

Revisiting Change Agency in Challenge-Oriented Regional Innovation Systems: Insights from the hydrogen industry in Shanxi, China

Regions facing deep-rooted structural challenges—such as economic dependence on fossil fuels—must not only innovate technologically, but also reconfigure their institutional and political landscapes. Shanxi Province in China, as a coal-dominated region under growing pressure to decarbonize, represents a compelling case of such tensions. Hydrogen industry has emerged as a promising vector for low-carbon transition, yet its implementation remains embedded in established institutional and industrial configurations.

This PhD project asks: How do different forms of agency negotiate the tension between structural continuity and transformative goals in regions facing grand societal challenges? More specifically, in the context of Shanxi, what kinds of agency are possible and effective in navigating energy transition under conditions of path dependence?

This study draws on and critically engages with the Challenge-Oriented Regional Innovation System (CoRIS) framework. CoRIS emphasize not only the creation of new socio-technical systems (innovation), but also the dismantling of unsustainable ones (exnovation). It acknowledges the importance of agency in driving both processes. In practice, innovation and exnovation are often intertwined beyond the framework's binary framing. To address this, I conceptualize agency not as a dualistic force of change versus reproduction, but as a relational and negotiated process that operates within structural constraints. Rather than assuming that actors are either change-oriented or reproduction-oriented, I examine how different agents—such as governments, enterprises, and researchers—navigate tensions, accommodate contradictions, and sometimes strategically blur the line between continuity and disruption.

The research is based on an ongoing qualitative case study of the hydrogen industry transition in Shanxi. Methodologically, it combines in-depth policy document analysis, semi-structured interviews with key actors (local governments, SOEs, universities, private firms), and fieldwork conducted across multiple localities.

Initial findings suggest that both change agency and reproductive agency are present in Shanxi's hydrogen industry development, but they are not easily separable in practice. Instead of acting as clearly distinct forces, the actors—particularly local governments and enterprises—engage in strategies that simultaneously introduce new technologies and preserve key institutional logics. This challenges binary framings of transformation versus continuity. It also suggests that the presence of reproductive agency should not be interpreted as the absence of transition. Rather, transition processes in structurally locked regions may unfold through complex interactions between reinforcing and reorienting strategies, requiring more nuanced criteria for assessing change.

This PhD project contributes to broader discussions on sustainability transitions, regional innovation systems, and the political economy of transformation. I hope to receive feedback on both the conceptual framing and methodological approach, and to engage in comparative dialogue with scholars working on similar transitions in other regional contexts.