

## **Water scarcity assessment of provincial energy production in China**

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The geographical distribution of energy and water resources in China is reversed, leading to the severe challenge of water shortage in energy production. Some studies have measured the water resource use of energy production through water footprint and virtual water, but they cannot fully reflect the water resource vulnerability of energy production. Based on the input-output analysis method and regional water stress index, this study develops the scarce water footprint assessment model and virtual scarce water trade estimation model to comprehensively assess water scarcity for production activities of different energy types at the provincial level in China. The results show that although the water use for energy production in regions like Ningxia Hui Autonomous Region is not large, its energy production faces a serious water shortage problem due to high water stress. To effectively alleviate the vulnerability of water resources in energy production in the above regions, at the regional level, attention should be focused on virtual scarce water transfer from net outflow areas like Ningxia Hui Autonomous Region to net inflow areas like Shaanxi Province. At the sectoral level, attention should be focused on virtual scarce water transfer from energy industries and agriculture to sectors like petroleum, coking products and nuclear fuel processing products. In addition, the scarce water footprint of different types of energy production varies greatly. It is necessary to develop targeted water management measures for production activities of different energy types. This study calls for incorporating water scarcity into energy production planning in China and strengthening cooperation between energy and water management departments to promote the sustainable development of energy and water resources in China.