# Shu Zhang

## Contact & Personal Information

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## Research Profile

Dr. Zhang is Assistant Professor of the Institute of Energy, Environment and Economy at Tsinghua University. His research focuses on integration and interactions across energy, land, water, and air quality systems, with particular emphasis on cross-sector synergies. He develops and applies the energy-environment-economy model China TIMES to explore pathways that integrate energy, transport, buildings, and industry sectors, while accounting for shared infrastructures such as power grid, storage and $CO_2$ transport network. A central strand of his research is quantifying uncertainty in decarbonization pathways using the probabilistic framework, which enables robust policy recommendations. With publications in Nature Sustainability, Nature Communications, and Engineering, He has contributed new insights on the costs, potentials, and enabling policies of integrated low-carbon transitions, and provides evidence-based insights to support strategic policymaking.

## Professional Experiences

Jul 2024 – present **Assistant Professor**
Institute of Energy, Environment and Economy, Tsinghua University, China

Mar 2022 – Apr 2023 **Visiting Scholar**
International Institute for Applied Systems Analysis (IIASA), Austria

## Education

Aug 2019 – Jun 2024 **Ph.D., Tsinghua University, China** in Management Science & Engineering
*Thesis title: Assessing the Energy Transition, Synergies and Uncertainties toward Carbon Neutrality in China (Supervisor: Prof. Wenying Chen)*

Aug 2015 – Jul 2019 **B.Eng., Tsinghua University, China** in Electrical Engineering (Major)
*Core field: Power load forecasting (Supervisor: Prof. Chongqing Kang)*

**B.Econ., Tsinghua University, China** in Economics (2nd degree)
*Core field: Behavioral Economics*

**B.Fin., Tsinghua University, China** in Finance (Minor)

## Grants & Research Funding

**As PI or co-PI**

Jan 2026 – Dec 2028 **Young Scientists Fund (C), National Natural Science Foundation of China (NSFC)**
*Hydrogen Energy and Hydrogen-based Fuel Supply Potential and Development Pathway in China under the Carbon Neutrality Target,* Principal Investigator

Sep 2025 – Sep 2026 **International Joint Mission on Climate Change and Carbon Neutrality**
*China's green hydrogen, green ammonia and green methanol fuel development pathways under the carbon neutrality target,* Principal Investigator

**As Member**

Jan 2025 – Jun 2028 **Horizon Europe, European Commission**
*New Pathways for Equitable Climate Action in Line with the Paris Agreement and Sustainable Development (NEWPATHWAYS),* Key Member

Nov 2024 – Dec 2030 **National Science and Technology Major Project, Ministry of Science and Technology of China (MOST)**
*$CO_2$ driven technology for significant enhanced oil recovery and long-term sequestration, WP6: Planning Study for $CO_2$ Oil Diversion and Sequestration Development,* Key Member

Aug 2024 – May 2025 **China National Nuclear Corporation**
*Methodological research on carbon emission accounting for the nuclear energy industry chain,* Key Member

Mar 2023 – Jun 2026 **DG-CLIMA Project, European Commission**
*Enhanced sharing of good practices on greenhouse gas emissions modelling between EU and Asian countries (COMMITTED),* Key Member

Jan 2023 – Oct 2025 **Key Research Base for Humanities and Social Sciences Major Project, Ministry of Education (MOE)**
*Research on Electricity Transition Pathways and Policies under the Carbon Neutral Vision 2060,* Key Member

Jun 2021 – Jun 2023 **World Bank Group Project**
*Green China: Towards Cleaner and More Sustainable Growth,* Key Member

Mar 2019 – Feb 2022 **International Cooperation and Exchange Project, National Natural Science Foundation of China (NSFC)**
*Socio-Techno-Economic Pathways for sustainable Urban energy development (STEP-UP),* Key Member

Jan 2019 – Dec 2023 **Horizon 2020, European Commission**
*Exploring National and Global Actions to reduce Greenhouse gas Emissions (ENGAGE),* Key Member

Jan 2019 – Dec 2021 **National Key Research and Development Program, Ministry of Science and Technology of China (MOST)**
*Research on Global Governance and Domestic Responses to Climate Change Risks, WP6: Simulation of synergistic governance pathways to address climate change and the economy, society and environment in China,* Key Member

Jan 2018 – Dec 2021 **International Cooperation and Exchange Project, National Natural Science Foundation of China (NSFC)**
*Multi-model innovations in Integrated Assessment Modelling of Global, Chinese, and Irish energy-economy-environment-climate systems investigating deep decarbonization pathways from the Paris Agreement to the United Nations sustainable development goals (CHIMERA),* Key Member

Jan 2017 – Dec 2021 **Major Program, National Natural Science Foundation of China (NSFC)**

*Research on Green and Low-carbon Economy Transformation Management and Policy, WP4: Study on international climate governance and cooperation mechanisms,* Key Member

Sep 2015 – Sep 2019 **Horizon 2020, European Commission**
*Linking Climate and Development Policies-Leveraging International Networks and Knowledge Sharing (CD-LINKS),* Key Member

## Research Publications

### Journal Articles

1 Dong, H.*, Zhang, T., Geng, Y., Wang, P., **Zhang, S.**, and Sarkis, J. (2025). Sub-technology market share strongly affects critical material constraints in power system transitions. *Nature Communications* 16, 1285, https://doi.org/10.1038/s41467-025-56592-5.

2 Chen, W.*, **Zhang, S.**, Zhang, Q., Ren, J., and Ding, Q. (2025). Assessing China's province-coordinated power system carbon-neutral transition pathway. *Journal of Energy and Climate Change* 1, 1–15, https://doi.org/10.3724/j.issn.2097-4981.JECC-2024-0022. (In Chinese)

3 Zhang, Q., **Zhang, S.**, and Chen, W.* (2024). Provincial pathways to carbon-neutral energy systems in China considering interprovincial electricity transmission development. *Applied Energy* 375, 123953, https://doi.org/10.1016/j.apenergy.2024.123953.

4 **Zhang, S.**, Chen, W.*, Zhang, Q., Krey, V.*, Byers, E., Rafaj, P., Nguyen, B., Awais, M., and Riahi, K. (2024). Targeting net-zero emissions while advancing other sustainable development goals in China. *Nature Sustainability* 7, 1107–1119, https://doi.org/10.1038/s41893-024-01400-z. (**ESI Highly Cited Paper, ESI Hot Paper, Featured paper**)

5 Tang, H., Chen, W.*, **Zhang, S.**, and Zhang, Q. (2023). China's multi-sector-shared CCUS networks in a carbon-neutral vision. *iScience* 26, 106347, https://doi.org/10.1016/j.isci.2023.106347.

6 Shao, T., Pan, X.*, Li, X., Zhou, S., **Zhang, S.**, and Chen, W. (2022). China's industrial decarbonization in the context of carbon neutrality: A sub-sectoral analysis based on integrated modelling. *Renewable and Sustainable Energy Reviews* 170, 112992, https://doi.org/10.1016/j.rser.2022.112992.

7 **Zhang, S.**, and Chen, W.* (2022). China's Energy Transition Pathway in a Carbon Neutral Vision. *Engineering* 14, 64–76, https://doi.org/10.1016/j.eng.2021.09.004. (**ESI Highly Cited Paper, ESI Hot Paper**)

8 **Zhang, S.**, and Chen, W.* (2022). Assessing the energy transition in China towards carbon neutrality with a probabilistic framework. *Nature Communications* 13, 87, https://doi.org/10.1038/s41467-021-27671-0. (**ESI Highly Cited Paper, ESI Hot Paper**)

9 Tang, H., **Zhang, S.**, and Chen, W.* (2021). Assessing Representative CCUS Layouts for China's Power Sector toward Carbon Neutrality. *Environmental Science & Technology*. 55, 11225–11235, https://doi.org/10.1021/acs.est.1c03401.

10 **Zhang, S.**, Wang, Y.*, Zhang, Y., Wang, D., and Zhang, N. (2020). Load probability density forecasting by transforming and combining quantile forecasts. *Applied Energy* 277, 115600, https://doi.org/10.1016/j.apenergy.2020.115600.

### Conference Proceedings

1 **Zhang, S.**, and Chen, W.* (2020). Modeling the Rapid Development of Electric Vehicles and Energy Storage Technology Under China Carbon Neutral Scenario Based on China-TIMES Model. In J. Yan, ed. *Proceedings of 12th International Conference on Applied Energy*. https://doi.org/10.46855/energy-proceedings-7202

**Working Papers**

1 **Zhang, S.**, and Chen, W.* (2025). Exploring the feasible net-zero transition pathway in China considering energy system flexibility. *Nature Communications*. (In Peer Review)

2 **Zhang, S.**, and Chen, W.* (2025). Probabilistic scenarios reveal the impacts of China's energy system net-zero transition on the water-energy-food nexus. *Environmental Science & Technology*. (In Peer Review)

3 Ding, Q., Ren, J., **Zhang, S.**, and Chen, W.* (2025). The Role of Shared Autonomous Electric Vehicles in Decarbonizing China's Passenger Transport Sector. *Applied Energy*. (In Peer Review)

4 Lyu, J., **Zhang, S.**, Chen, W.* (2025). The Development Process of CCUS in China Towards Carbon Neutrality: Insights from International Experience. *Climate Change Research*. (In Peer Review, In Chinese)

## Professional Service

Editorial roles
- Energy and Climate Management – Editor

Journal Reviewer
- Nature Climate Change, Renewable & Sustainable Energy Reviews, Applied Energy, Progress in Energy, Communications Earth & Environment, npj Climate Action, Climatic Change, Journal of Cleaner Production

Scientific Report
- Fifth National Assessment Report on Climate Change (In charge of Volume 3 Chapter 2), Ministry of Science and Technology of China (MOST), Lead Author (In Progress)
- Synthesis Report 2022 on China's Carbon Neutrality: Electrification in China's Carbon Neutrality Pathways, Energy Foundation China, Lead Author