# **Soil Maps for GIZ ProSoil Project in India**

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ISRIC - World Soil Information

1. **Introduction**

Soil degradation is a global issue. Soil protection and rehabilitation of degraded soils safeguard the natural resource of agricultural production which secures income and food supplies and reduces poverty and hunger in rural areas. Germany’s Federal Ministry for Economic Cooperation and Development (BMZ) intends to make a significant contribution to this objective through substantial investments in soil protection and rehabilitation with a view to enhancing food security as well as adaptation to climate change and exploring co-benefits with carbon sequestration. Subsequent programs are implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Kreditanstalt für Wiederaufbau and NGOs with a focus in Africa (Benin, Burkina Faso, Ethiopia, Kenya, Madagascar, Tunisia) and India and as part of BMZ’s ONEWORLD – No Hunger Initiative.

The World Overview of Conservation Approaches and Technologies (WOCAT – [www.wocat.net](http://www.wocat.net) ) is a global network on Sustainable Land Management (SLM) that promotes the documentation, sharing and use of information and knowledge to support adaptation, innovation and decision-making in SLM. WOCAT supports governments and their development partners in effective Knowledge Management (KM) and Decision Support (DS) tools and processes.

GIZ ProSoil Project asked WOCAT Consortium through WOCAT secretariat for contribution to knowledge management and decision support in the soil protection and rehabilitation initiatives including: 1) Good SLM Practices documented and shared, including national soil maps in the Good SLM Practices compilations; 2) Mapping, digital solutions and platforms.

**This report provides an overview of the soil maps compiled for the earmarked study areas of the GIZ Prosoil project in India, *i.e.,* Bungoma, Kakamega and Siaya (Figure 1). The soil maps are compiled from ISRIC’s global product SoilGrids(v2).**

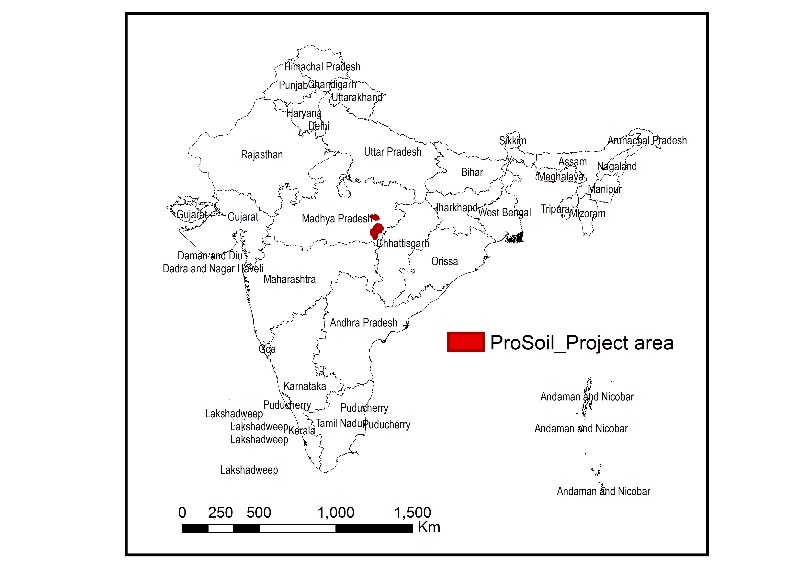
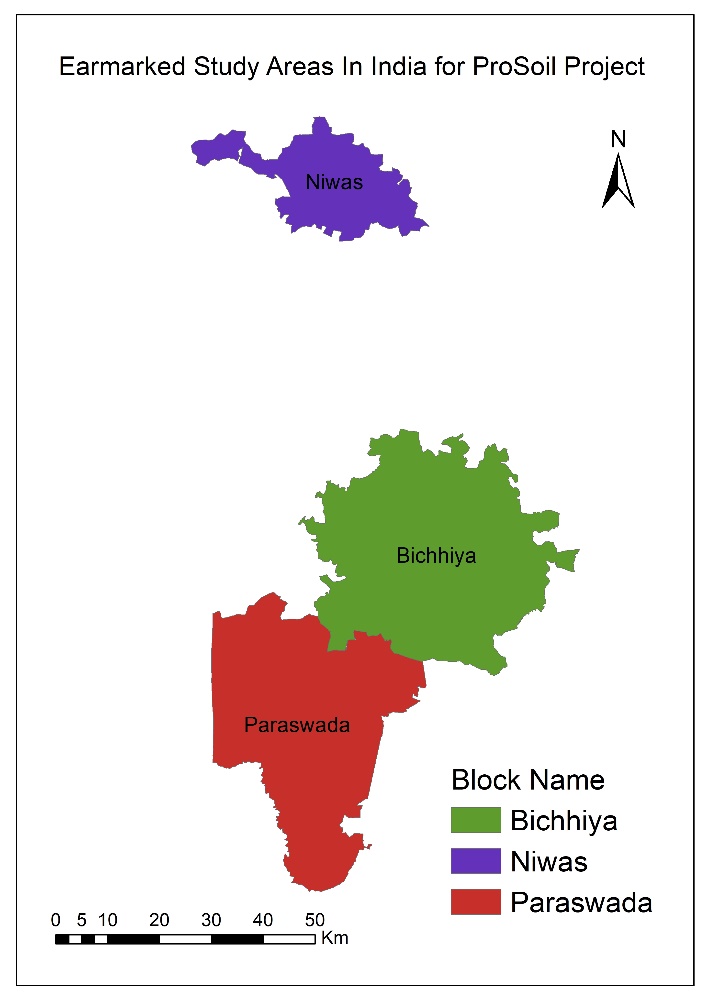


Figure 1. Locations of the GIZ ProSoil project areas in India.

1. **SoilGrids Product (v2)**

**SoilGrids(v2) are** global soil property maps that are predicted using state-of-the-art machine learning methods using over 230 000 soil profile observations (WoSIS database, Batjes *et al*. 2017) and more than 400 environmental covariates from Earth observation derived products and other environmental information including climate, land cover and terrain morphology (Poggio *et al.,* 2020, <https://www.isric.org/explore/soilgrids>). The SoilGrids are mapped at six standard depth intervals (0-5cm, 5-15cm, 15-30cm, 30-60cm, 60-100cm, 100-200cm) at a spatial resolution of 250 meters. Prediction uncertainty is quantified by the lower and upper limits of a 90% prediction interval. Currently soil properties in the SoilGrdis include: pH, bulk density, coarse fragments content, sand content, silt content, clay content, cation exchange capacity (CEC), total nitrogen, soil organic carbon content, soil organic carbon density and soil organic carbon stock.

At the request we compiled s**oil maps including: soil types, soil pH, soil texture content (sand, clay, silt), coarse fragment and soil organic carbon content (SOC) for the project areas. The soil property maps (pH, texture, coarse fragment, SOC) are at 250 meters resolution for depth of 0-30cm** that are aggregated by soil depths of 0-5cm, 5-15cm, 15-30cm. For SoilGrids these are the measurement units in which the properties are mapped. These can be somewhat unconventional for reporting soil property values. Reason for this is that all SoilGrids properties required to be mapped as integer values for computational and storage efficiency. For this report the mapped units are converted into conventional units. Table 1 lists the soil maps, units and sources.

**Table 1. Soil types and properties for the GIZ ProSoil project areas in India.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Soil property** | **Soil depth (cm)** | **Unit\*** | **Spatial resolution (meter)** | **Data layer name and format** | **Source** |
| **Soil type** |  |  | **250** | **WRB\_MostProbable.tif** | **SoilGrids v2 (based on IUSS-FAO WRB)** |
| **Sand** | **0-30** | **%(vol)** | **250** | **sand\_0\_30\_cm\_%.tif** | **SoilGrids v2** |
| **Silt** | **0-30** | **%(vol)** | **250** | **Silt\_30\_cm\_%.tif** | **SoilGrids v2** |
| **Clay** | **0-30** | **%(vol)** | **250** | **clay\_0\_30\_cm\_%.tif** | **SoilGrids v2** |
| **Coarse fragment** | **0-30** | **%(vol)** | **250** | **cfvo\_0\_30\_cm\_vol%.tif** | **SoilGrids v2** |
| **Bulk density** | **0-30** | **kg/dm³** | **250** | **Bdod\_0\_30\_cm\_kg\_dm3.tif** | **SoilGrids v2** |
| **pH in water** | **0-30** | **unitless** | **250** | **pH\_0\_30cm\_unitless.tif** | **SoilGrids v2** |
| **CEC** | **0-30** | **cmol(c)/kg** | **250** | **CEC\_0\_30\_cm\_cmol(c)\_kg.tif** | **SoilGrids v2** |
| **SOC content** | **0-30** | **g/kg** | **250** | **SOC\_0\_30cm\_g\_kg.tif** | **SoilGrids v2** |
| **SOC stock** | **0-30** | **kg/m²** | **250** | **ocs\_0\_30\_cm\_kg\_m2.tif** | **SoilGrids v2** |
| SOC density | **0-30** | **kg/m3** | **250** | **ocd\_0\_30\_cm\_kg\_m3.tif** | **SoilGrids v2** |
| Total Nitrogen | **0-30** | **g/kg** | **250** | **Nitrogen\_0\_30cm\_g\_kg.tif** | **SoilGrids v2** |

All the maps’ attribute properties and layouts are uploaded for access in the GIZ created Teams channel: WOCAT-ProSoil Cooperation with guests/India.

1. **Grided soil maps**

Figures 2-10 shows soil type, soil pH, soil organic carbon content, soil texture contents of sand, clay and silt, coarse fragment at depth of 0-30 cm.

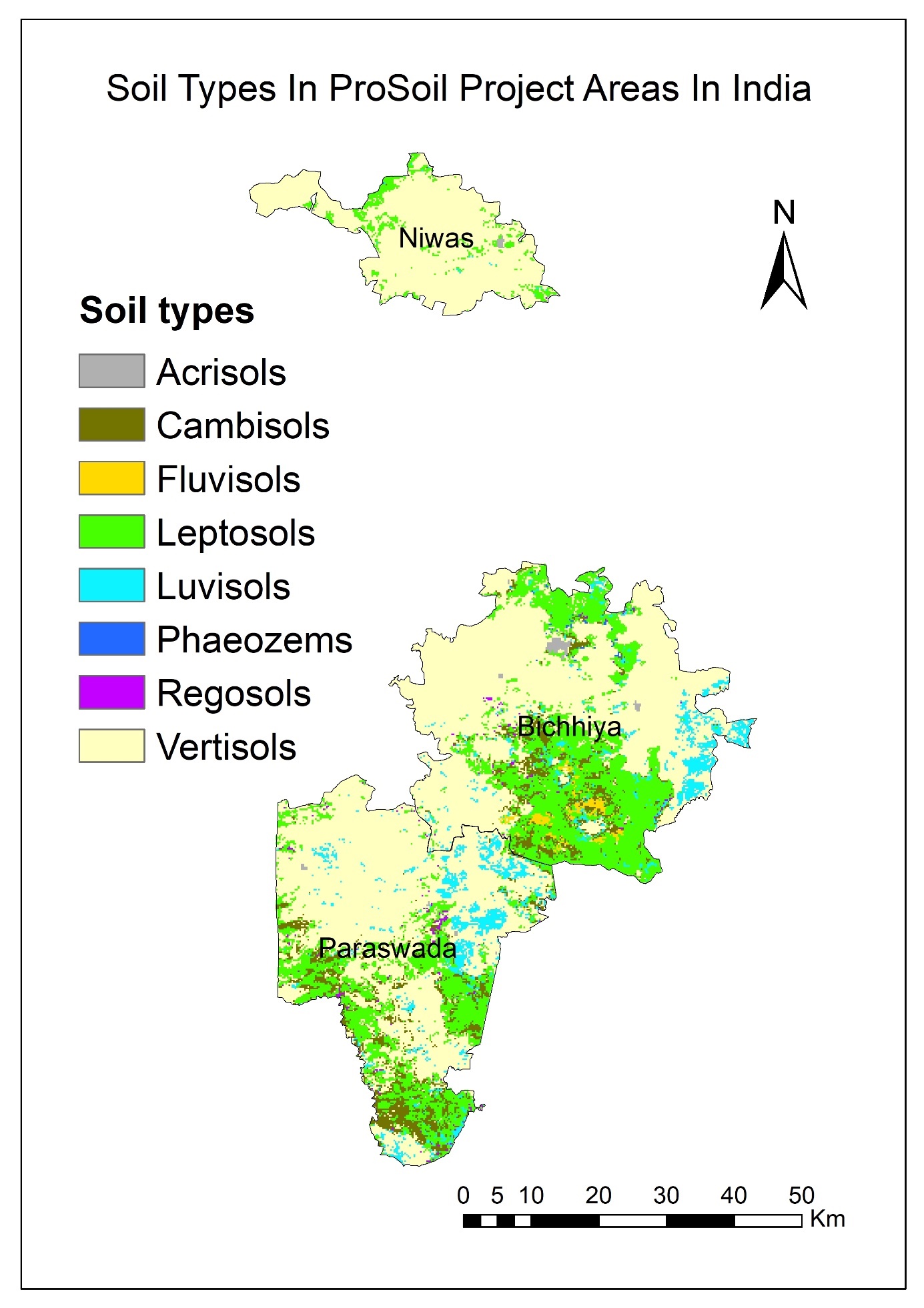


Figure 2. Soil types of the ProSoil project areas in India

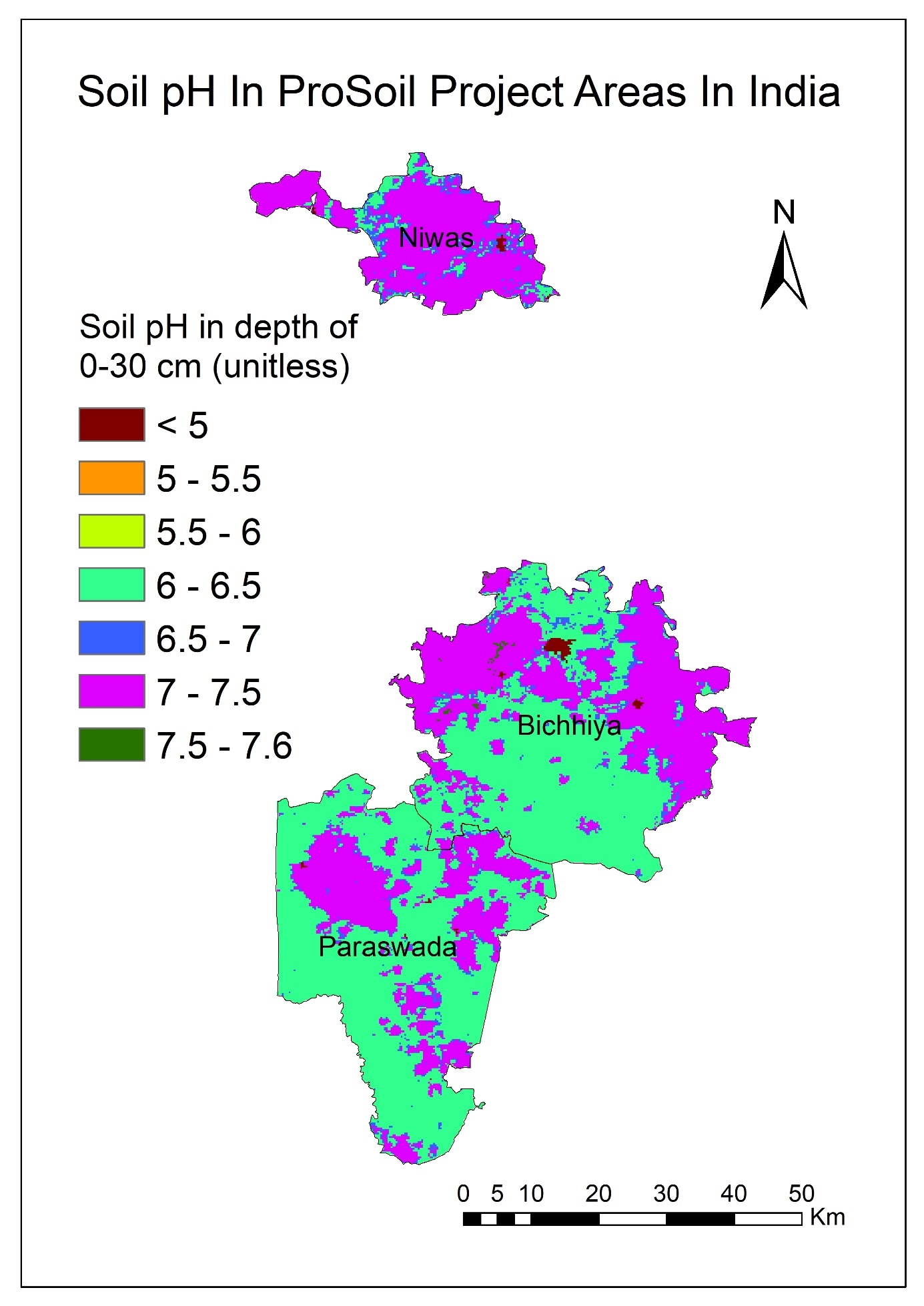


Figure 3. Soil pH of the ProSoil project areas in India

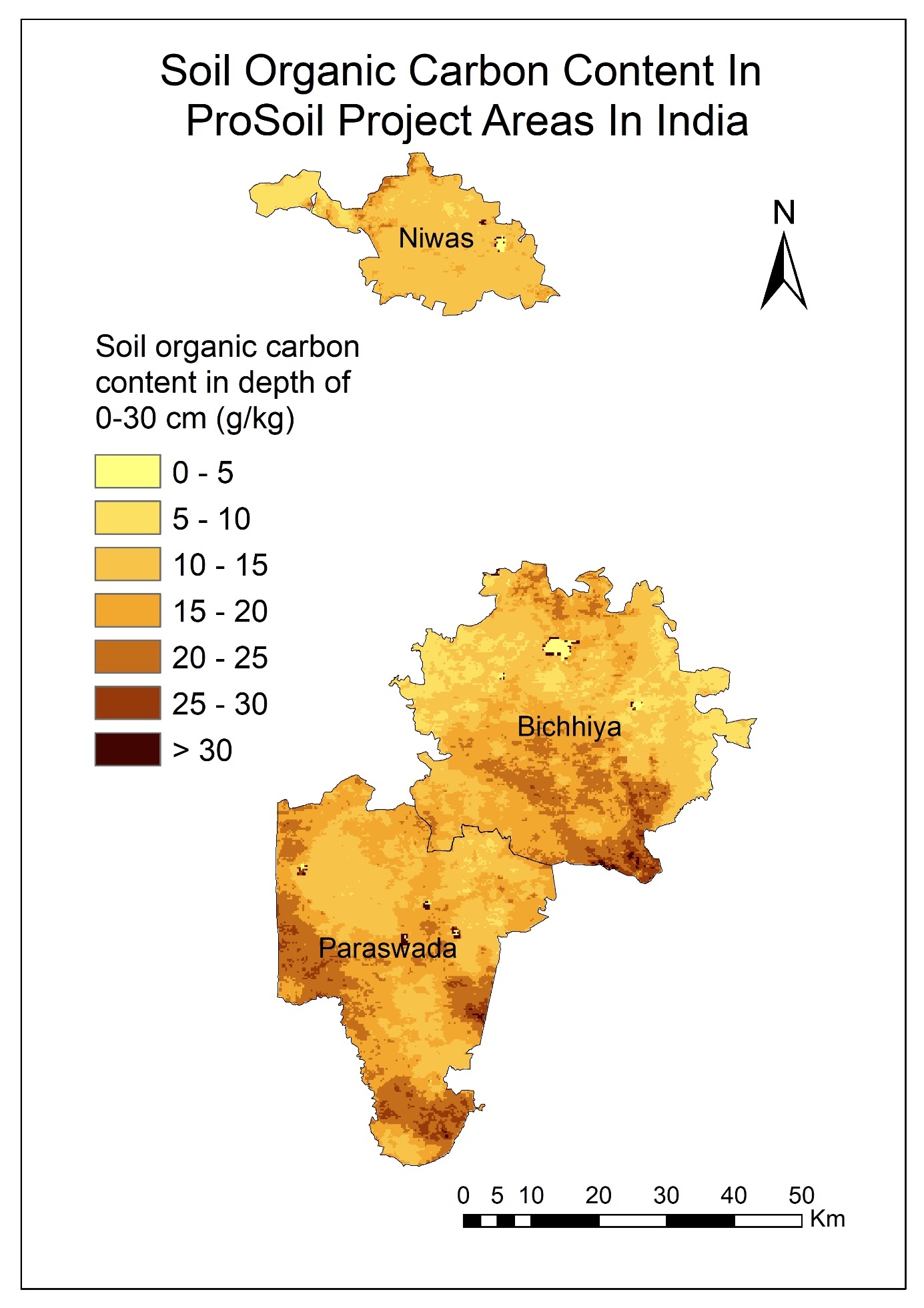


Figure 4. Soil organic carbon content of the ProSoil project areas in India

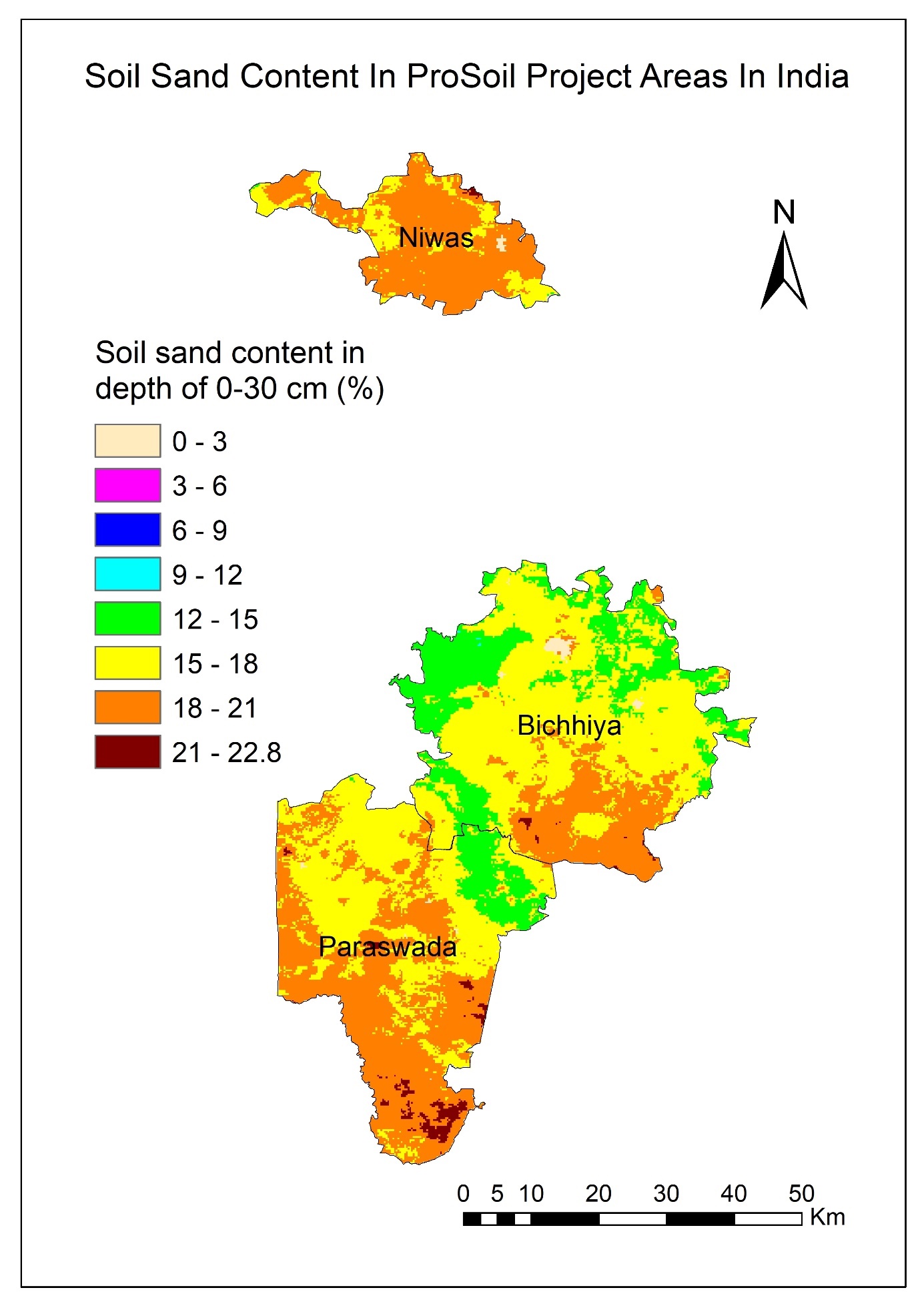


Figure 5. Soil sand content of the ProSoil project areas in India

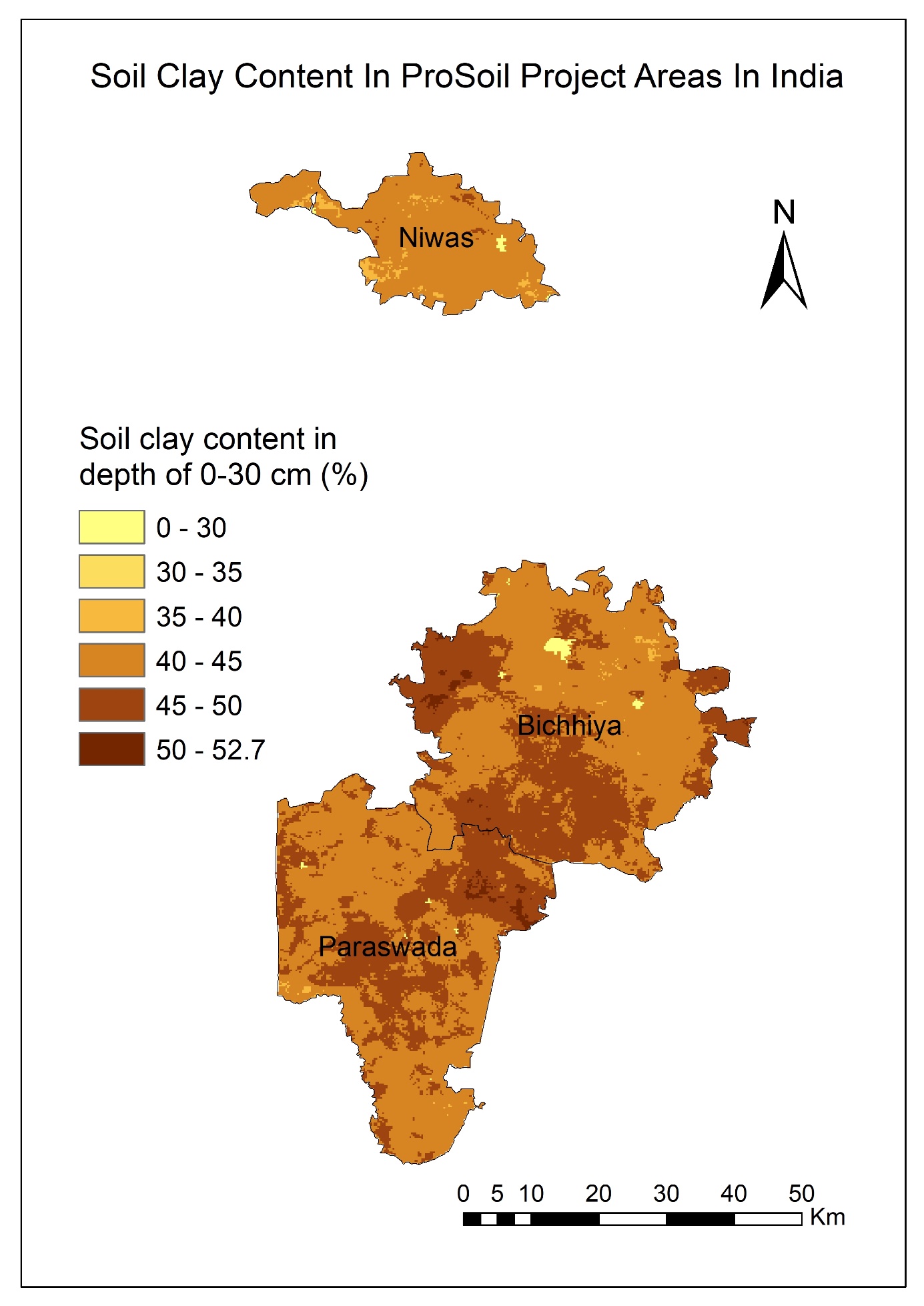


Figure 6. Soil clay content of the ProSoil project areas in India

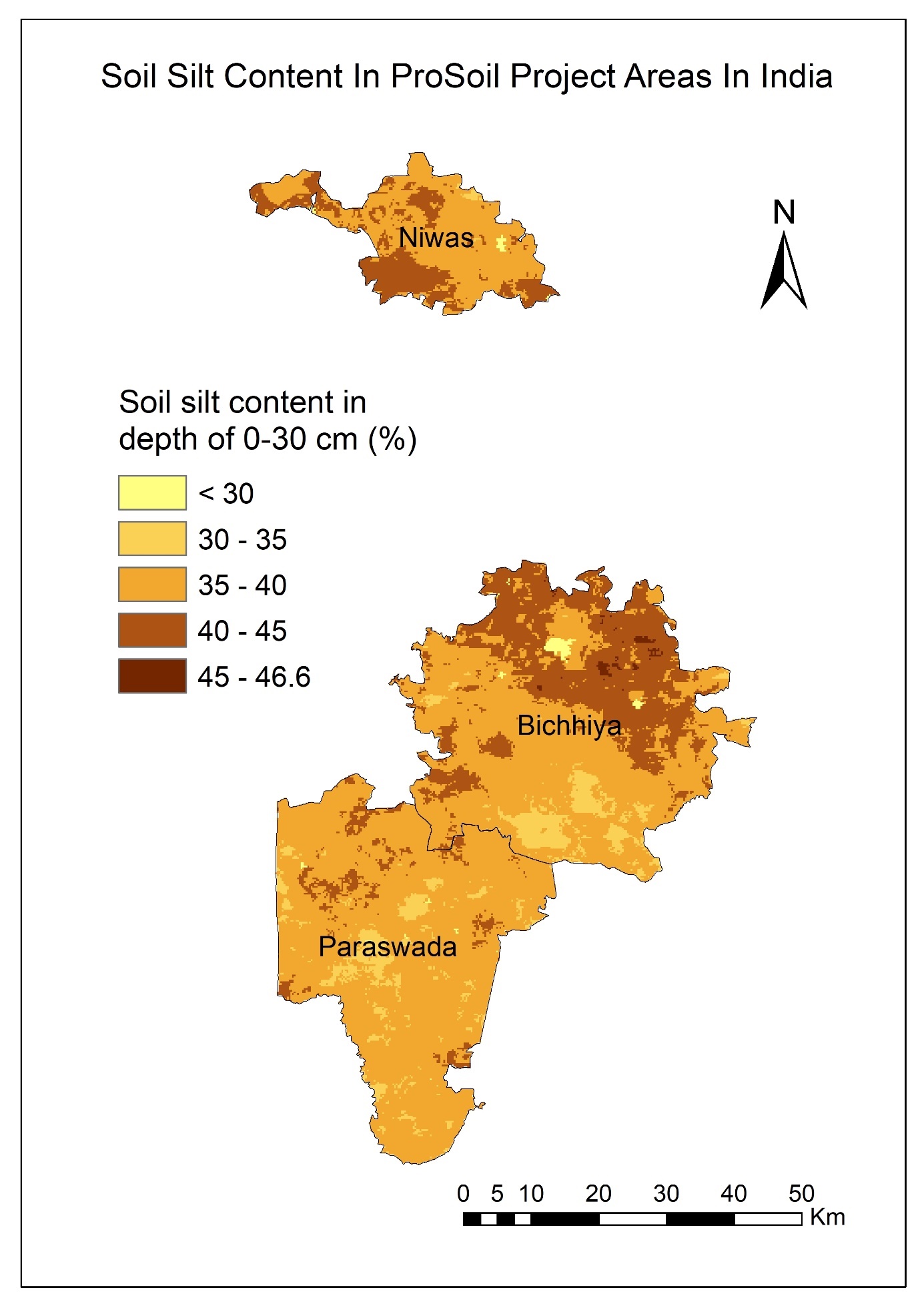


Figure 7. Soil silt content of the ProSoil project areas in India

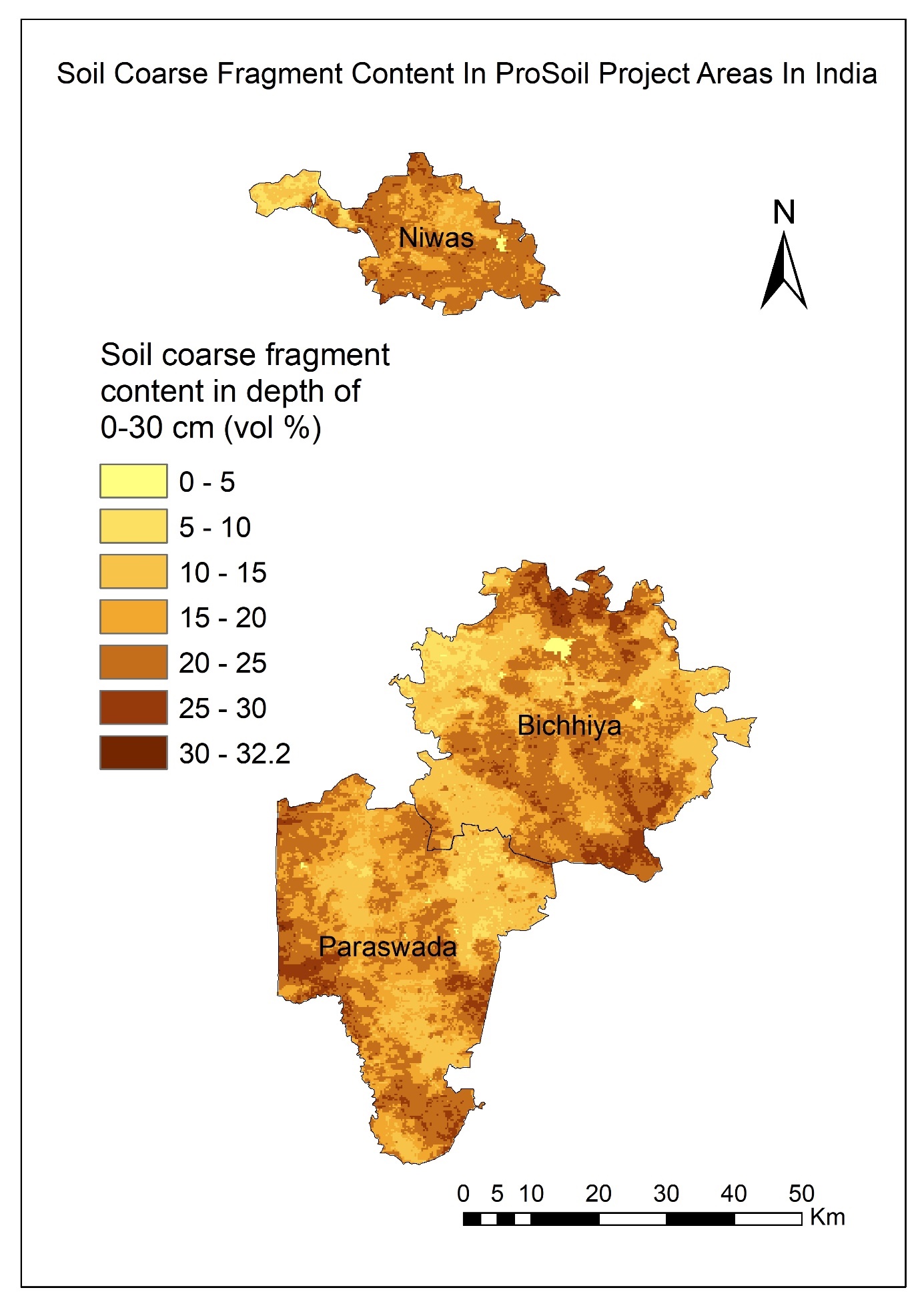


Figure 8. Soil coarse fragment content of the ProSoil project areas in India

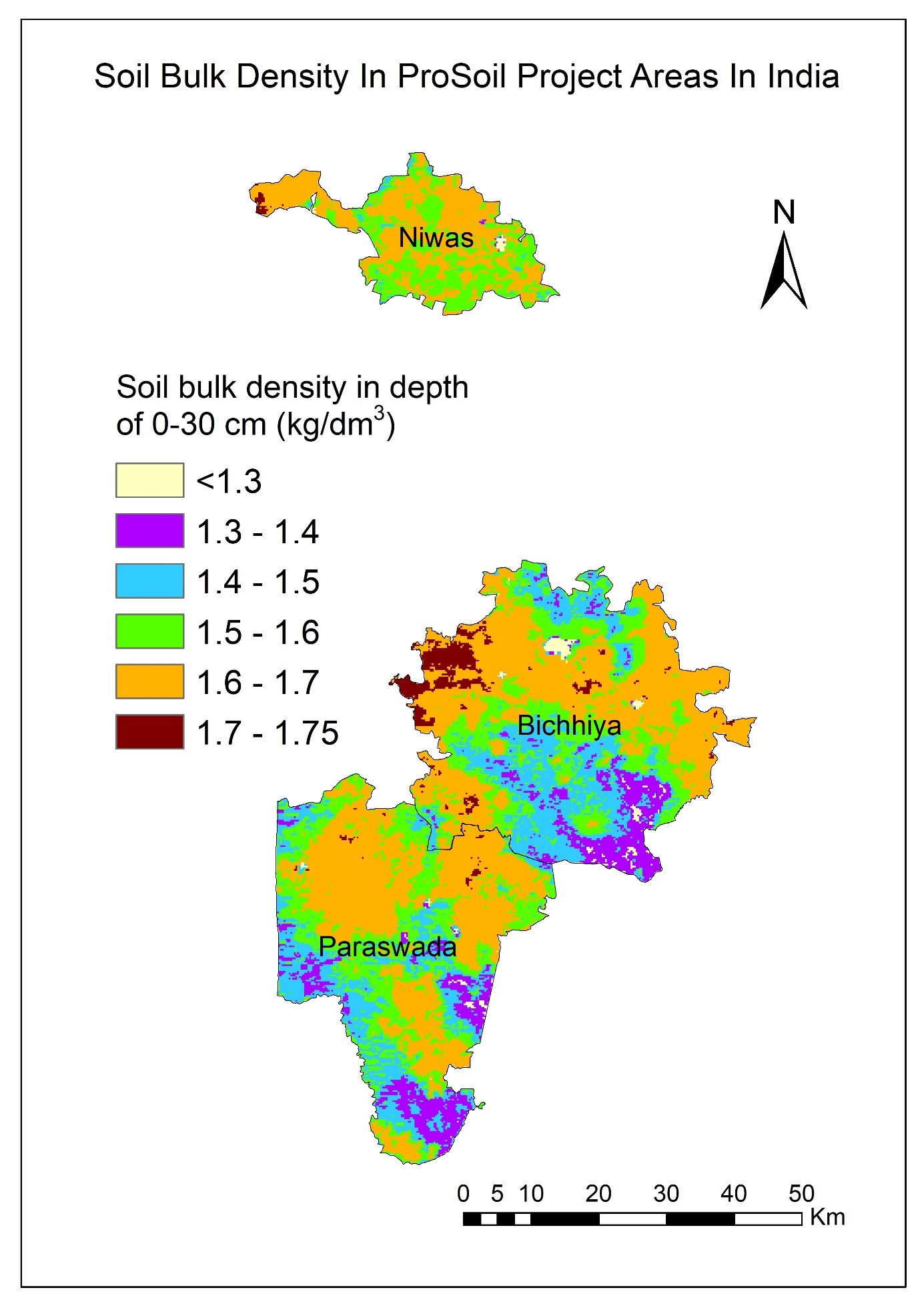


Figure 9. Soil bulk density of the ProSoil project areas in India

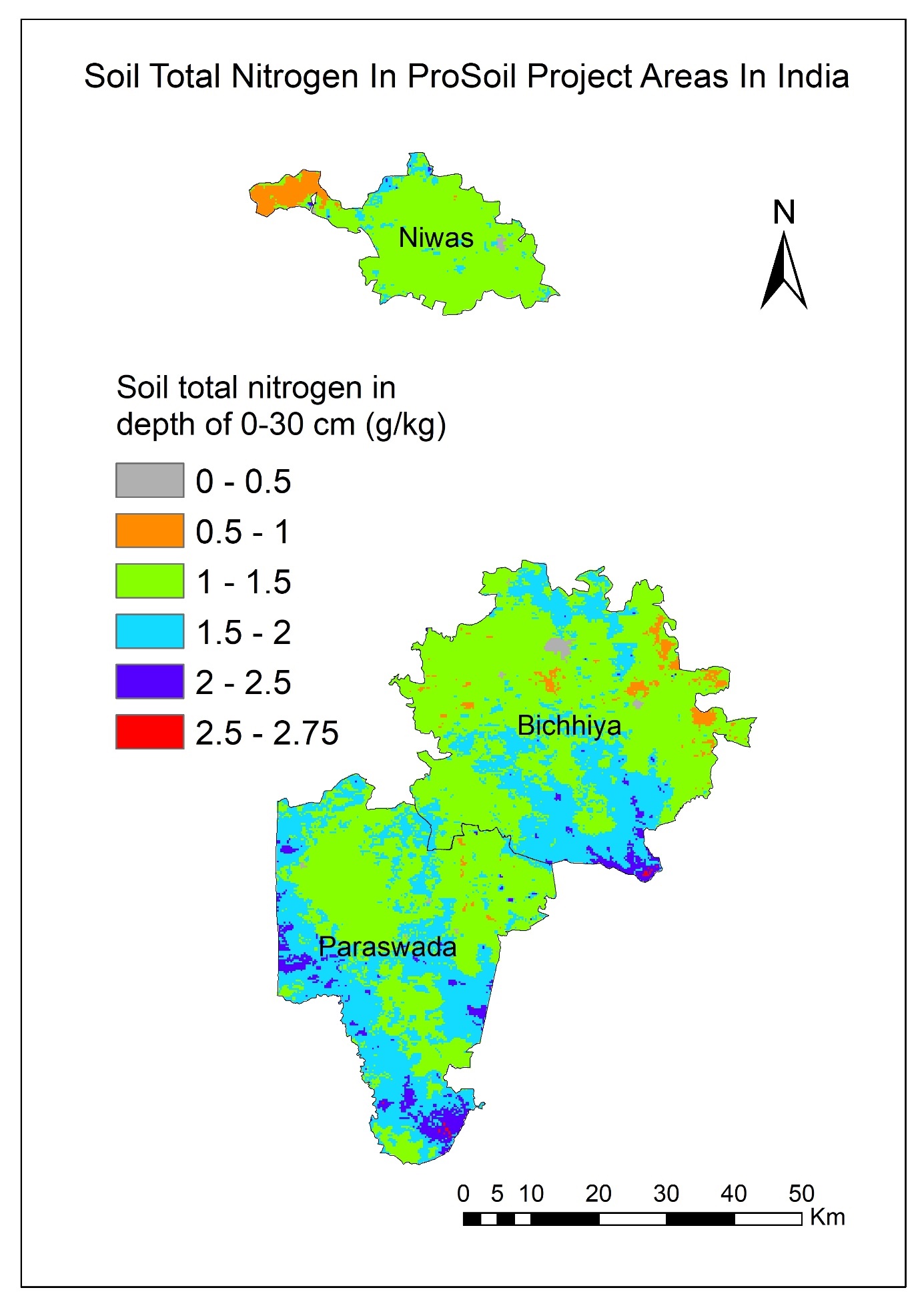


Figure 10. Soil total nitrogen content of the ProSoil project areas in India

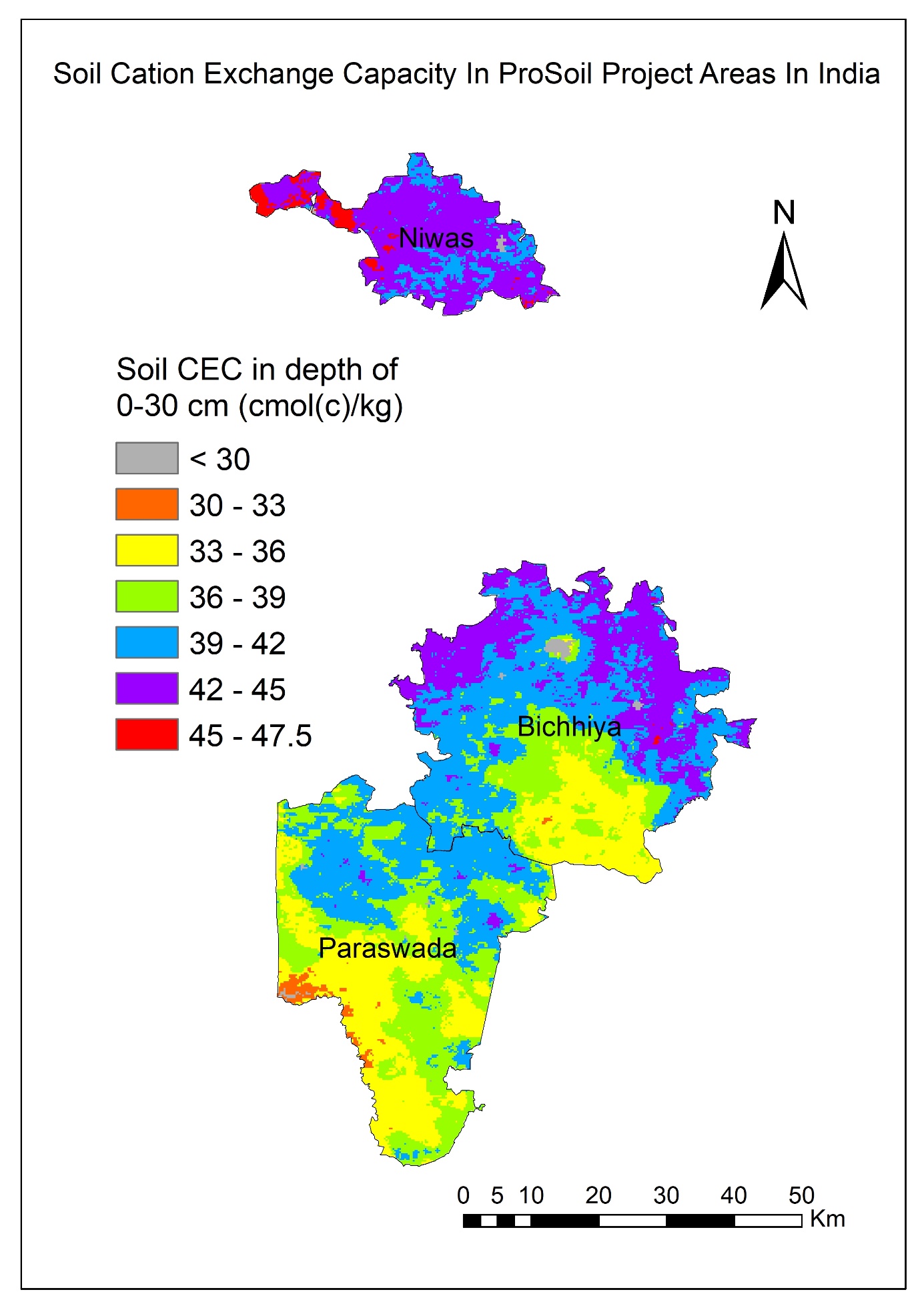


Figure 11. Soil cation exchange capacity (CEC) of the ProSoil project areas in India

References

Batjes, N.H., Ribeiro, E., van Oostrum, A., Leenaars, J., Hengl, T. and Mendes de Jesus, J. (2017). WoSIS: providing standardised soil profile data for the world.  Earth Syst. Sci. Data 9, 1-14.  [doi:10.5194/essd-9-1-2017](http://dx.doi.org/10.5194/essd-9-1-2017)

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