

A Planetary Boundary Based Framework for Regional Sustainable Development Assessment in Heihe River Basin

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1. Introduction

The concept of Planetary Boundary [1, 2] defines sustainable development as the development of human activities that does not transgress our ecosystem limitation. Nine boundaries are quantitatively defined at global scale. To guide policymakers, downscaling the framework to regional scale must be performed [3, 4]. Furthermore, examining the risk perception of local people towards how transgressing boundaries impact their livelihood can complement the scientific findings.

The objective of this research is to propose a Planetary Boundary based framework for regional sustainable development assessment. We take Heihe River Basin, an inland river basin in northwest China, as a case study. Our study area is constrained to the ecosystem of middle reaches, which covers most human activities in the region. The outcome is expected to provide guidance for local policymakers in future development planning.

2. Methodology

Five environmental boundaries, i.e. freshwater use, biogeochemical flow, land-system change, atmospheric aerosol loading, and novel entities are selected based on the suggestion in Planetary Boundary [2]. Measureable indicators are defined for each boundary (i.e. water use amount, NO₃ concentration in river); boundary values are set according to national regulations [4], and historic patterns [3]. The current data is collected through literatures, reports, and field survey.

Risk perception of impact on livelihood is surveyed by questionnaire with a target of 300 responses. The livelihood is defined as food security, water security, income, health, and relationship with neighbors [5]. Three parts of questionnaire include how local people perceived changes in livelihood over the past ten years, and changes in the five environmental boundaries, and how transgressing environmental boundaries will impact livelihood. A field survey is planned to conduct on August 1 to August 14, 2015.

3. Results and Discussion

Figure 1 shows a tentative result of five environmental boundaries of the study area based on previous studies and online available material. The boundaries are represented in safe, uncertain, and high risk of maintaining safety ecosystem. Freshwater is at high risk due to overconsumption, water quality is beyond safe due to fertilizer use in agriculture.

The boundary of ecosystem is related to the normative value of safe environment. With the update of survey on local people (after the coming fieldwork), we can further discuss the implementation of the proposed framework on guiding policy making.

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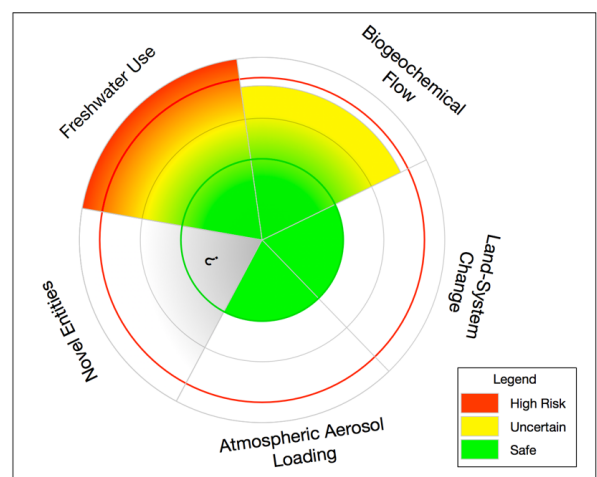


Figure 1 Tentative result of regional environmental boundaries of the middle reaches of Heihe River Basin.