Base station (BS) positioning is considered an effective method to improve the performance of a Wireless Sensor Network (WSN). The goal of this dissertation is to minimize total energy consumption and to prolong lifetime of a WSN. First, the idea of the BS positioning in WSNs through our exhaustive search algorithm is evaluated; where it is shown that the BS position has an undeniable effect on the energy efficiency and lifespan of a WSN. Then, a metric-aware optimal BS positioning and relocation mechanism for WSNs is proposed. This technique locates the BS with respect to the available energy resources and the amount of traffic travelling through the sensor nodes at the time. Moreover, a BS relocation technique is presented in response to the dynamic environment that the sensor nodes operate in. Specifically, two optimization strategies based on the value of the path loss exponent are analyzed as weighted linear or nonlinear least squares minimization problems. Lastly, a distributed algorithm is proposed that can effectively handle the required computation by exploiting the nodes' cooperation. The simulation results demonstrate that the proposed BS positioning and relocation method can significantly improve the lifespan and energy efficiency in WSNs.