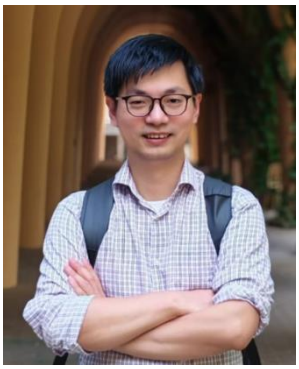
Peng Wang



Full Professor

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Brief Statement

My research lies at the intersection of Artificial Intelligence, Circular Economy, and Climate Change (AICC), primarily working at promoting the AI of strategic resource (e.g., lithium, cobalt, rare earths, sand, plastics, and other) for global low-carbon and digital transition.

As the first and corresponding author, I have published over 50 peer-reviewed papers including those in prestigious journals like *Nature Energy*, *Nature Computational Science*, *Nature Geoscience(2)*, *One Earth(2)*, *Nature Communications(2)*, etc. My research has garnered international recognition as one of Stanford/ Elsevier's Top 2% Scientist (2023/2024) and have been featured in the New York Times, ABC, Washington Post, DW, and over 100 media outlets worldwide.

I have been serving as an associate editor for the *Journal of Cleaner Production*, the board member for *Science of the Total Environment*, and further contributed to the global governance of material systems, including a board member of International Round Table of Material Criticality (IRTC), invited participation in Wilton Park Conference on critical minerals, IRP Financing Minerals Research Group of UNEP, and serves as an expert group member for the Intergovernmental Negotiating Committee (INC-2/3/4/5) of UNEP, focusing on the development of a global plastic treaty.

The key research interests are listed as follows:

- Artificial intelligence for strategic resource sustainability
- Circular economy of renewable waste (battery, PV, wind power, etc.)
- Industrial ecology (specialising in material flow analysis, life cycle assessment, and geospatial analysis)

Education Experience

2014/06-2019/01	**UNSW (University of New South Wales), Sydney, Australia** Doctor of Philosophy, Manufacturing Engineering and Management
2007/09-2014/03	**USTB (University of Science and Technology Beijing), China** BSc/MSc in Energy System Engineering

Professional Experience

2023/01-now	**Professor** Institute of Urban Environment, Chinese Academy of Sciences
2024/11-2024/12	**FEIT visiting professor fellowship** Department of Mechanical Engineering, the University of Melbourne
2022/01-2022/11	**Associate Professor** Institute of Urban Environment, Chinese Academy of Sciences
2019/01-2021/12	**Assistant Professor (funded by CAS-level project)** Institute of Urban Environment, Chinese Academy of Sciences
2018/06-2018/12	**Postdoc Fellow (funded by UNSW writing fellowship)** Sustainability in Manufacturing and Life Cycle Engineering Group, UNSW
2017/05-2017/08	**Visiting Researcher**

Professional Services

- Associate editor of ***Journal of Cleaner Production***, 2023/12-present
- Editorial board of ***Science of the Total Environment***, 2020/12—present
- Special Issue Editor of ***Resources Conservation and Recycling***, 2019/12-2020/06
  Critical Material Management for Sustainable Transition (with Keisuke Nansai, Roderick Eggert, Mohan Yellishetty, Rene Kleijn)
- Academic board member of ***IRTC -International Round Table of Material Criticality,*** 2022/01-present
- Invited participator of ***Wilton Park Conference on Critical minerals***, 2023/03
  Hosted by UK Cabinet Office, Foreign Commonwealth & Development Office, Department for Energy Security& Net Zero
- Sustainability Advisor Member of ***REIA-The Global Rare Earth Industry Association***, 2021/09-present
- Intergovernmental Observer of **Intergovernmental Negotiating Committee (INC)** on Plastic Pollution
- China Youth Consultation of **UNDP Stockholm+50 Stakeholder Consultation**, 2022/06

Invited Reviewer

Journals: Nature, Nature Climate Change, PNAS, One Earth, ES&T, Resources Conservation and Recycling, Journal of Cleaner Production, Journal of Industrial Ecology, Applied Energy, Sustainable Production and Consumption, Renewable and Sustainable Energy Reviews, etc.

Grants: French LE STUDIUM Loire Valley Institute, National Natural Science Foundation of China, Macao Science and Technology Development Fund, etc.

Grants

• Digital Twin for urban battery waste mapping and management, funded by MOHRSS	PI, 2023/11-2024/12
• Urban mining of critical metals for low-carbon transition, funded by CAS talents program	PI, 2023/11-2025/12
• Modelling global material flows of rare earth elements and their future changes, funded by NSFC	PI, 2023/01-2025/12
• Urban mining potentials of critical metals and their recycling pathways planning, funded by IUE CAS	PI, 2023/01-2025/12
• Exploring the metal-energy nexus and management strategies with the focus on battery critical metals, funded by NSFC	PI, 2020/01-2022/12
• Sustainable metal cycles and their environmental impacts, funded by CAS young research support program	PI, 2020/01-2022/12
• Metal system and their environmental impacts, funded by CAST project	2021/10-2023/12

With other 9 projects serving as CI (over 1000,000 RMB)

Course &Teaching

- Industry ecology and life cycle engineering (Online course with recorded materials, over 100 students intake)
- Frontier in environmental system engineering (University of science and technology China, at undergraduate level)
- Advances in academic writing (IUE course for postgraduate students)

Research Students

I have acted as co-supervisor for PhD students from Peking University (Yuyao Yang, Haotong Tian, QianYou Sun), Wuhan university (Keyi Rao, Chang Wu), University of Melbourne (Haiwei Zhou), USTC (Wei Chen), University of Nottingham Ningbo China (Zipeng Lin) with other 12 master/visiting students and research staff.

Featured Publications (as co-/-first and corresponding author)

1) **Wang, P.**, Yang, Y.Y., Heidrich, O., Chen, L.Y., Chen, L.H., Fishman, T. and Chen, W.Q., 2024. Regional rare-earth element supply and demand balanced with circular economy strategies. ***Nature Geoscience,*** 17(1), 94-102.

   Featured as journal cover and cited by two editorial papers in Nature Geoscience (link1, link2)

2) **Wang, P.**, Zhang, L.Y., Tzachor, A., and Chen, W.Q., 2024. E-waste Challenges of Generative Artificial Intelligence. ***Nature Computational Science****. 4, 818–823.*

   Reported by Washington Post, DW, Scientific American, ABC, etc. ranked as 2 of 708 of this journal (Altmetric)

3) Liu B, **Wang, P.***, Zhou J., Guo Y., Ma S., Chen W.Q., Li J.S. & Chang V. W.-C. Refocusing on effectiveness over expansion in urban waste–energy–carbon development in China. ***Nature Energy***. 2024.

4) **Wang, P.**, Ryberg, M., Yang, Y., Feng, K., Kara, S., Hauschild, M. and Chen, W.Q., 2021. Efficiency stagnation in global steel production urges joint supply-and demand-side mitigation efforts. ***Nature Communications***, 12(1), 2066.

5) Wang, H., **Wang, P**., Zhang, X., Chen, W.Q., Tzachor, A., Fishman, T., Schandl, H., Acuto, M., Yang, Y., Lu, Y. and Böcher, C., 2024. Substantial increase in China's manufactured sand supply since 2010. ***Nature Geoscience***. 17, 833–836

6) Zhou, H., Yang, Y., Li, W., McKechnie, J., Thiede, S. and **Wang, P.**, EU's recycled content targets of lithium-ion batteries are likely to compromise critical metal circularity. ***One Earth,*** 2024, 7(7), 1288-1300.

7) Chen, W.Q., Eckelman, M.J., Sprecher, B., Chen, W. and **Wang, P.**, 2024. Interdependence in rare earth element supply between China and the United States helps stabilize global supply chains. ***One Earth***, 7(2), 242-252.

8) **Wang, P.**, Wang, C., Li, J., Hubacek, K., Sun, L., Yang, F., Feng, K. and Chen, W.Q., 2024. Incorporating platinum circular economy into China's hydrogen pathways toward carbon neutrality. ***PNAS nexus***, 3(5), 172.

9) Wang, H., Feng, K., **Wang, P.,** Yang, Y., Sun, L., Yang, F., Chen, W.Q., Zhang, Y. and Li, J., 2023. China's electric vehicle and climate ambitions jeopardized by surging critical material prices. ***Nature Communications***, 14(1), 1246.

10) **Wang, P.**, Wang, H., Chen, W.Q. and Pauliuk, S., 2022. Carbon neutrality needs a circular metal-energy nexus. ***Fundamental Research***, 2(3), 392-395.

Other Publications (More in Google scholar)

11) Peng, K., Feng, K., Chen, B., Shan, Y., Zhang, N., **Wang, P.**, Fang, K., Bai, Y., Zou, X., Wei, W. and Geng, X., 2023. The global power sector's low-carbon transition may enhance sustainable development goal achievement. ***Nature Communications,*** 14(1), 3144.

12) Fu, R., Peng, K., **Wang, P.***, Zhong, H., Chen, B., Zhang, P., Zhang, Y., Chen, D., Liu, X., Feng, K.* and Li, J.*, 2023. Tracing metal footprints via global renewable power value chains. ***Nature Communications***, 14(1), 3703.

13) Li, J., Peng, K., **Wang, P.**, Zhang, N., Feng, K., Guan, D., Meng, J., Wei, W. and Yang, Q., 2020. Critical rare-earth elements mismatch global wind-power ambitions. ***One Earth,*** 3(1), 116-125.

14) Li, S., **Wang, P**., Zhang, Q., Li, J., Cao, Z., Li, W. and Chen, W.Q., 2025. Monitoring China's solar power plant in-use stocks and material recycling potentials using multi-source geographical data. ***Resources, Conservation and Recycling***, 212, 107920.

15) Cui, D., Bi, Z., Wang, Y., Gu, Y., Wang, H., Gao, X., **Wang, P.**, Sun, X. and Chen, W.Q., 2024. Scenario analysis of waste tires from China's vehicles future. ***Journal of Cleaner Production***, 478, 143940.

16) Wang, C., Song, J., Nunes, L.M., Zhao, H., **Wang, P.**, Liang, Z., Arp, H.P.H., Li, G. and Xing, B., 2024. Global microplastic fiber pollution from domestic laundry. ***Journal of Hazardous Materials***, 477, 135290.

17) Yang, J., Duan, L., Peng, S., Heijungs, R., Geng, X., **Wang, P.**, Chen, W.Q. and Yang, Y., 2024. Toward More Realistic Estimates of Product Displacement in Life Cycle Assessment. ***Environmental Science & Technology***, 58(37), 16237-16247.

18) Bai, R., Cai, G., Chen, X., Nie, S., Zhou, Z., Gao, L. and **Wang, P**., 2024. Enriching wind power utility through offshore wind-hydrogen-chemicals nexus: Feasible routes and their economic performance. ***Journal of Cleaner Production***, 476, 143732.

19) Hou, L., Fishman, T., Wang, R., Tzachor, A., Wang, H., **Wang, P.**, Chen, W.Q. and van der Voet, E., 2024. A Comprehensive Accounting of Construction Materials in Belt and Road Initiative Projects. ***Environmental Science & Technology*****.** 58, 15575-15586.

20) Feng, Y., **Wang, P.,** Li, W., Zhang, Q., Chen, W.Q. and Feng, D., 2024. Environmental impacts of lithium supply chains from Australia to China. ***Environmental Research Letters***, 19(9), 094035.

21) Zhao, S., **Wang, P.,** Wang, L. and Chen, W.Q., 2024. Quantifying provincial in-use stocks of rare earth to identify urban mining potentials in the Chinese mainland. ***Journal of Cleaner Production***, 453, 142251.

22) Zhao, S., **Wang, P**. and Chen, W.Q., 2024. Refining material criticality for global circular, low-carbon and just transition. ***Resources, Conservation and Recycling***, 208, 107708.

23) Yuan, P., Li, D., Feng, K., Wang, H., **Wang, P**. and Li, J., 2024. Assessing the supply risks of critical metals in China's low-carbon energy transition. ***Global Environmental Change***, 86, 102825.

24) Dai, T., Liu, Y.F., **Wang, P.,** Qiu, Y., Mancheri, N., Chen, W., Liu, J.X., Chen, W.Q., Wang, H. and Wang, A.J., 2023. Unlocking Dysprosium Constraints for China's 1.5 C Climate Target. ***Environmental Science & Technology***, 57(38), 14113-14126.

25) Yuan, P., Li, D., Feng, K., Wang, H., **Wang, P.** and Li, J., 2024. Assessing the supply risks of critical metals in China's low-carbon energy transition. ***Global Environmental Change***, 86, 102825.

26) Yuan, P., Li, D., Feng, K., Wang, H., **Wang, P.** and Li, J., 2024. Assessing the supply risks of critical metals in China's low-carbon energy transition. ***Global Environmental Change***, 86, 102825.

27) Ma, Z., Yang, Y., Chen, W.Q., **Wang, P.**, Wang, C., Zhang, C. and Gan, J., 2021. Material flow patterns of the global waste paper trade and potential impacts of China's import ban. ***Environmental Science & Technology***, 55(13),8492-8501.

28) Yang, X., Zhang, C., Li, X., Cao, Z., **Wang, P.**, Wang, H., Liu, G., Xia, Z., Zhu, D. and Chen, W.Q., 2024. Multinational dynamic steel cycle analysis reveals sequential decoupling between material use and economic growth. ***Ecological Economics***, 217, 108092.

29) Chen, W., **Wang, P.,** Meng, F., Pehlken, A., Wang, Q.C. and Chen, W.Q., 2024. Reshaping Heavy Rare Earth Supply Chains Amidst China's Stringent Environmental Regulations. ***Fundamental Research***.

30) Ji, G., Zhong, H., Nzudie, H.L.F., **Wang, P.** and Tian, P., 2024. The structure, dynamics, and vulnerability of the global food trade network. J***ournal of Cleaner Production***, 434, 140439.

31) Liu, Y.F., **Wang, P.**, Feng, D.Y., Liu, X., Han, Z., Dai, T., Zhang, S.T. and Chen, W.Q., 2024. Illustrating China's journey to balance, circular, and secure potassium cycles in the last three decades. ***Resources, Conservation and Recycling***, 202, 107378.

32) Zhao, S., **Wang, P.**, Chen, W., Wang, L., Wang, Q.C. and Chen, W.Q., 2023. Supply and demand conflicts of critical heavy rare earth element: Lessons from gadolinium. ***Resources, Conservation and Recycling***, 199, 107254.

33) Wang, Y., Ma, F., Tzachor, A., **Wang, P.,** Wang, H., Lyu, J., Yue, Q., Du, T., Chen, W.Q. and Liang, S., 2023. Quantifying economic sectoral iron commodity use and related vulnerability in China's supply chains. ***Resources, Conservation and Recycling***, 198, 107150.

34) Zhong, Q., Zhang, Z., Wang, H., Zhang, X., Wang, Y., **Wang, P.**, Ma, F., Yue, Q., Du, T., Chen, W.Q. and Liang, S., 2023. Incorporating scarcity into footprints reveals diverse supply chain hotspots for global fossil fuel management. ***Applied Energy***, 349, 121692.

35) Wang, Y., Wang, H., **Wang, P.**, Zhang, X., Zhang, Z., Zhong, Q., Ma, F., Yue, Q., Chen, W.Q., Du, T. and Liang, S., 2023. Cascading impacts of global metal mining on climate change and human health caused by COVID-19 pandemic. ***Resources, Conservation and Recycling,*** 190, 106800.

36) Hu, X., Sun, B., Wang, C., Lim, M.K., **Wang, P.**, Geng, X., Yao, C. and Chen, W.Q., 2023. Impacts of China's exports decline in rare earth primary materials from a trade network-based perspective. ***Resources Policy***, 81, 103321.

37) Hu, X., Wang, C., Lim, M.K., Chen, W.Q., Teng, L., **Wang, P.**, Wang, H., Zhang, C., Yao, C. and Ghadimi, P., 2023. Critical systemic risk sources in global lithium-ion battery supply networks: Static and dynamic network perspectives. ***Renewable and Sustainable Energy Reviews***, 173, 113083.

38) Hao, M., Tang, L., **Wang, P.**, Wang, H., Wang, Q.C., Dai, T. and Chen, W.Q., 2023. Mapping China's copper cycle from 1950–2015: Role of international trade and secondary resources. ***Resources, Conservation and Recycling***, 188, 106700.

39) **Wang, P.,** Chen, W.Q., Cui, X., Li, J., Li, W., Wang, C., Cai, W. and Geng, X., 2022. Critical mineral constraints in global renewable scenarios under 1.5 C target. ***Environmental Research Letters***, 17(12), 125004.

40) Tang, L., **Wang, P.,** Ma, Z., Pauliuk, S., Chen, W.Q., Dai, T. and Lin, Z., 2023. Exploring the global trade networks of the tungsten supply chain: Insights into the physical and monetary mismatch among countries. ***Journal of Industrial Ecology***, 27(1), 323-335.

41) Wang, Q.C., **Wang, P.,** Qiu, Y., Dai, T. and Chen, W.Q., 2020. Byproduct surplus: Lighting the depreciative europium in China's rare earth boom. ***Environmental Science & Technology*,** 54(22), 14686-14693.

42) **Sun, N.**, Wang, P., Jian, X., Hao, M., Yan, X. and Chen, W.Q., 2022. Material Flow analysis of plastics from provincial household appliances in China: 1978–2016. ***Waste Management***, 153, 156-166.

43) Chen, W.Q., Wang, H., Li, N. and **Wang, P.**, 2022. Advancing UN Comtrade for physical trade flow analysis. ***Resources, Conservation and Recycling,*** 186, 106520.

44) Ma, F., Wang, H., Schandl, H., Fishman, T., Tan, X., Li, Y., Shi, L., **Wang, P.** and Chen, W.Q., 2022. Exploring the relationship between economic complexity and resource efficiency. ***Resources, Conservation and Recycling***, 186, 106530.

45) Lin, L., Feng, K., **Wang, P.**, Wan, Z., Kong, X. and Li, J., 2022. Hazardous waste from the global shipbreaking industry: Historical inventory and future pathways. ***Global Environmental Change***, 76, 102581.

46) Wang, Q.C., Chen, W.Q., Wang, P. and Dai, T., 2022. Illustrating the supply chain of dysprosium in China through material flow analysis. ***Resources, Conservation and Recycling***, 184, 106417.

47) Zhang, T., Zhang, P., Peng, K., Feng, K., Fang, P., Chen, W., Zhang, N., **Wang, P.** and Li, J., 2022. Allocating environmental costs of China's rare earth production to global consumption. ***Science of The Total Environment,*** 831, 154934.

48) **Wang, P.**, Zhao, S., Dai, T., Peng, K., Zhang, Q., Li, J. and Chen, W.Q., 2022. Regional disparities in steel production and restrictions to progress on global decarbonization: A cross-national analysis. ***Renewable and Sustainable Energy Reviews***, 161, 112367.

49) Jian, X., **Wang, P.**, Sun, N., Xu, W., Liu, L., Ma, Y. and Chen, W.Q., 2022. Material flow analysis of China's five commodity plastics urges radical waste infrastructure improvement. ***Environmental Research: Infrastructure and Sustainability***, 2(2), 025002.

50) Sun, Y., Liu, S., **Wang, P.**, Jian, X., Liao, X. and Chen, W.Q., 2022. China's roadmap to plastic waste management and associated economic costs. ***Journal of Environmental Management***, 309, 114686.

51) Lin, L., Feng, K., Wan, Z., **Wang, P.**, Kong, X., Zhang, N., Hubacek, K. and Li, J., 2022. Unexpected side effects of the EU Ship Recycling Regulation call for global cooperation on greening the shipbreaking industry. ***Environmental Research Letters***, 17(4), 044024.

52) Kong, X., Feng, K., **Wang, P.,** Wan, Z., Lin, L., Zhang, N. and Li, J., 2022. Steel stocks and flows of global merchant fleets as material base of international trade from 1980 to 2050. *Global Environmental Change*, 73, 102493.

53) Li, F.Q., **Wang, P.**, Chen, W., Chen, W.Q., Wen, B.J. and Dai, T., 2022. Exploring recycling potential of rare, scarce, and scattered metals: Present status and future directions. *Sustainable Production and Consumption*, 30, 988-1000.

54) Wang, C., Feng, K., Liu, X., **Wang, P.**, Chen, W.Q. and Li, J., 2022. Looming challenge of photovoltaic waste under China's solar ambition: A spatial–temporal assessment. ***Applied Energy,*** 307, 118186.

55) Shen, J., Zhang, Q., Xu, L., Tian, S. and **Wang, P.**, 2021. Future CO2 emission trends and radical decarbonization path of iron and steel industry in China. ***Journal of Cleaner Production***, 326, 129354.

56) Ding, Y., Geng, X., **Wang, P.** and Chen, W.Q., 2021. How material stocks sustain economic growth: evidence from provincial steel use in China. ***Resources, Conservation and Recycling***, 171, 105635.

57) Ren, K., Tang, X., **Wang, P.,** Willerström, J. and Höök, M., 2021. Bridging energy and metal sustainability: insights from China's wind power development up to 2050. ***Energy***, 227, 120524.

58) Ma, Z., Yang, Y., Chen, W.Q., **Wang, P.**, Wang, C., Zhang, C. and Gan, J., 2021. Material flow patterns of the global waste paper trade and potential impacts of China's import ban. ***Environmental Science & Technology***, 55(13), 8492-8501.

59) Ma, Z., Ryberg, M.W., **Wang, P.**, Tang, L. and Chen, W.Q., 2020. China's import of waste PET bottles benefited global plastic circularity and environmental performance. ***ACS Sustainable Chemistry & Engineering***, 8(45), 16861-16868.

60) Wang, L., Wang, P., Chen, W.Q., Wang, Q.Q. and Lu, H.S., 2020. Environmental impacts of scandium oxide production from rare earths tailings of Bayan Obo Mine. ***Journal of cleaner production,*** 270, 122464.

61) Song, L., Wang, P., Xiang, K. and Chen, W.Q., 2020. Regional disparities in decoupling economic growth and steel stocks: Forty years of provincial evidence in China. ***Journal of Environmental Management,*** 271, 111035.

62) Huang, C.L., Xu, M., Cui, S., Li, Z., Fang, H. and **Wang, P.**, 2020. Copper-induced ripple effects by the expanding electric vehicle fleet: A crisis or an opportunity. ***Resources, Conservation and Recycling***, 161, p.104861.

63) Wang, Q.C., **Wang, P.,** Qiu, Y., Dai, T. and Chen, W.Q., 2020. Byproduct surplus: Lighting the depreciative europium in China's rare earth boom. ***Environmental Science & Technology,*** 54(22), 14686-14693.

64) Liu, L., Yin, Z., **Wang, P.,** Gan, Y. and Liao, X., 2020. Water-carbon trade-off for inter-provincial electricity transmissions in China. ***Journal of Environmental Management***, 268, 110719.

65) Song, L., **Wang, P**., Hao, M., Dai, M., Xiang, K., Li, N. and Chen, W.Q., 2020. Mapping provincial steel stocks and flows in China: 1978–2050. *Journal of Cleaner Production*, 262, 121393.

66) Tang, L., Wang, P., Graedel, T.E., Pauliuk, S., Xiang, K., Ren, Y. and Chen, W.Q., 2020. Refining the understanding of China's tungsten dominance with dynamic material cycle analysis. ***Resources, Conservation and Recycling,*** 158, 104829.

67) **Wang, P.**, Chen, L.Y., Ge, J.P., Cai, W. and Chen, W.Q., 2019. Incorporating critical material cycles into metal-energy nexus of China's 2050 renewable transition. ***Applied Energy***, 253, 113612.

68) **Wang, P.,** Li, W. and Kara, S., 2017. Cradle-to-cradle modeling of the future steel flow in China. ***Resources, Conservation and Recycling***, 117, pp.45-57.

69) **Wang, P.,** Kara, S. and Hauschild, M.Z., 2018. Role of manufacturing towards achieving circular economy: the steel case***. CIRP Annals***, 67(1), 21-24.

70) **Wang, P.**, Jiang, Z., Geng, X., Hao, S. and Zhang, X., 2014. Quantification of Chinese steel cycle flow: Historical status and future options. ***Resources, Conservation and Recycling*****,** 87, 191-199.

etc.