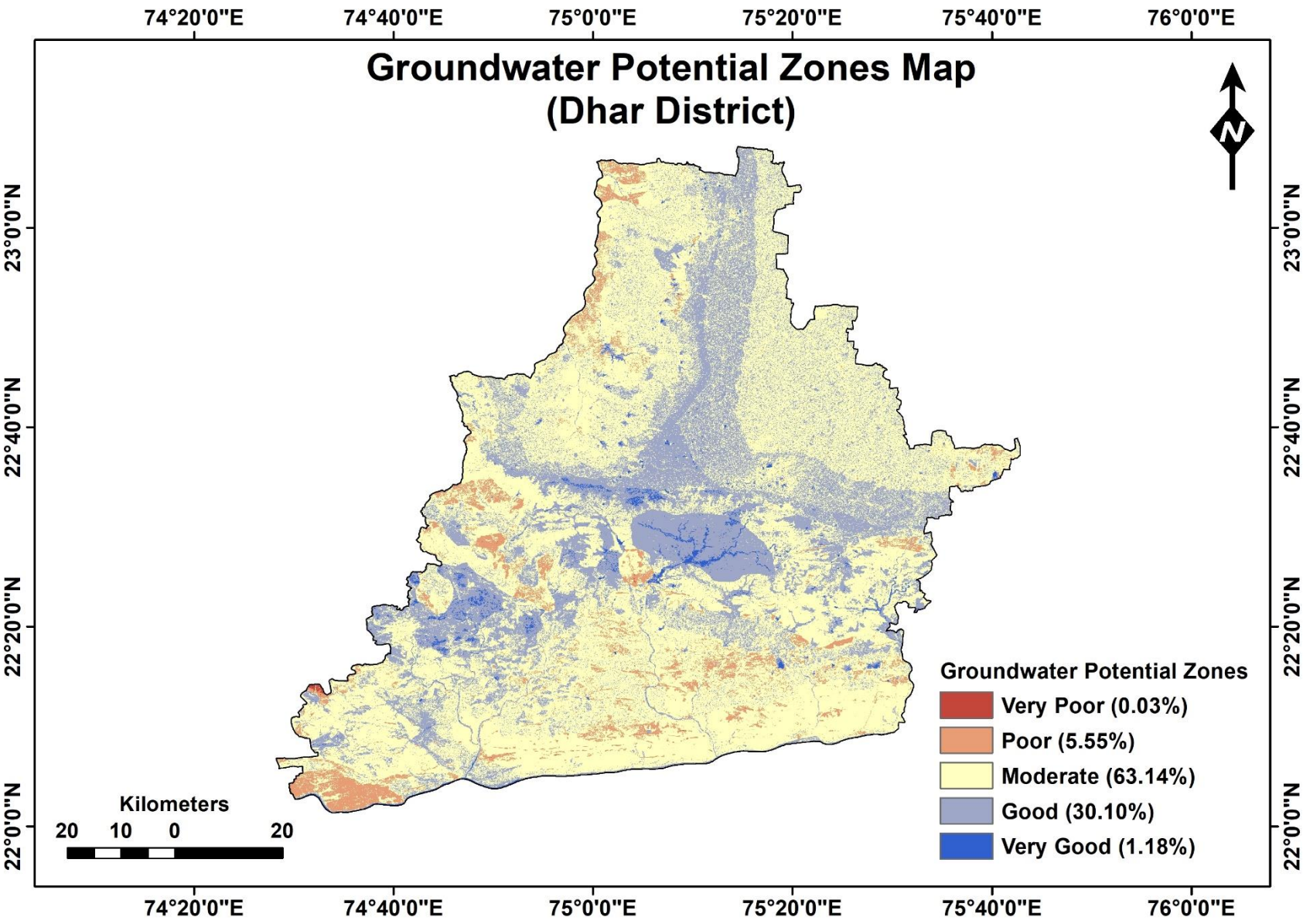

Groundwater Potential Zones Map
(Chhatarpur District)
78°40'0"E
79°0'0"E
79°20'0"E
79°40'0"E
80°0'0"E
80°20'0"E
80°40'0"E
25°20'0"N
25°0'0"N
24°40'0"N
24°20'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (2.11%)
Poor (29.90%)
Moderate (52.03%)
Good (14.17%)
Very Good (1.79%)

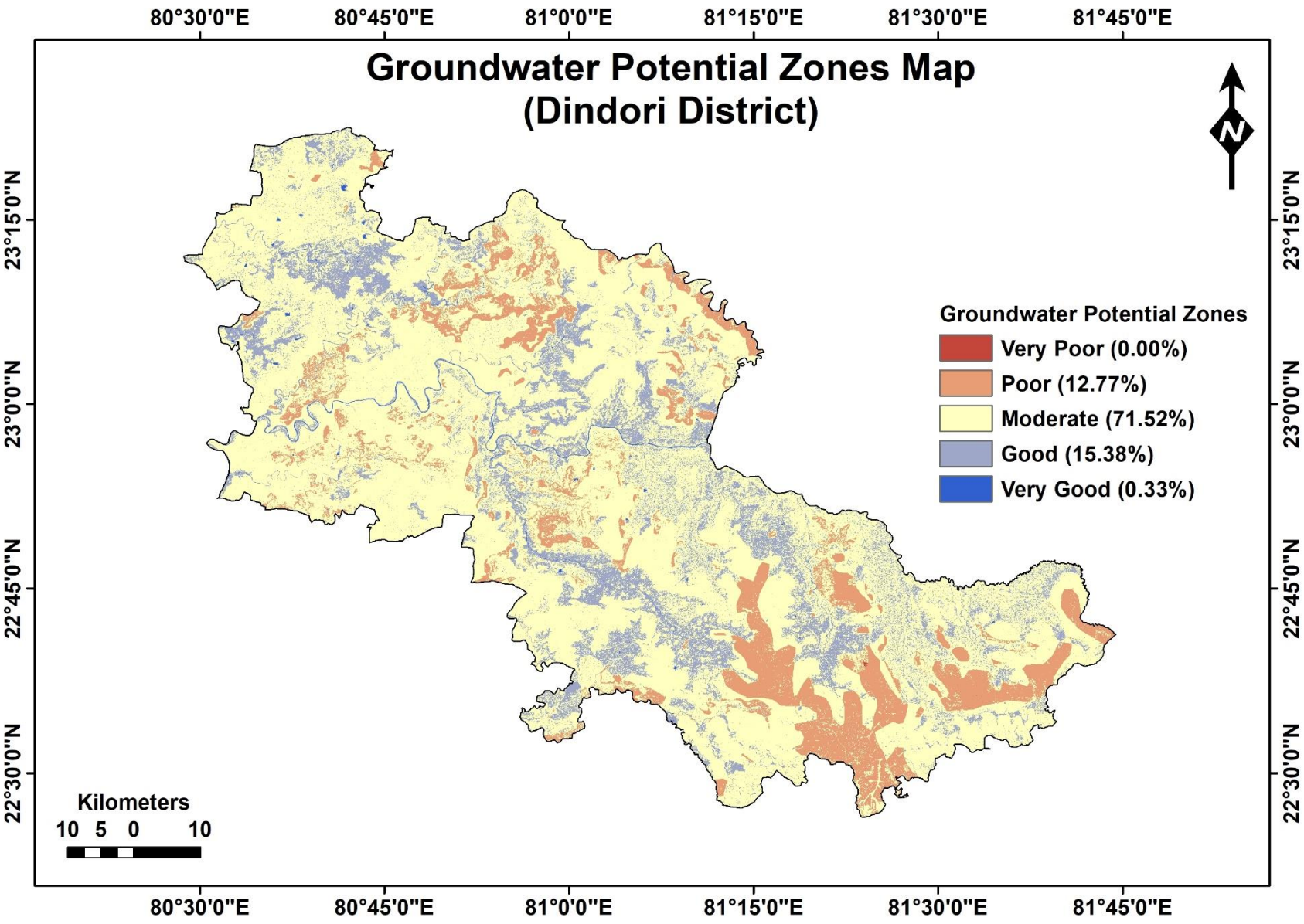

Groundwater Potential Zones Map
(Chhindwara District)
78°0'0"E
78°20'0"E
78°40'0"E
79°0'0"E
79°20'0"E
79°40'0"E
80°0'0"E
23°0'0"N
22°40'0"N
22°20'0"N
22°0'0"N
21°40'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.17%)
Poor (8.34%)
Moderate (63.22%)
Good (26.89%)
Very Good (1.39%)

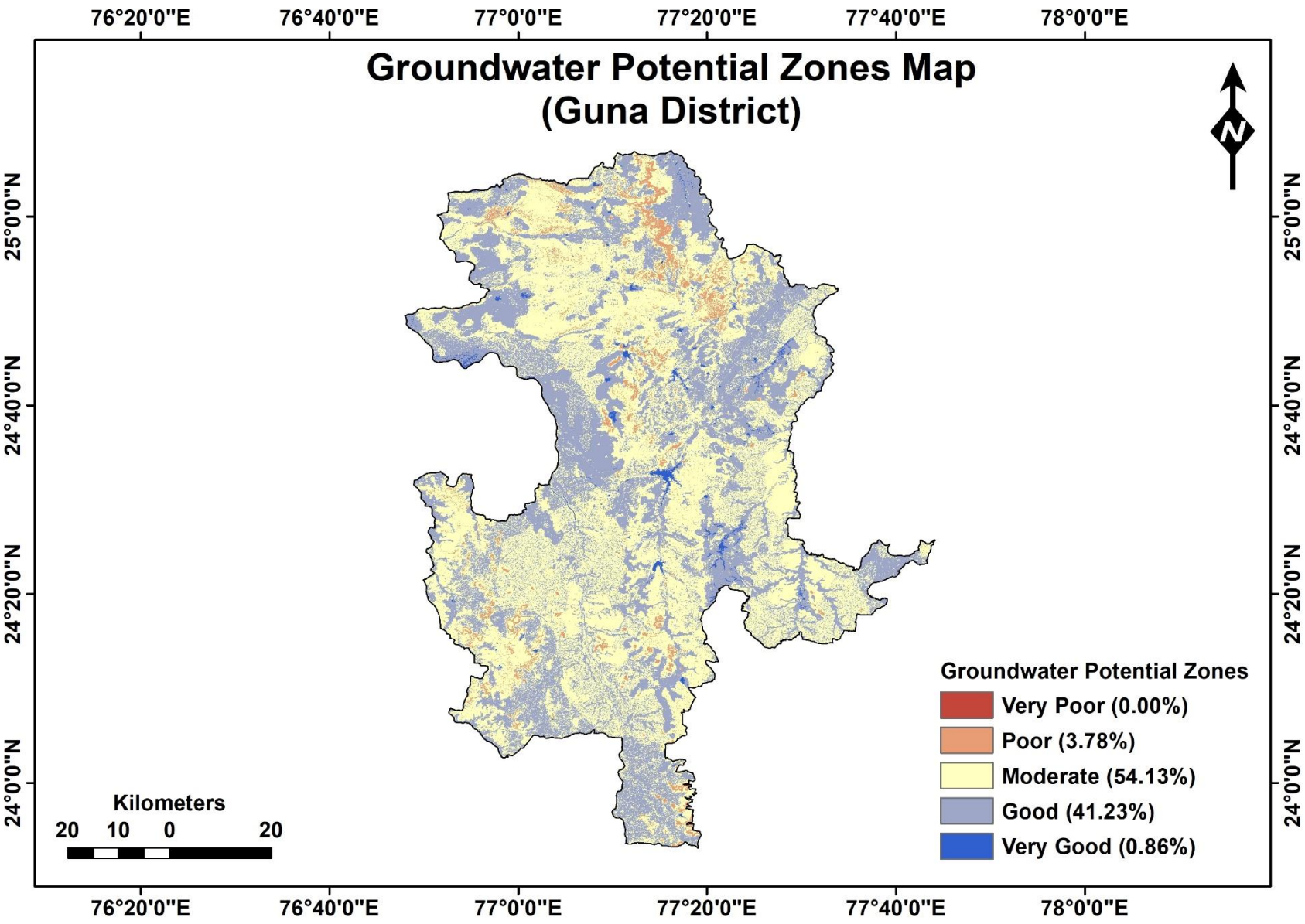

Groundwater Potential Zones Map
(Damoh District)
78°40'0"E
79°0'0"E
79°20'0"E
79°40'0"E
80°0'0"E
80°20'0"E
24°20'0"N
24°0'0"N
23°40'0"N
23°20'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.21%)
Poor (21.20%)
Moderate (54.18%)
Good (22.89%)
Very Good (1.53%)

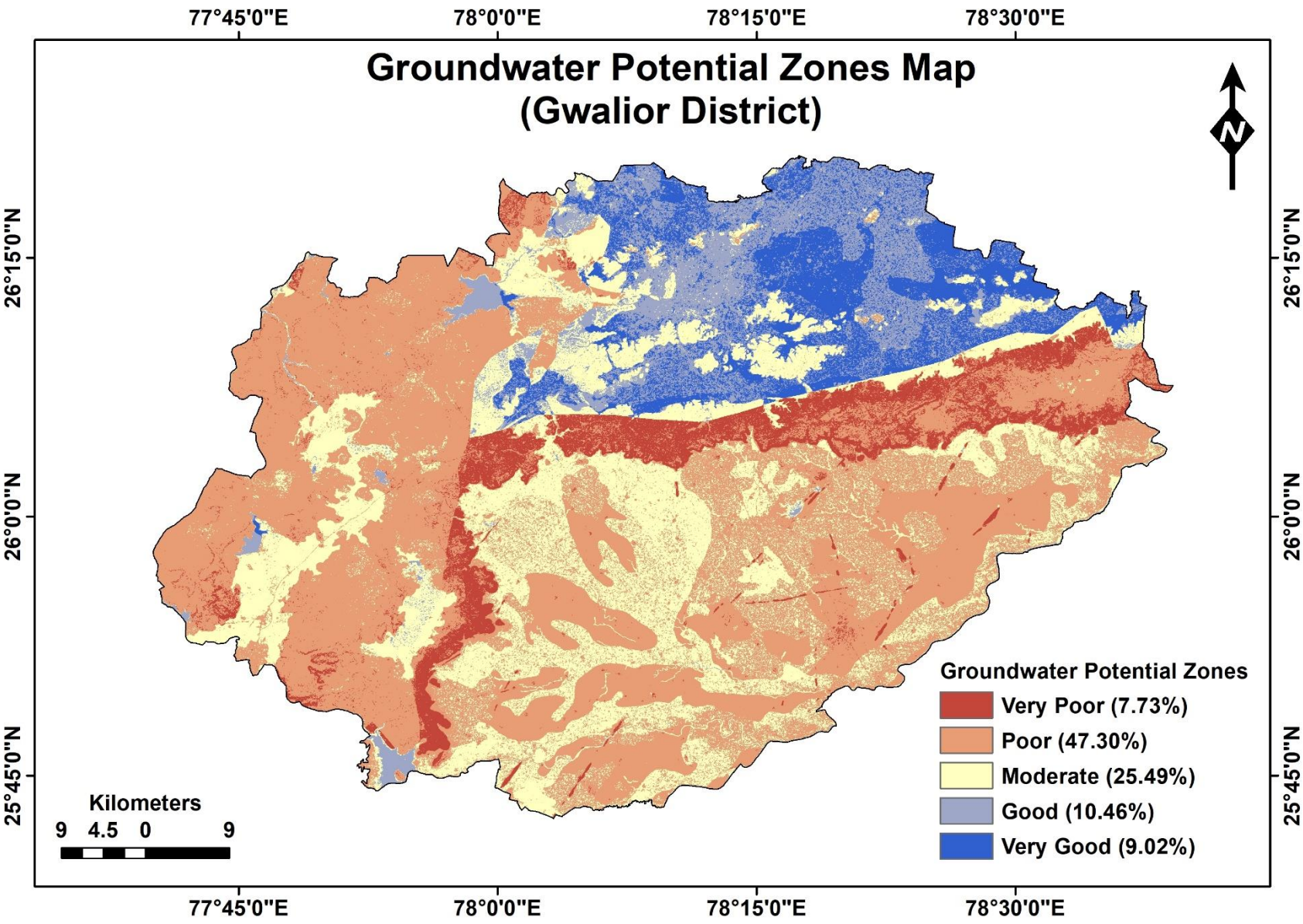

Groundwater Potential Zones Map
(Datia District)
77°40'0"E
78°0'0"E
78°20'0"E
78°40'0"E
79°0'0"E
79°20'0"E
26°20'0"N
26°0'0"N
25°40'0"N
25°20'0"N
N
Groundwater Potential Zones
Very Poor (1.86%)
Poor (57.67%)
Moderate (29.97%)
Good (8.44%)
Very Good (2.05%)
Kilometers
20 10 0 20

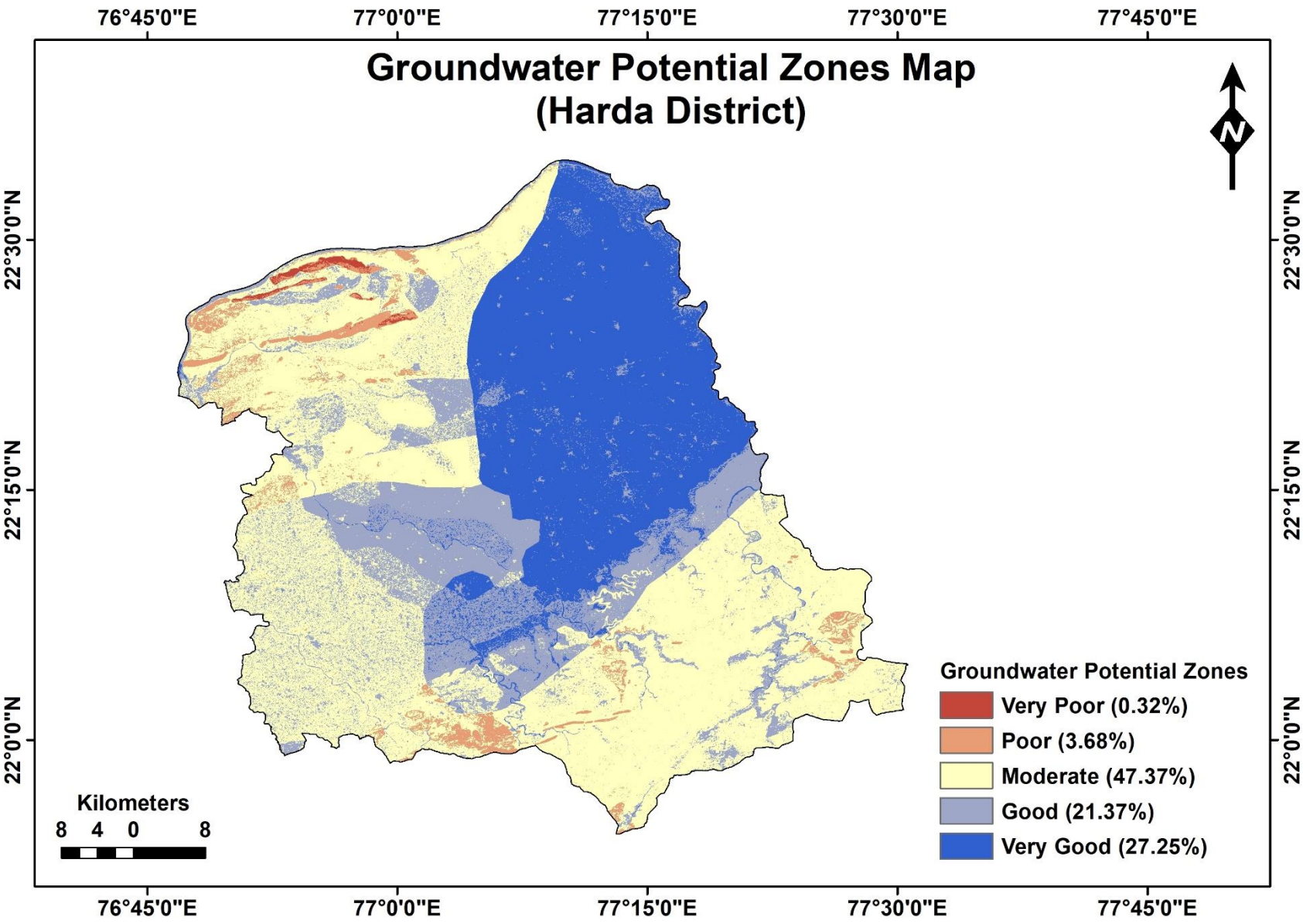

Groundwater Potential Zones Map
(Dewas District)
75°40'0"E
76°0'0"E
76°20'0"E
76°40'0"E
77°0'0"E
77°20'0"E
23°20'0"N
23°0'0"N
22°40'0"N
22°20'0"N
N
Groundwater Potential Zones
Very Poor (0.89%)
Poor (17.20%)
Moderate (59.08%)
Good (21.02%)
Very Good (1.82%)
Kilometers
20 10 0 20

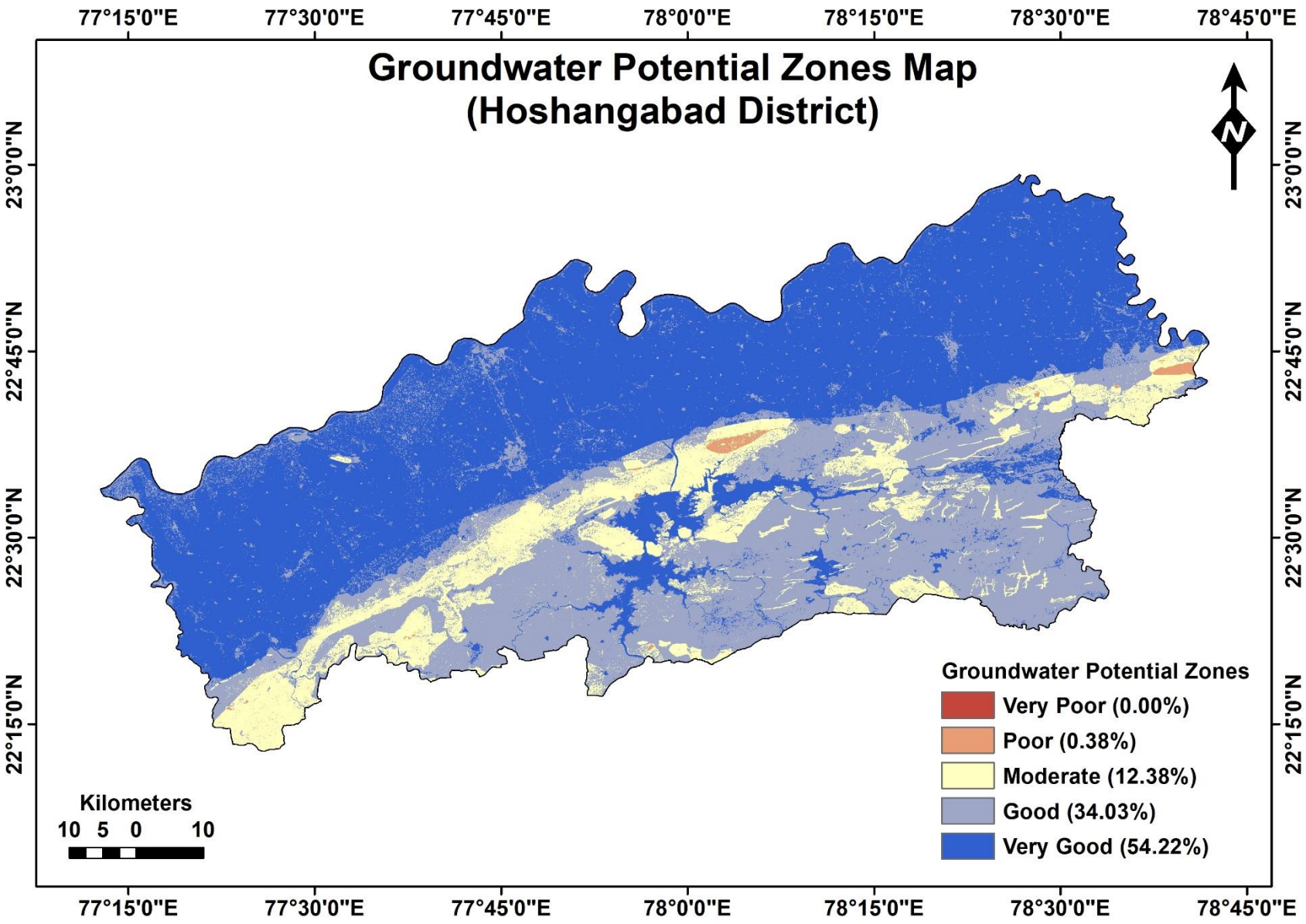

Groundwater Potential Zones Map
(Dhar District)
74°20'0"E
74°40'0"E
75°0'0"E
75°20'0"E
75°40'0"E
76°0'0"E
23°0'0"N
22°40'0"N
22°20'0"N
22°0'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.03%)
Poor (5.55%)
Moderate (63.14%)
Good (30.10%)
Very Good (1.18%)

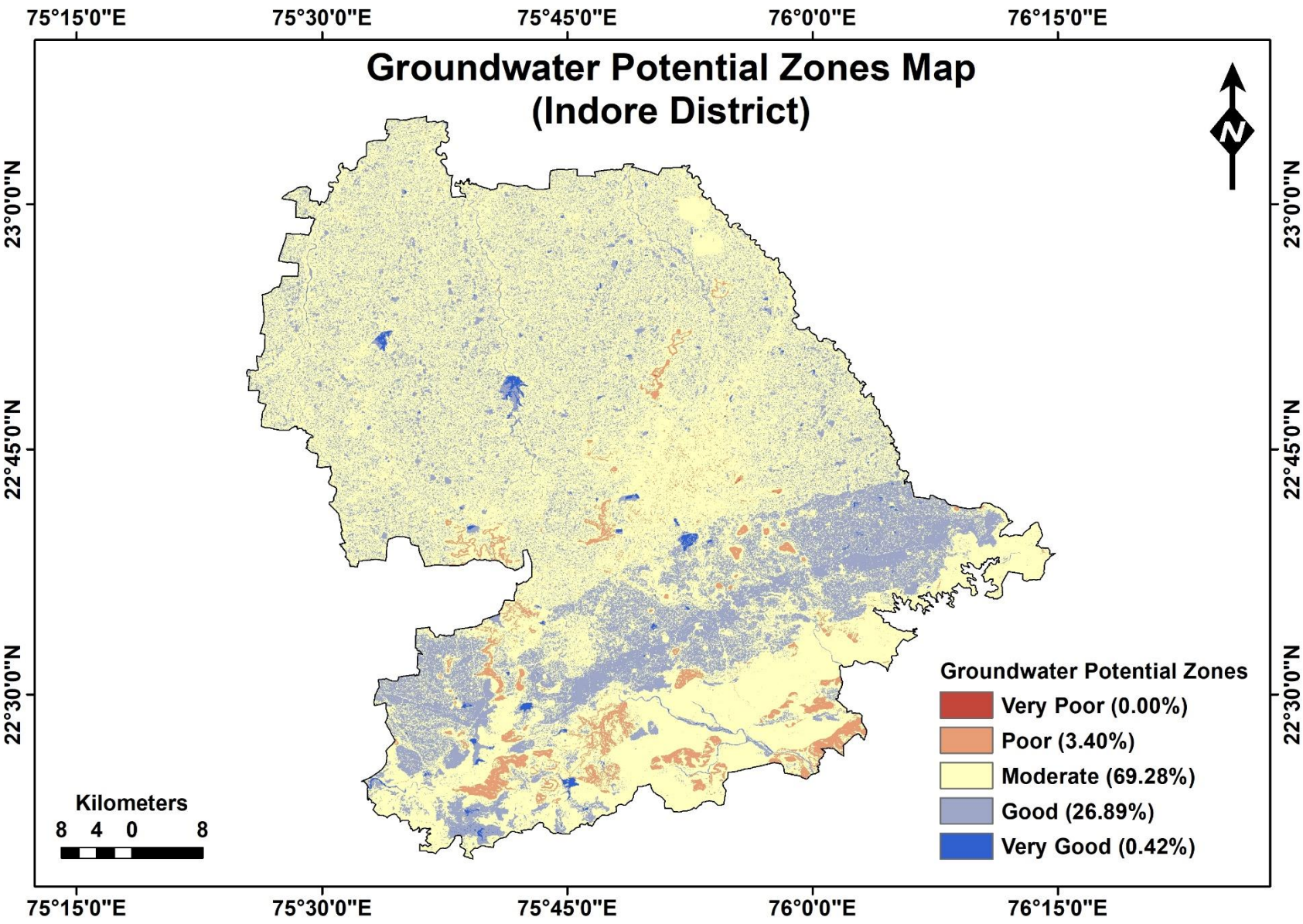

Groundwater Potential Zones Map
(Dindori District)
80°30'0"E
80°45'0"E
81°0'0"E
81°15'0"E
81°30'0"E
81°45'0"E
23°15'0"N
23°0'0"N
22°45'0"N
22°30'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (12.77%)
Moderate (71.52%)
Good (15.38%)
Very Good (0.33%)
Kilometers
10 5 0 10

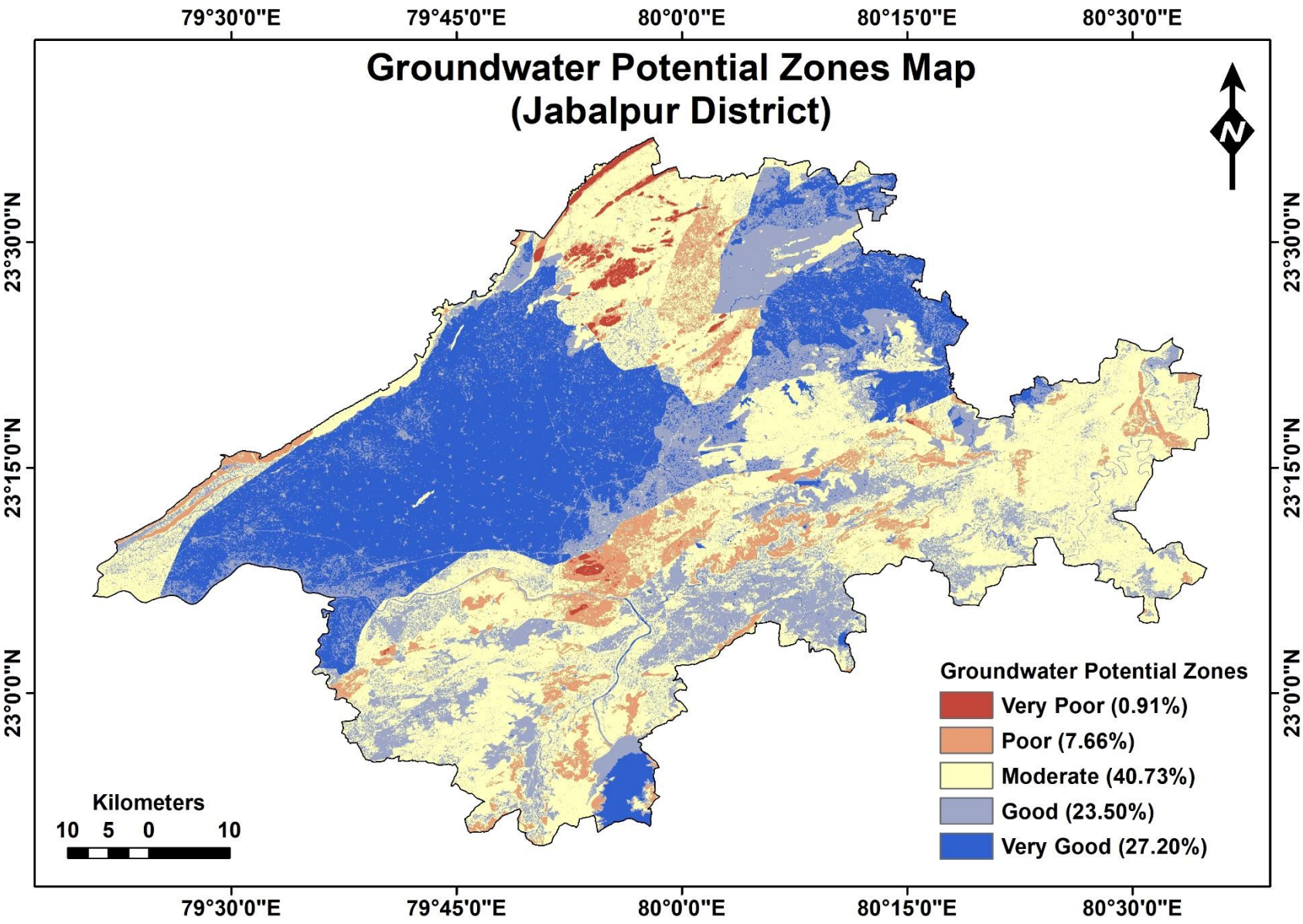

Groundwater Potential Zones Map
(Guna District)
76°20'0"E
76°40'0"E
77°0'0"E
77°20'0"E
77°40'0"E
78°0'0"E
25°0'0"N
24°40'0"N
24°20'0"N
24°0'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.00%)
Poor (3.78%)
Moderate (54.13%)
Good (41.23%)
Very Good (0.86%)

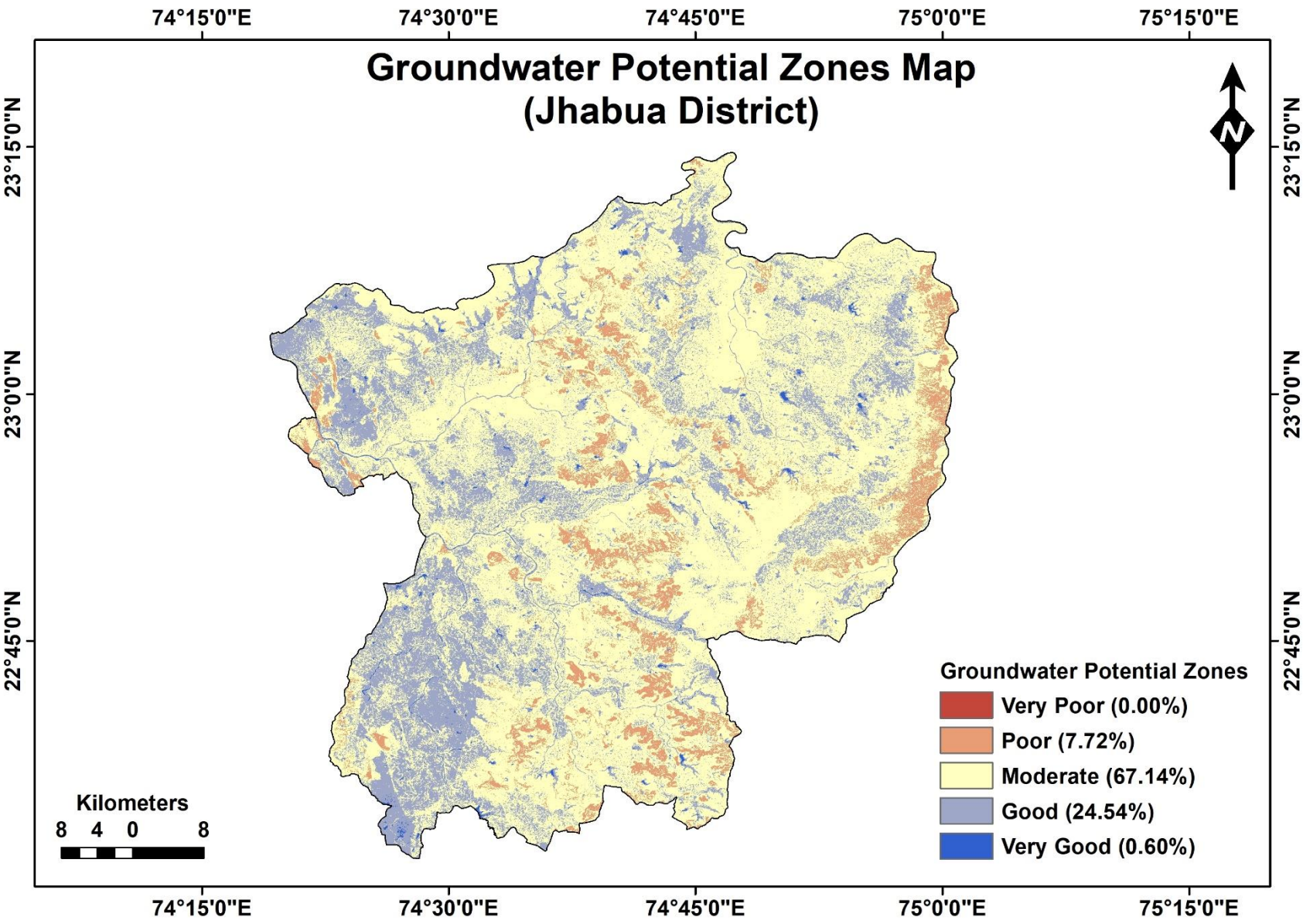

Groundwater Potential Zones Map
(Gwalior District)
77°45'0"E
78°0'0"E
78°15'0"E
78°30'0"E
26°15'0"N
26°0'0"N
25°45'0"N
N
Groundwater Potential Zones
Very Poor (7.73%)
Poor (47.30%)
Moderate (25.49%)
Good (10.46%)
Very Good (9.02%)
Kilometers
9 4.5 0 9

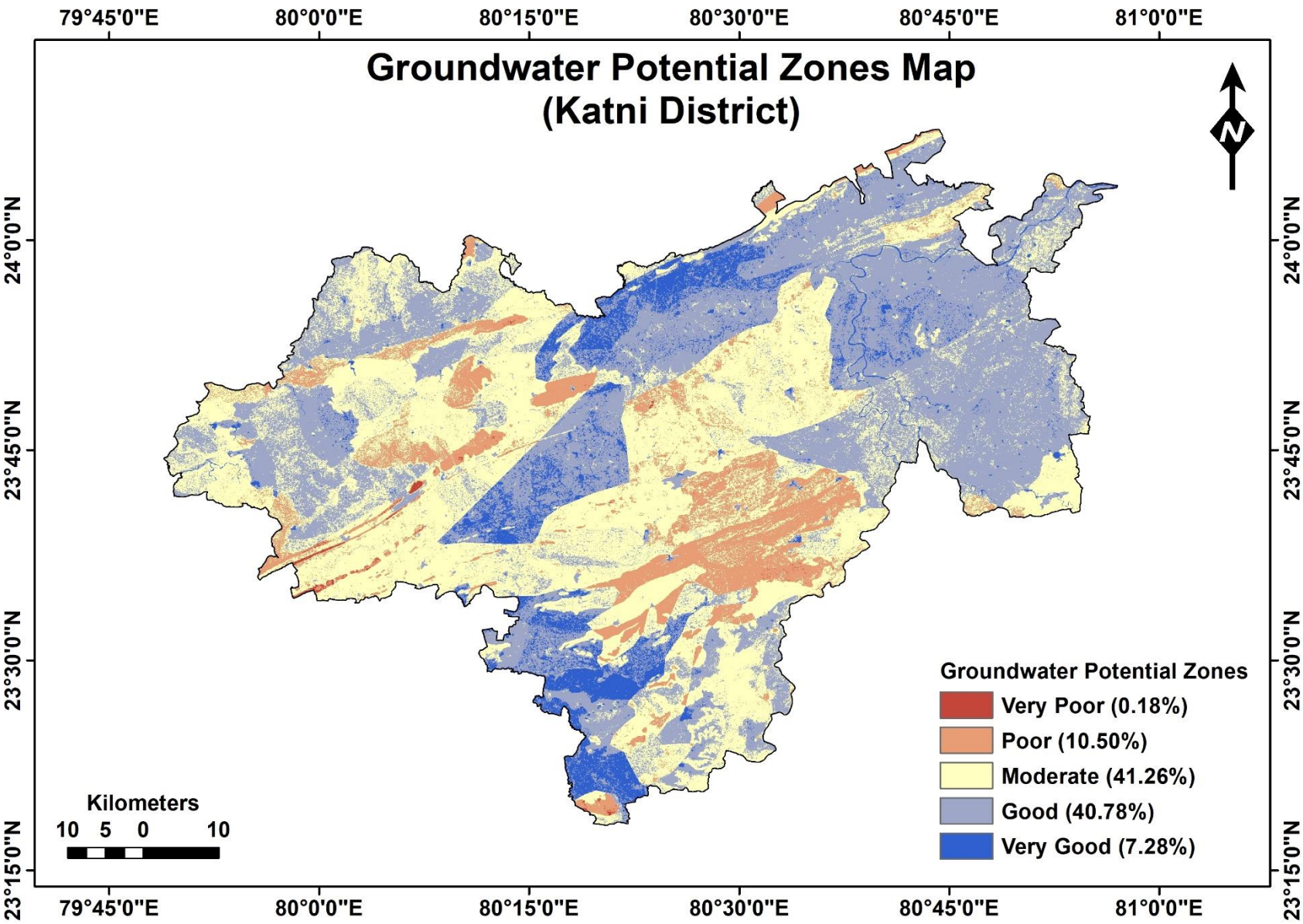

Groundwater Potential Zones Map
(Harda District)
76°45'0"E
77°0'0"E
77°15'0"E
77°30'0"E
77°45'0"E
22°30'0"N
22°15'0"N
22°0'0"N
N
Kilometers
8 4 0 8
Groundwater Potential Zones
Very Poor (0.32%)
Poor (3.68%)
Moderate (47.37%)
Good (21.37%)
Very Good (27.25%)

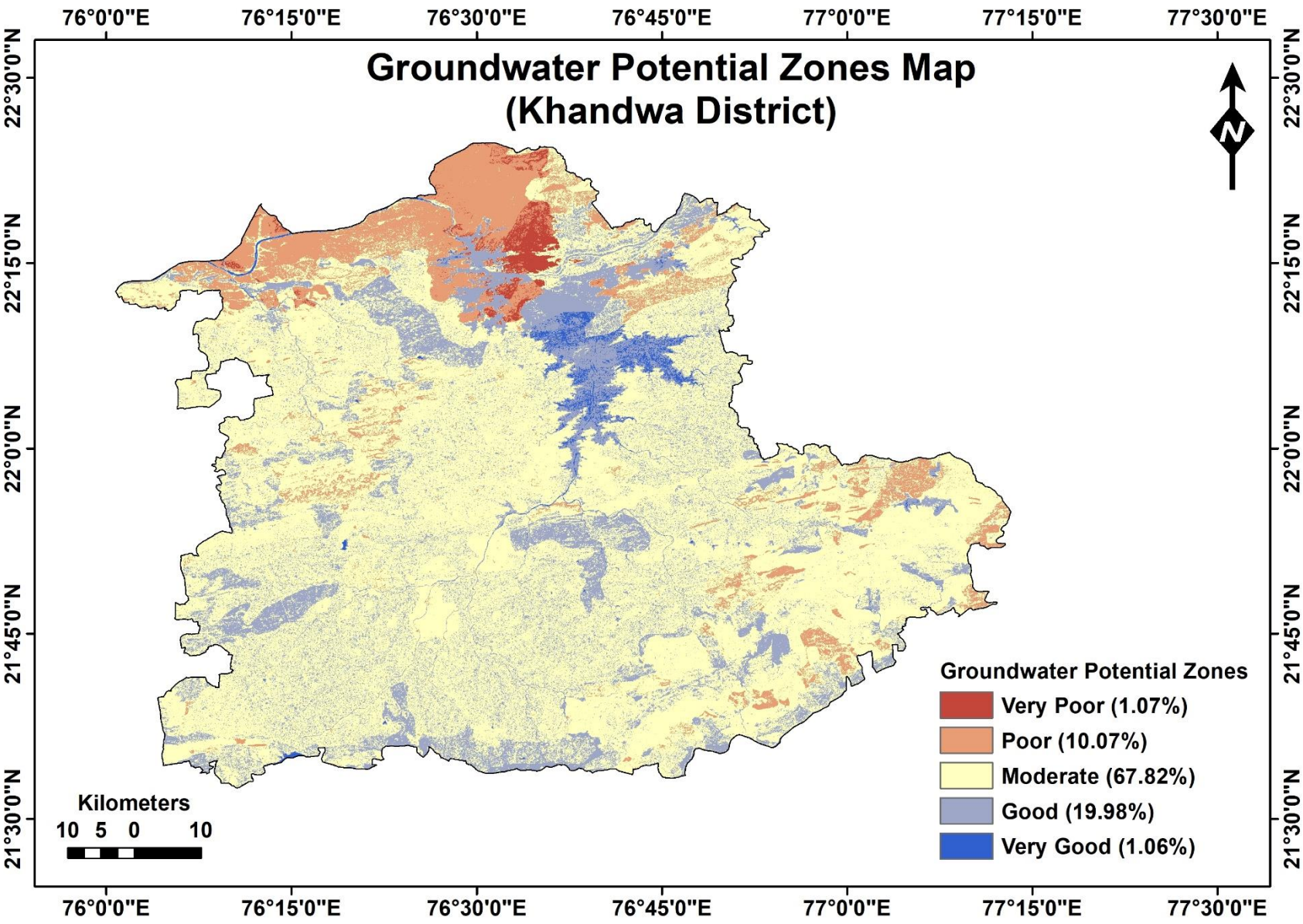

Groundwater Potential Zones Map
(Hoshangabad District)
77°15'0"E
77°30'0"E
77°45'0"E
78°0'0"E
78°15'0"E
78°30'0"E
78°45'0"E
23°0'0"N
22°45'0"N
22°30'0"N
22°15'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (0.38%)
Moderate (12.38%)
Good (34.03%)
Very Good (54.22%)
Kilometers
10 5 0 10

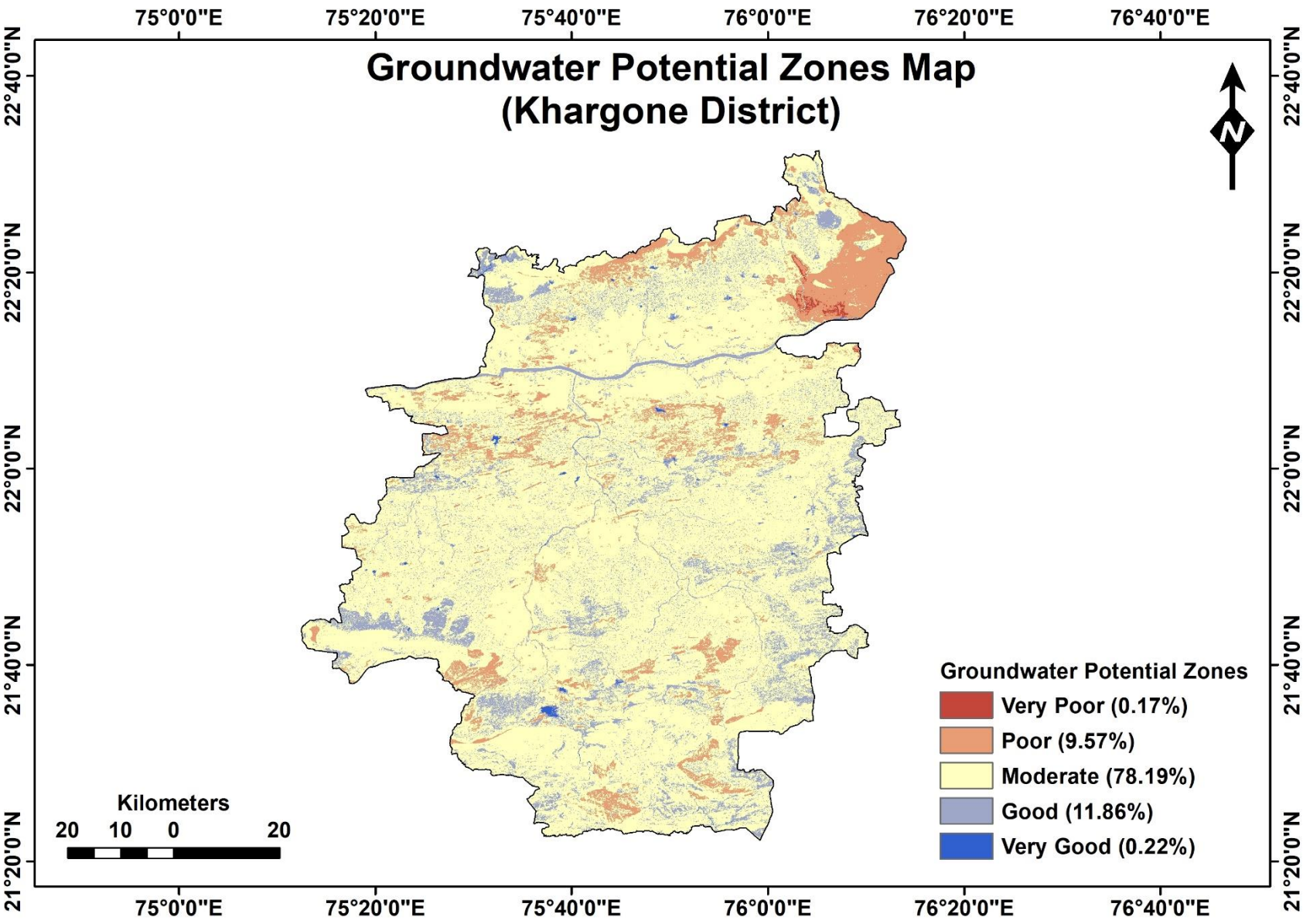

Groundwater Potential Zones Map
(Indore District)
75°15'0"E
75°30'0"E
75°45'0"E
76°0'0"E
76°15'0"E
23°0'0"N
22°45'0"N
22°30'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (3.40%)
Moderate (69.28%)
Good (26.89%)
Very Good (0.42%)
Kilometers
8 4 0 8

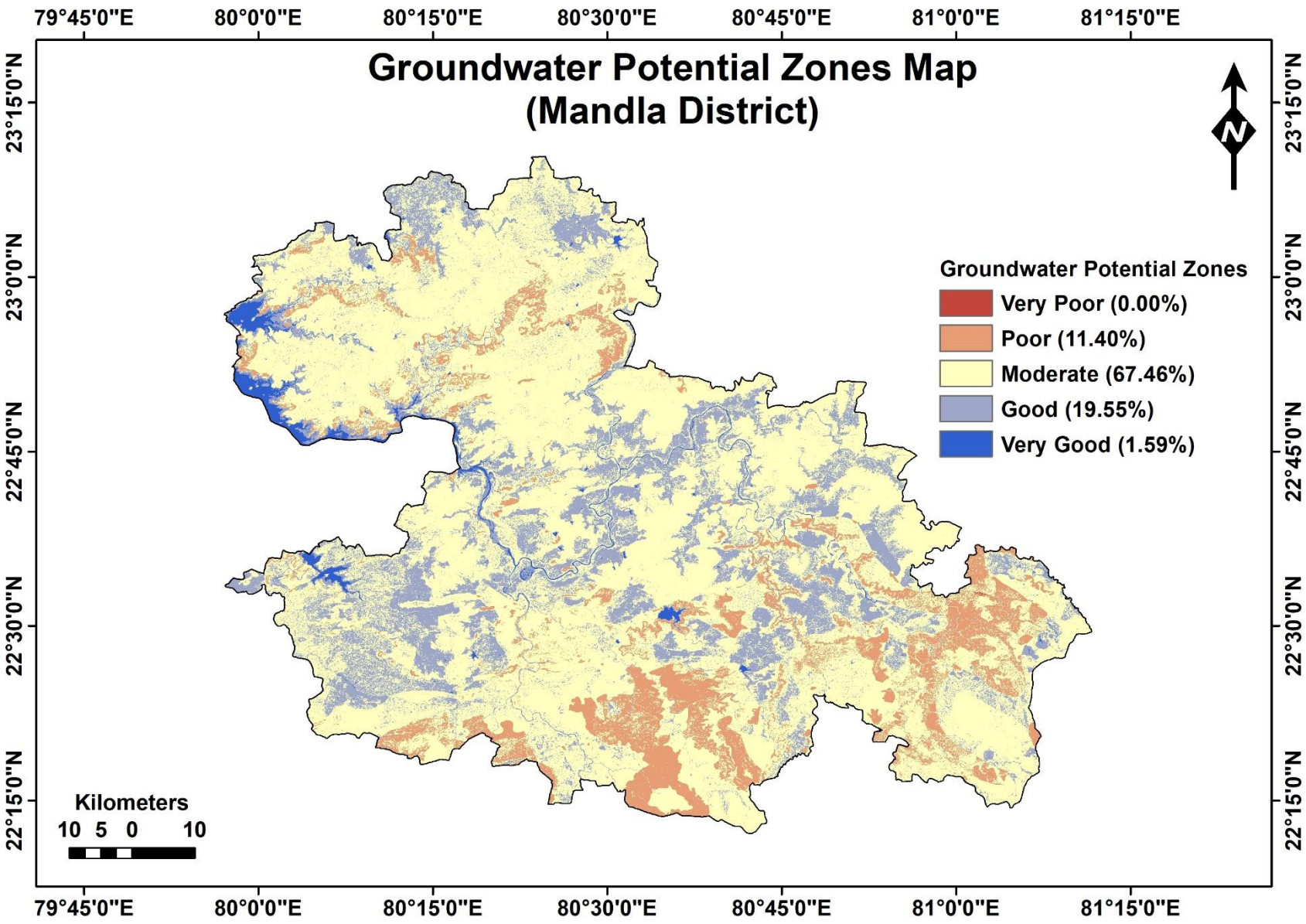

Groundwater Potential Zones Map
(Jabalpur District)
79°30'0"E
79°45'0"E
80°0'0"E
80°15'0"E
80°30'0"E
23°30'0"N
23°15'0"N
23°0'0"N
N
Groundwater Potential Zones
Very Poor (0.91%)
Poor (7.66%)
Moderate (40.73%)
Good (23.50%)
Very Good (27.20%)
Kilometers
10 5 0 10

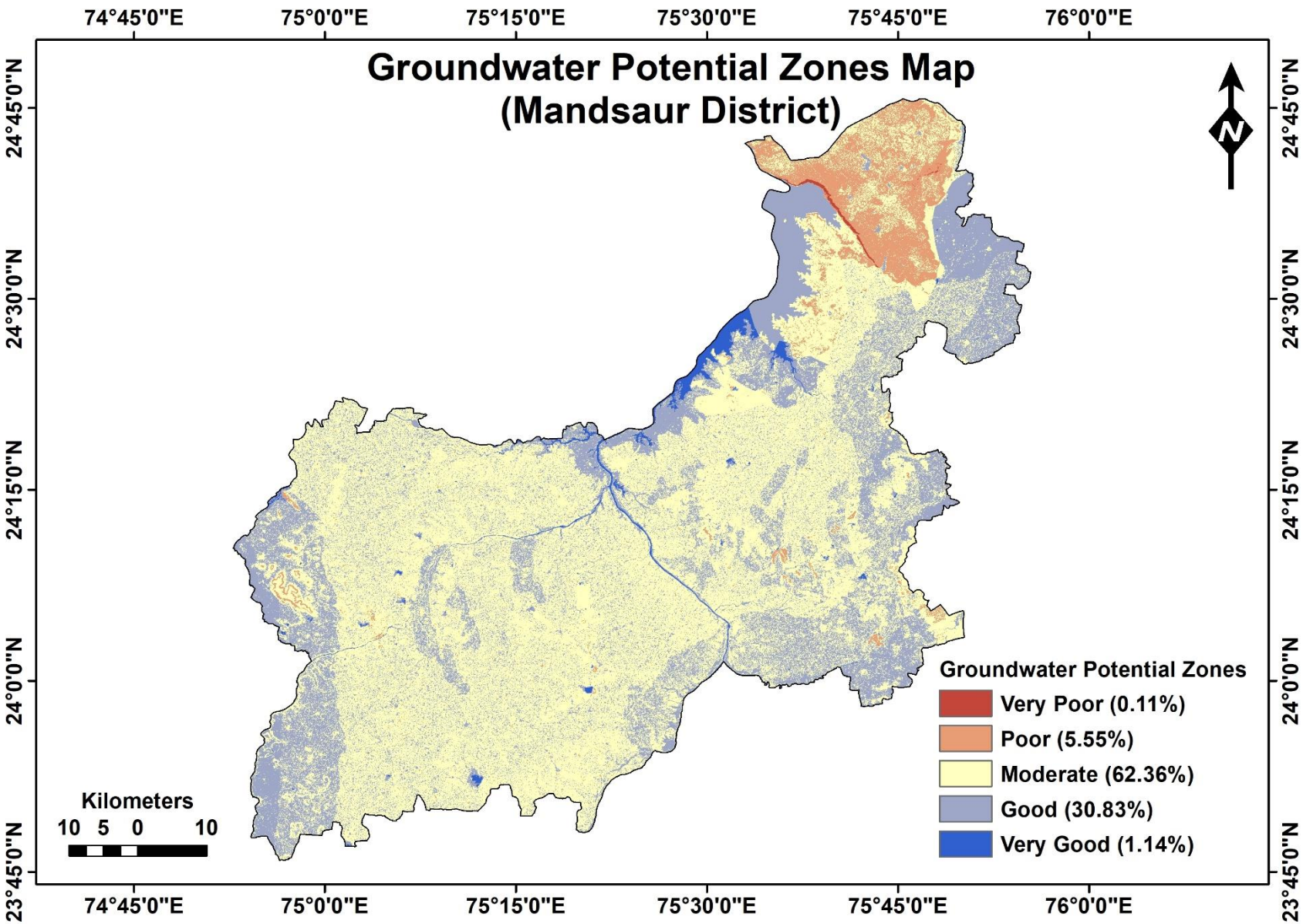

Groundwater Potential Zones Map
(Jhabua District)
74°15'0"E
74°30'0"E
74°45'0"E
75°0'0"E
75°15'0"E
23°15'0"N
23°0'0"N
22°45'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (7.72%)
Moderate (67.14%)
Good (24.54%)
Very Good (0.60%)
Kilometers
8 4 0 8

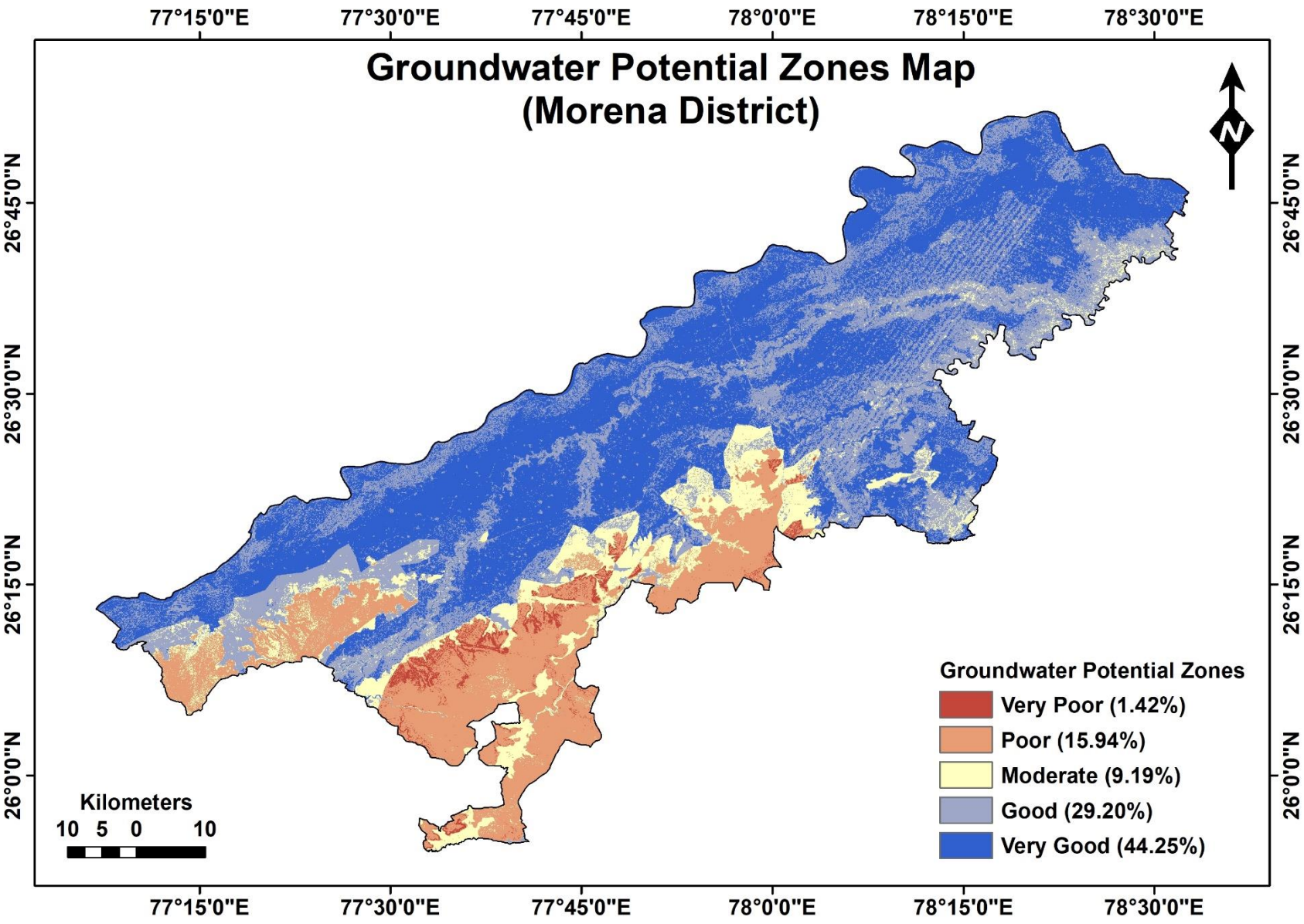

Groundwater Potential Zones Map
(Katni District)
79°45'0"E
80°0'0"E
80°15'0"E
80°30'0"E
80°45'0"E
81°0'0"E
24°0'0"N
23°45'0"N
23°30'0"N
23°15'0"N
N
Groundwater Potential Zones
Very Poor (0.18%)
Poor (10.50%)
Moderate (41.26%)
Good (40.78%)
Very Good (7.28%)
Kilometers
10 5 0 10

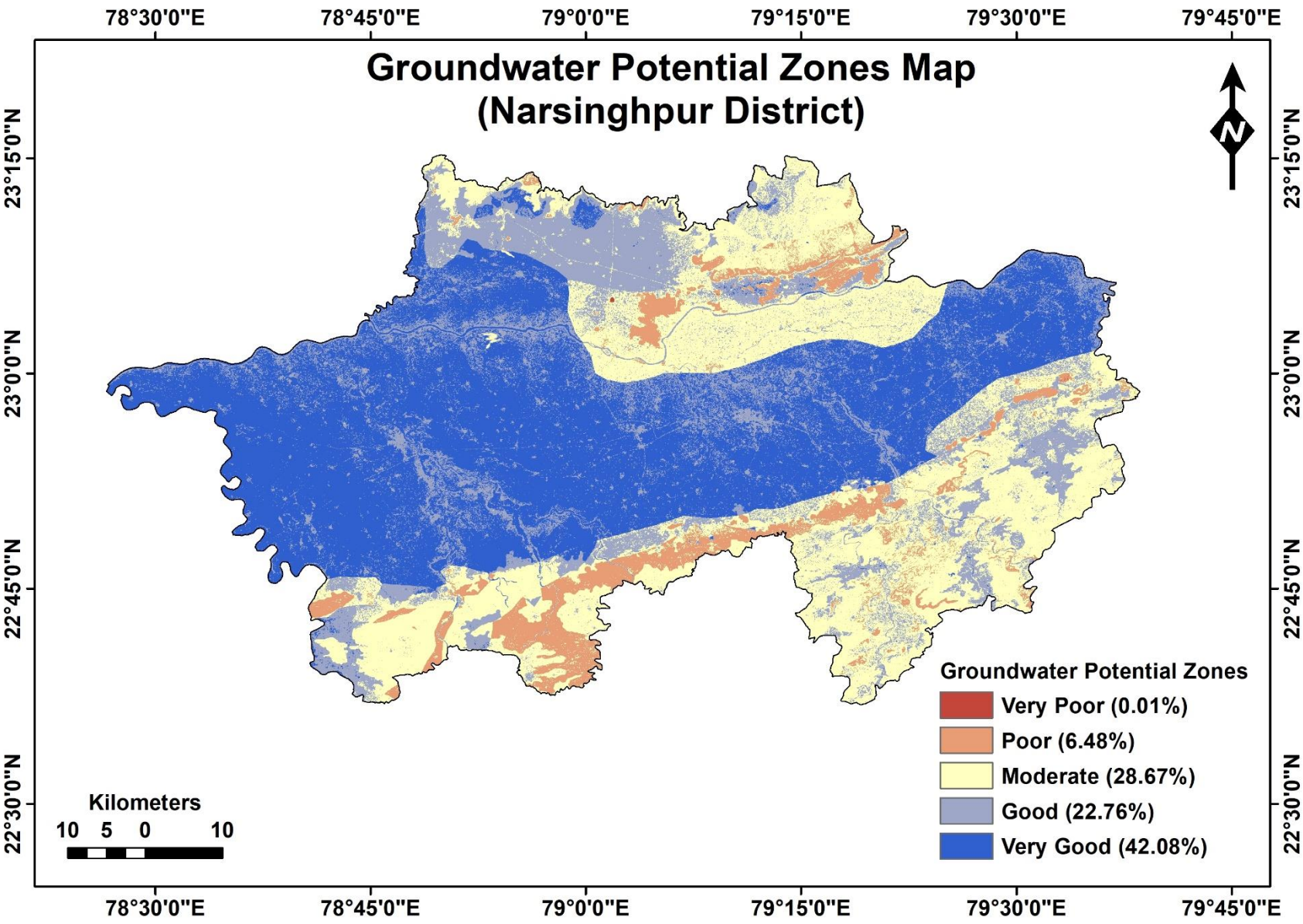

Groundwater Potential Zones Map
(Khandwa District)
76°0'0"E
76°15'0"E
76°30'0"E
76°45'0"E
77°0'0"E
77°15'0"E
77°30'0"E
22°30'0"N
22°15'0"N
22°0'0"N
21°45'0"N
21°30'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (1.07%)
Poor (10.07%)
Moderate (67.82%)
Good (19.98%)
Very Good (1.06%)

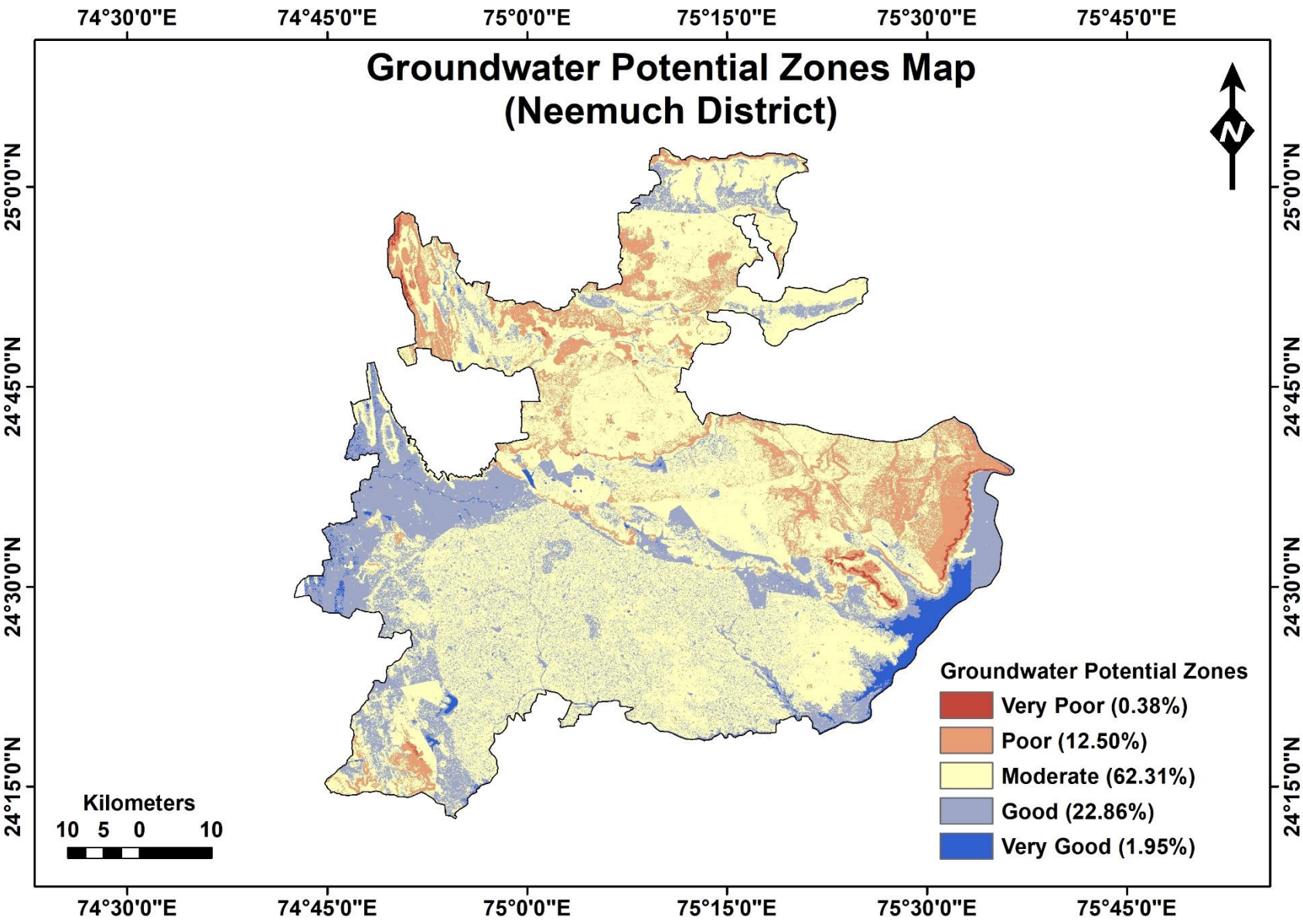

Groundwater Potential Zones Map
(Khargone District)
75°0'0"E
75°20'0"E
75°40'0"E
76°0'0"E
76°20'0"E
76°40'0"E
22°40'0"N
22°20'0"N
22°0'0"N
21°40'0"N
21°20'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.17%)
Poor (9.57%)
Moderate (78.19%)
Good (11.86%)
Very Good (0.22%)

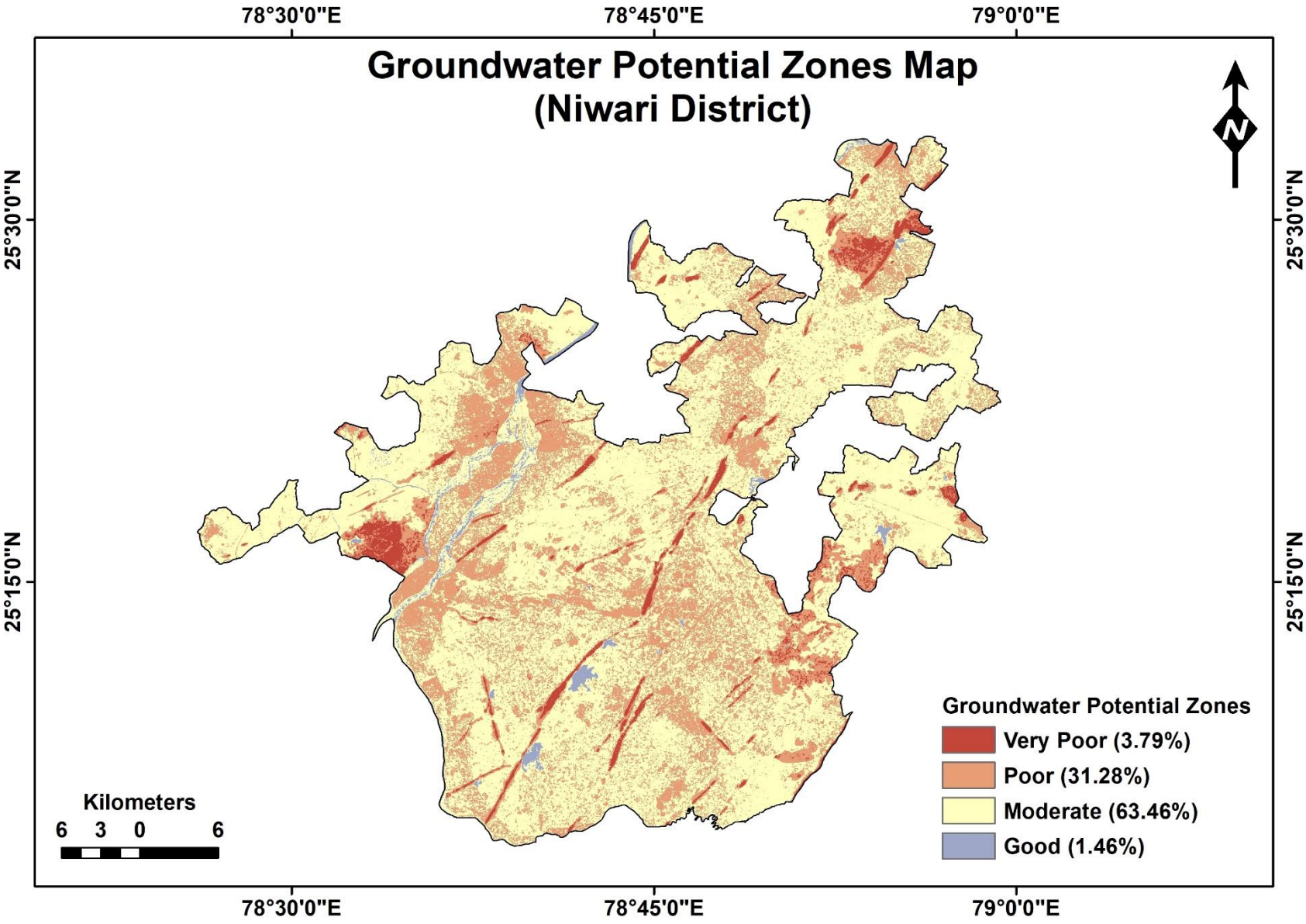

Groundwater Potential Zones Map
(Mandla District)
79°45'0"E
80°0'0"E
80°15'0"E
80°30'0"E
80°45'0"E
81°0'0"E
81°15'0"E
23°15'0"N
23°0'0"N
22°45'0"N
22°30'0"N
22°15'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (11.40%)
Moderate (67.46%)
Good (19.55%)
Very Good (1.59%)
Kilometers
10 5 0 10

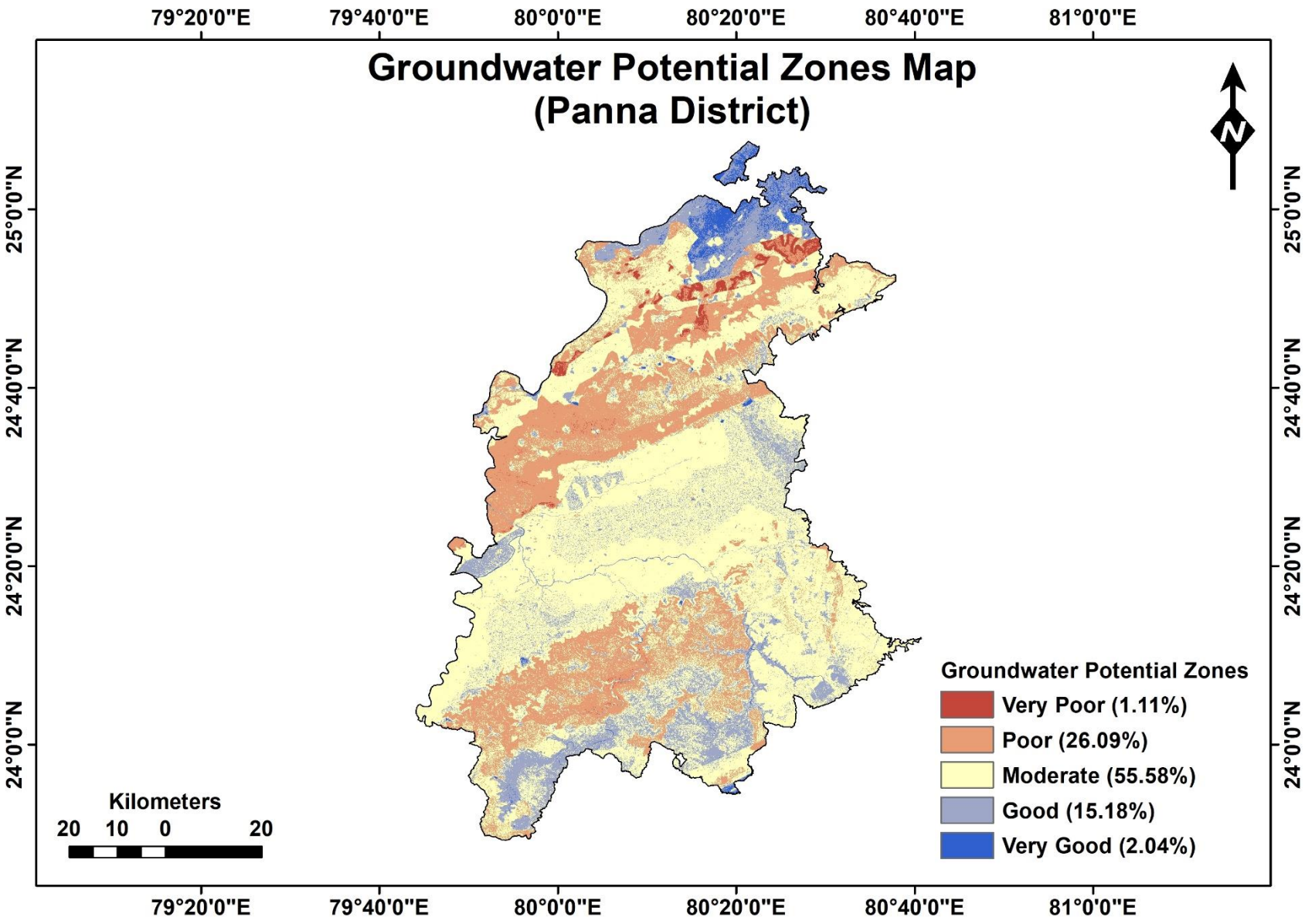

Groundwater Potential Zones Map
(Mandsaur District)
74°45'0"E
75°0'0"E
75°15'0"E
75°30'0"E
75°45'0"E
76°0'0"E
24°45'0"N
24°30'0"N
24°15'0"N
24°0'0"N
23°45'0"N
N
Groundwater Potential Zones
Very Poor (0.11%)
Poor (5.55%)
Moderate (62.36%)
Good (30.83%)
Very Good (1.14%)
Kilometers
10 5 0 10

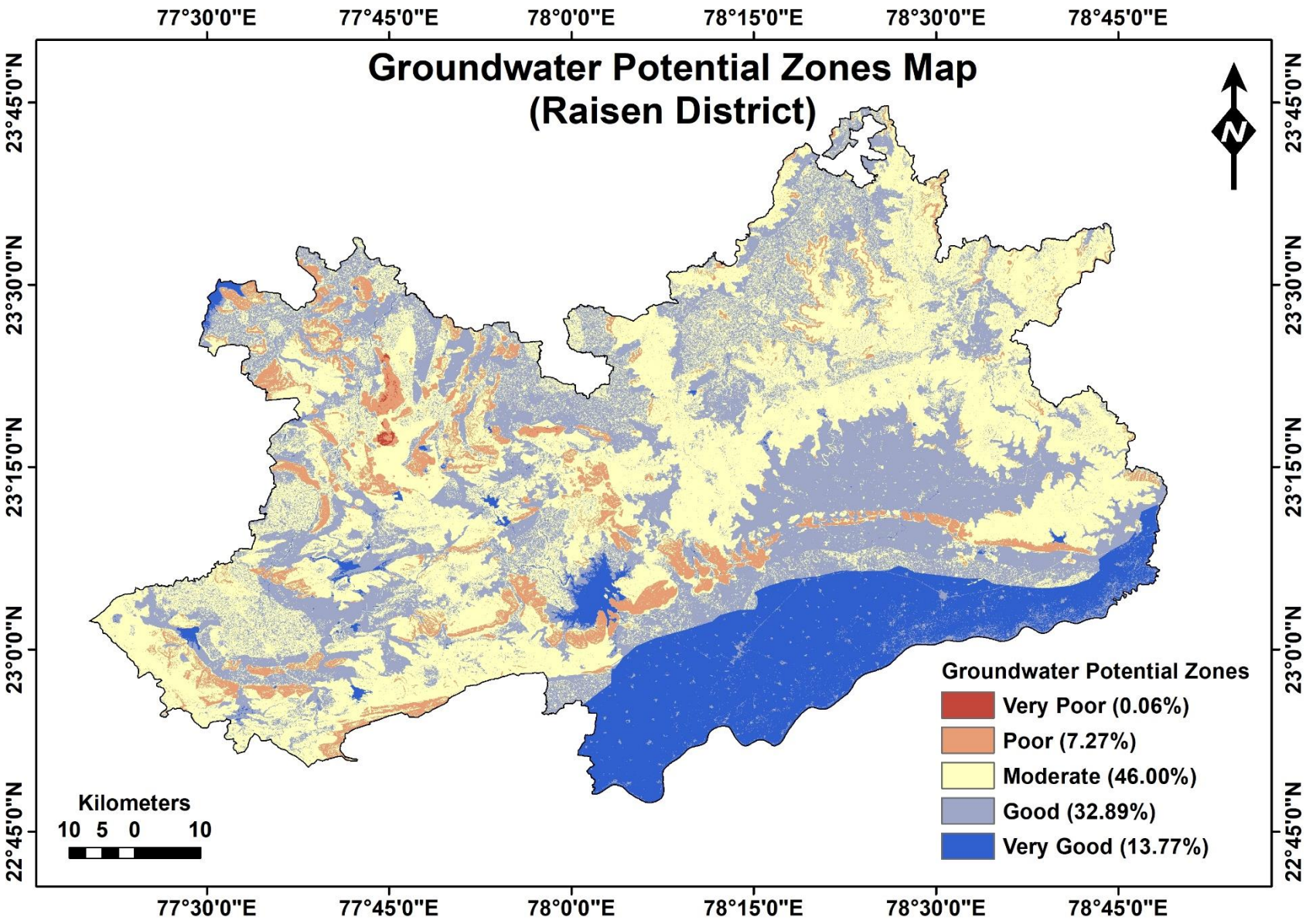

Groundwater Potential Zones Map
(Morena District)
77°15'0"E
77°30'0"E
77°45'0"E
78°0'0"E
78°15'0"E
78°30'0"E
26°45'0"N
26°30'0"N
26°15'0"N
26°0'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (1.42%)
Poor (15.94%)
Moderate (9.19%)
Good (29.20%)
Very Good (44.25%)

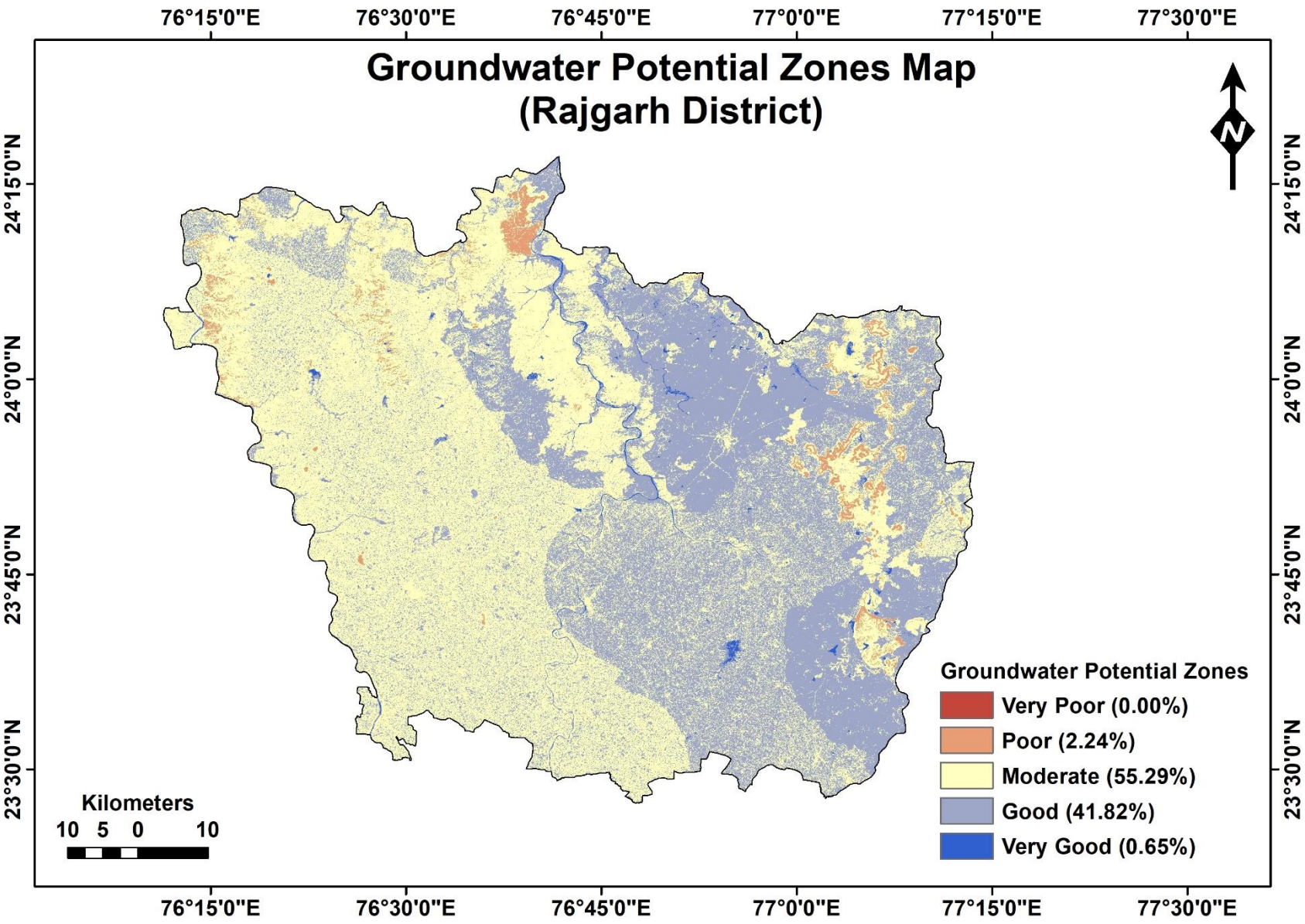

Groundwater Potential Zones Map
(Narsinghpur District)
78°30'0"E
78°45'0"E
79°0'0"E
79°15'0"E
79°30'0"E
79°45'0"E
23°15'0"N
23°0'0"N
22°45'0"N
22°30'0"N
N
Groundwater Potential Zones
Very Poor (0.01%)
Poor (6.48%)
Moderate (28.67%)
Good (22.76%)
Very Good (42.08%)
Kilometers
10 5 0 10

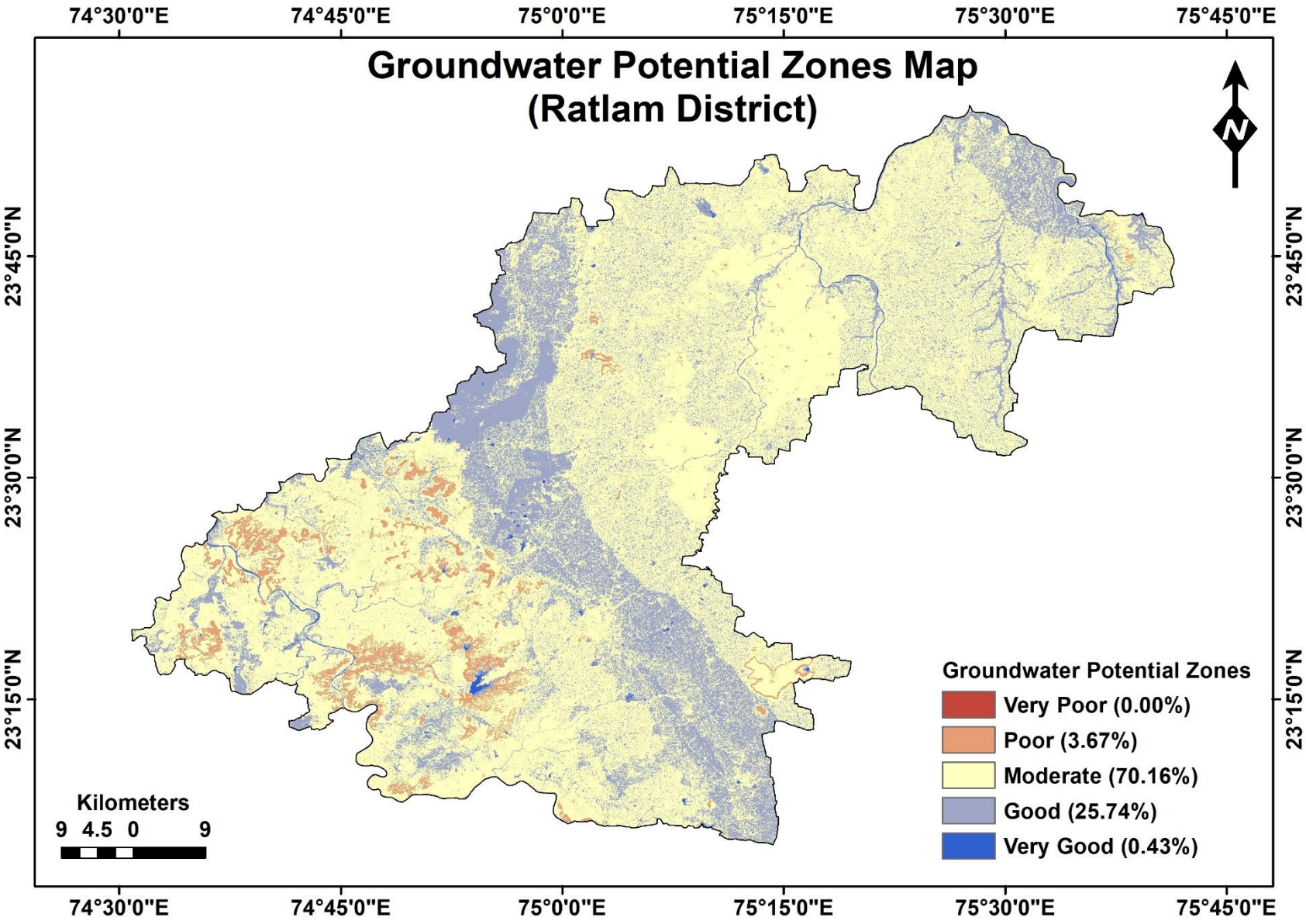

Groundwater Potential Zones Map
(Neemuch District)
74°30'0"E
74°45'0"E
75°0'0"E
75°15'0"E
75°30'0"E
75°45'0"E
25°0'0"N
24°45'0"N
24°30'0"N
24°15'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.38%)
Poor (12.50%)
Moderate (62.31%)
Good (22.86%)
Very Good (1.95%)

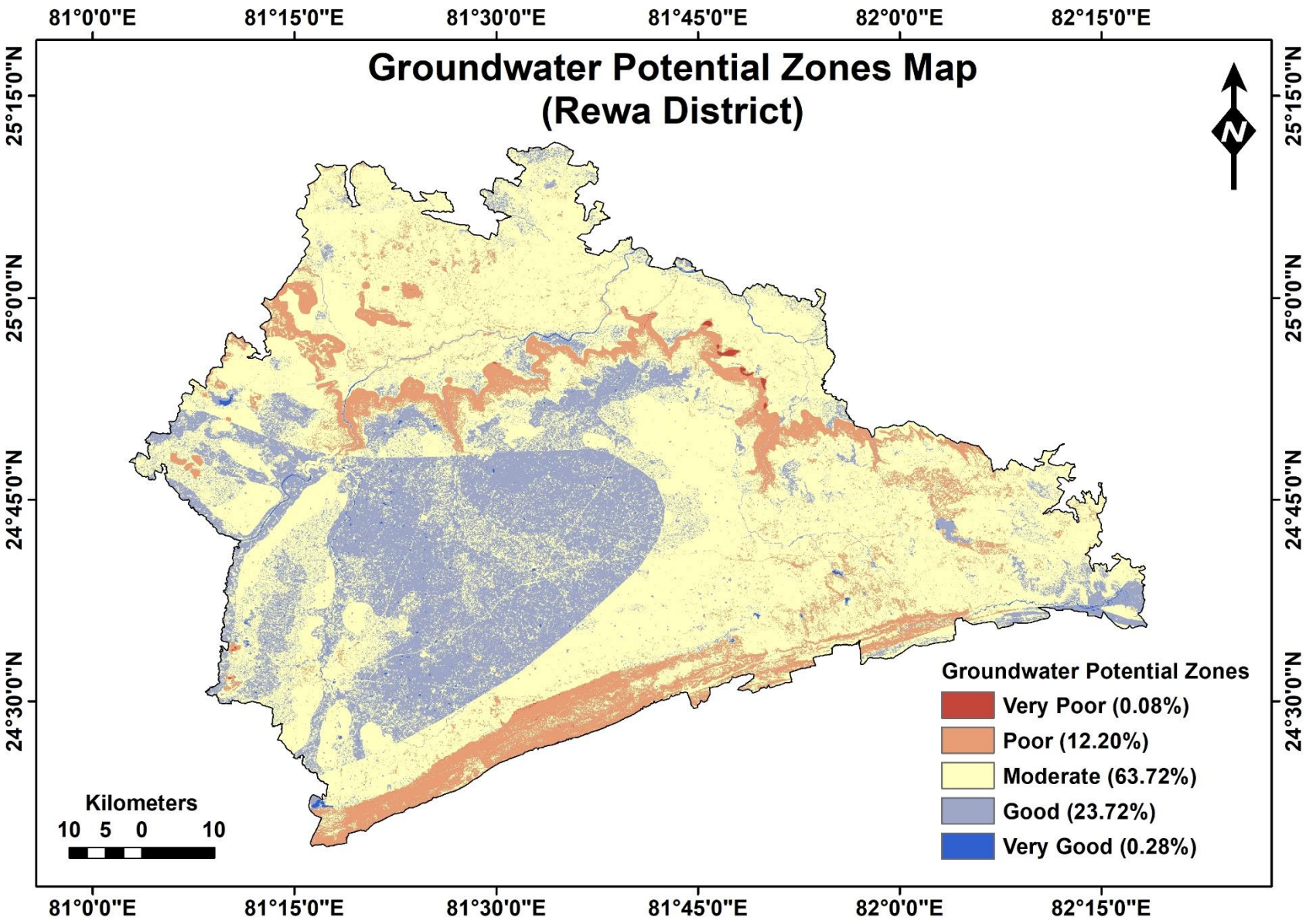

Groundwater Potential Zones Map
(Niwari District)
78°30'0"E
78°45'0"E
79°0'0"E
25°30'0"N
25°15'0"N
N
Groundwater Potential Zones
Very Poor (3.79%)
Poor (31.28%)
Moderate (63.46%)
Good (1.46%)
Kilometers
6 3 0 6

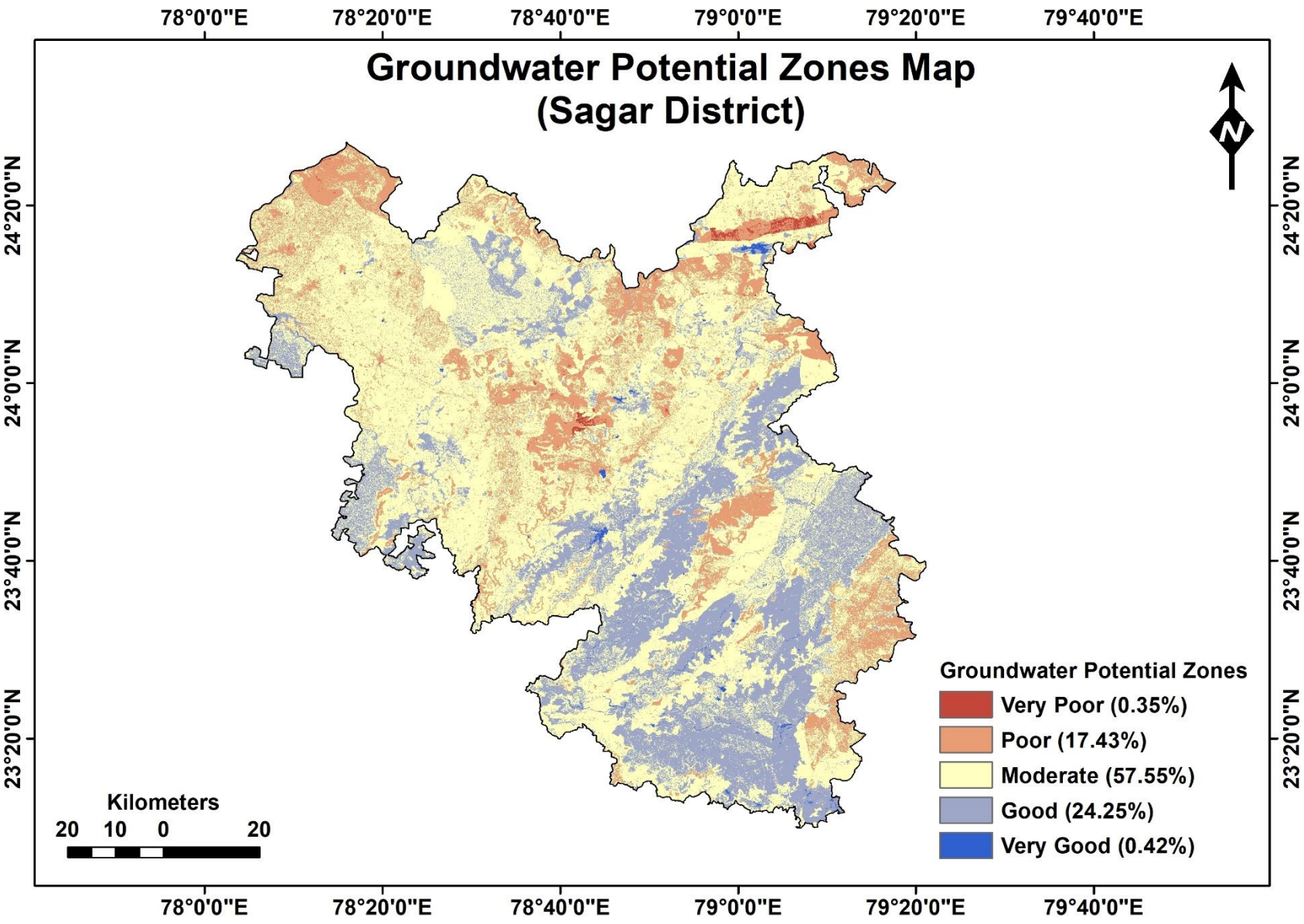

Groundwater Potential Zones Map
(Panna District)
79°20'0"E
79°40'0"E
80°0'0"E
80°20'0"E
80°40'0"E
81°0'0"E
25°0'0"N
24°40'0"N
24°20'0"N
24°0'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (1.11%)
Poor (26.09%)
Moderate (55.58%)
Good (15.18%)
Very Good (2.04%)

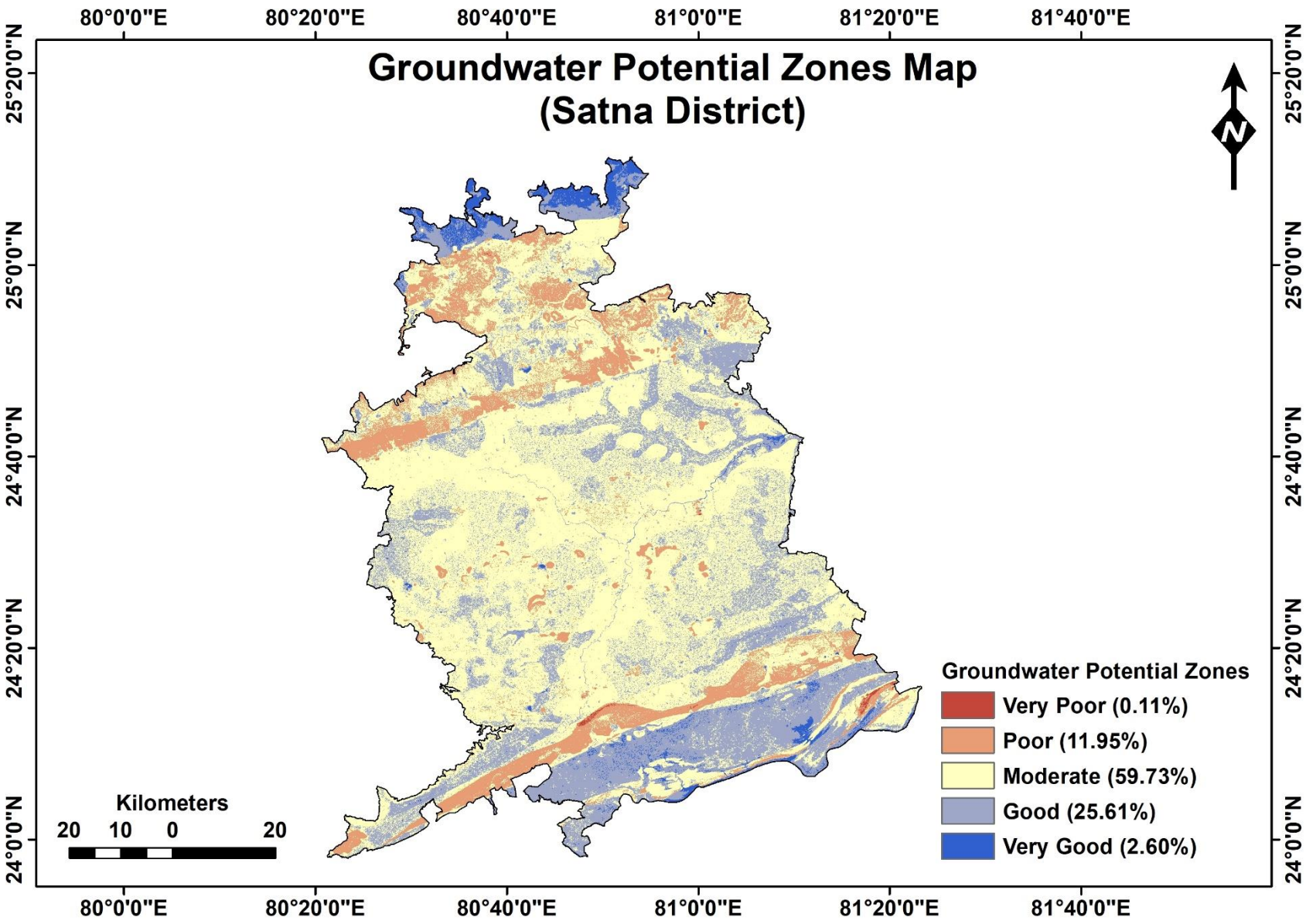

Groundwater Potential Zones Map
(Raisen District)
77°30'0"E
77°45'0"E
78°0'0"E
78°15'0"E
78°30'0"E
78°45'0"E
23°45'0"N
23°30'0"N
23°15'0"N
23°0'0"N
22°45'0"N
N
Groundwater Potential Zones
Very Poor (0.06%)
Poor (7.27%)
Moderate (46.00%)
Good (32.89%)
Very Good (13.77%)
Kilometers
10 5 0 10

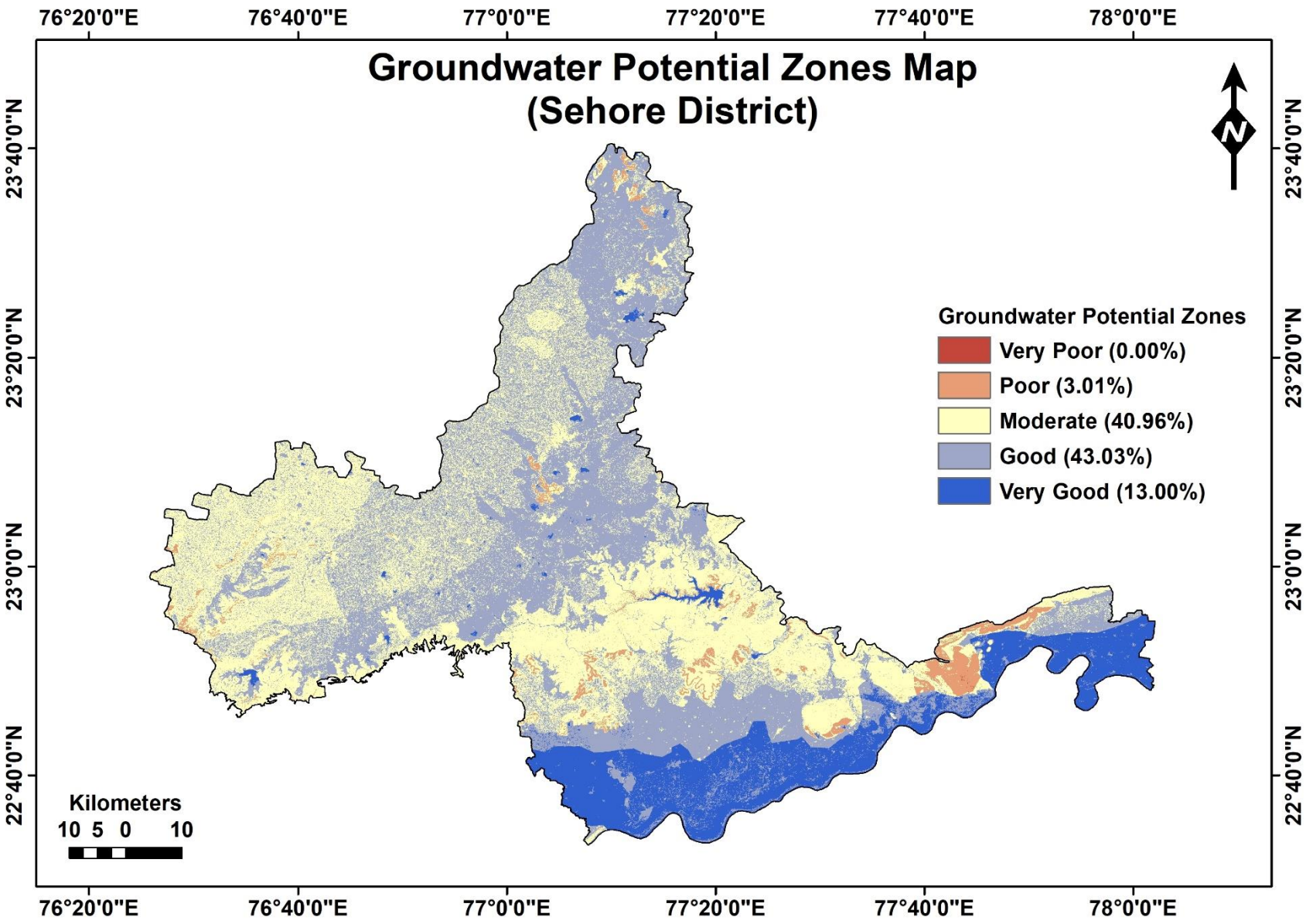

Groundwater Potential Zones Map
(Rajgarh District)
76°15'0"E
76°30'0"E
76°45'0"E
77°0'0"E
77°15'0"E
77°30'0"E
24°15'0"N
24°0'0"N
23°45'0"N
23°30'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.00%)
Poor (2.24%)
Moderate (55.29%)
Good (41.82%)
Very Good (0.65%)

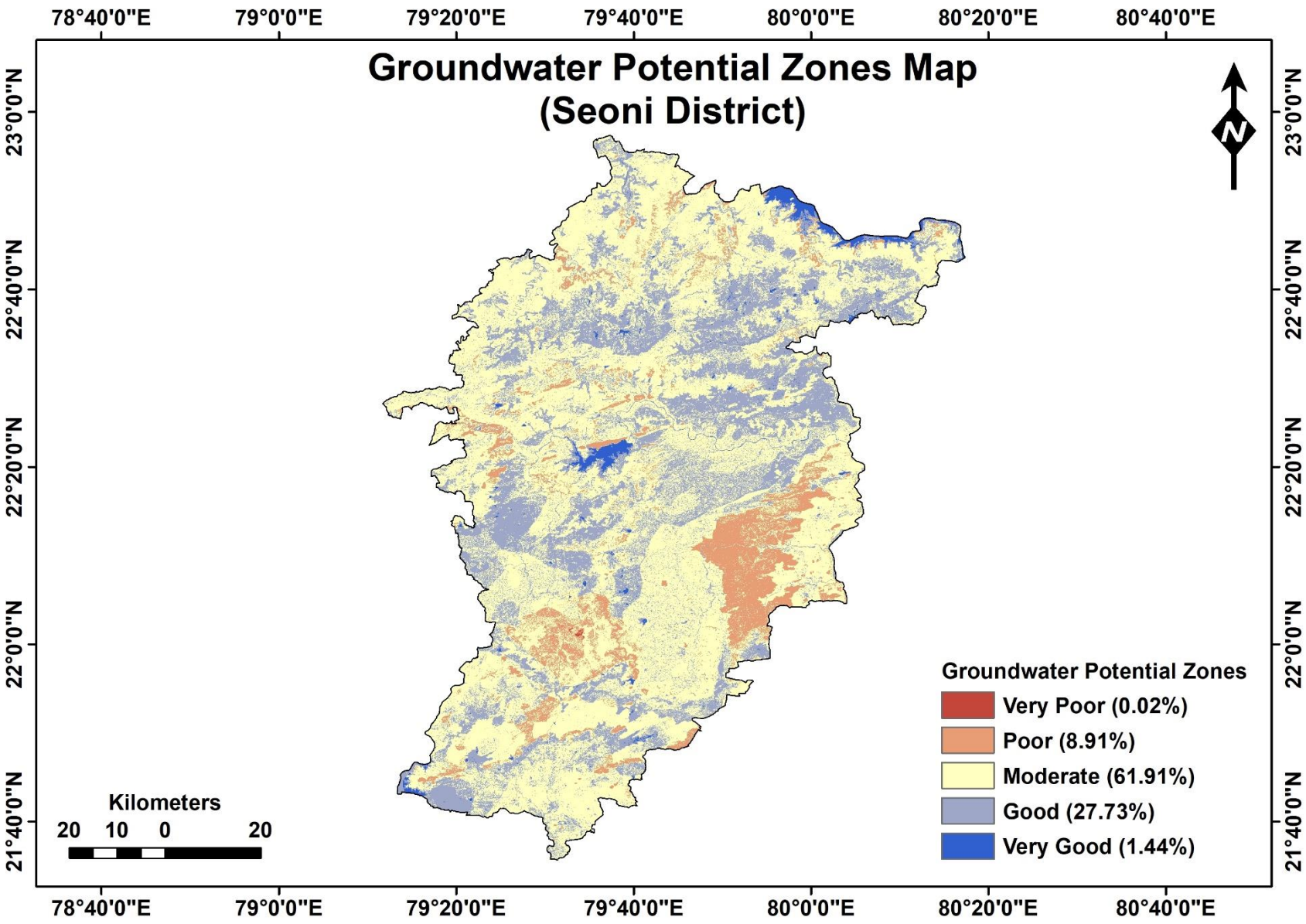

Groundwater Potential Zones Map
(Ratlam District)
74°30'0"E
74°45'0"E
75°0'0"E
75°15'0"E
75°30'0"E
75°45'0"E
23°45'0"N
23°30'0"N
23°15'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (3.67%)
Moderate (70.16%)
Good (25.74%)
Very Good (0.43%)
Kilometers
9 4.5 0 9

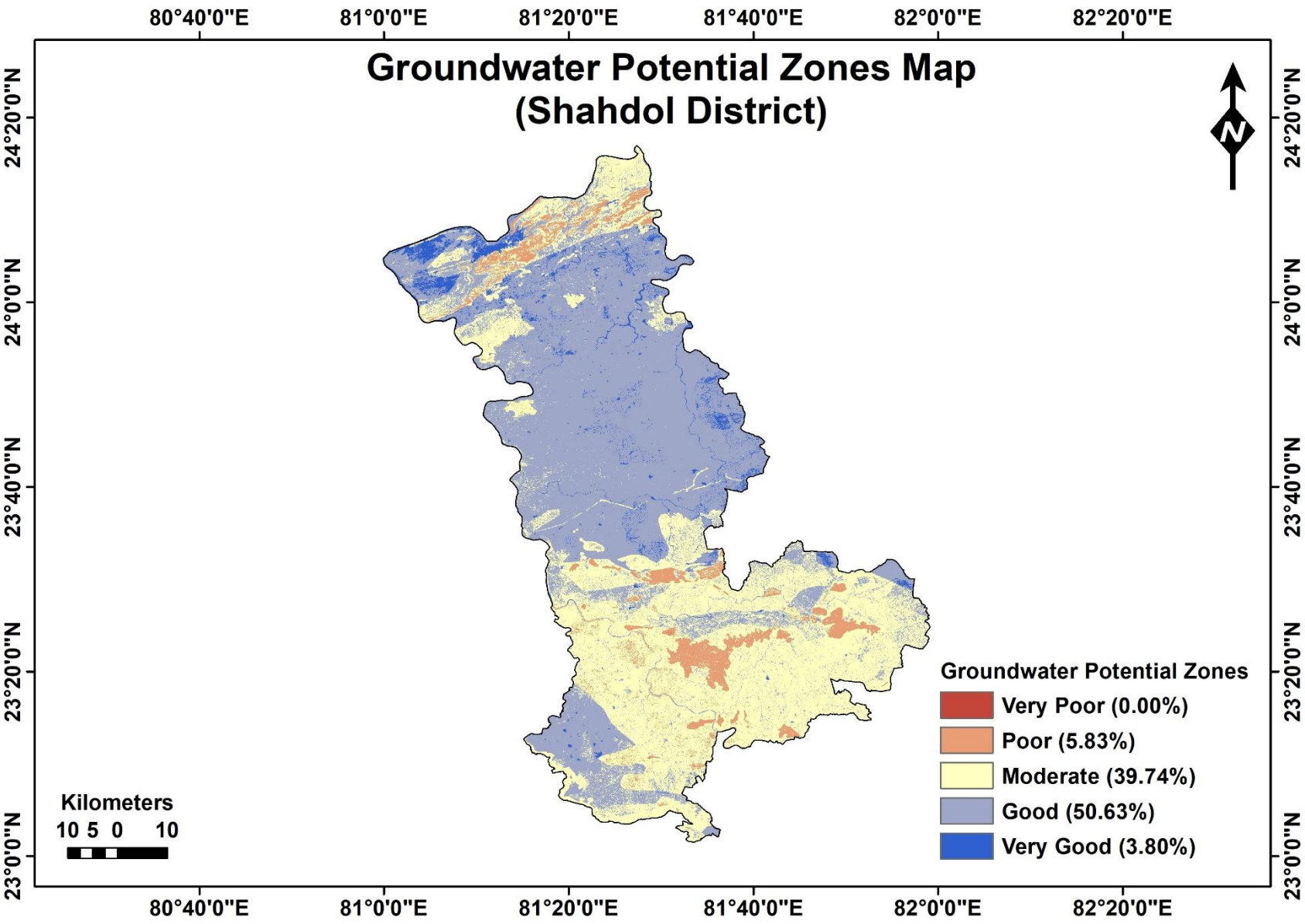

Groundwater Potential Zones Map
(Rewa District)
81°0'0"E
81°15'0"E
81°30'0"E
81°45'0"E
82°0'0"E
82°15'0"E
25°15'0"N
25°0'0"N
24°45'0"N
24°30'0"N
N
Groundwater Potential Zones
Very Poor (0.08%)
Poor (12.20%)
Moderate (63.72%)
Good (23.72%)
Very Good (0.28%)
Kilometers
10 5 0 10

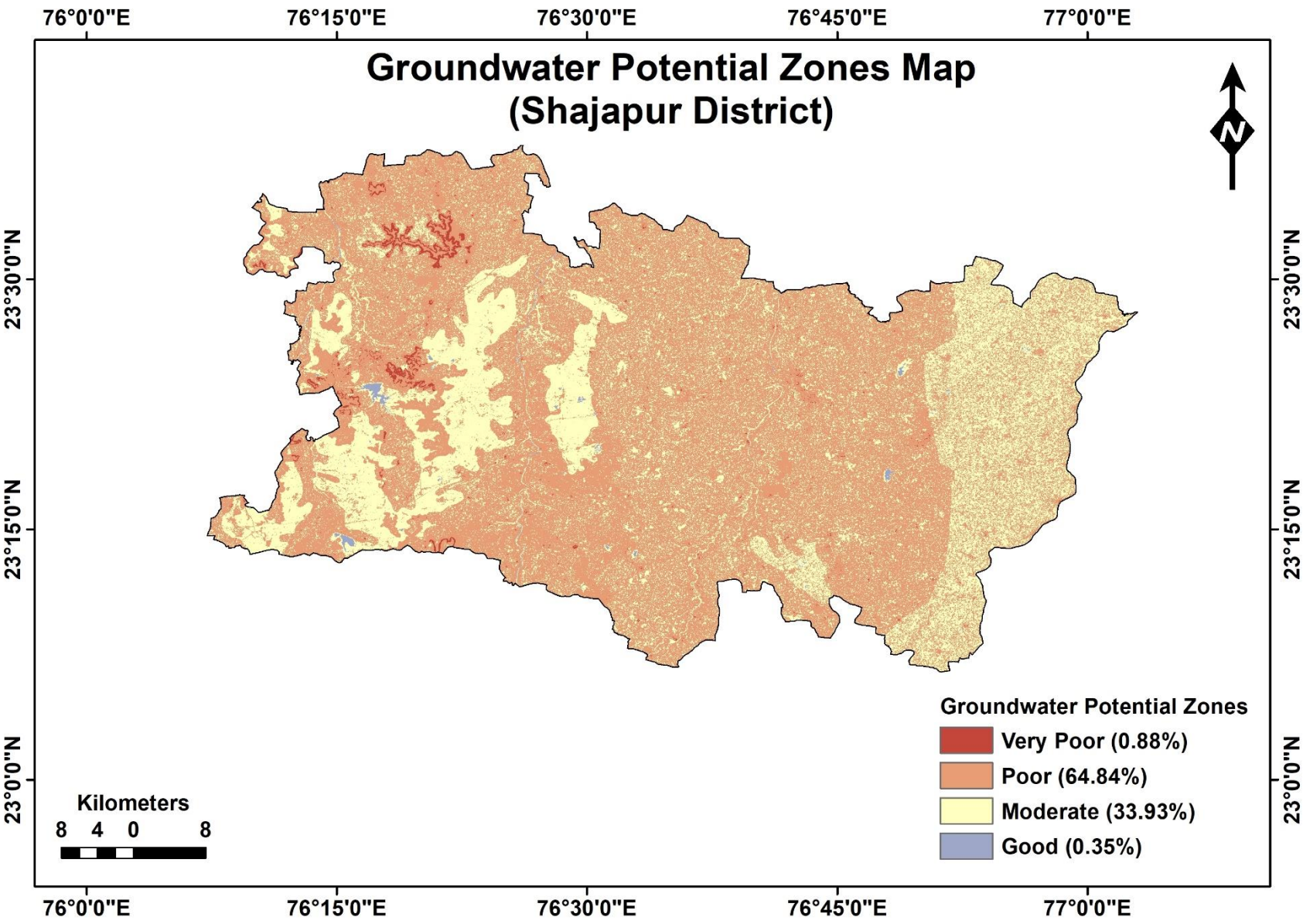

Groundwater Potential Zones Map
(Sagar District)
78°0'0"E
78°20'0"E
78°40'0"E
79°0'0"E
79°20'0"E
79°40'0"E
24°20'0"N
24°0'0"N
23°40'0"N
23°20'0"N
N
Groundwater Potential Zones
Very Poor (0.35%)
Poor (17.43%)
Moderate (57.55%)
Good (24.25%)
Very Good (0.42%)
Kilometers
20 10 0 20

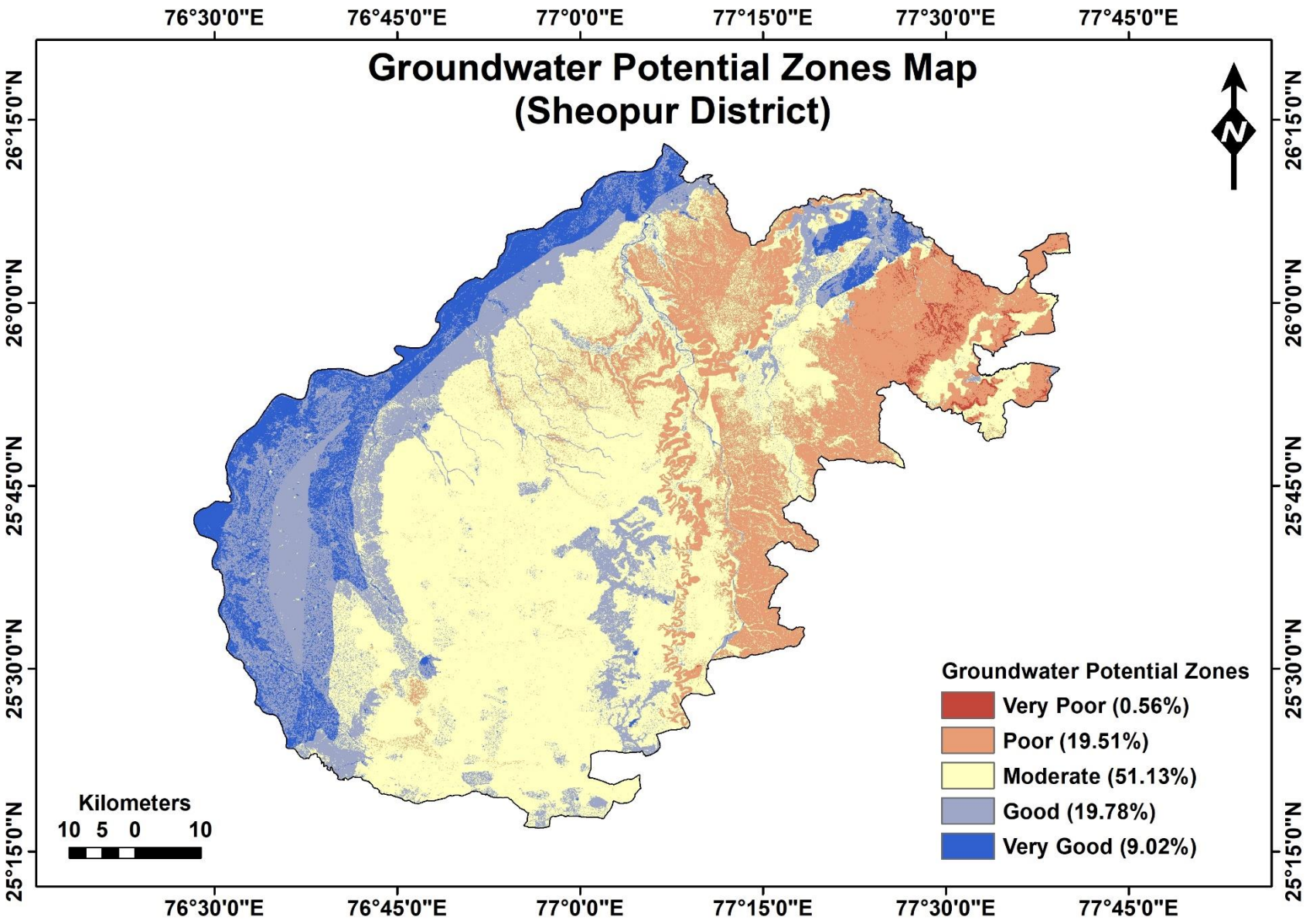

Groundwater Potential Zones Map
(Satna District)
80°0'0"E
80°20'0"E
80°40'0"E
81°0'0"E
81°20'0"E
81°40'0"E
25°20'0"N
25°0'0"N
24°40'0"N
24°20'0"N
24°0'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.11%)
Poor (11.95%)
Moderate (59.73%)
Good (25.61%)
Very Good (2.60%)

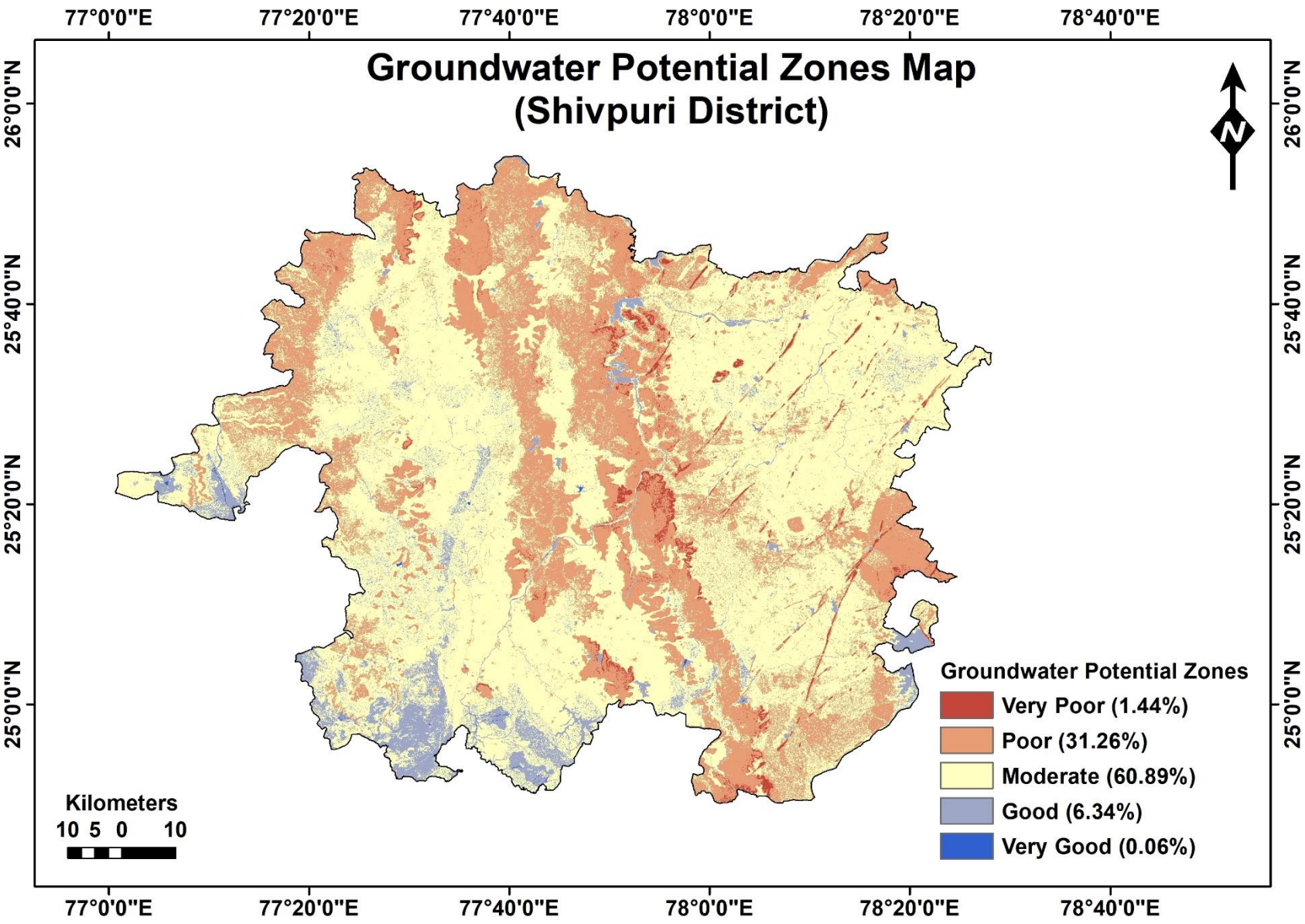

Groundwater Potential Zones Map
(Sehore District)
76°20'0"E
76°40'0"E
77°0'0"E
77°20'0"E
77°40'0"E
78°0'0"E
23°40'0"N
23°20'0"N
23°0'0"N
22°40'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (3.01%)
Moderate (40.96%)
Good (43.03%)
Very Good (13.00%)
Kilometers
10 5 0 10

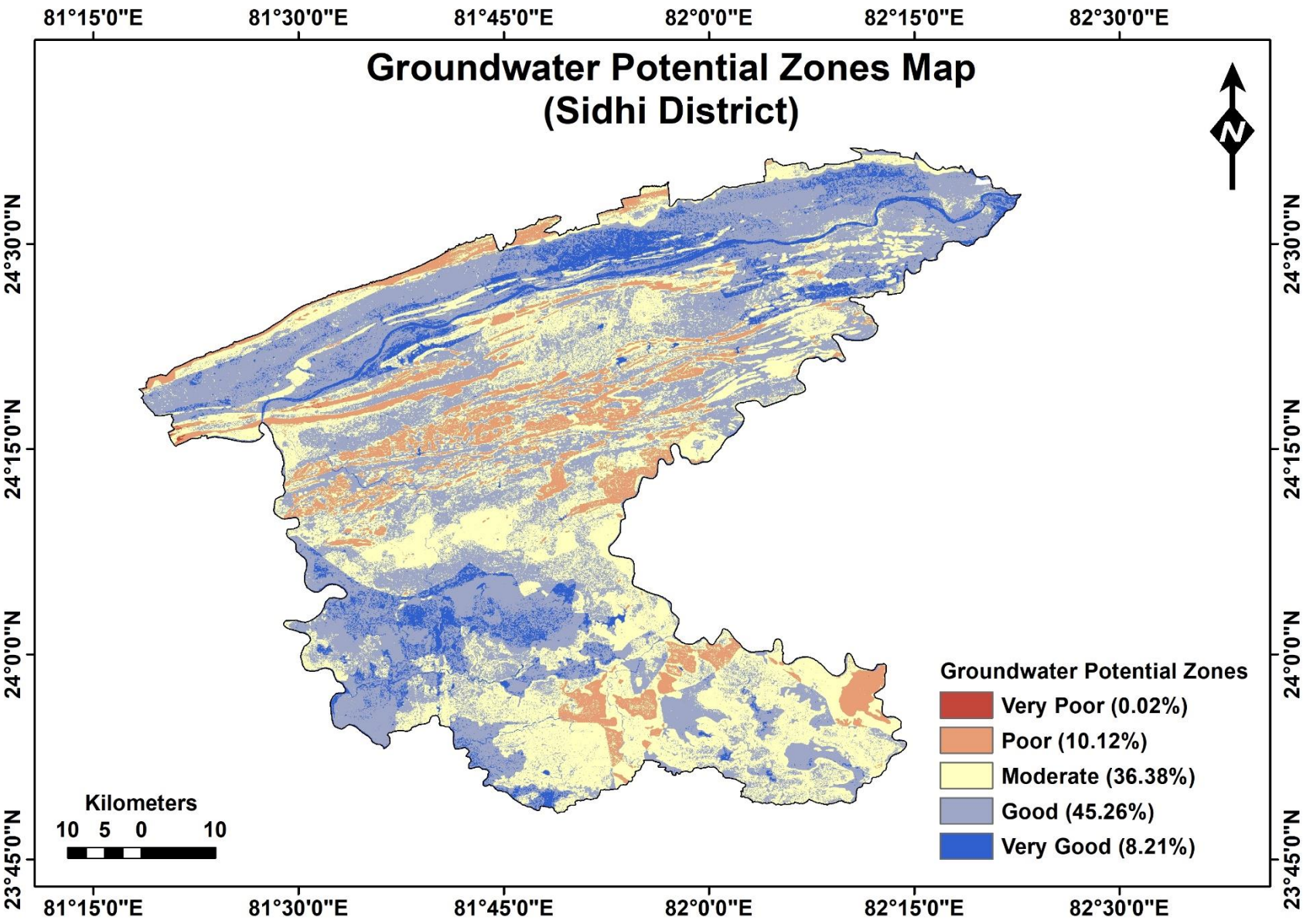

Groundwater Potential Zones Map
(Seoni District)
78°40'0"E
79°0'0"E
79°20'0"E
79°40'0"E
80°0'0"E
80°20'0"E
80°40'0"E
23°0'0"N
22°40'0"N
22°20'0"N
22°0'0"N
21°40'0"N
N
Kilometers
20 10 0 20
Groundwater Potential Zones
Very Poor (0.02%)
Poor (8.91%)
Moderate (61.91%)
Good (27.73%)
Very Good (1.44%)

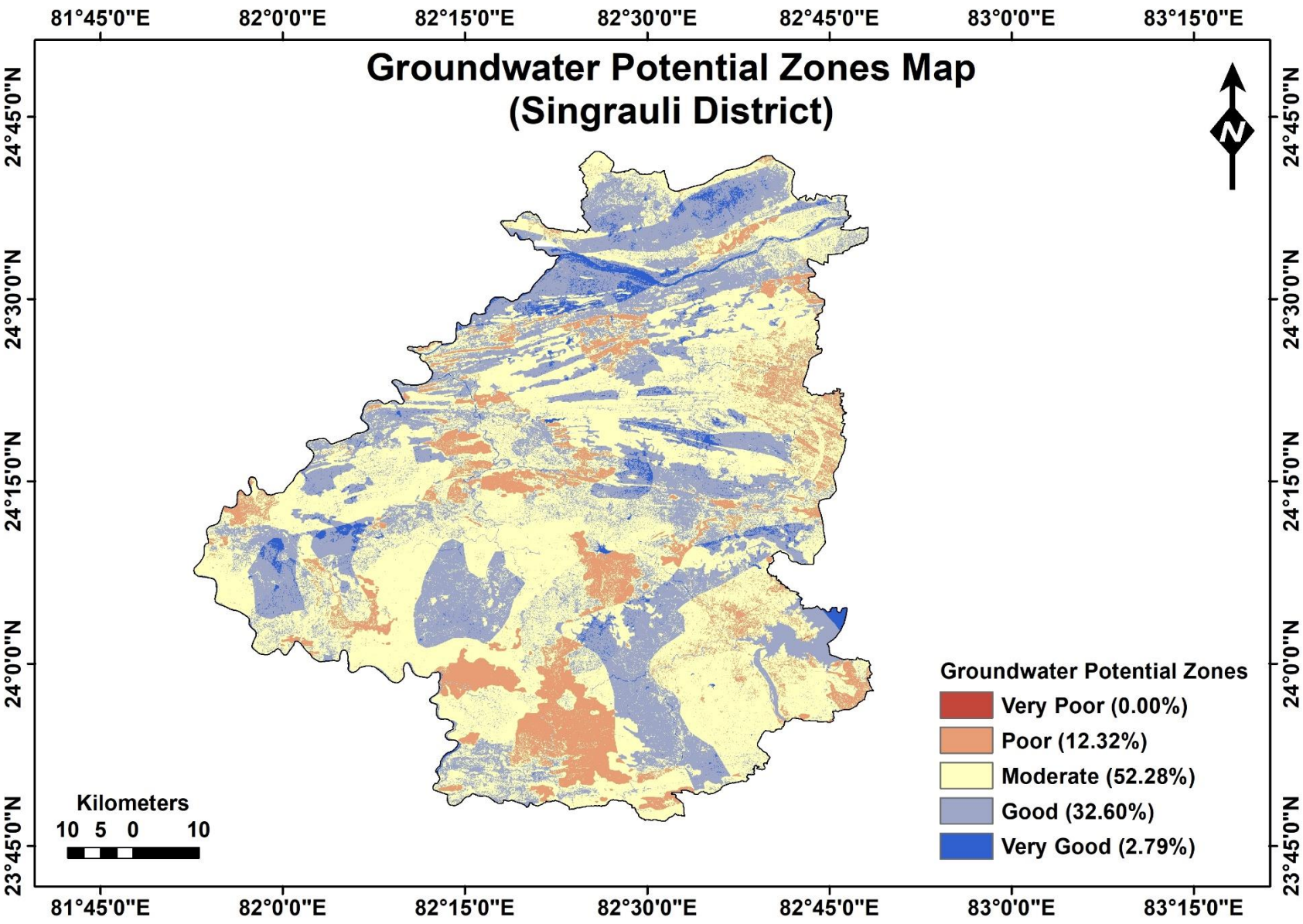

Groundwater Potential Zones Map
(Shahdol District)
80°40'0"E
81°0'0"E
81°20'0"E
81°40'0"E
82°0'0"E
82°20'0"E
24°20'0"N
24°0'0"N
23°40'0"N
23°20'0"N
23°0'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.00%)
Poor (5.83%)
Moderate (39.74%)
Good (50.63%)
Very Good (3.80%)

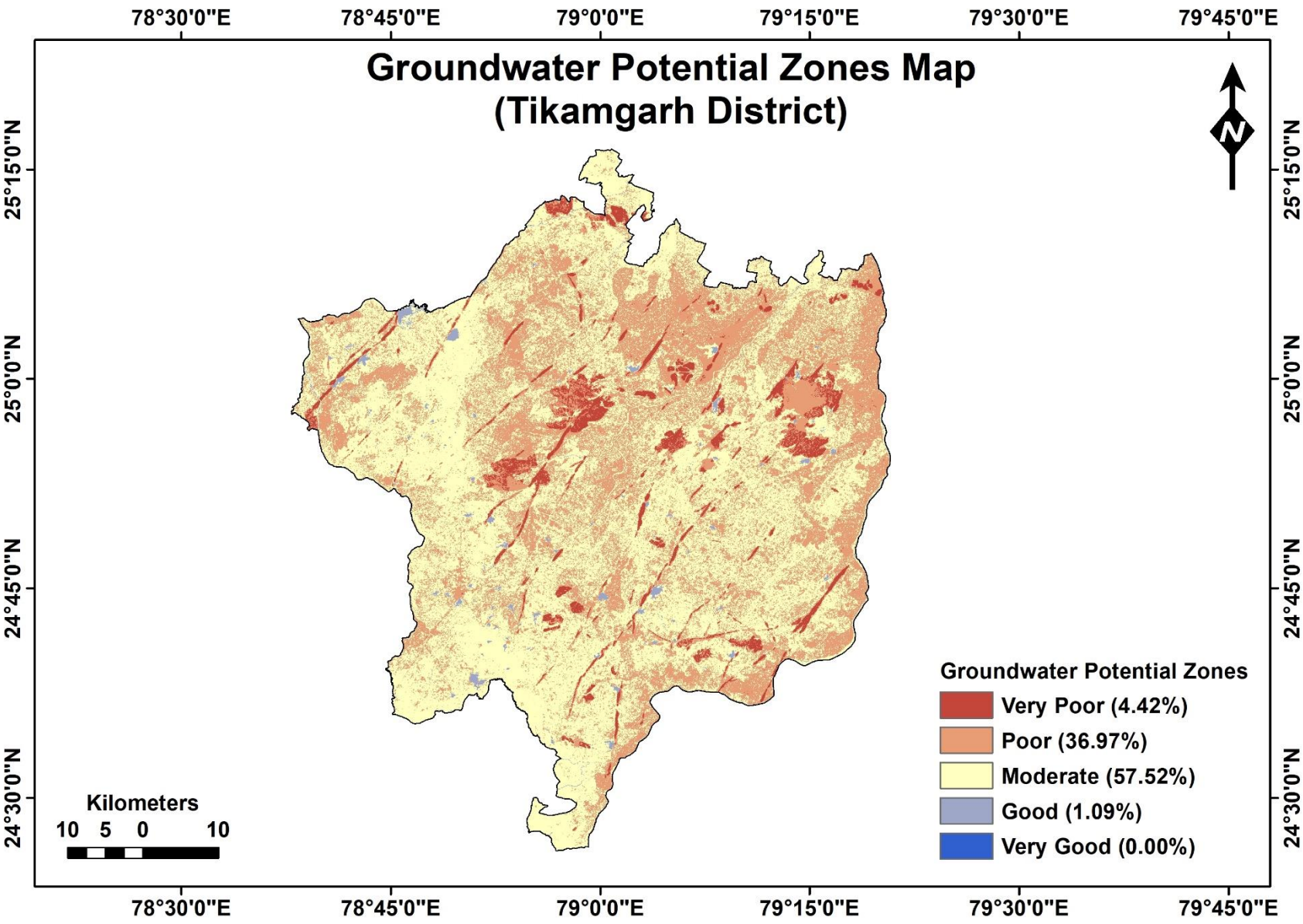

Groundwater Potential Zones Map
(Shajapur District)
76°0'0"E
76°15'0"E
76°30'0"E
76°45'0"E
77°0'0"E
23°30'0"N
23°15'0"N
23°0'0"N
N
Groundwater Potential Zones
Very Poor (0.88%)
Poor (64.84%)
Moderate (33.93%)
Good (0.35%)
Kilometers
8 4 0 8

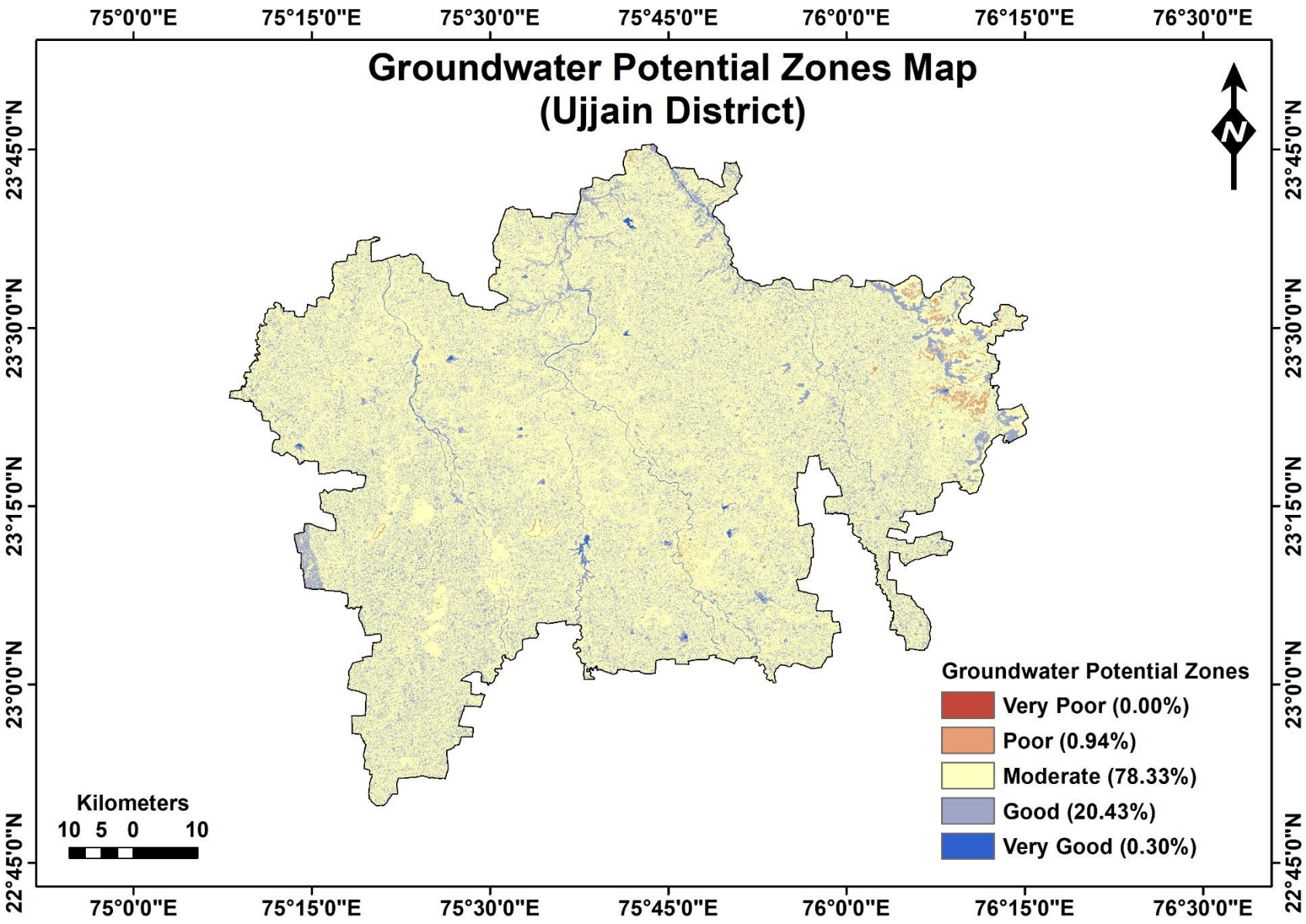

Groundwater Potential Zones Map
(Sheopur District)
76°30'0"E
76°45'0"E
77°0'0"E
77°15'0"E
77°30'0"E
77°45'0"E
26°15'0"N
26°0'0"N
25°45'0"N
25°30'0"N
25°15'0"N
N
Groundwater Potential Zones
Very Poor (0.56%)
Poor (19.51%)
Moderate (51.13%)
Good (19.78%)
Very Good (9.02%)
Kilometers
10 5 0 10

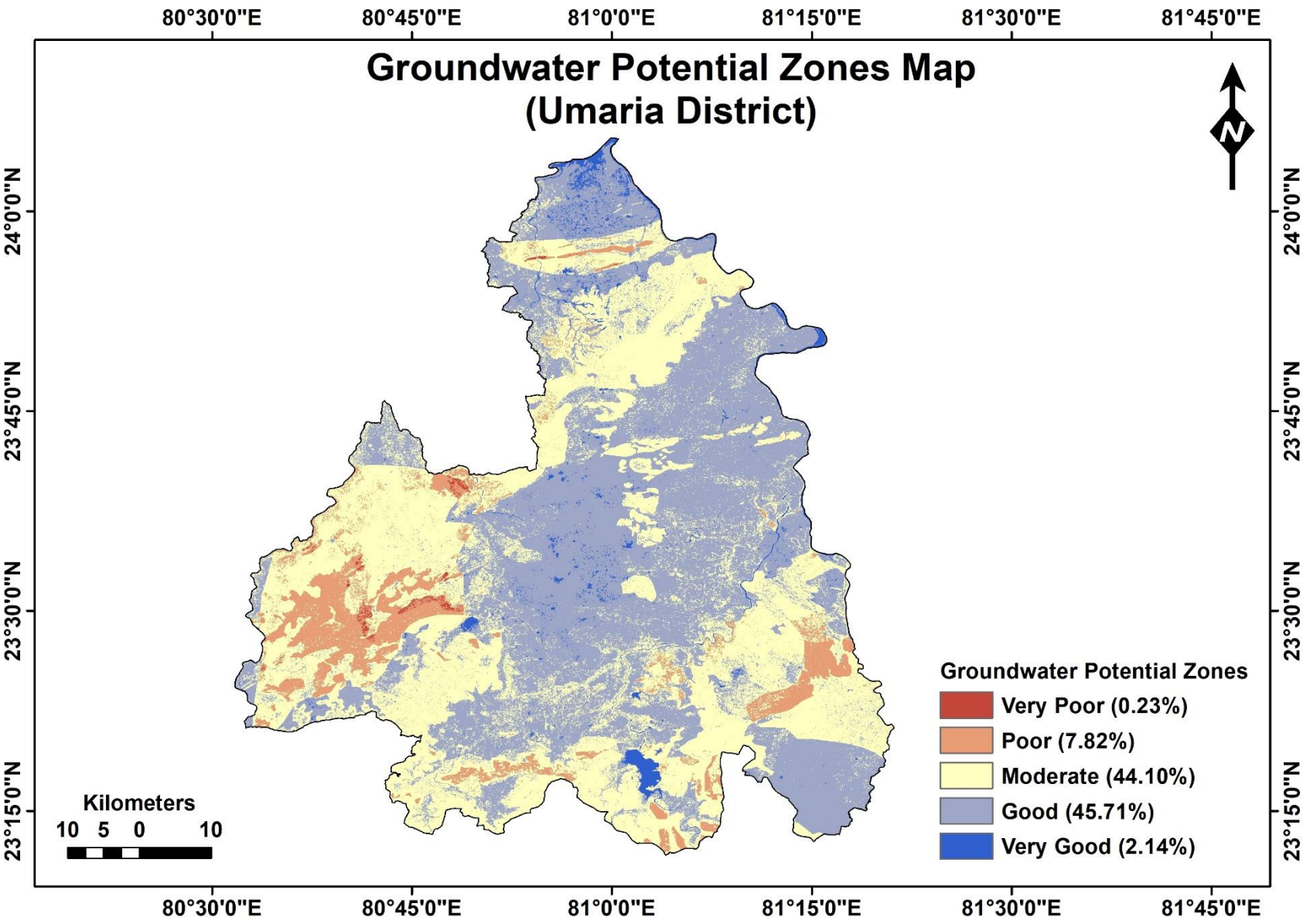

Groundwater Potential Zones Map
(Shivpuri District)
77°0'0"E
77°20'0"E
77°40'0"E
78°0'0"E
78°20'0"E
78°40'0"E
26°0'0"N
25°40'0"N
25°20'0"N
25°0'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (1.44%)
Poor (31.26%)
Moderate (60.89%)
Good (6.34%)
Very Good (0.06%)

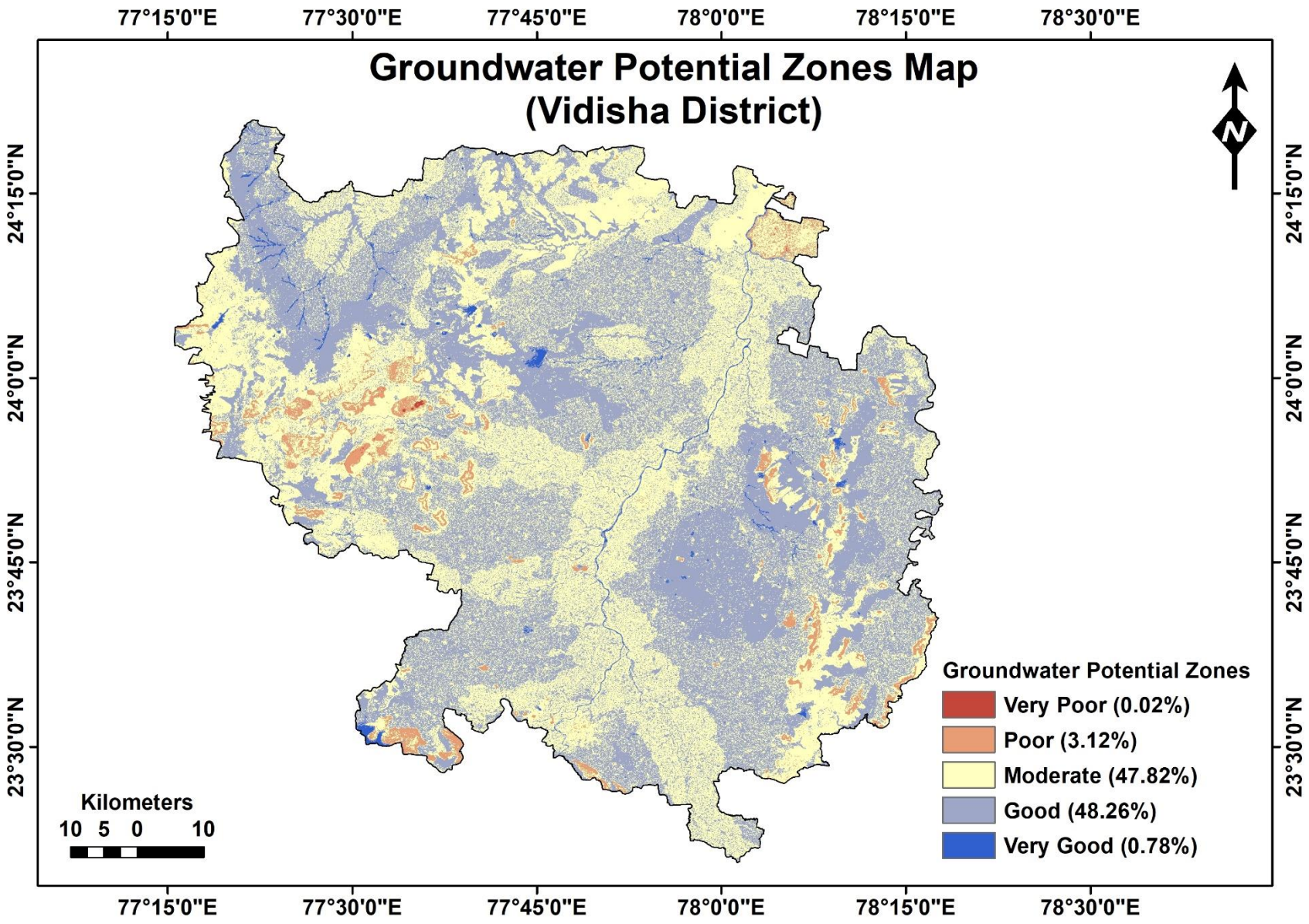

Groundwater Potential Zones Map
(Sidhi District)
81°15'0"E
81°30'0"E
81°45'0"E
82°0'0"E
82°15'0"E
82°30'0"E
24°30'0"N
24°15'0"N
24°0'0"N
23°45'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.02%)
Poor (10.12%)
Moderate (36.38%)
Good (45.26%)
Very Good (8.21%)


Groundwater Potential Zones Map
(Singrauli District)
81°45'0"E
82°0'0"E
82°15'0"E
82°30'0"E
82°45'0"E
83°0'0"E
83°15'0"E
24°45'0"N
24°30'0"N
24°15'0"N
24°0'0"N
23°45'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.00%)
Poor (12.32%)
Moderate (52.28%)
Good (32.60%)
Very Good (2.79%)


Groundwater Potential Zones Map
(Tikamgarh District)
78°30'0"E
78°45'0"E
79°0'0"E
79°15'0"E
79°30'0"E
79°45'0"E
25°15'0"N
25°0'0"N
24°45'0"N
24°30'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (4.42%)
Poor (36.97%)
Moderate (57.52%)
Good (1.09%)
Very Good (0.00%)


Groundwater Potential Zones Map
(Ujjain District)
75°0'0"E
75°15'0"E
75°30'0"E
75°45'0"E
76°0'0"E
76°15'0"E
76°30'0"E
23°45'0"N
23°30'0"N
23°15'0"N
23°0'0"N
22°45'0"N
N
Groundwater Potential Zones
Very Poor (0.00%)
Poor (0.94%)
Moderate (78.33%)
Good (20.43%)
Very Good (0.30%)
Kilometers
10 5 0 10


Groundwater Potential Zones Map
(Umaria District)
80°30'0"E
80°45'0"E
81°0'0"E
81°15'0"E
81°30'0"E
81°45'0"E
24°0'0"N
23°45'0"N
23°30'0"N
23°15'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.23%)
Poor (7.82%)
Moderate (44.10%)
Good (45.71%)
Very Good (2.14%)


Groundwater Potential Zones Map
(Vidisha District)
77°15'0"E
77°30'0"E
77°45'0"E
78°0'0"E
78°15'0"E
78°30'0"E
24°15'0"N
24°0'0"N
23°45'0"N
23°30'0"N
N
Kilometers
10 5 0 10
Groundwater Potential Zones
Very Poor (0.02%)
Poor (3.12%)
Moderate (47.82%)
Good (48.26%)
Very Good (0.78%)

AICRP on Irrigation Water Management

Department of Soil and Water Engineering

College of Agricultural Engineering

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (MP)