The development of a reliable methodology for the selection of optimal sites for weather radar installation is presented in this paper. The proposed methodology is based on the combination of geographic information systems (GIS) and multi-criteria decision making (MCDM) methods. The Algerian central north region is selected as a case study. Six constraints and eight evaluation criteria divided into radar coverage, infrastructures and environmental and social clusters are considered in the decision model. The weights coefficients of the criteria are generated using an analytical network process combined with decision making trial and evaluation laboratory (DEMATEL-ANP) techniques. The produced site locations are then ranked by multi-attribute border approximation area comparison (MABAC) and the results are compared to those obtained using VIKOR, TOPSIS and COPRAS. The tool can be used by decision makers in the selection of future weather radar sites or the evaluation of existing ones for different geographical regions. 