With the increased numbers of nuclear power plants constructed along the east coast of China, it is important to know radioactive sources and transport pathways between land and sea, in order to better understand the impact of these nuclear facilities to the marine environment. Two sediment cores collected from the East China Sea dated to 1959–2010 were analyzed for long-lived radioactive \(^{129}\)I and stable \(^{127}\)I. It was observed that \(^{129}\)I levels \(\frac{\text{\(^{129}\)I}}{\text{\(^{127}\)I}}\) ratio of \((15.0–75.0) \times 10^{-12}\) were significantly increased compared to the pre-nuclear value \(\frac{\text{\(^{129}\)I}}{\text{\(^{127}\)I}} = 1.5 \times 10^{-12}\). Some \(^{129}\)I peaks were observed in layers of 1959, 1966, 1971 and 1976 (1977), corresponding to the atmospheric nuclear weapon tests at Pacific Proving Grounds and Lop Nor. The high values of \(^{129}\)I after the late 1970s are attributed to the releases from the European reprocessing plants. In addition to ocean current transport, the atmospheric dispersion through the interaction of the Westerlies with East Asia monsoon is the important pathway of large-scale transport of pollutants from high latitude West Europe to middle latitude East Asia. Riverine input is the main transport pathway of radioactive pollutants released from Lop Nor to the East China Sea through the atmospheric dispersion, deposition and runoff processes. The sources and transport pathway of anthropogenic \(^{129}\)I in the ECS was investigated to estimate the impact of the human nuclear activities to the marine ecosystem in the east China sea and to improve the understanding of pollutant dispersion.