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Development of Planning and Decision Support Tools for IWRM in Vietnam

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The German-Vietnamese joint research project „Integrated Water Resources Management Vietnam" (IWRM-Vietnam) funded by the German Federal Ministry of Education and Research is developing Planning and Decision Support Tools for Integrated Water Resources Management (IWRM) in Vietnam.

The Institute of Environmental Engineering and Ecology (eE+E) at the University of Bochum is closely cooperating with the Department of Water Resources Management (DWRM) of the Vietnamese Ministry of National Resources and Environment (MoNRE) in order to develop a method in compliance with Vietnamese conditions (data availability, administration and legislation).

The approach facilitates a consideration of water resources quantity and quality leading to the identification of Water Management Units (WMUs) with priority need for action. The methodical concept consists of three main tools: Water Balance Tool, Contamination Risk Tool and Ranking Tool.

The tools unify different aspects of water related issues and enable the user to make sustainable planning decisions.

The methodical concept of the IWRM-Vietnam follows the ideas of the European Water Framework Directive (EU-WFD).

The visualization of all input components and the results of the three tools take place in a Geographical Information System (GIS).

The research focuses on the development and application of Planning and Decision Support Tools to improve the Integrated Water Resources Management in three different regions of Vietnam: Upper Dong Nai basin (Province Lam Dong), Red River sub-basin (Province Nam Dinh), Mekong sub-basin (Province Can Tho).

The following sections outline the application of the methodology based on the case study upper Dong Nai basin (Province Lam Dong).
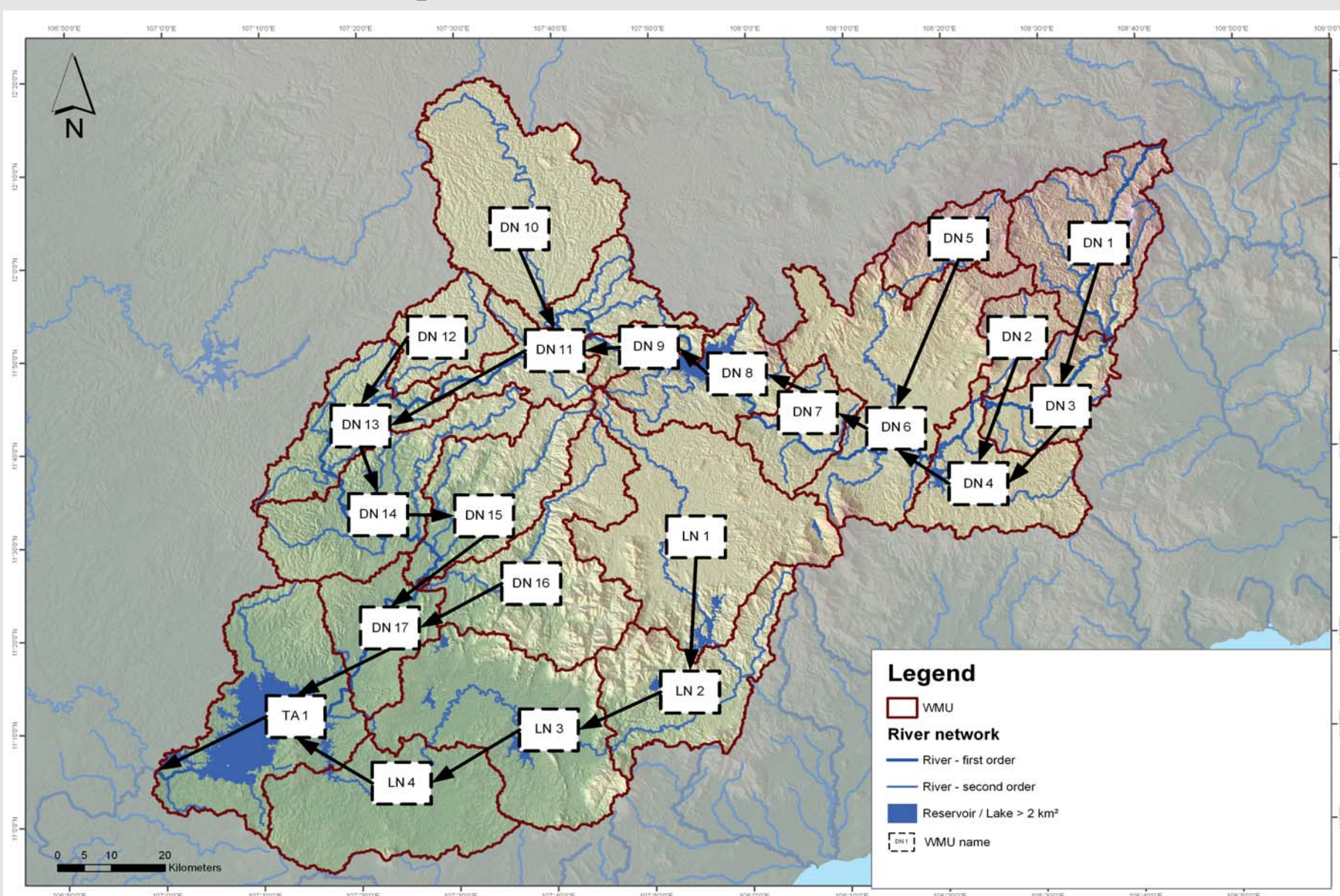
Maps Water Balance
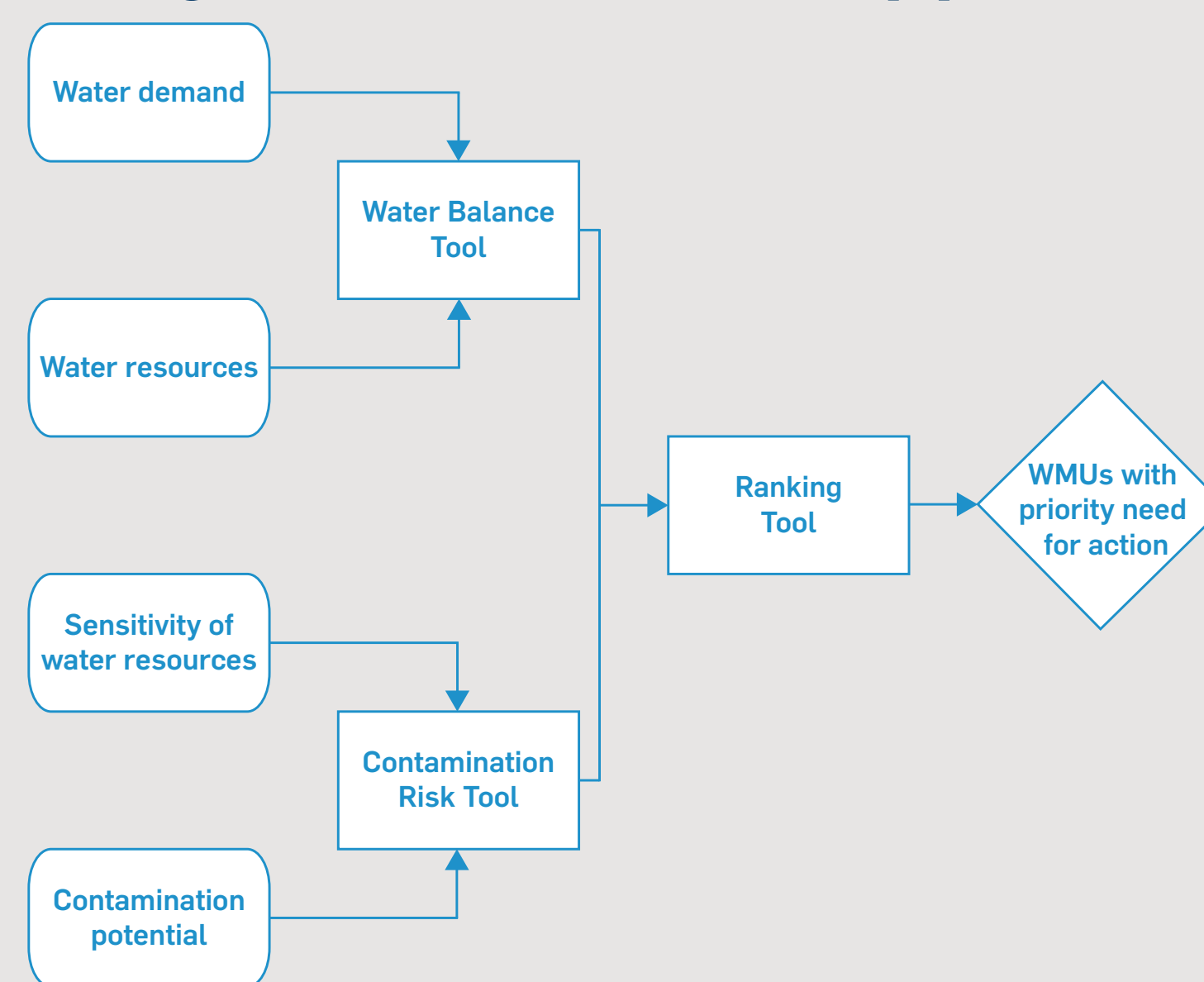

Figure 1: Water Management Units (WMUs)

Figure 2: Water use (February)

Figure 3: Deficit / Surplus (December - May)

Figure 4: Ranking Water Balance - Deficit / Surplus (February)

Planning and Decision Support Tools

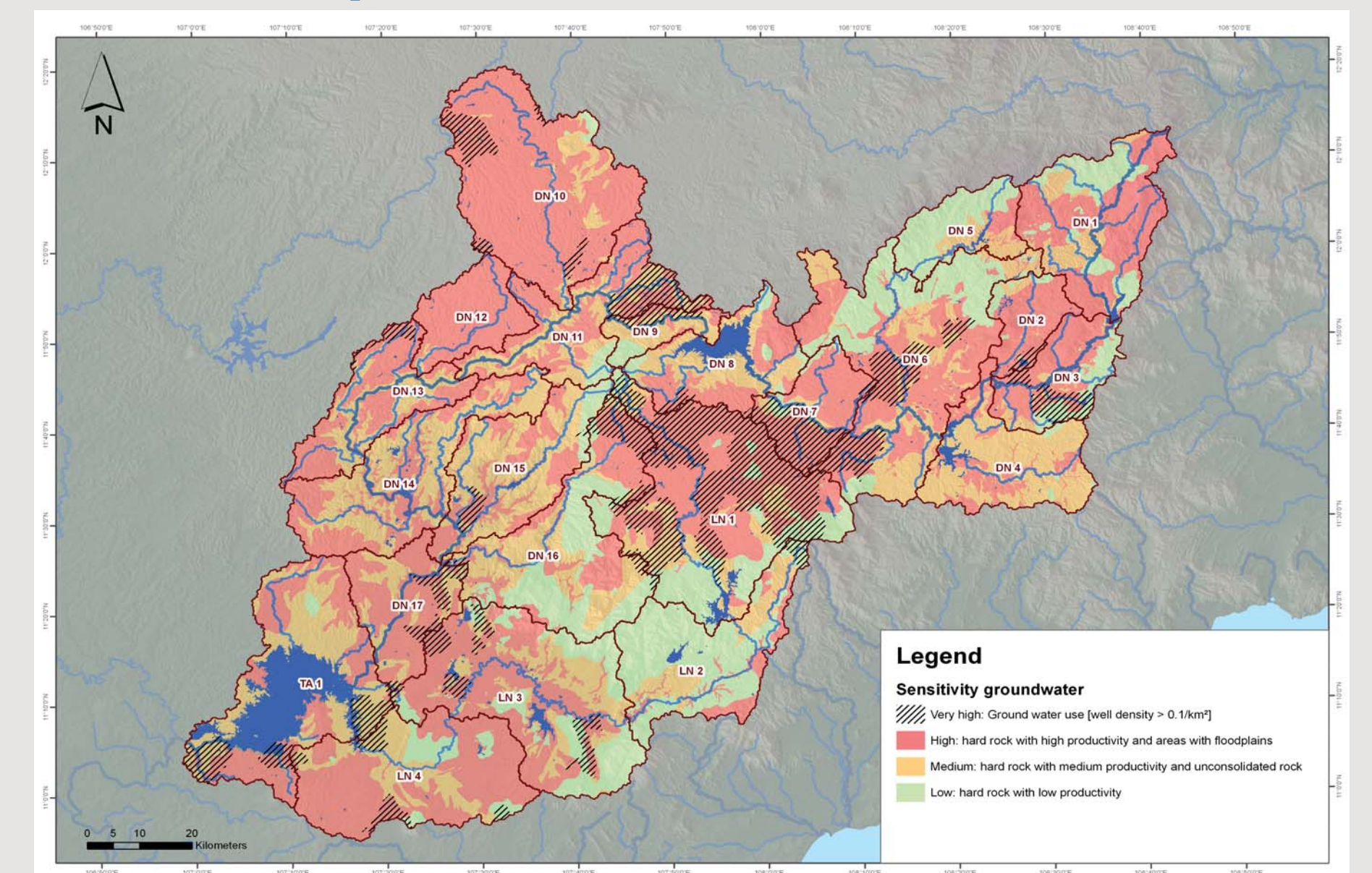Figure 5: Methodical aggregation of the Planning and Decision Support Tools
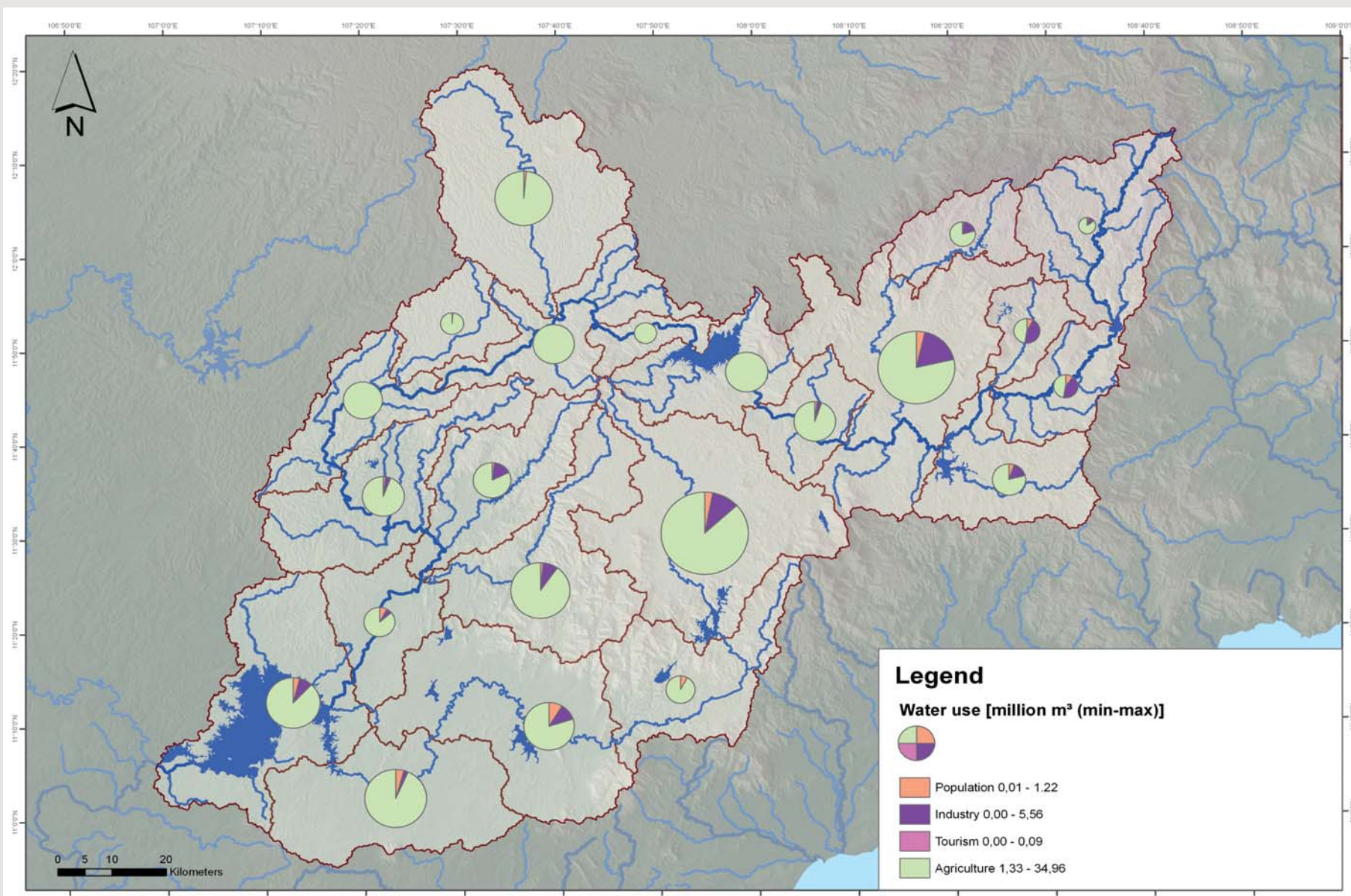
Water Balance Tool

The Water Balance Tool is a tool to calculate the water quantities of Water Management Units (WMUs) by contrasting water resources and water demands of water users and thus identifying surpluses and deficits.

The calculation is made for each month, for the dry season, the rainy season as well as for the whole year.

Water resources per month - Water demand per month = Deficit / Surplus per month

Parameters for the calculation of water resources within a WMU are the discharge generated inside the WMU as well as the inflow coming from the upstream, yield of reservoirs, groundwater resource and water transfers.
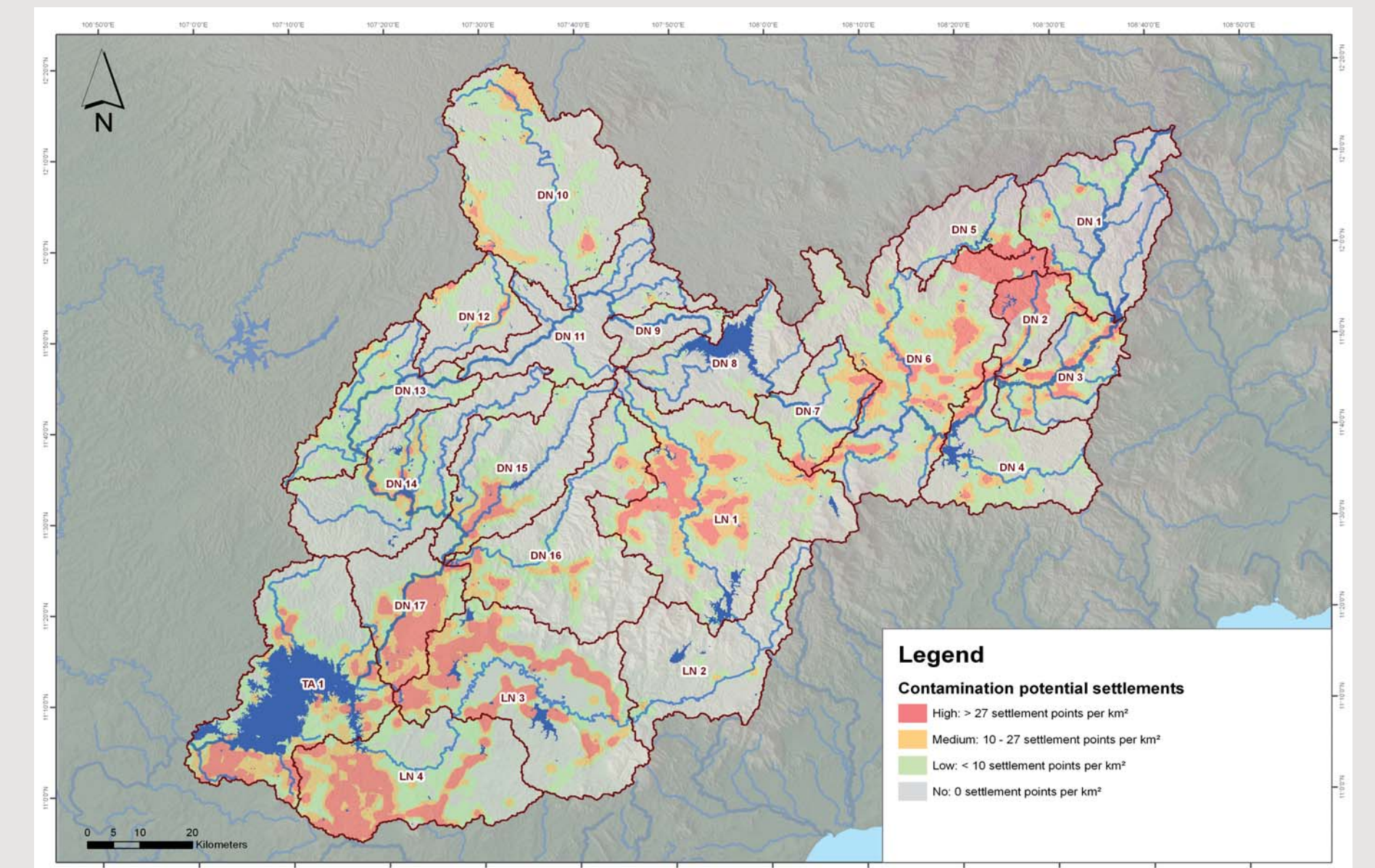
Contamination Risk Tool

The Contamination Risk Tool is used to assess contamination risks for water resources (groundwater and surface water) as follows:

Sensitivity of water resources + Contamination potential of pollutants = Contamination risk

Three possible contamination paths are considered:

1. Infiltration of solute pollutants from diffuse and point sources into groundwater.
2. Transport of pollutants from diffuse sources by erosive runoff into surface water.
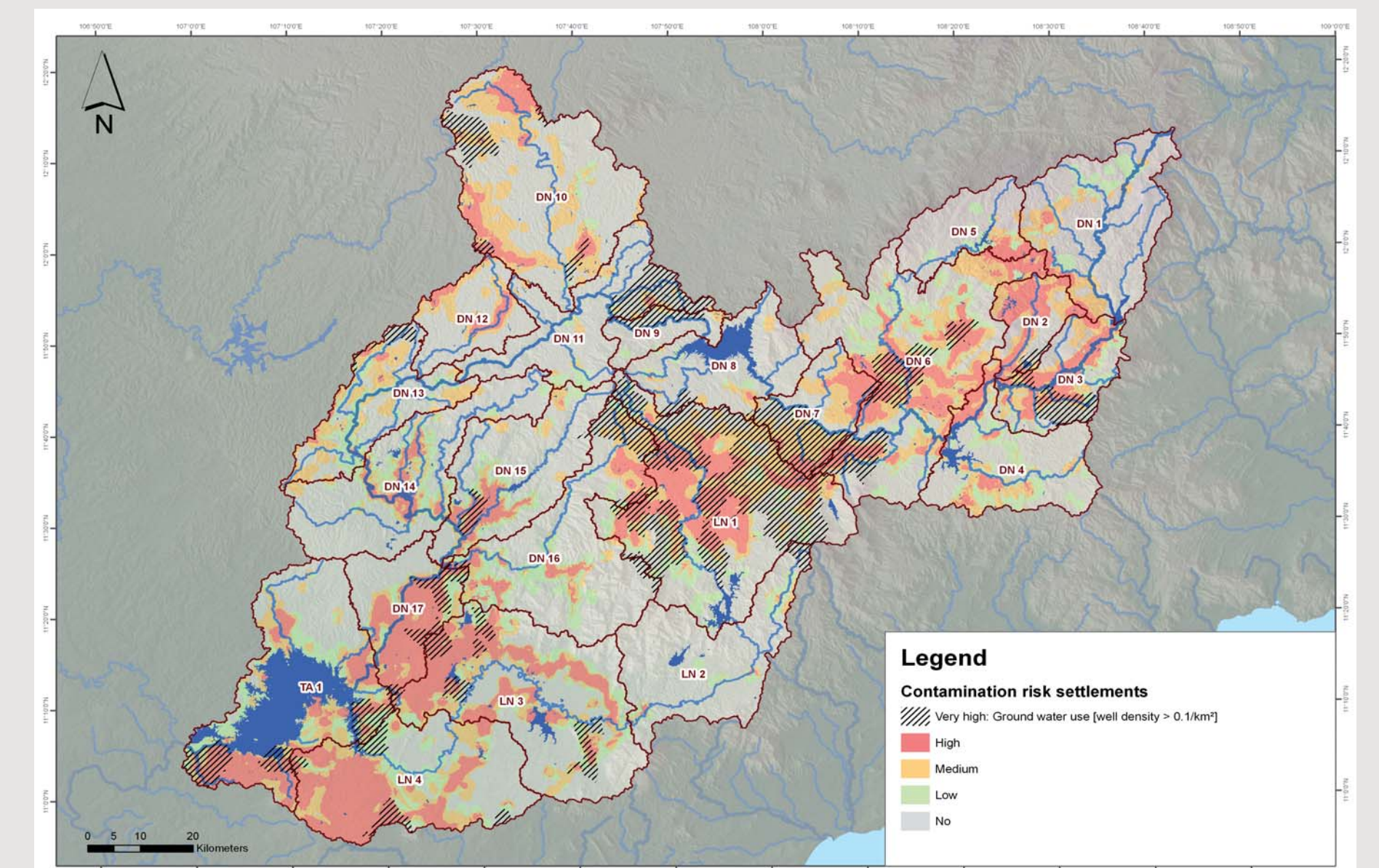3. Direct discharge of pollutants from point sources into surface water.

Ranking Tool

The Ranking Tool implies the results of the Water Balance and the Contamination Risk Tool in a graduated way in tables or maps. The aim of this ranking is to identify sub-basins with priority need for action regarding water quantity or water quality aspects in order to prepare decisions and measures.

On the basis of the Water Balance Tool different indicators can be calculated and ranked for each WMU (e.g. number of months with water deficit, water deficit per area, water availability, water exploitation index).

The results of the Contamination Risk Tool are ranked for each of the three contamination paths.

Maps Contamination Risk

Figure 6: Path 1 - Sensitivity of groundwater resource

Figure 7: Path 1 - Contamination potential of settlements
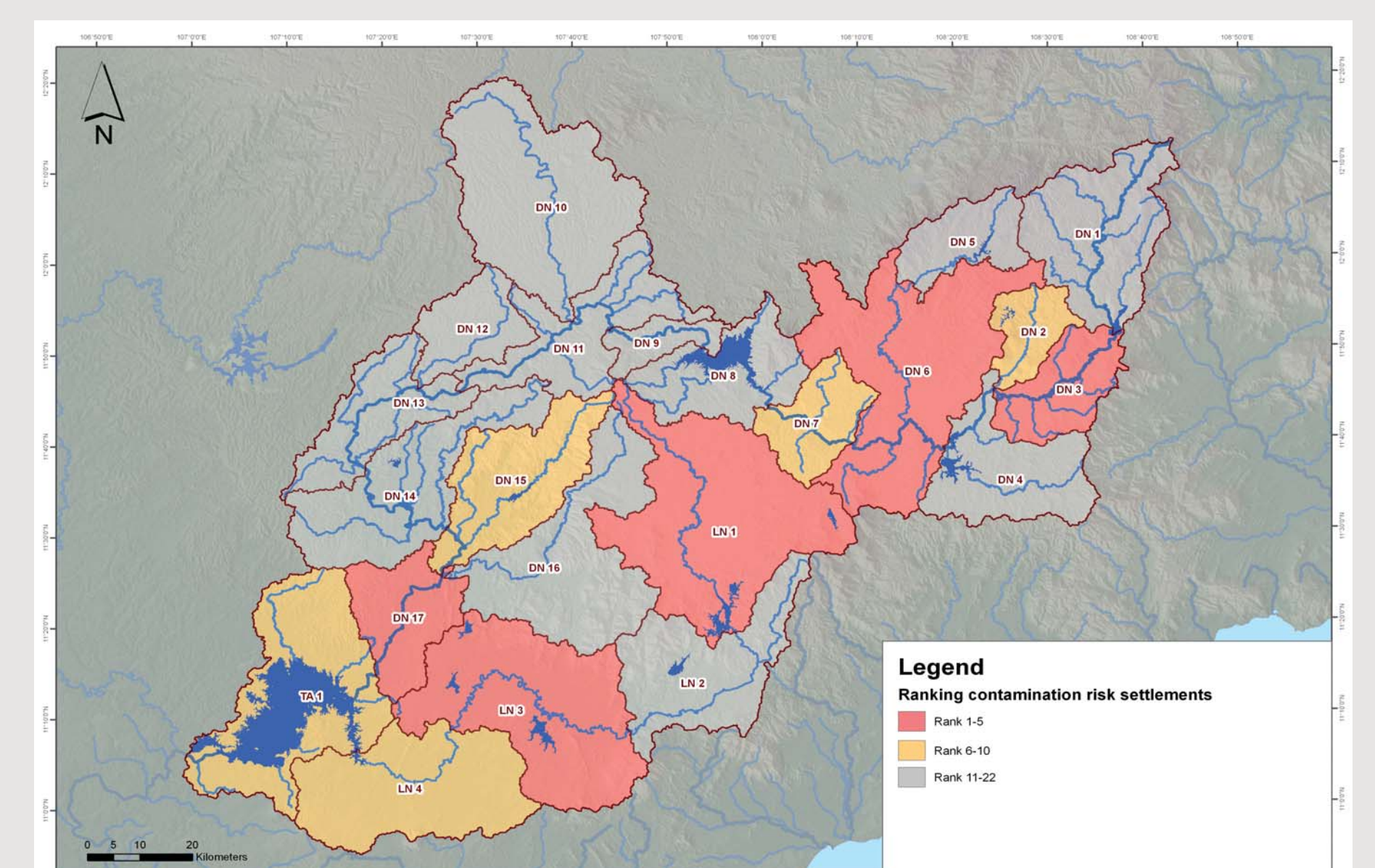

Figure 8: Path 1 - Contamination risk of settlements

Figure 9: Ranking path 1 - Contamination risk of settlements

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