We evaluated the potential variations of aquifer temperature attributed to anthropogenic effects in past, present, and future. A hypothesis was tested that treated climate change as a significant and equally important cause as urbanization for potential changes in aquifer thermal regime. A series of synthetic simulations were performed and matched with the observed temperature–depth profiles as a preliminary step for parameter calibration. The magnitude of ground surface warming evaluated from subsurface temperature spans 0.9–1.3 °C. Approximately, 75% of ground surface temperature change was estimated to attribute to urbanization effect in the Sendai plain suggesting that urbanization has dominated the causes of influencing aquifer temperature in second half of 20th century. For the climate predictions, climate variables produced by three General Circulation Models (HADCM3, MRI and ECHAM5) under the A2, A1B and B1 scenarios were used. Downscaled monthly data were used in water budget technique to account the recharge variations and further, applied in heat transport equation together with the estimated ground surface warming rates in 2080. The overall results from nine scenarios estimate 1.2–3.3 °C subsurface temperature change in 2080 which is notably higher than the past urbanization effect has possessed in the Sendai plain. Moreover, groundwater temperature was considered as a proxy to develop a relationship between urbanization level and surface air temperature change. In a time where adaptation measures are increasingly required to cope with the climate change impacts, the composed methodology in this research will assist planners and decision–makers in environment management programs.