

EGU2020-12375

<https://doi.org/10.5194/egusphere-egu2020-12375>

EGU General Assembly 2020

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Ecological and environmental consequences of ecological projects in the Beijing–Tianjin Sand Source Region, China

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Evaluation of the influences of the Beijing–Tianjin Sand Source Control Project on soil wind erosion and ecosystem services is imperative for mastering the benefits and drawbacks of the program, as well as for distinguishing more reasonable estimations to evaluate regional sustainable development. Within the Beijing–Tianjin Sand Source Region, we quantified the spatiotemporal patterns of land use/cover changes (LUCCs), soil wind erosion modulus (SWEM), and essential ecosystem services throughout 2000–2015 by utilizing field investigations, remotely sensed data, meteorological data, and modeling. The influences of ecological projects on wind erosion and ecosystem services has been subsequently assessed by using those modifications brought on via the LUCCs (e.g., conversion from cropland to grassland/woodland) during the ecological construction. The results indicated that the SWEM showed a decline and ecosystem services which included carbon storage, water retention, and air quality regulation exhibited growth driven by using both local climate exchanges and human activities such as ecological projects. Excluding the effects of climate factors, the LUCCs stemming from ecological projects caused a total SWEM decrease of 3.77 million tons during 2000–2015, of which approximately 70% was prompted by the way of the transition from desert to sparse grassland. The sub-regions of desert grassland in Bayannur, Ordos Sandy Land, and Otindag Sandy Land were hot spots for wind erosion declines and ecosystem service enhancements induced by the ecological projects. We recommend that endeavors be coordinated toward the scientific management of the degraded lands and distribution of the local populace, as well as the implementation of diverse measures in the expected hotter and drier future.