Current study reported the concentration levels, profile distribution, soil air exchange and ecological risk assessment via environmental matrices viz; water, sediment, soil and air of Khabeki and Uchallli lakes as Ramsar sites of international importance. ΣOCPs were ranged between in the water (0.27-2.70 μg g^{-1}; 0.94-10.37 μg g^{-1}) and sediment (146.9-348.49 ng g^{-1}; 289.26-589.03 ng g^{-1}) while ΣOCPs in soil (159.01-384.78 ng g^{-1}; 247.06-480.17 ng g^{-1}) and air (187.43-1349.99 pg m^{-3}; 3.31 pg m^{-3}-168.65 pg m^{-3}) of Khabeki and Uchalli lakes respectively. ΣDDT has the highest contribution in water (56%, 68%), sediment (88%; 89%), soil (86%; 89%) and in air (56% and 76%) of Khabeki and Uchalli lakes from total of all analyzed OCPs. Significant variations ($p < 0.05$) in water and non-significant ($p > 0.05$) in sediment of studies lakes were observed through independent sample T test. While only cis-chlordane in soil and *pp'*-DDE, *pp'*-DDD, *op'*-DDT in air revealed significant difference ($p < 0.05$). The Pearson correlation revealed significant associations of *pp'*-DDE ($p = 0.038$) and γ-HCH ($p = 0.041$) with organic matter in the sediment while positively related with *op'*-DDE ($r = 0.360$, $p = 0.250$) and *pp'*-DDE ($r = 0.317$, $p = 0.316$) in the soil. DDTs and HCHs showed fugacity fraction (*ff*) > 0.5, indicating the net volatilization of OCPs from soil to air in Khabeki lake except DDE in Uchalli lake. While chlordanes and endosulphans in Khabeki lake and *op'*-DDE, chlordanes and endosulphans in Uchalli lake revealed *ff* < 0.5, indicating the net deposition from air to soil. The ecological risk assessment of all metabolites of DDTs in Uchalli lake and the only metabolite (*op'*-DDE) in Khabeki lake showed a high risk with RQ > 1.