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The effect of networked social interactions on the attainability of the safe operating space in a stylized social-ecological model

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Humanity depends on the resources ecosystems provide. Especially in the last century, human activities have changed the relationship between nature and society at a global scale. Here, we study this interdependent relationship with a generic model of the coevolution of individual resource use and social preference formation. The latter is an adaptive network process based on two social key interactions beyond economic paradigms: imitation and homophily. The individual resources follow a logistically growing stock harvested with either a sustainable (small) or non-sustainable (large) effort. We are able to show that these kinds of social processes can have a profound influence on environmental state, such as determining whether the regional renewable resources collapse from overuse or not. We demonstrate additionally that heterogeneously distributed resource capacities among the nodes of the network shift the critical social parameters where this resource extraction system collapses. We make these points to argue that, in more elaborate and sophisticated implementations, such social phenomena as well as heterogeneities should receive attention in social-ecological systems models as well as Earth system and integrated assessment models. It is a necessary first step to better understand the underlying dynamics and interactions of planetary boundaries and the safe and just operating space for humanity.