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Impacts of Human Appropriation of Net Primary Production on Ecosystem Services

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Human has fundamentally transformed the biosphere, the alteration has reached an unprecedented extent and rate. Human appropriation of net primary production (HANPP) is an operational framework to quantify the impact of human activities on ecosystems.Net primary production (NPP) is a key process of ecosystems, humanity interfere this process by appropriating a fraction of NPP. This fraction is defined as HANPP. Even though the introduction of this concept has initiated an amount of researches, however, much of the previous research has focused on the extent of HANPP and its trajectory. The exploration in using HANPP for sustainability indication remains insufficient.
Ecosystem services bridge human systems and natural ecosystems. NPP has been categorized as a supporting ecosystem service, which is connected with other provisioning and regulating services. Human appropriate a fraction of NPP to provide food, fuel and other service, which means HANPP is related to provisioning services. While the fraction of NPP remaining in the ecosystem after human appropriation (NPPeco) is providing the regulating services. Human maximize provisioning services by appropriating more NPP will lead to a decline in regulating services. Thus, under the background of climate change, we contribute to this comprehensive progress by offering hypothetical possible trends of ecosystem regulating services impacted by HANPP. We suggest that HANPP has two thresholds concerning its impact on ecosystem regulating services.
In addressing this hypothesis, we performed an empirical study in the Tibet Autonomous Region of China (herein after Tibet), by assessing the impacts of HANPP on three important ecosystem regulating service -wind erosion prevention, soil retention and water retention service. We estimated HANPP and ecosystem services in Tibet for 1989-2015, interpolated wind speed, annual precipitation and mean annual temperature as climate factors. The results show that climate change dominant the changes of ecosystem regulating services in Tibet overall, while at county level, in some counties located at central river valley area, HANPP became the dominant factor in recent two decades. The extent of HANPP in the northern grassland ecosystem based area which did not reach the first threshold was considered to be sustainable, where the first threshold of HANPP is different related to different regulating services. We provide this study as a discussion concerning the impacts of HANPP on ecosystem services to be an interesting insight and a framework for understanding and assessing the sustainability of ecosystems under human influence and domination.