Prediction of groundwater quality index to assess suitability for drinking purpose using averaged neural network and geospatial analysis

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Supplementary Material

1 Supplementary tables

Supplementary Table S1. Water quality standard for potable groundwater in Korea.

Category	Parameter	Standard	Category	Parameter	Standard
Microorganism (4)	General Baceteria	< 100 CFU / mL	Harmful organic (17)	Benzene	< 0.01 mg / L
	Total Coliform	Undetected / 100 mL		Toluene	< 0.7 mg / L
	Fecal Coliform	Undetected / 100 mL		Ethylbenzene	< 0.3 mg / L
	Escherichia coli	Undetected / 100 mL		Xylene	< 0.5 mg / L
Harmful inorganic (11)	Lead	< 0.01 mg / L		1.1-Dichloroethylene	< 0.03 mg / L
	Fluoride	< 1.5 mg / L		Carbon tetrachloride	< 0.002 mg / L
	Arsenic	< 0.01 mg / L		1,2-Dibromo-3-chloropropane	< 0.003 mg / L
	Selenium	< 0.01 mg / L		1,4-dioxane	< 0.05 mg / L
	Mercury	< 0.001 mg / L	Aesthetic Impact Substance (15)	Total hardness	< 300 mg / L
	Cyanide	< 0.01 mg / L		Potassium permanganate consumption	< 10 mg / L
	Chromium	< 0.05 mg / L		Smell	No smell
	Ammonia	< 0.5 mg / L		Taste	No taste
	Nitrate	< 10 mg / L		Color	< 5 degree
	Cadmium	< 0.005 mg / L		Detergent	< 0.5 mg / L
	Boron	< 1.0 mg / L		Copper	< 1.0 mg / L
Harmful organic (17)	Phenol	< 0.005 mg / L		pH	5.8 - 8.5
	Diazinon	< 0.02 mg / L		Zinc	< 3.0 mg / L
	Parathion	< 0.06 mg / L		Chloride	< 250 mg / L
	Fenitrothion	< 0.04 mg / L		Iron	< 0.3 mg / L
	Carbaryl	< 0.07 mg / L		Manganese	< 0.05 mg / L
	1,1,1-Trichloroethane	< 0.1 mg / L		Turbidity	< 0.5 NTU
	Tetrachloroethene	< 0.01 mg / L		Sulfate	< 200mg / L
	Trichloroethene	< 0.03 mg / L		Aluminum	< 0.2 mg / L
	Dichloromethane	< 0.02 mg / L			

Supplementary figures

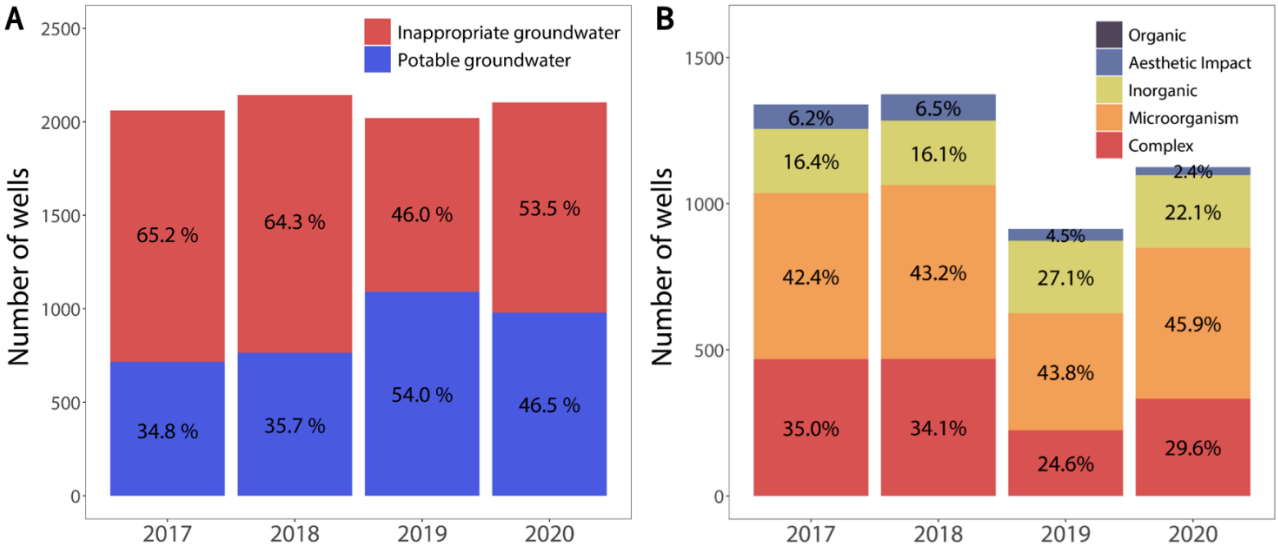

Figure S2. (A) Proportion of potable groundwater passed through groundwater quality standards (2017 ~ 2019). (B) The main sources of pollution of groundwater (2017 ~2019)

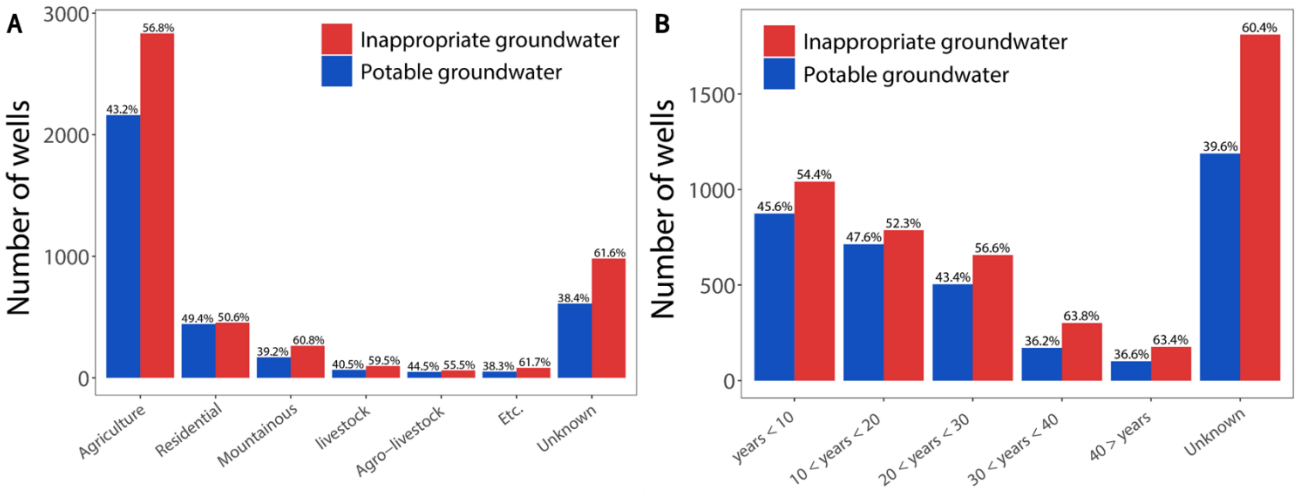

Figure S2. (A) Proportion of potable groundwater according to land-use (B) Proportion of potable groundwater according to the year of well development.

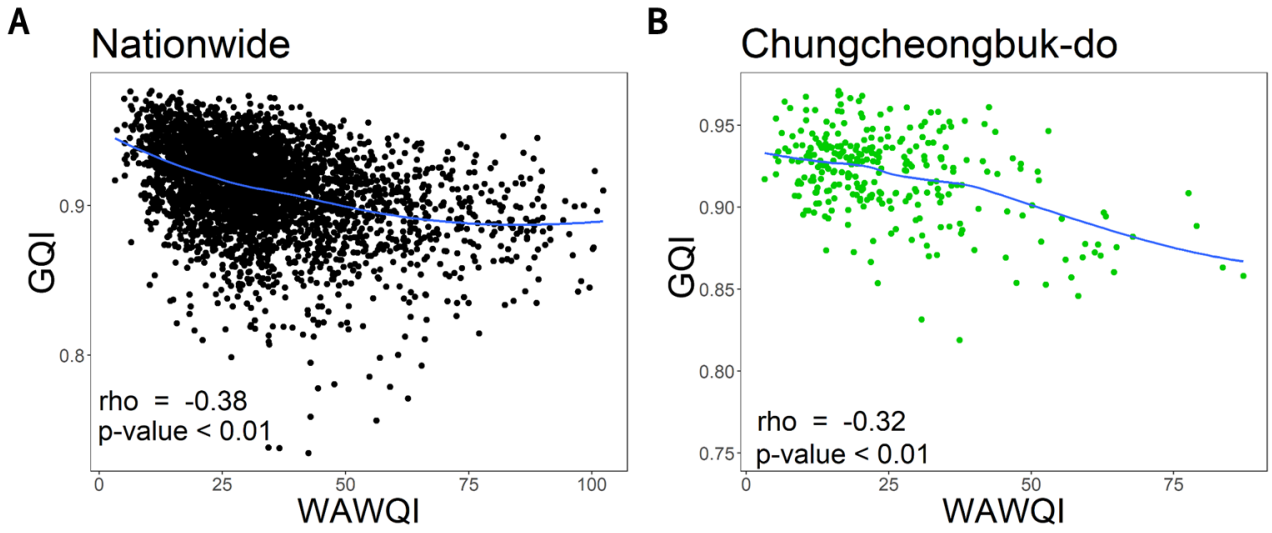

Figure S3. The correlation between WAWQI and GQI was visualized using a scatter plot. (A)nationwide, (B) Chungcheongbuk-do.

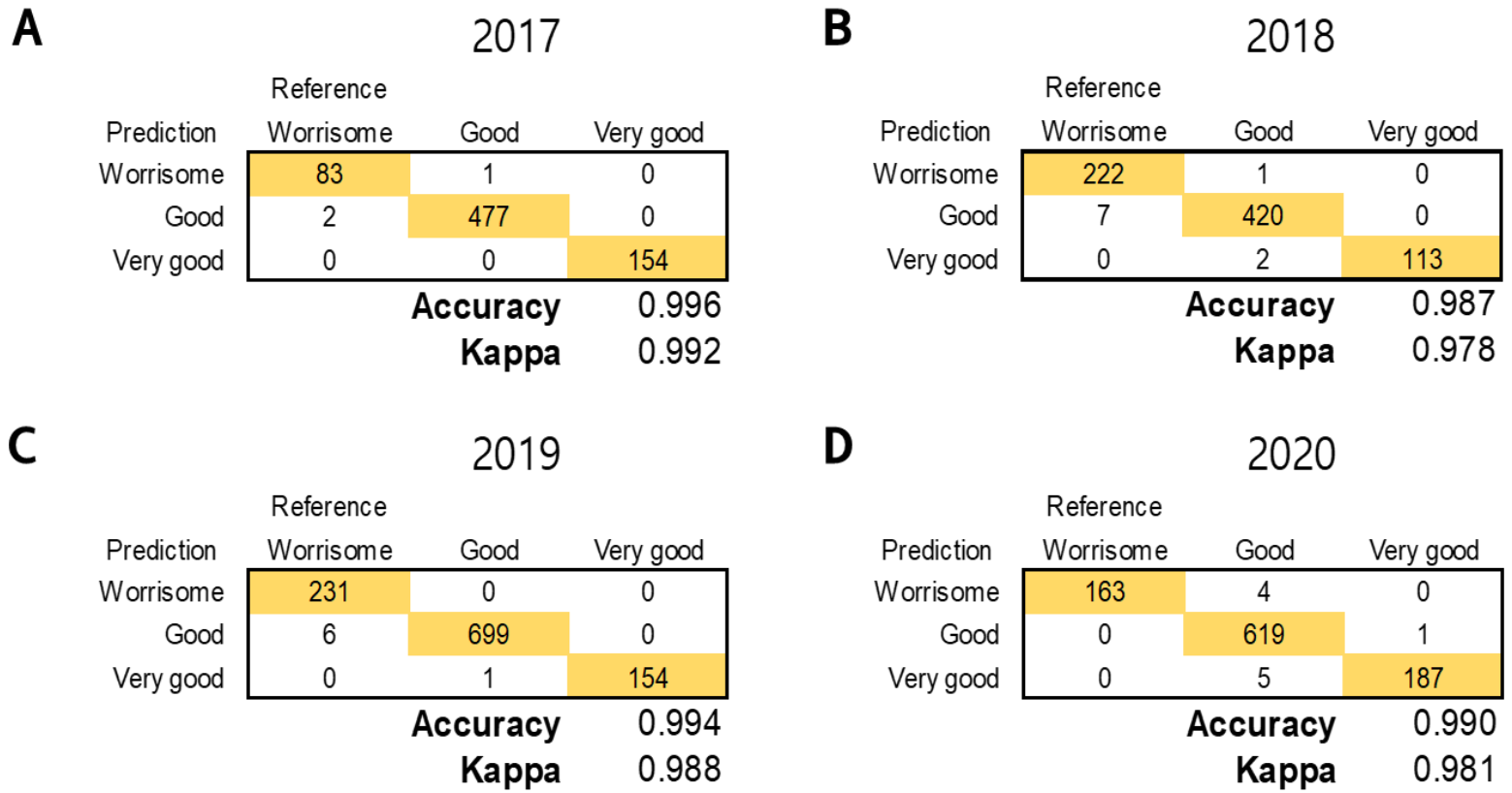

Figure S4. Confusion matrix of the best performing Averaged Neural Network model for (A) 2017 year, (B) 2018 year, (C) 2019 year, and (D) 2020 year. The column represents the groundwater vulnerability grade based on the distance score of the existing data, and row is the result of predicting the groundwater vulnerability grade with the averaged neural network model.

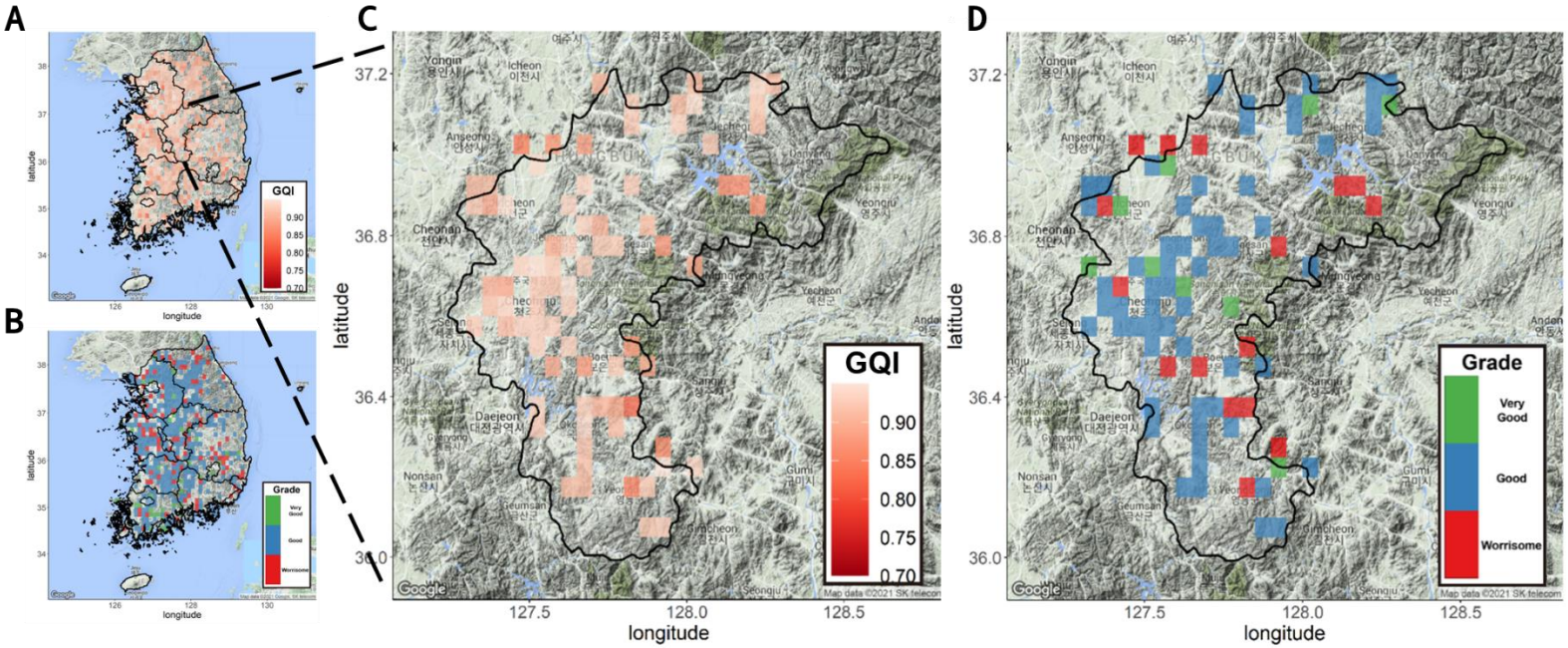

Figure S5. The GQI of potable groundwater were binned and displayed on the map (A) nationwide (C) Chungcheongbuk-do. The grades of binned area were visualized in the map (B) nationwide (D) Chungcheongbuk-do.